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Alaska Department of
Environmental Conservation

Alaska Cruise Ship Initiative

Part 2 Report

(June 1, 2000 to July 1, 2001)

Forward

This report is prepared by the Alaska Department of Environmental Conservation on behalf of the Alaska Cruise Ship Initiative (ACSI). This ad hoc group and it's associated work groups were founded voluntarily to mutually identify, study and make advisory recommendations to the participants to improve cruise ship environmental performance in Alaska. Each member organization retains its authorities and responsibilities to act on matters related to the ACSI work. This effort was not designed to be a consensus process to limit each party's actions. However, except where indicated, much of the work performed under ACSI was in a cooperative atmosphere and resulted in a mutually beneficial experience.

Endorsements of the Part 2 Final Report - by each Steering Committee member, with individual comments, are attached to this document as part of the final report.

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INTRODUCTION

The cruise ship industry is not new to Alaska; however its operations and scale have grown significantly. Today's vessels bring a floating population that exceeds the size of many of Alaska's smaller communities. Wastewater treatment technology for cruise ships was developed decades ago. International law requirements do not adequately take into account the unique environments in Alaska.

In the late 1990's, one cruise line was convicted of illegally dumping dry cleaning fluids, photo processing chemicals and oil in Alaska waters. Also, in 1994 one cruise line pled guilty to discharging untreated bilge water. Realizations that these types of activities had occurred led to heightened concern about exactly what cruise ships are discharging and what standards they are required to maintain.

Therefore in December 1999, Alaska Department of Environmental Conservation (ADEC) Commissioner Michele Brown convened a forum to thoroughly review the cruise industry's waste management and disposal practices in Alaska, and to discuss what is and/or should be done to improve the situation. The ADEC asked the U.S. Coast Guard (USCG), the U.S. Environmental Protection Agency (EPA), and the Southeast Conference (a group representing Southeast Alaska communities) to join industry representatives and local concerned citizens in a public discussion. This initial effort, along with subsequent follow-on work has become known as the Alaska Cruise Ship Initiative (ACSI).

Under ACSI, four work groups were chartered to undertake fact finding on air emissions, wastewater discharges and waste disposal management, oil spill prevention and response, and environmental leadership. The specific mandate was to:

- Identify the waste streams and spill risks that could impact Alaska's air and water resources.
- Develop pollution prevention and waste management solutions that will eliminate or reduce impacts, including better technology, management practices and shoreside capacity.
- Assess what process is needed to verify and monitor compliance.
- Keep Alaskans informed.

The work groups' accomplishments through May 2000 were presented in "The Alaska Cruise Ship Initiative Part 1, Final Report" and are summarized below:

- Development of a plan for random, third party wastewater analysis of all cruise ships.
- Development of a plan for air monitoring in downtown Juneau.
- A survey of waste stream discharges and solid waste handling practices for all cruise ships operating in Alaska.
- Identification of proposals and pilot projects from industry for a number of new technologies.
- Approved maintenance and operation plans for eight new oil spill recovery barges, and regional priorities for the purchase of additional spill response equipment.

During the 2000 season, large cruise lines voluntarily restricted where they discharged wastewater. The cruise lines agreed to no discharges of untreated blackwater anywhere in the Alexander Archipelago, including areas that are technically outside territorial waters; also, no discharge of graywater or treated blackwater while in port anywhere in Alaska. Additionally, discharges did not occur within 10 nautical miles of the ships last and next ports of call. In the future, large cruise ships will be required to maintain a minimum speed of six knots and keep a distance of at least one mile from shore during discharges, unless specific protective treatment can be achieved under the new state and federal laws.

This report (Alaska Cruise Ship Initiative 2000 Season: Part 2 Report) presents the information gathered by the work groups since May 2000 through June 30, 2001, interprets the information and makes

recommendations on what next steps should be taken. Work group minutes, previous reports, other fact sheets and handouts are available and downloadable from the ADEC Cruise Ship web pages at http://www.state.ak.us/local/akpages/ENV.CONSERV/press/cruise/cruise.htm.

EXECUTIVE SUMMARY

In response to growing concerns about the emissions and disposal practices of the growing cruise industry, Alaska Department of Environmental Conservation Commissioner Michele Brown convened a public forum to thoroughly review the industry's waste management and disposal practices. Four work groups were chartered to undertake fact finding on air emissions, wastewater discharges, waste disposal practices, oil spill prevention and response, and environmental leadership. The effort has become known as the Alaska Cruise Ship Initiative (ACSI).

The ACSI's Part 1 Report summarized the planning steps taken to determine sampling and monitoring protocols. This report, ACSI Report Part 2, presents the results and recommendations.

Ambient air monitoring for particulates, sulfur dioxide (SO_2) and carbon dioxide (CO_2) was conducted to determine if pollution levels were approaching or exceeding health based standards regardless of the source. Particulates, SO_2, and CO_2 are common constituents of petroleum combustion found in emissions from cruise ships, buses, automobiles and fuel oil used to heat homes and business. Monitoring was conducted during the cooler and wetter portion of Juneau's summer - August 14th through September 30, 2000. The highest readings were well below state and federal health based standards. While it is not anticipated that health based standards would be exceeded in the drier, warmer portion of the summer; the work group made the recommendation that a full year of ambient air monitoring would be valuable in determining existing impacts to Juneau's air quality. Additionally this will establish a baseline from which changes can be gauged. The cruise industry has agreed to fund six months of that study, with an option to extend to a full year.

The state has prescribed standards for the opacity of visible emissions from any vessel. Over the past 10 years, the state opacity-monitoring program was eliminated as budgets were reduced. Funding from a cruise ship enforcement settlement is being used for a 5-year opacity-monitoring project and therefore is not a part of the ACSI work group process. However, the results are discussed in this report to provide additional information in understanding the impacts of cruise ships. Thirty-four of the 240 (14%) opacity readings exceeded the standard and 20 ships were cited for violations of the state standard. Opacity monitoring will continue for four more seasons.

The wastewater of 21 large cruise ships was sampled for priority pollutants and for the common parameters used to assess the level of sewage treatment. Priority pollutants are a list of 126 toxic compounds used to determine if hazardous chemicals are being mixed with discharges. There was no evidence of hazardous wastes being mixed with overboard discharges.

Blackwater (sewage or toilet water) and graywater (from sinks, showers, laundries and galleys) were sampled to determine if there was reason to be concerned that discharges could adversely impact the waters of the state. Blackwater is required to be treated in a Coast Guard Certified Marine Sanitation Device (MSD). Graywater can be discharged overboard at any time without treatment as it is presumed to be less harmful than blackwater. Sampling found that the marine sanitation devices (MSDs) currently being used on the cruise ships were found to be incapable of treating the sewage to the level that the manufacturers claim and the Coast Guard requires through their certification process. 60% of the blackwater samples exceeded the standard of 200 fecal coliforms per 100 ml. More than 75% of the graywater samples exceeded the level required for treated sewage. Only one sample from one MSD met the standard for both fecal coliform and total suspended solids.

The Environmental Leadership Work Group sponsored Cruise Ship Awareness Days with public tours of cruise ships' waste management systems as well as a public discussion. It is anticipated that more attention will be paid to environmental leadership issues once compliance issues are resolved.

The Oil Spill Work Group completed the management plan for the four barges and response equipment provided by the Northwest Cruise Ship Association. Future work on spill issues will be carried out by the

Southeast Alaska Subarea Contingency Plan Committee and will include development of geographic response areas and identification and standardization of response resources and tactics.

The Cruise Ship industry has been investing in new technology. Shoreside power will be available for the Princess Ships in the 2001 season; gas turbines have been installed in two new ships coming to Alaska. New types of sewage treatment systems are being tested on various ships.

In December 2000, Title XIV -- Certain Alaskan Cruise Ship Operations -- was signed into law prohibiting the discharge of untreated sewage in the waters of Alaska. Blackwater must meet an effluent limit of 200 fecal coliform per 100 ml and total suspended solids of 150 mg/l. All discharges must occur while a ship is at least one mile from shore and proceeding at 6 knots, unless more stringent effluent levels are met.

The Alaska Legislature passed new cruise ship legislation in HB 260 that established a “Commercial Passenger Vessel Environmental Compliance Program” during a Special Legislative Session. The legislation was signed by Governor Tony Knowles, and is effective July 1, 2001.

REPORT OF THE AIR EMISSIONS WORK GROUP

The ACSI Air Emissions Work Group was tasked with gaining a better understanding of air pollutants emitted by cruise ships at the dock or at anchor (hoteling) in downtown Juneau. Specifically, the work group was tasked with understanding ground level impacts, determining if these emissions could be causing adverse public health or environmental impacts and if so, identifying ways to alleviate the impacts. The Air Emissions Work Group developed a plan to monitor ambient air quality in downtown Juneau (Alaska Cruise Ship Initiative, Part 1 Final Report available at the ADEC Cruise Ship web page).

ADEC and EPA conducted opacity monitoring to determine if visual stack emissions exceeded the state standards. Citizens from other communities have expressed concerns about the air quality in their community. It was determined that air impact analysis would start in Juneau. The need for future air assessments in other communities will be determined by the working group.

Ambient Air Monitoring

The ambient air-monitoring project was designed as an initial survey of air pollution levels in Juneau. The program was developed to determine if pollutant levels were approaching the state's health based standards for particulates and sulfur dioxide. It was not designed to determine exactly which sources were contributing to the monitored air pollution concentrations.

RTP Environmental Associates, Inc. (RTP), a contractor funded by the cruise industry, developed the monitoring and quality assurance plans for the summer 2000 monitoring effort. Once plans were approved by ADEC, RTP installed the monitors, conducted calibrations, routine site operations and prepared the project report titled *Northwest Cruise Ship Association and Alaska DEC Air Quality and Meteorological Monitoring Study.* As part of the project, ADEC contributed most of the monitoring equipment, reviewed and approved monitoring locations, assisted with field operations, reviewed reports and conducted monitoring site audits.

Three locations in downtown Juneau were chosen by ADEC and RTP as monitoring sites. They are listed below with rationale for their selection:

- Capitol School Park – used in a previous study and had no sources of air pollution outside of home heating and car exhaust.
- The roof of the Baranof Hotel – representative of uphill residences northwest through northeast of the hotel.
- 245 Marine Street across from the Marine Park bus stop – below the cruise ship's plumes, to measure the effect of traffic, buses, commercial activity, and space heating.

All three sites monitored fine particulates (PM2.5). In addition, the Capitol School Park site monitored for sulfur dioxide (SO_2), and the Baranof site monitored for SO_2 and oxides of nitrogen (NO_2). All of these chemicals are constituents of petroleum combustion from cruise ships, automobiles, buses, home and business heating, and are commonly found in the ambient air of Juneau. Monitoring was conducted from August 14 through September 30, 2000. Additionally, meteorological data (precipitation, wind speed and direction) was collected in downtown Juneau.

Tables 1 and 2 display the date and location of the two highest readings for each air monitoring station, as well as the ambient standard and the percent of the standard that was achieved.

Table 1: Two Highest SO_2 and NO_2 Monitoring Measurements by Location

	Date	Measurement (3 hour)	Standard (3 hour)	Percent of Standard
Capitol School SO_2	8/16/2000	41 ppb	500 ppb	8.30%
	8/13/2000	28 ppb	500 ppb	5.70%
Baranof Hotel SO_2	9/5/2000	52 ppb	500 ppb	10.50%
	8/16/2000	41 ppb	500 ppb	8.20%
Baranof Hotel NO_2	8/16/2000	44 ppb	No State Standards For NO_2	
	8/17/2000	44 ppb		

Table 2: Two Highest Particulate Readings at Each Monitoring Location

	Date	Measurement (2.5 micron filter/24 hour max)	Standard (2.5 micron filter/24 hour max)	Percent of Standard
Capitol School	8/24/2000	8.2 ug/m^3	65 ug/m^3	12.6 %
	8/18/2000	8.1 ug/m^3	65 ug/m^3	12.5 %
Baranof Hotel	9/21/2000	8.7 ug/m^3	65 ug/m^3	13.4 %
	8/24/2000	8.6 ug/m^3	65 ug/m^3	13.2 %
Marine Way	9/21/2000	10.0 ug/m^3	65 ug/m^3	15.4 %
	9/15/2000	7.4 ug/m^3	65 ug/m^3	11.4 %

The highest recorded pollutant levels were far below the state and federal health based standards as listed in 18 AAC 50.010. Because sampling occurred during the coolest and wettest portion of the summer, these results can not be directly translated to pollutant levels during the earlier, drier portion of the summer. However, since the monitored levels were significantly below the standard, it is not anticipated that state health based standards would have been exceeded.

The ACSI Air Emissions Work Group met in October and December 2000, January and April 2001 to discuss the results of the 2000 season monitoring and develop recommendations. The work group

recommended additional sampling be conducted during the early part of the 2001 cruise ship season, to determine ambient impacts during the warmer, drier portion of the summer. The Northwest Cruiseship Association (NWCA) awarded the Juneau Ambient Air Monitoring Contract to RTP, the same contractor as the previous year. Three monitoring sites were selected by the work group: Wickersham House, Marine Park, and a residence in the Highlands. The start date for air monitoring was May 18, 2001.

The work group decided that a year long ambient air monitoring study would be valuable in determining existing impacts on Juneau's air quality, as well as establishing an air monitoring baseline data set. The cruise industry is funding the first six months of the ambient air study with an option to extend to a full year.

Under direction of the work group, a technology committee developed a one-year plan to perform ambient air monitoring. The study was approved by the work group in January; subsequently, the cruise industry has hired a contractor to conduct the first six months of the study. Three monitoring sites have been selected by ADEC, the contractor, CBJ and community representatives.

Opacity Monitoring

Opacity is the visible emission from a smokestack. Opacity can not be used to measure public health impacts. However, the fact that cruise ships are emitting enough visible smoke to produce a haze over Juneau is of significant concern to local citizens and ADEC. The Alaska Marine Vessel Visible Emission Standard in 18 AAC 50.070 regulates opacity during a particular operating mode. The opacity standard allows for temporary excedences for maneuvering, so as not to compromise a vessel's ability to safely operate.

Opacity monitoring is conducted as part of a five-year project funded by Royal Caribbean's settlement agreement and is not part of the ACSI work group process. The opacity monitoring information gathered during the summer of 2000 is presented in this report as it contributes to a more complete picture of cruise ship impacts in Alaska.

Opacity is monitored by gauging the density of smokestack emissions. The well-established method of "reading smoke" and certifying 'smoke readers" is found in 40 C.F.R. 60 Appendix A, Method 9. The visible smoke emissions are "read" by having the reader positioned so the sun is at the reader's back. While "hoteling" (tied up at the dock or at anchor), the standard allows a ship to obscure 20% of the background when looking through the smoke plume against a background that contrasts the color of the smoke.

In the early 1990's ADEC routinely monitored the opacity of cruise ship emissions. As the department's budget shrank, this program was reduced to citizen complaint response. With funding from the settlement agreement, routine opacity monitoring began again in July and continued through September 2000 in Juneau, Ketchikan, Haines, and Skagway. EPA conducted limited opacity monitoring in June 2000, in response to numerous citizen complaints. The National Park Service has been monitoring cruise ship opacity levels in Glacier Bay for the past several years. A ranger shortage resulted in fewer readings this past summer, but those that were taken were all in compliance. The Park Service hopes to resume routine monitoring in 2001.

ADEC and EPA conducted a total of 240 opacity readings of cruise ship emissions during the 2000 season. Thirty-four observations exceeded the opacity standard; sixteen ships were cited by the state and four by EPA.

The need for documentation of visibility accumulation impacts in downtown Juneau was discussed at the January 2001 Air Working Group meeting. A subcommittee has been formed to develop methods for documenting visibility problems, separate from stack emissions opacity.

New Technologies

The cruise lines are investing in new technologies to eliminate problems and concerns about cruise ship air emissions. The following new technologies should be in place by the summer of 2001.

- Princess Cruises expects to be able to use shore side power, instead of main engine generators, at its South Franklin dock beginning in May.
- Royal Caribbean Cruise Line and Celebrity Cruise Lines will each have a gas turbine cruise ship coming to Alaska. Gas engines burn fuel with less visible emissions.
- Carnival Cruise Lines will have a new ship using electronically controlled fuel injection.
- Numerous retrofits are being made that include direct steam injection and lube oil consumption monitoring, both of which have been shown to reduce emissions by up to 40%.

REPORT OF WATER AND SOLID WASTE DISCHARGE WORKING GROUP

The ACSI Water Discharge and Solid Waste Work Group was tasked with assessing the nature and extent of wastewater and solid waste discharges, developing pollution prevention and waste management solutions, assessing a process for verifying and monitoring compliance, and keeping Alaskans informed of the situation during this process and on into the future.

Wastewater discharges were sampled and analyzed to determine their chemical and biological composition. The work group developed the Cruise Ship Wastewater Monitoring Protocol for 2000 in Southeast Alaska (Appendix A to Alaska Cruise ship Initiative, Part I Final Report) describing the scope of work and sampling plan. Prior to the start of sampling, a Quality Assurance and Project Plan was developed detailing sampling, transportation and laboratory protocols. This plan includes project description work plans and laboratory management plans for participating laboratories. This 28-page document is available from ADEC or downloadable from the ADEC Cruise Ship web page.

During the summer and fall of 2000, the wastewater of 21 large cruise ships was sampled for priority pollutants and for the common parameters used to assess the level of wastewater treatment. Priority pollutants are a list of 126 toxic compounds (Appendix A), identified in the Clean Water Act, used to determine if hazardous wastes were mixed with discharges. Each ship was sampled once for priority pollutants and twice for the common wastewater parameters using ship-specific sampling plans.

Wastewater discharges vary depending on the particular ship. Wastewater can include one or more sources of graywater (from dishwater, showers, laundry, wash basins, bath and galleys), treated blackwater (from toilets, urinals and medical facility water) or a combination of graywater and treated blackwater. Wastewater samples were analyzed for fecal coliform, total suspended solids, biochemical oxygen demand, chemical oxygen demand, ammonia, pH and chlorine. The cruise lines hired a contractor to conduct the sampling and develop vessel specific sampling plans. The vessel specific plans took into account the variations in how gray and blackwater are discharged.

Priority Pollutants

The work group determined that priority pollutant analyses would be performed on combined samples of graywater and blackwater when there was more than one overboard discharge of graywater or blackwater. Sampling of priority pollutants was done to determine if hazardous toxic chemicals were being improperly discharged in wastewater.

Appendix B lists the detected priority pollutants, along with the analytical result in micrograms per liter (ug/l) and the water quality criterion (WQC) applicable to that compound, if any, in the receiving water. Analytical results that exceed the WQC are shown in bold type. It is important to recognize that water quality criteria are not directly applicable to the concentration of a pollutant in a wastewater stream or

effluent. The water quality criteria are used to calculate effluent limits in a permit, taking into account dilution in the receiving water. In this case, the WQC are shown in order to put the wastewater analytical results in perspective.

Although ten pollutants exceeded Alaska's water quality standards, there was no evidence of hazardous wastes being mixed with overboard discharges. Seven metals – chromium, copper, lead, mercury, zinc, silver and nickel – were present in levels above the water quality standards for aquatic life. Table 3 lists the priority pollutants that were found, the Alaska Water Quality Standard, the highest sample concentration of a pollutant found, and the number of samples that were above the Alaska Water Quality Standards. Additionally, the table lists the drinking water standard maximum contaminant level (MCL) and the number of samples above the drinking water standard.

Table 3: Highest Concentration of Priority Pollutants Found During Cruise Ship Wastewater Testing, Summer 2000

Metals	**WQS**	**Highest Sample**	**Number Above**	**DW MCL's**	**Number Above DW**
	ug/L	**ug/L**	**WQS**	**ug/L**	**MCL's**
Chromium	50	430	2	100	1
Copper	2.9	7100	46	1000	6
Lead	5.6	62	12	15	10
Mercury	0.25	0.33	1	2	0
Nickel	8.3	630	11	100	3
Silver	2.3	610	7	Na	Na
Zinc	86	1800	39	5000	0
Organics					
Diethyl phthalate	3.4	15	14	No Drinking Water Criteria for these organic compounds	
Di-n-butyl phthalate	3.4	98	5		
Ethylbenzene	430	2600	1		

The water quality standard is frequently a very low concentration in order to protect sensitive life stages of aquatic organisms. Since the drinking water standards for some priority pollutants are higher than state water quality standards, cruise ships could be picking up some of the metals through the drinking water taken on board in Alaska or British Columbia. Follow-up will be necessary to make that determination.

The level of phthalates exceeded the water quality criteria. Phthalates are a class of priority pollutant that imparts flexibility or plasticity to substances. Phthalates, at this level, can leach from plastics that might be used in water piping or storage.

The presence of the pesticide heptachlor was mistakenly reported in samples from two ships. The mistaken reading of heptachlor sent the industry into a massive hunt on ships, and back through suppliers to find the source of the pesticide. When no evidence turned up, the industry asked the lab to test again with other methodologies. The lab finally concluded it had made a mistake.

Assessing the Level of Wastewater Treatment

All overboard waste streams were analyzed separately for the common parameters used to determine the level of wastewater treatment. Listed below is a description of each of these parameters:

- BOD – Biochemical oxygen demand – the potential for pollutants to reduce dissolved oxygen levels in water through biological and chemical processes. This is important because fish "breath" dissolved oxygen.

- COD – Chemical oxygen demand – the same as BOD except it only looks at the effect of chemical (not biological) processes on dissolved oxygen. COD and BOD are indicators of how much oxygen a pollutant is going to rob from water. If pollutants consume too much oxygen, it doesn't leave enough to support aquatic life.

- TSS – Total suspended solids – a measure of how much solid material is suspended in water. Solid materials can keep light from penetrating into the water column which is important for aquatic plant life. Solid materials can settle on the bottom where they can smother bottom life and fish eggs.

- Fecal coliform – a class of bacteria that are found in the intestines of warm-blooded animals. While some forms of fecal coliform are not harmful, their presence indicates that harmful microbes, bacteria or viruses may also be present. The class of fecal microbes includes many disease causing organisms that can create symptoms, from mild nausea and diarrhea to death, if ingested by humans.

- Total ammonia - a by-product of wastewater treatment that can be toxic to aquatic life.

- pH - the measure of how acidic or basic a discharge is.

- Free/total chlorine measures chlorine that may be used to reduce fecal coliform levels; high chlorine levels can be toxic to aquatic life.

In the summer of 2000 only blackwater discharges from cruise ships were regulated. The EPA established standards in 1976 for wastewater treatment plants (Marine Sanitation Devices – otherwise known as MSD's) aboard vessels. MSD's constructed after 1980 have to meet effluent limits of 150 mg/l of TSS and 200 fecal coliform per 100 milliliters.[1] The U.S. Coast Guard has the responsibility for certifying that MSD's meet these standards and ensuring they are properly installed, maintained and operated. There were no federal standards for graywater during the summer 2000.

When the cruise ship companies volunteered to eliminate in-port discharges, gray and blackwater were placed in holding tanks until the wastewater could be discharged 10 miles from port. Storing wastewater in a warm holding tank could lead to increased fecal coliform counts and higher total suspended solids readings. Sampling plans were amended so that samples were taken immediately after treatment, instead of from holding tanks. This would determine if the MSD was able to treat wastewater to the required levels.

The results of analyses of treated blackwater clearly demonstrated that generally MSDs do not meet the federal standards for TSS and fecal coliform. Only one blackwater sample out of 70 samples met both the TSS and fecal coliform standards. Approximately 57% of the fecal coliform samples exceeded the

[1]By State of Alaska requirements, there is no distinction between gray and blackwater. Both are regulated as sewage due to the presence of fecal coliforms

MSD standard of 200 fecal coliform per 100 ml, and 68% of the samples for total suspended solids exceeded the MSD standard of 150 mg/l.

The results of analyses of graywater demonstrated that the strength of the graywater, in terms of BOD, COD and TSS is variable and that it can have high levels of fecal coliform bacteria. Some samples contained fecal coliforms in the millions. Graywater is not expected to contain pollutant levels as high as blackwater. The results indicated that graywater being discharged was not benign.

Table 4 displays the number of samples that had fecal coliforms in the 0 to 200, 200 to 1000, 1000 to 1 million, 1 million to 10 million and greater than 10 million ranges. Similar ranges are shown for total suspended solids, BOD and COD.

Table 4: Sample Ranges for Fecal Coliform, TSS, BOD and COD

Fecal Coliform per 100 mL	**0 to 200**	**200 to 1000**	**1000 to 1,000,000**	**1,000,000 to 10,000,000**	**more than 10,000,000**
Gray Water	14	2	27	12	9
Black Water*	27	6	16	15	4
Gray & Black Water Combined	1	1	5	2	1
Rev. Osmosis Treated B&G Water	5				

*FC results greater than 200 per 100 ml exceed the federal standard for MSD.

TSS	**0 to 150 mg/L**	**150 - 1000 mg/L**	**More than 1,000 mg/l**
Gray Water	39	23	3
Black Water*	8	22	6
Gray & Black Water Combined	8	3	
Rev. Osmosis Treated B&G Water**	5		

*samples >150 mg/l exceed the federal standard for MSDs

**All of the samples of gray water and black water treated by reverse osmosis meet the federal standards of <150 mg/l of TSS and <200 FC/100 ml for MSDs.

BOD	**0 to 100 mg/L**	**100 to 1000 mg/L**	**More than 1,000 mg/l**
Gray Water	16	36	13
Black Water	18	16	1
Gray & Black Water Combined	1	10	
Rev. Osmosis Treated B&G Water	3	2	

COD	**0 to 100 mg/L**	**100 to 1000 mg/L**	**1000 to 10,000 Mg/L**	**more than 10,000 mg/l**
Gray Water	1	39	15	2
Black Water		2	5	1
Gray & Black Water Combined		10	1	
Rev. Osmosis Treated B&G Water		5		

Appendix C provides the results of all the analyses used to assess the levels of wastewater treatment. Values for TSS or fecal coliform that exceed the MSD criteria are in bold type.

Graywater is usually characterized as untreated wastewater that has not come into contact with toilet waste. Specifically cruise ship graywater is defined in 33 CFR 151.05 as drainage from dishwashers, showers, laundry, washbasins and galleys, and does not include drainage from toilets, urinals, hospitals, and cargo spaces. Table 5 shows the common characteristics found in domestic graywater from various sources.

Table 5: Sources and Characteristics of Graywater

Water Source	Characteristics
Automatic Clothes Washer	Bleach, Foam, High pH, Hot water, Nitrate, Oil and Grease, Oxygen demand, Phosphate, Salinity, Soaps, Sodium, Suspended solids, and Turbidity
Automatic Dish Washer	Bacteria, Foam, Food particles, High pH, Hot water, Odor, Oil and grease, Organic matter, Oxygen demand, Salinity, Soaps, Suspended solids, and Turbidity
Bathtub and shower	Bacteria, Hair, Hot water, Odor, Oil and grease, Oxygen demand, Soaps, Suspended solids, and Turbidity
Sinks, including kitchen	Bacteria, Food particles, Hot water, Odor, Oil and grease, Organic matter, Oxygen demand, Soaps, Suspended solids, and Turbidity

The results of the analysis of graywater from cruise ships showed high levels of fecal coliforms (Table 4). Some samples contained fecal coliforms in the millions. As described in Table 5, bacteria can come from bath and shower water as well from sinks and laundry.

Analyses of cruise ship graywater discharges during the summer of 2000 (Appendix B) showed 78% of the samples exceeded the effluent limit of 200 FC/100 ml for discharges from marine sanitation devices. Forty percent of the graywater samples for TSS exceeded the MSD effluent limit of 150mg/l. These results indicate that graywater is similar to blackwater in number of fecal coliform bacteria and total suspended solids, and that graywater should be treated prior to discharge.

In response to concerns about pollution from cruise ships, the Coast Guard instigated Operation Cruise Watch 2000. Cutters and aircraft were directed to more closely monitor cruise ships in case of unreported discharges. Coast Guard marine safety inspectors were instructed to increase their focus on the proper use and operation of marine sanitation devices and oily water separators. The Coast Guard found five MSD's were not properly operated and maintained, and civil penalties were issued.

Based on the results of the 2000 season sampling effort, the ACSI working group agreed that wastewater monitoring should continue for the 2001 season to increase the understanding of the characteristics and impacts of cruise ship discharges, as well as evaluating industry initiatives. This work should include:

- Determining whether MSD's are operating within design specifications.
- Collecting data needed to determine the impacts of gray and treated blackwater on the receiving waters.
- Evaluating the effectiveness of new wastewater treatment technologies being tested by various cruise lines.
- Analyzing discharges for dissolved metals, in addition to total recoverable metals.
- Documenting discharge volumes to determine the total volumes discharged.
- Sampling each MSD to determine if it is working properly.

In October 2000 the ACSI wastewater and solid waste discharge working group agreed to form a science panel to assist the work group in addressing complex technical issues. The science panel is chartered to:

- Evaluate the 2000 wastewater monitoring data.
- Comment on the appropriateness of certain laboratory analysis.
- Review the 2001 sampling results.
- Evaluate the cumulative impacts of cruise ship wastewater discharges on receiving waters.
- Assist with the determination of no discharge zones.

The Science Panel began meeting in January 2001. Their initial focus is to review and comment on the Alaska SeaLife Center report on wastewater discharges into Alaska Coastal Waters, commissioned by the Northwest Cruise Ship Association, as well as recommend updates to last seasons quality assurance plans prior to use this summer.

New Technologies

The cruise industry has been working on new wastewater treatment technologies. Listed below are some of the on-going initiatives:

- Princess Cruises is retrofitting one ship's treatment system with Hamworthy MSDs and biomembrane filtration capable of treating black and graywater. This system will not use chlorination.
- Holland America has one ship using 100% Zenon treatment, a combined bio-reactor, ultrafiltration, and UV system. Currently, this system is discharging effluents where total suspended solids are consistently below 5 mg/l and fecal coliform is not detected or is below 2 per 100 ml. Holland America is committed to retrofitting Zenon treatment systems throughout its fleet, but this will take some time -- a function of hardware availability.
- Norwegian Cruise Lines is working to enhance performance of traditional MSD treatment. NCL is also evaluating two separate ozone-based disinfections systems that treat both graywater and post-MSD blackwater.
- Royal Caribbean Cruise Lines noted that the separate cruise line companies continue to share information and lessons learned, as witnessed by a recent environmental round table. Hydroxyl treatment systems show promise and continue to be investigated. RCCL is employing a number of new strategies to improve MSD performance.
- Cruise ships Mercury and Galaxy will continue to use reverse osmosis/ultraviolet treatment for black and graywater.
- Crystal Cruises will continue their policy of discharging 12 miles or more offshore. Crystal has upgraded the MSDs on both of its ships. They have developed rigorous standard operating procedures and operational tests to ensure treatment systems are operating

properly. The capability to perform on-board water quality measurements is being developed.
- Carnival Cruises will be operating a new "Spirit" class vessel in Alaska in 2001. The Spirit will have state of the art waste management systems.
- The US Cruise Ship Association member companies will continue testing and retesting to optimize performance. They are using and evaluating special solvents to decrease the opportunity for fecal coliform and associated pathogen accumulation and growth within on-board plumbing.

REPORT OF THE ENVIRONMENTAL LEADERSHIP WORK GROUP

Environmental Leadership is an approach for taking responsibility for the negative effects to the environment by integrating environmental stewardship into business management practices of an organization. Environmental excellence is achieved through employing prevention based environmental management systems and environmental accounting. Organizations move beyond mere compliance with existing regulations by establishing an environmental management system that incorporates pollution prevention into the core business philosophy and practices. The results are efficient, profitable operations that protect the environment.

The overall goal of the Environmental Leadership Work Group is a clean Alaska environment through establishment of a long-term sustainable system for environmental excellence and leadership. The work group recognizes that this is a long-term process.

Accomplishments

Cruise Ship Awareness Days were held July 12th, 13th and 14th, 2000 and were co-sponsored by ADEC, Coast Guard, EPA and industry. The goal was to provide the citizens of Juneau with an opportunity to understand the issues, problems and concerns with cruise ships, and for cruise ship operators and agencies to hear citizen concerns first hand. Cruise Ship Awareness Days included the following:

- A public information document that summarized the cruise ship industry's environmental management systems in an understandable question and answer format. In addition, the roles of the agencies were outlined.
- The cruise lines offered shipboard tours of waste management systems and operations to the public.
- A panel discussion with DEC, USCG, industry and Citizens Groups with opportunities for citizens to ask questions and voice concerns directly to the parties involved.
- Displays and presentations from DEC, USCG, Citizens Groups and industry.

The overall goals of Cruise Ship Awareness Days were achieved. It provided one of the continuous steps in the process of educating and engaging the community, agencies and industry. However, efforts to engage all stakeholders must continue.

Future Steps

The Environmental Leadership Work Group is involved in a long-term process that requires a "shift" to pollution prevention and responsibility as the guiding principles, moving away from simple compliance of the law. Within the ACSI work groups, focus on these shifts has stalled for the time being, because of limited resources dealing with the significant wastewater sample issues. The Environmental Leadership process has the ability to provide results for long-term solutions. This will require the commitment of industry to correct existing systems and environmental groups to engage in the process, instead of relying solely on government regulations and oversight. In addition, agencies must have the resources and ability to provide oversight monitoring. It is a partnership that involves all parties.

The work group agreed to begin a long-term process for continuous dialogue and activity in Environmental Leadership. A sub-committee was proposed to develop a format for engagement. Components of this process could include:

- Environmental Performance Measures: An on-going reporting program to measure and rate environmental achievements. Performance measures will require third party verification or evaluation.
- Stakeholder involvement: This will require a commitment of both stakeholders and industry for continued engagement, based on the principals of Environmental Leadership.
- Regulatory agency involvement: Resources provided to agencies for continued monitoring and reporting programs.
- Recognition of superior performance.
- Development of Best Management Practices for the cruise ship industry. Standards are to be developed in conjunction with industry, community, citizens and other stakeholders.

  Examples of Best Management Practices may include, but are not limited to:
  1. Corporation commitment, adoption and implementation of IS0 14001.
  2. Environmental Management Systems (EMS) based on Pollution Prevention for each vessel.
  3. Systematic reporting and sharing of discharge and sampling results.
  4. Training and certification of operators of onboard wastewater treatment systems during operation.
  5. Reduction and inventory of hazardous materials.
  6. Connection to on-shore power.
  7. Education of customers on pollution prevention activities.
  8. Using community wastewater treatment plants.

Since most of the agency and industry effort was placed on air and water quality activities for the 2000 season, little was accomplished beyond the Environmental Awareness Days. We expect environmental leadership to lag behind the air and water quality efforts until those major projects are completed. Environmental Leadership will then pick up activities to incorporate provisions resulting from the Air and Water Quality Work Group efforts.

REPORT OF THE OIL SPILL RESPONSE WORKING GROUP

The large cruise ships operating in Alaska carry up to 405,000 gallons of heavy persistent fuel oil. The NWCA recognized that the oil spill response capabilities in Southeast Alaska were not designed to effectively recover the heavier more viscous fuel oils used by the cruise ships. The NWCA announced in December 1999 that they were going to build 4 sets of paired oil spill barges positioned in Southeast Alaska. The first barge was delivered to Glacier Bay in May 2000. By the end of the summer, 3 additional sets of barges were located in Haines, Juneau and Ketchikan. Each of the two barges in the set can hold 259 barrels or just over 10,000 gallons of recovered oil. One barge in each set comes equipped with a skimmer for recovery of oil from the surface of the water.

The Alaska Cruise Ship Initiative: Part I Final Report discusses, in detail, the accomplishments of the Oil Spill Work Group through the end of May. The management plan developed by the Southeast Alaska Petroleum Response Organization (SEAPRO) for the four barges was approved and the barges have been included as a part of SEAPRO's oil spill response capabilities. This allows the barges to be used to respond to oil spills from vessels other than just cruise ships.

Through the Royal Caribbean settlement, $2.1 million has been given to SEAPRO to increase oil spill response capabilities in Southeast Alaska. In consultation with the DEC and the U.S. Coast Guard a variety of pollution response equipment was selected for purchase. Major purchases include:

- Two 48 foot multi-mission fast response vessels
- One 55 foot oil spill response barge for the Northern Lynn Canal Near Shore oil spill response package
- LORI brush skimming system
- 1,000 feet shoreguard boom

- 2,000 feet of containment boom
- Seven 21 foot spill response skiffs

The Oil Spill Work Group recommended that further oil spill response issues be handled by the Southeast Alaska Subarea Contingency Plan Committee, a federally mandated response preparedness committee led by the Coast Guard and DEC under the Oil Pollution Act of 1990. The Oil Spill Work Group suggested that the following issues be addressed by the sub area committee:

- Proceed with development of geographic response strategies funded through the Royal Caribbean Settlement.
- Standardization of response resources and tactics.
- Identification of additional response equipment shortfalls.

NEW STATE OIL SPILL LEGISLATION

Senate Bill 273 enacted by the 2000 Alaska Legislature established financial responsibility and oil spill response planning requirements for non-tank vessels of more than 400 gross tons. This includes most cruise ships. The law established a response planning standard for “containment and control of 15 percent of the maximum oil capacity” within 48 hours. Cleanup is required “within the shortest possible time consistent with minimizing damage to the environment.”

SB 273 also established the Task Force on Motorized Oil Transport and charged the task force with determining how to implement the response planning standard. The legislature also passed Senate Concurrent Resolution 1, setting the membership of the task force. The resolution directed the task force to recommend statutes and regulations to achieve the response planning standard in a practical and cost efficient manner. The task force recommendations are in the “Task Force and Motorized Oil Transport Final Report, December 15, 2000”. A copy of the report can be downloaded at http://www.state.ak.us/dec/nontank/pdf/tfmot_final_rpt.pdf. Additional information on the task force activities can be found at http://www.state.ak.us/dec/nontank/home.htm.

The task force’s statutory recommendations were concurrently introduced in the House as HB 55 and in the Senate as SB 16. Both are titled: "An Act regarding oil discharge prevention and cleanup involving self-propelled non tank vessels exceeding 400 gross registered tonnage and railroad tank cars and related facilities and operations and requiring preparation and implementation of oil discharge contingency plans for those non-tank vessels and railroad tank cars; amending the definition of 'response action' that relates to releases or threatened releases of oil and thereby amending the duties and liabilities of response action contractors; authorizing compliance verification for non-tank vessels and for trains and related facilities and operations; and providing for an effective date." This bill passed the legislature in March 2001.

STATE LEGISLATION

During a Special Session of the Legislature convened on June 7, 2001, HB 260 was passed, creating a Commercial Passenger Vessel Environmental Compliance Program. This legislation was signed by Governor Tony Knowles on June 28, 2001 and became effective July 1, 2001. Under the new legislation:

- Cruise ships and Alaska's marine ferries with 50 or more overnight passengers must comply with the new state law, although some discharge and fee requirements are phased in at a later date (2004) for smaller vessels with between 50 and 249 overnight passengers.

- Vessels must register annually with the state and agree to abide by state requirements on wastewater discharges.

- The discharge of graywater or sewage with fecal coliform bacteria counts greater than 200 colonies per 100 milliliters or suspended solids greater than 150 milligrams per liter is prohibited.

- The new law provides flexibility in meeting the graywater standards during the 2001 and 2002 cruise seasons if a large cruise ship submits a plan of "interim protective measures".

- "Large" cruise ships (with 250 or more overnight passengers) must be at least a mile from shore and traveling at a speed greater than 6 knots when discharging wastewater.

- Vessels may request assistance from the state in establishing alternate terms and conditions under which they can discharge.

- All vessels discharging wastewater in state waters must sample and test their discharges to ensure that they meet the required levels and report test results to the state.

- All vessels must report wastewater discharges that violate the Alaska standards.

- All vessels must provide plans that describe hazardous substances and solid waste disposal practices.

- Large vessels pay an environmental compliance fee roughly equal to $1.00 per passenger. Small vessels will pay the fee beginning in 2004.

- Cruise lines that fail to meet state standards are subject to both civil and criminal enforcement.

- ADEC is authorized to conduct monitoring, as well as, research into the environmental affects of sewage and graywater on marine waters and coastal resources.

Details on this legislation can be found on ADEC's cruise ship web site.

FEDERAL LEGISLATION

In December 2000, the President signed federal legislation enacting *Title XIV – Certain Alaskan Cruise Ship Operations*. This legislation gives the Coast Guard and EPA new responsibilities, including the implementation of a cruise ship inspection regimen and the establishment of effluent limits for treated blackwater and graywater. All cruise ship discharges in Alaskan waters must be made while the ship is at a minimum speed of 6 knots and a distance of at least one-mile from shore. No cruise ship can discharge untreated blackwater anywhere in the Alaska waters of the Alexander Archipelago, navigable

waters of the U.S. within the State of Alaska, and within the Kachemak Bay National Estuarine Research Reserve.

The Coast Guard issued regulations on July 26, 2001 to implement this statute during the 2001 cruise season. EPA has not determined if they will evaluate the effluent limits set by this statute, nor have they indicated a time frame for making such decisions. The industry had agreed that all the NWCA lines would comply with the requirements of Title XIV, until the regulations were fully in place.

EPA NATIONAL ASSESSMENT

EPA is conducting a national assessment of the cruise ship industry in response to a petition received on March 17, 2000, from the Bluewater Network. The assessment addresses the following:

1. Quantification of the volumes of waste streams from large passenger vessels and assessment of the adequacy of existing regulations to control such wastes.
2. Assessment of the impacts of these wastes on water quality, the marine environment and human health.
3. Delineation of options for comprehensive monitoring, record keeping and reporting of pollutants discharged into US waters and wastes offloaded at US ports from large passenger vessels.
4. Evaluation of the effect of requiring National Pollutant Discharge Elimination System (NPDES) permits for discharges of blackwater, graywater and other discharges.
5. Examination of the need for, and best means of, more strictly defining and regulating graywater.
6. Consideration of the need for clarifying the regulations governing hazardous and toxic wastes generated on cruise ships, both while at sea and once off-loaded, and a delineation of options for whether and how these regulations should be strengthened.
7. Determination and implementation of effective means for EPA to assist the USCG in fully enforcing its current regulations.

EPA conducted three public hearings in Los Angeles, Juneau, and Miami. The transcripts are available on the DEC Cruise Ship Web pages. A draft report is currently undergoing internal EPA review.

Appendix A: 126 Priority Pollutants

DEC Criteria for Marine Waters, Compiled 7/13/00, revised 7/20/00			
Priority Pollutant	**Criterion µg/L**	**Priority Pollutant**	**Criterion µg/L**
chlorinated benzenes	129 (LOEL)	hexachlorocyclobuta-diene	32 (acute LOEL)
chlorobenzene			
1,2-dichlorobenzene	1,970 (acute LOEL)	hexachlorocyclopenta-diene	7 (acute LOEL)
1,3-dichlorobenzene	1,970 (acute LOEL)		
1,4-dichlorobenzene	1,970 (acute LOEL)	tetrachloroethylene	450 (LOEL) (88.5 NTR)
hexachlorobenzene	129 (LOEL) (0.0077 NTR)	trans-1,2-dichloroethylene	None
1,2,4-trichlorobenzene	129 (LOEL)	trichloroethylene	2,000 (acute LOEL) (810 NTR)
chlorinated ethanes	None	vinyl chloride	none (5,250 NTR)
chloroethane			
1,1-dichloroethane	None	***chlorinated phenols***	None
		2-chlorophenol	
1,2-dichloroethane	113,000 (acute LOEL) (990 NTR)	2,4-dichlorophenol	none (790 NTR)
hexachloroethane	940 (acute LOEL) (89 NTR)	parametachlorocresol	None
1,1,2,2-tetrachloroethane	9,020 (acute LOEL) (110 NTR)	pentachlorophenol	7.9
1,1,1-trichloroethane	31,200 (acute LOEL)	2,4,6-trichlorophenol	none (65 NTR)
1,1,2-trichloroethane	none (420 NTR)	***chloroalkyl ethers***	none (14 NTR)
		bis(2-chloroethyl) ether	
chlorinated organics	None	bis(2-chloroisopropyl) ether	4,360
bis(2-chloroethoxy) methane			
carbon tetrachloride	50,000 (acute LOEL) (44 NTR)	4-bromophenyl phenyl ether	None
2-chloroethylvinyl ether	None	4-chlorophenyl phenyl ether	None
chloroform	none (4,700 NTR)	***halomethanes***	none (3,600 NTR)
		bromoform	
2-chloronaphthalene	None	chlorodibromomethane	none (340 NTR)
3,3-dichlorobenzidine	none (0.77 NTR)	dichlorobromomethane	6,400 (LOEL) (220 NTR)
1,1-dichloroethylene	224,000 (acute LOEL) (320 NTR)	methyl bromide	6,400 (LOEL) (4,000 NTR)
1,2-dichloropropane	3,040 (LOEL)	methyl chloride	6,400 (LOEL)
1,3-dichloropropylene	790 (acute LOEL)	methylene chloride	6,400 (LOEL)
dioxin(s)	none (0.00000014 NTR)		

DEC Criteria for Marine Waters, compiled 7/13/00, revised 7/20/00			
Priority Pollutant	**Criterion µg/L**	**Priority Pollutant**	**Criterion µg/L**
inorganics	45,000 (4,300 NTR)	***organics***	55 (acute LOEL)
antimony (TR)		acrolein	
arsenic III	36	acrylonitrile	none (6.6 NTR)
asbestos	None	benzene	700 (LOEL)
beryllium	None	benzidine	none (0.0054 NTR)
cadmium (TR)	9.3	2,4-dinitrotoluene	370 (LOEL) (91 NTR)
chromium VI (TR)	50	2,6-dinitrotoluene	370 (LOEL)
copper (TR)	2.9 (acute)	1,2-diphenylhydrazine	none (5.4 NTR)
cyanide (free)	1.0 (acute)	ethylbenzene	430 (acute LOEL)
lead (TR)	5.6	isophorone	12,900 (acute LOEL) (6,000 NTR)
mercury (TR)	0.025	naphthalene	2,350 (acute LOEL)
nickel (TR)	8.3	nitrobenzene	6,680 (acute LOEL) (1,900 NTR)
selenium (TR)	71	toluene	5,000 (LOEL)
silver (TR)	2.3 (acute)	***pesticides and metabolites***	1.3 (0.0014 NTR)
		aldrin	
thallium (TR)	2,130 (acute LOEL) (6.3 NTR)	alpha-bhc	none (0.13 NTR)
zinc (TR)	86	alpha-endosulphan	0.0087

Appendix A cont.

nitrosamines		beta-bhc	none (0.46 NTR)
N-nitrosodimethylamine	3,300,000 (acute LOEL) (81 NTR)		
N-nitrosodi-n-proplyamine	3,300,000 (acute LOEL)	beta-endosulphan	0.0087
N-nitrosodiphenylamine	3,300,000 (acute LOEL) (160 NTR)	chlordane	0.0040
nonchlorinated phenols	None	4,4-DDD	none (0.0084 NTR)
2,4-dimethylphenol			
2-methyl , 4,6-dinitrophenol	4,850 (acute LOEL) (765 NTR)	4,4-DDE	none (0.0059 NTR)
2,4-dinitrophenol	4,850 (acute LOEL)	4,4-DDT	0.001
2-nitrophenol	4,850 (acute LOEL)	delta-bhc	None
4-nitrophenol	4,850 (acute LOEL)		
phenol	5,800 (acute LOEL)		

DEC Criteria for Marine Waters, compiled 7/13/00, revised 7/20/00			
Priority Pollutant	Criterion µg/L	Priority Pollutant	Criterion µg/L
Dieldrin	0.0019 (0.0014 NTR)	acenaphthylene	None
Endosulphan sulfate	0.0087	anthracene	300 (acute LOEL)
Endrin	0.0023	benzo(a)anthracene	300 (acute LOEL) (0.31 NTR)
Endrin aldehyde	none (0.81 NTR)	benzo(a)pyrene	300 (acute LOEL) (0.31 NTR)
Gamma-bhc	0.16 (acute)	benzo(b)fluoranthene	300 (acute LOEL) (0.31 NTR)
Heptachlor	0.0036 (0.0021 NTR)	benzo(g,h,i)perylene	300 (acute LOEL)
Heptachlor epoxide	none (0.0011 NTR)	benzo(k)fluoranthene	300 (acute LOEL) (0.31 NTR)
Toxaphene	0.0002	chrysene	300 (acute LOEL) (0.31 NTR)
Phthalate esters		dibenzo(a,h)anthracene	300 (acute LOEL) (0.31 NTR)
bis(2-ethylhexyl) phthalate	none (59 NTR)		
Butylbenzyl phthalate	none	fluoranthene	16 (LOEL)
Diethyl phthalate	3.4 (LOEL)	fluorene	300 (acute LOEL)
Dimethyl phthalate	3.4 (LOEL)	indeno(1,2,3-cd)pyrene	300 (acute LOEL) (0.31 NTR)
di-n-butyl phthalate	3.4 (LOEL)	phenanthrene	None
di-n-octyl phthalate	3.4 (LOEL)	pyrene	300 (acute LOEL)
PCBs	0.03 (0.0017 NTR)		
Acenaphene	710 (LOEL)		
PCBs	0.03 (0.0017 NTR)		
Polynuclear aromatic hydrocarbons (PAHs)			
Acenaphene	710 (LOEL)		

DEC Criteria for Marine Waters, compiled 7/13/00		
Other pollutants	Criterion	The amount of total ammonia equivalent to 35 µg/l of unionized ammonia depends on the pH, salinity and temperature of the receiving marine water. For instance at a pH of 7.4, a salinity of 20 ppt and a temperature of 10 ºC, 35 µg/l of unionized ammonia is equivalent to ~53 mg/l of total ammonia.
Ammonia (unionized)	35 µg/l	
PH	≥6.5, ≤8.5, no more than 0.2 pH unit outside of naturally occurring range	
BOD	none	
COD	none	
TSS	none	
Total residual chlorine	≤ 2.0 µg/l for salmonids or ≤ 10.0 µg/l for other organisms	
Fecal coliform	May not exceed 14 FC/100 ml. Not more than 10% of samples may exceed 43 FC/100 ml	

NTR means the EPA National Toxics Rule that adopted some criteria for priority pollutants for some states. These criteria are not applicable to the cruise ship sampling program and are presented for information purposes only.

LOEL means the Lowest Observed Effect Level.

Appendix B: Cruise Ship Wastewater Discharges

Cruise ship J (sampled 8/11/00)								
priority pollutant detected	WQC	Blackwater composite	blkwtr port side stp	blkwtr starbrd side stp	grywtr 5 tank (composite)	grywtr shaft tank	Grywtr stabilizer port tank	grywtr laundry room
phenol	5800	13	NA	NA	2.2	NA	NA	NA
2,4,6-tri-chlorophenol	none	ND	NA	NA	0.61	NA	NA	NA
bis(2-ethyl-hexyl) phthalate	none	1.9	NA	NA	19	NA	NA	NA
diethylphthalate	3.4	ND	NA	NA	**9.7**	NA	NA	NA
butylbenzyl-phthalate	none	ND	NA	NA	0.61	NA	NA	NA
cadmium	9.3	ND	NA	NA	0.35	NA	NA	NA
chromium (total)	50(VI)	ND	NA	NA	5.6	NA	NA	NA
copper	2.9	**360**	NA	NA	**480**	NA	NA	NA
lead	5.6	ND	NA	NA	**14**	NA	NA	NA
silver	2.3	0.76	NA	NA	**3.5**	NA	NA	NA
zinc	86	**170**	NA	NA	**1600**	NA	NA	NA
bromodichloro-methane	6400	NA	ND	ND	NA	ND	0.69	ND
chloroform	none	NA	0.92	1.2	NA	34	25	13
chloromethane (methyl chloride)	6400	NA	ND	ND	NA	23	ND	ND
toluene	5000	NA	ND	ND	NA	ND	ND	1.7
trichloroethene	2000	NA	ND	ND	NA	ND	ND	0.76
tetrachloroethene	450	NA	ND	ND	NA	ND	ND	2.3
ethylbenzene	430	NA	ND	ND	NA	1.0	ND	24
heptachlor	0.0036	ND	NA	NA	ND	NA	NA	NA
all values in µg/l	ND=Non-detect		NA=Not analyzed for in this sample		**values in bold exceed WQC**			

Cruise ship A (sampled 8/22/00)					
priority pollutant detected	WQC	treated blackwater	main graywater	starboard graywater	composite graywater
2,4,6-trichlorophenol	None	ND	NA	NA	2.3
bis(2-ethylhexyl) phthalate	None	ND	NA	NA	10
diethylphthalate	3.4	ND	NA	NA	3.0
di-n-butylphthalate	3.4	ND	NA	NA	1.1
bromoform	None	95	1.3	32	ND
chloroform	None	21	15	96	ND
chloromethane (methyl chloride)	6400	25	ND	ND	ND
bromodichloromethane	6400	18	0.70	89	ND
dibromochloromethane	None	40	0.65	64	ND
1,2-dichloroethane	113,000	1.5	0.91	ND	ND
tetrachloroethene	450	ND	ND	0.46	ND
chromium (total)	50 (Cr VI)	18	NA	NA	ND
copper	2.9	**560**	NA	NA	**260**
lead	5.6	**23**	NA	NA	**7.5**
zinc	86	**1100**	NA	NA	**560**

Appendix B cont.

Cruise ship A cont. (sampled 8/22/00)					
cyanide (total)	1.0 (free)	***25***(may be interferences)	NA	NA	***22***(may be interferences)
Heptachlor	0.0036	ND	NA	NA	ND
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**					

Cruise ship T2 *(sampled 8/18/00)*			
priority pollutant detected	WQC	blackwater composite	graywater composite
1,4-dichlorobenzene	1970	1.2	ND
bis (2-ethylhexyl) phthalate	none	1.9	ND
di-n-butylphthalate	3.4	**4.8**	**4.2**
bromoform	none	1.2	ND
chloroform	none	1.6	ND
bromodichloromethane	6400	1.9	ND
dibromochloromethane	none	1.4	ND
chromium (total)	50 (Cr VI)	ND	21
copper	2.9	**50**	**3.4**
lead	5.6	ND	**16**
silver	2.3	0.27	ND
zinc	86	**210**	ND
all values in µg/l ND=Non-detect **values in bold exceed WQC applicable to the receiving water**			

Cruise ship P *(sampled 8/15/00)*					
priority pollutant detected	WQC	graywater port	graywater starboard	graywater composite	blackwater
chloroform	none	15	19	ND	2.9
toluene	5000	1.4	1.7	ND	ND
ethylbenzene	430	1.6	2.6	ND	0.93
bromoform	none	ND	1.1	ND	3.3
heptachlor	0.0036	NA	NA	ND	ND
phenol	5800	NA	NA	2.9	29
bis (2-ethylhexyl) phthalate	none	NA	NA	15	2.0
butylbenzylphthalate	none	NA	NA	1.6	ND
diethylphthalate	3.4	NA	NA	**5.8**	2.7
di-n-butylphthalate	3.4	NA	NA	**4.2**	ND
phenanthrene	none	NA	NA	ND	1.8
cadmium	9.3	NA	NA	0.48	0.43
chromium (total)	50 (VI)	NA	NA	9.0	3.1
copper	2.9	NA	NA	**1200**	**210**
nickel	8.3	NA	NA	**99**	ND
lead	5.6	NA	NA	5.4	ND
silver	2.3	NA	NA	**7.5**	0.59
zinc	86	NA	NA	**770**	**390**
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**					

Appendix B cont.

Cruise ship H [also sometimes called ship Z] *(sampled 8/29/00)*			
priority pollutant detected	WQC	Gray/Black water forward overboard discharge	Gray/Black water aft overboard discharge
diethylphthalate	3.4	1.6	1.5
di-n-butylphthalate	3.4	1.0	**9.8**
bis(2-ethylhexyl) phthalate	none	3.6	1.9
chloroform	none	15	6.6
1,2-dichloroethane	113,000	1.2	ND
bromodichloromethane	6400	3.6	3.6
dibromochloromethane	none	8.4	13
bromoform	none	30	ND
ethylbenzene	430	ND	0.53
chromium (total)	50 (VI)	39	***52****(the WQC of 50 is Cr VI. The 52 is total chromium. It is not possible to know if all of the total Cr is Cr VI or whether some is Cr III that is much less toxic)*
copper	2.9	**740**	**250**
lead	5.6	**50**	**16**
silver	2.3	ND	1.9
zinc	86	**140**	**120**
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**			

Cruise ship F *(sampled 8/25/00)*				
priority pollutant detected	WQC	Gray water overboard	Black water composite	Black water STP B
bis(2-2ethylhexyl) phthalate	none	32	ND	NA
chloroform	none	1.8	NA	18
1,2-dichloroethane	113,000	0.52	NA	ND
bromodichloromethane	6,400	ND	NA	1.1
cadmium	9.3	0.29	0.26	NA
chromium (total)	50 (Cr VI)	4.0	1.5	NA
copper	2.9	**62**	**150**	NA
lead	5.6	2.5	1.8	NA
mercury	0.025	**0.33**	ND	NA
nickel	8.3	ND	**130**	NA
silver	2.3	0.30	0.18	NA
zinc	86	**350**	**350**	NA
2-nitrophenol	4,850	ND	5.4	NA
cyanide (total)	1.0(free)	ND	***51*** (may be due to interference's)	NA
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**				

Appendix B cont.

Cruise ship U *(sampled 9/8/00)*					
priority pollutant detected	WQC	Gray water galley tank 4	Black water	Gray water accumulation tank 4	Gray water composite (galley, accumulation, laundry)
delta-BHC	none	NA	0.068 (high recoveries in the method blank spike duplicate indicates a possible high bias)	NA	ND
heptachlor	0.0036	NA	ND	NA	ND
1,4-dichlorobenzene	1,970	NA	1.1	NA	ND
butylbenzyl phthalate	none	NA	1.1	NA	ND
bis(2-ethylhexyl) phthalate	none	NA	1.5	NA	14
diethyl phthalate	3.4	NA	ND	NA	1.1
di-n-butylphthalate	3.4	NA	ND	NA	**6.5**
Phenol	5,800	NA	250	NA	NA
Chloroform	none	2.0	0.79	4.0	NA
Bromodichloromethane	6,400	0.98	ND	2.0	NA
Dibromochloromethane	none	1.3	ND	2.8	NA
Bromoform	none	1.2	ND	2.1	NA
Copper	2.9	NA	**510**	NA	**230**
Lead	5.6	NA	**30**	NA	**21**
Mercury	0.025	NA	***0.93***	NA	ND
zinc	86	NA	**1,200**	NA	**480**
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**					

Cruise ship B *(sampled 9/13/00)*									
priority pollutant detected	WQC	Gry galley tank H	Gry tank C	Blk STP A	Blk STP B	Blk STP C	Blk STP D	Blk Composite	Gry Composite
chloroform	none	14	15	180	210	87	57	NA	
1,2-dichloroethane	113,000	0.76	ND	ND	ND	ND	ND	NA	
bromoform	none	ND	ND	ND	170	140	20	NA	
Bromodichloromethane	6,400	ND	2.1	17	68	77	53	NA	
dibromochloromethane	none	ND	0.86	3.3	65	88	38	NA	
ethylbenzene	430	ND	0.59	ND	ND	ND	ND	NA	
carbon tetrachloride	50,000	ND	ND	1.4	4.2	0.90	0.88	NA	
chromium (total)	50(CrVI)	NA	NA	NA	NA	NA	NA	ND	35
copper	2.9	NA	NA	NA	NA	NA	NA	**240**	**430**
lead	5.6	NA	NA	NA	NA	NA	NA	ND	**28**
mercury	0.025	NA	NA	NA	NA	NA	NA	***0.67***(may be interference's)	ND
nickel	8.3	NA	NA	NA	NA	NA	NA	ND	**46**
silver	2.3	NA	NA	NA	NA	NA	NA	ND	1.9
zinc	86	NA	NA	NA	NA	NA	NA	**580**	**330**
cyanide (total)	1.0 (free)	NA	NA	NA	NA	NA	NA	***73*** (may be interference's)	ND
diethylphthalate	3.4	NA	NA	NA	NA	NA	NA	ND	3.3
di-n-butylphthalate	3.4	NA	NA	NA	NA	NA	NA	ND	**5.6**
butylbenzylphthalate	none	NA	NA	NA	NA	NA	NA	ND	9.6

Appendix B cont.

Cruise ship B cont. *(sampled 9/13/00)*									
Bis (2-ethylhexyl) phthalate	none	NA	NA	NA	NA	NA	NA	ND	69
All values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**									

Cruise ship D *(sampled 9/20/00)*						
Priority pollutant detected	WQC	Gry ballast # 6	Blk ballast # 4	Gry galley # 11	Composite # 4,6,11	Gry tank F
Methylene chloride	6,400	3.2(pos. lab contamination)	1.0(pos. lab contamination)	ND	NA	1.1(pos. lab contamination)
Chloroform	none	4.1	6.7	1.4	NA	6.5
Bromodichloromethane	6,400	1.5	6.3	ND	NA	1.1
Toluene	5,000	1.3	ND	ND	NA	ND
Tetrachloroethene	450	0.74	ND	ND	NA	4.2
Dibromochloromethane	none	1.4	7.8	ND	NA	ND
Ethylbenzene	430	1.5	0.87	1.1	NA	NA
Bromoform	none	1.5	16	1.9	NA	0.54
Dimethylphthalate	3.4	NA	NA	NA	ND	1.1
Diethylphthalate	3.4	NA	NA	5.8	ND	15
di-n-butylphthalate	3.4	NA	NA	NA	ND	1.6(pos. lab contamination)
Bis (2-ethylhexyl) phthalate	none	NA	NA	NA	11	13
Copper	2.9	NA	NA	NA	**2200**	**210**
Silver	2.3	NA	NA	NA	1.5	ND
Zinc	86	NA	NA	NA	**860**	**330**
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**						

Cruise ship D *(sampled 9/20/00)*							
priority pollutant detected	WQC	Blk STP A	Blk STP B	Blk STP C	Blk STP D	Blk STP E	Blk STP composite
Chloroform	none	13	3.2	ND	5.6	93	NA
1,2-dichloroethane	113,000	0.57	ND	ND	ND	0.66	NA
Bromodichloromethane	6,400	11	6.4	ND	10	53	NA
Dibromochloromethane	none	17	11	ND	19	56	NA
Bromoform	none	36	36	1.9	38	80	NA
di-n-butylphthalate	3.4	NA	NA	NA	NA	NA	2.5(pos. lab contamination)
bis (2-ethylhexyl) phthalate	none	NA	NA	NA	NA	NA	1.4(pos. lab contamination)
Copper	2.9	NA	NA	NA	NA	NA	**360**
Nickel	8.3	NA	NA	NA	NA	NA	**89**
Zinc	5.6	NA	NA	NA	NA	NA	**420**
cyanide (total)	1.0 (free)	NA	NA	NA	NA	NA	***19*** (may be partly interference's)
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**							

Appendix B cont.

Cruise ship E *(sampled 9/21/00)*				
priority pollutant detected	WQC	Blk STP # 3	? BHW Tank 8 Port	Gry tank 7 port and starboard
Phenol	5,800	100	17	3.1
di-n-butylphthalate	3.4	2.6(pos. lab contamination)	2.1(pos. lab contamination)	3.0(pos. lab contamination)
diethylphthalate	3.4	ND	3.3	**11**
bis (2-ethylhexyl) phthalate	none	ND	8.8(pos. lab contamination)	14(pos. lab contamination)
chloroform	none	1.6	13	16
bromodichloromethane	6,400	ND	1.7	2.0
dibromochloromethane	none	ND	0.99	1.1
ethylbenzene	430	ND	0.92	0.68
bromoform	none	ND	1.1	1.2
chromium (total)	50(CrVI)	ND	10	ND
copper	2.9	**130**	**6400**	**150**
lead	5.6	ND	**16**	ND
mercury	0.025	***0.37***(may be interference's)	***0.84***(may be interference's)	ND
silver	2.3	ND	2.1	ND
zinc	86	**700**	**1800**	**740**
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**				

Cruise ship F *(sampled 9/22/00)*						
priority pollutant detected	WQC	Gry galley tank # 11	Blk STP B	Blk STP C	Blk STP D	Blk STP E
diethylphthalate	3.4	6.3	NA	NA	NA	NA
di-n-butylphthalate	3.4	3.3(pos. lab contamination)	NA	NA	NA	NA
bis (2-ethylhexyl) phthalate	none	3.7(pos. lab contamination)	NA	NA	NA	NA
chloromethane	6,400	3.0	ND	19	7.9	81
chloroethane	none	1.5	ND	ND	ND	ND
chloroform	none	48	11	20	39	1500
carbon tetrachloride	50,000		ND	1.1	ND	27
bromodichloromethane	6,400	16	1.2	ND	ND	190
dibromochloromethane	none	14	ND	ND	ND	88
bromoform	none	9.8	ND	ND	ND	25
chromium (total)	50(CrVI)	***53***	NA	NA	NA	NA
copper	2.9	**650**	NA	NA	NA	NA
lead	5.6	**62**	NA	NA	NA	NA
zinc	86	**530**	NA	NA	NA	NA
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**						

Appendix B cont.

Cruise ship G *(sampled 9/10/00)*			
priority pollutant detected	WQC	Gry/Blk treated by Reverse Osmosis	Gry/Blk treated by Reverse Osmosis
Phenol	5,800	2.1	1.3
1, 3-dichlorobenzene	1,970	1.2	ND
di-n-butylphthalate	3.4	1.1	ND
bis (2-ethylhexyl) phthalate	none	ND	1.3
Chloroform	none	4.1	4.0
Metals		NA	all ND
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**			

Cruise ship K *(sampled 9/6/00)*										
priority pollutant detected	WQC	Blk STP #1	Blk STP #2	Blk STP #3	Blk STP #4	Blk Comp.	Gry galley	Gry laun dry	Gry acco m.	Gry comp
Chloroform	none	7.7	11	20	5.8	NA	6.2	42	75	NA
1,2-dichloroethane	none	0.97	ND	ND	ND	NA	ND	ND	ND	NA
Toluene	5,000	ND	ND	ND	ND	NA	ND	ND	1.5	NA
Bromodichloromethane	6,400	6.9	9.9	18	6.8	NA	ND	ND	ND	NA
Dibromochloromethane	none	13	12	18	8.9	NA	ND	ND	ND	NA
tetrachloroethene	450	ND	ND	ND	ND	NA	ND	24	ND	NA
bromoform	none	28	17	25	23	NA	ND	ND	ND	NA
alpha-BHC	none	NA	NA	NA	NA	ND	NA	NA	NA	ND
delta-BHC	none	NA	NA	NA	NA	ND	NA	NA	NA	ND
endosulfan sulfate	0.0087	NA	NA	NA	NA	ND	NA	NA	NA	ND
copper	2.9	NA	NA	NA	NA	**530**	NA	NA	NA	**2600**
lead	5.6	NA	NA	NA	NA	**27**	NA	NA	NA	**250**
nickel	8.3	NA	NA	NA	NA	**41**	NA	NA	NA	**59**
silver	2.3	NA	NA	NA	NA	1.9	NA	NA	NA	**2.9**
zinc	86	NA	NA	NA	NA	**1000**	NA	NA	NA	**390**
cyanide (total)	1.0 (free)	NA	NA	NA	NA	***19*** (may be interference's)	NA	NA	NA	ND
diethylphthalate	3.4	NA	NA	NA	NA	ND	NA	NA	NA	2.6
bis (2-ethylhexyl) phthalate	none	NA	NA	NA	NA	ND	NA	NA	NA	11
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**										

Cruise ship M *(sampled 9/14/00)*							
priority pollutant detected	WQC	Gry tank # 2	? ballast tank 5S	Blk STP composite	Blk STP # 1	Blk STP # 2	Blk STP # 3
heptachlor	0.0036	ND	ND	ND	NA	NA	ND
diethylphthalate	3.4	5.8	3.7	ND	NA	NA	NA
di-n-butylphthalate	3.4	2.1(lab contamination)	2.5(lab contamination)	3.2(lab contamination)	NA	NA	NA
bis (2-ethylhexyl) phthalate	none	20	17	1.4	NA	NA	NA
Chloromethane	6,400	ND	ND	NA	ND	9.4	ND
Chloroform	none	1.8	15	NA	ND	140	13
carbon tetrachloride	50,000	ND	ND	NA	ND	2.0	ND

Appendix B cont.

Cruise ship M cont. *(sampled 9/14/00)*							
1,2-dichloroethane	113,000	0.65	0.75	NA	0.89	ND	0.76
Trichloroethene	2,000	1.6	71	NA	ND	ND	ND
Tetrachloroethene	450	7.7	230	NA	ND	ND	ND
Bromodichloromethane	6,400	ND	1.1	NA	ND	110	8.6
Toluene	5,000	ND	0.77	NA	ND	ND	ND
Dibromochloromethane	none	ND	ND	NA	ND	63	4.8
Bromoform	none	ND	ND	NA	ND	14	1.4
Copper	2.9	**130**	**150**	**170**	NA	NA	NA
Lead	5.6	ND	ND	**18**	NA	NA	NA
Nickel	8.3	**85**	**46**	ND	NA	NA	NA
Silver	2.3	ND	ND	1.5	NA	NA	NA
Zinc	86	**340**	**460**	**800**	NA	NA	NA
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**							

Cruise ship N *(sampled 9/18/00)*					
priority pollutant detected	WQC	Blk STP P	Gry pump accom.	Gry galley	Gry composite
phenol	5,800	ND	NA	NA	1.2
1,4-dichlorobenzene	1,970	5.7	NA	NA	2.2
diethylphthalate	3.4	ND	NA	NA	**5.1**
di-n-butylphthalate	3.4	2.3(lab contamination)	NA	NA	1.8(lab contamination)
bis (2-ethylhexyl) phthalate	none	2.9	NA	NA	21
di-n-octylphthalate	3.4	1.2	NA	NA	ND
methylene chloride	6,400	1.2(lab contamination)	0.69(lab contamination)	2.6(lab contamination)	NA
chloroform	none	2.5	2.3	2.6	NA
bromodichloromethane	6,400	6.8	ND	ND	NA
toluene	5,000	ND	1.7	ND	NA
dibromochloromethane	none	6.5	ND	ND	NA
ethylbenzene	430	4.7	2.8	ND	NA
bromoform	none	3.6	ND	ND	NA
chromium (total)	50(CrVI)	ND	NA	NA	22
copper	2.9	**110**	NA	NA	**120**
zinc	86	**190**	NA	NA	**130**
heptachlor	0.0036	ND	NA	NA	ND
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**					

Appendix B cont.

Cruise ship O *(sampled 9/18/00)*									
priority pollutant detected	WQC	Blk STP # 1	Blk STP # 2	Blk STP # 3	Blk STP # 4	Blk comp	Gry accom.	Gry galley	Gry comp
chloromethane	6,400	ND	6.6	ND	16	NA	6.3	ND	NA
methlyene chloride * pos lab contamination	6,400	42 *	ND	ND	0.55 *	NA	ND	36 *	NA
Chloroform	none	6.2	9.3	5.5	12	NA	11	29	NA
bromodichloromethane	6,400	6.6	19	8.5	45	NA	15	ND	NA
tetrachloroethene	450	ND	ND	ND	7.6	NA	ND	ND	NA
toluene	5,000	ND	ND	ND	ND	NA	4.0	ND	NA
dibromochloromethane	none	9.2	26	8.1	93	NA	22	ND	NA
bromoform	none	15	47	9.5	130	NA	36	ND	NA
1,3-dichlorobenzene	1,970	NA	NA	NA	NA	380	NA	NA	NA
1,4-dichlorobenzene	1,970	NA	NA	NA	NA	350	NA	NA	11
1,2-dichlorobenzene	1,970	NA	NA	NA	NA	390	NA	NA	ND
2,4,6-trichlorophenol	none	NA	NA	NA	NA	3.2	NA	NA	ND
diethylphthalate	3.4	NA	NA	NA	NA	ND	NA	NA	**4.8**
di-n-butylphthalate	3.4	NA	NA	NA	NA	2.7(pos. lab contamination)	NA	NA	3.4pos. lab contamination)
bis (2-ethylhexyl) phthalate	none	NA	NA	NA	NA	6.2	NA	NA	120
chromium (total)	50(Cr VI)	NA	NA	NA	NA	14	NA	NA	14
copper	2.9	NA	NA	NA	NA	**7100**	NA	NA	**810**
lead	5.6	NA	NA	NA	NA	ND	NA	NA	**17**
mercury	0.025	NA	NA	NA	NA	ND	NA	NA	***0.33***
nickel	8.3	NA	NA	NA	NA	ND	NA	NA	**52**
silver	2.3	NA	NA	NA	NA	2.0	NA	NA	ND
zinc	86	NA	NA	NA	NA	**610**	NA	NA	**1200**
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**									

Cruise ship Q *(sampled 9/18/00)*									
Priority Pollutant Detected	WQC	Blk STP #1	Blk STP #2	Blk STP #4	Blk comp	Gry gal/ acco	Gry accom	Gry laundry	Gry comp
chloromethane	6,400	4.4	ND	ND	NA	ND	ND	ND	NA
bromomethane	6,400	7.0	ND	ND	NA	ND	ND	ND	NA
methylene chloride * pos lab contamination	6,400	0.64 *	23 *	23 *	NA	ND	1.9 *	ND	NA
chloroform	none	5.3	160	380	NA	19	51	17	NA
carbon tetrachloride	50,000	0.99	2.9	5.8	NA	ND	ND	ND	NA
bromodichloromethane	6,400	14	180	70	NA	1.0	4.8	ND	NA
toluene	5,000	ND	2.2	ND	NA	ND	0.81	ND	NA
dibromochloromethane	none	28	270	54	NA	ND	3.8	ND	NA
ethylbenzene	430	ND	2.3	ND	NA	ND	ND	ND	NA
bromoform	none	64	440	44	NA	ND	5.2	ND	NA
1,1,2,2-tetrachloro-ethane	9,020	ND	5.9	ND	NA	ND	ND	ND	NA

Appendix B cont.

Cruise ship Q cont. *(sampled 9/18/00)*									
diethylphthalate	3.4	NA	NA	NA	ND	NA	NA	ND	2.3
di-n-butylphthalate	3.4	NA	NA	NA	2.7(pos. lab contam)	NA	NA	NA	1.6(pos. lab. cont.)
butylbenzylphthalate	3.4	NA	NA	NA	ND	NA	NA	NA	1.2
bis (2-ethylhexyl) phthalate	none	NA	NA	NA	3.3	NA	NA	NA	35
copper	2.9	NA	NA	NA	**440**	NA	NA	NA	**610**
lead	5.6	NA	NA	NA	ND	NA	NA	NA	**120**
Mercury	0.025	NA	NA	NA	***0.26*** (pos. interference	NA	NA	NA	
Nickel	8.3	NA	NA	NA	ND	NA	NA	NA	**73**
Zinc	86	NA	NA	NA	**590**	NA	NA	NA	**840**
cyanide (total)	1.0 (free)	NA	NA	NA	***28***(pos. interference	NA	NA	NA	ND
Heptachlor	0.0036	NA	NA	NA	ND	NA	NA	NA	ND

Cruise ship R *(sampled 9/21/00)*				
Priority Pollutant Detected	WQC	Blk	Gry HTS composite	Gry DHTS composite
phenol	5,800	160	ND	ND
1,4-dichlorobenzene	1,970	2.8	ND	ND
2,4,6-trichlorophenol	none	2.0	ND	ND
diethylphthalate	3.4	ND	**8.5**	**6.0**
di-n-butylphthalate	3.4	***8.2*** (possible lab contamination)	***6.8*** (possible lab contamination)	***5.3*** (possible lab contamination)
butylbenzylphthalate	3.4	ND	1.1	ND
bis (2-ethylhexyl) phthalate	none	3.7 (possible lab contamination)	51 (possible lab contamination)	35 (possible lab contamination)
naphthalene	2,350	ND	ND	3.0
acenaphthene	710	ND	ND	7.7
fluoranthene	16	ND	ND	1.2
fluorene	300	ND	ND	4.1
phenanthrene	none	ND	ND	3.1
chromium (total)	50(CrVI)	25	ND	NA
copper	2.9	**3900**	**830**	**720**
mercury	0.025	***0.30*** (possible interference's)	ND	ND
nickel	8.3	ND	**44**	**46**
zinc	86	**390**	**400**	**600**
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**				

Appendix B cont.

Cruise ship S *(sampled 9/20/00)*						
Priority Pollutant Detected	WQC	Gry/Blk	Gry composite	Gry laundry	Gry galley	Gry accom
Diethylphthalate	3.4	2.7	**4.4**	NA	NA	NA
di-n-butylphthalate	3.4	***3.9***(pos. lab contamination)	2.9(pos. lab contamination)	NA	NA	NA
bis (2-ethylhexyl) phthalate	none	6.5 (pos. lab contamination)	22 (pos. lab contamination)	NA	NA	NA
Chloroform	none	5.7	NA	28	15	6.0
1,2-dichloroethane	113,000	ND	NA	ND	ND	0.70
Trichloroethene	2,000	1.3	NA	8.2	ND	ND
Bromodichloromethane	6,400	0.57	NA	0.57	0.58	0.82
Toluene	5,000	0.69	NA	ND	1.3	5.1
Tetrachloroethene	450	33	NA	190	ND	11
Copper	2.9	**530**	**160**	NA	NA	NA
Nickel	8.3	**42**	**630**	NA	NA	NA
Silver	2.3	ND	2.1	NA	NA	NA
Zinc	86	**530**	**1000**	NA	NA	NA
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**						

Cruise ship S *(sampled 9/26/00)*					
Priority Pollutant Detected	WQC	Blk STP composite	Blk STP # 1	Blk STP # 2	Blk STP # 3
4-nitrophenol	4,850	7.7	NA	NA	NA
di-n-butylphthalate	3.4	2.1(pos. lab contamination)	NA	NA	NA
bis (2-ethylhexyl) phthalate	none	1.8 (pos. lab contamination)	NA	NA	NA
cadmium	9.3	0.24	NA	NA	NA
copper	2.9	**54**	NA	NA	NA
zinc	86	**250**	NA	NA	NA
chloromethane	6,400	NA	120	160	240
chloroform	none	NA	0.68	3.7	ND
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**					

Cruise ship V *(sampled 9/2/00)*			
Priority Pollutant Detected	WQC	Gry/Blk treated by reverse osmosis	Gry/Blk treated by reverse osmosis
bis (2-ethylhexyl) phthalate	none	4.1 (pos. lab contamination)	1.6 (pos. lab contamination)
chloroform	none	4.6	4.8
1,2-dichloroethane	113,000	1.9	0.74
toluene	5,000	0.58	ND
zinc	86	6.1	7.0
all values in µg/l ND=Non-detect NA=Not analyzed for in this sample **values in bold exceed WQC**			

Appendix B cont.

Cruise ship L *(sampled 9/20/00)*							
Priority Pollutant Detected	WQC	Blk STP # 1	Blk STP # 2	Blk STP # 3	Blk STP composite	Gry 78 port	Gry tank 3C
methylene chloride	6,400	1.8(lab contamination)	ND	ND	NA	ND	ND
Chloroform	none	7.8	89	2.4	NA	44	26
carbon tetrachloride	50,000	ND	1.6	ND	NA	ND	ND
1,2-dichloroethane	113,000	ND	ND	0.49	NA	ND	ND
Bromodichloromethane	6,400	18	38	4.6	NA	1.3	0.51
Toluene	5,000	ND	ND	ND	NA	0.47	ND
Dibromochloromethane	none	25	35	8.3	NA	ND	ND
Ethylbenzene	430	ND	ND	ND	NA	0.53	0.68
Bromoform	none	27	39	12	NA	ND	ND
Diethylphthalate	3.4	NA	NA	NA	ND	**4.5**	3.6
Phenanthrene	none	NA	NA	NA	ND	1.4	ND
di-n-butylphthalate	3.4	NA	NA	NA	3.1(pos. lab contamination)	2.2pos. lab contamination)	3.3pos. lab contamination)
Butylbenzylphthalate	3.4	NA	NA	NA	ND	1.1	ND
bis (2-ethylhexyl) phthalate	none	NA	NA	NA	5.1(pos. lab contamination)	20 (pos. lab contamination)	7.6(pos. lab contamination)
Cadmium	9.3	NA	NA	NA	ND	ND	**12**
chromium (total)	50(CrVI)	NA	NA	NA	19	ND	ND
Copper	2.9	NA	NA	NA	**360**	**180**	**1500**
Mercury	0.025	NA	NA	NA	***0.23***(possible interference's)	ND	ND
Nickel	8.3	NA	NA	NA	ND	ND	**140**
Silver	2.3	NA	NA	NA	ND	2.3	ND
Zinc	86	NA	NA	NA	**620**	**750**	**540**
cyanide (total)	1.0 (free)	NA	NA	NA	***26***(possible interference's)	***22*** (possible interference's)	ND

Cruise ship C *(sampled 9/15/00)*									
Priority Pollutant Detected	WQC	Blk comp	Blk STP 1	Blk STP 2	Blk STP 3	Gry comp	Gry accom	Gry laundry	Gry galley
di-n-butylphthalate * pos lab contamination	3.4	2.0 *(	NA	NA	NA	3.1 *(	NA	NA	NA
Diethylphthalate	3.4	ND	NA	NA	NA	3.3	NA	NA	NA
bis (2-ethylhexyl) phthalate	none	2.3	NA	NA	NA	17	NA	NA	NA
Copper	2.9	**760**	NA	NA	NA	**300**	NA	NA	NA
Mercury	0.025	***0.24*** (possible interfer)	NA	NA	NA	ND	NA	NA	NA

Appendix B cont.

Cruise ship C cont. *(sampled 9/15/00)*

Silver	2.3	ND	NA	NA	NA	2.0	NA	NA	NA
Zinc	86	ND	NA	NA	NA	**430**	NA	NA	NA
alpha-BHC	none	ND	NA	NA	NA	ND	NA	NA	NA
Chloromethane	6,400	NA	ND	ND	ND	NA	22	ND	ND
1,2-dichloroethane	1,970	NA	0.97	ND	ND	NA	ND	ND	ND
methylene chloride * pos lab contamintaion	6,400	NA	ND	ND	ND	NA	2.9 *	67 *	2.4 *
Chloroform	none	NA	ND	200	ND	NA	170	120	240
carbon tetrachloride	50,000	NA	ND	ND	ND	NA	1.8	ND	ND
Trichloroethene	2,000	NA	ND	ND	ND	NA	0.67	ND	ND
Toluene	5,000	NA	ND	0.73	ND	NA	ND	ND	ND
Bromodichloromethane	6,400	NA	ND	43	ND	NA	8.9	ND	2.0
Bromoform	none	NA	ND	6.1	ND	NA	ND	ND	ND
Tetrachloroethene	450	NA	ND	ND	ND	NA	0.65	**740**	2.2
Dibromochloromethane	none	NA	ND	16	ND	NA	1.3	ND	ND
1,1,2,2-tetrachloro-ethane	9,020	NA	ND	ND	ND	NA	0.91	ND	1.0

Appendix C: Summary of Analyses of Cruise Ship Wastewater for Non-Priority Pollutants, Summer of 2000

	BOD	TSS	Total Ammonia as N	pH	COD	Fecal Coliform	Free/Total Chlorine
Waste Stream	**(mg/l)**	**(mg/l)**	**(mg/L**		**(mg/l)**	**(FC/100 ml)**	**(mg/l)**
Cruise ship A (sampled 8/7/00)							
Gry laundry	70	4	0.39	10.5	230	ND	0.4/0.85
Gry	81	67	3.4	7.2	190	50,000	ND/ND
Blk	63	100	ND	7.6	NA	300	0.25/2.5
Cruise ship A (sampled 8/22/00)							
Gry main overboard	1040	480	1.2	6	1140	32,000,000	ND/ND
Gry stbrd laundry	6.7	54	0.1	9.6	180	ND	>3.5/>3.5
Gry in ballast	420	250	1.7	5.5	860	27,000	ND/ND
Blk	98	99	68	7.7	NA	ND	3.5/>3.5
Cruise ship B (sampled 8/1 and 8/2/00)							
Gry (?) Ballast tank 8	1100	623	24	5.8	3860	3,500,000*	0.1/0.1
Gry (?) Ballast tank	1270	612	15	4.8	3460	490,000	ND/ND
Gry tanks D,E	1120	497	1.4	6.1	2060	350,000	ND/ND
Blk TBW STP composite	75	236	100	5.3	NA	NA	NA/NA
Blk STP B	NA	NA	NA	NA	NA	350	1.7/3.5
Blk STP C	NA	NA	NA	NA	NA	3,500,000	0.7/0.9
Blk STP D	NA	NA	NA	NA	NA	9,200,000	1.9/2.2
Blk STP E	NA	NA	NA	NA	NA	ND	1.1/>3.5
Cruise ship B (sampled 9/13/00)							
Gry galley composite	1210	320	0.63	9.5	1730	NA	NA/NA
Gry galley tank H	NA	NA	NA	NA	NA	3,000	0.2/2.5
Gry tank C	NA	NA	NA	NA	NA	30	ND/0.5-1.0
Gry ballast tank 4	480	120	0.76	6.2	720	16,000,000	ND/ND
Blk STP A	NA	NA	NA	NA	NA	230	0.1/2.8
Blk STP B	NA	NA	NA	NA	NA	230	3.0/>3.5
Blk STP C	NA	NA	NA	NA	NA	ND	0.2/1.0
Blk STP D	NA	NA	NA	NA	NA	13,000	0.2/3.5
Blk STP composite	130	650	64.1	6.9	NA	NA	NA/NA
Cruise ship C (sampled 9/28 and 9/29/00)							
Gry overboard	190	86	5.3	6.7	286	170,000	ND/ND
Gry in ballast	4.8	18	0.21	7.8	320	NA	NA/NA
Gry in ballast	25	53	ND	7.6	469	NA	ND/ND
Blk ballast # 1	NA	NA	NA	7	NA	16,000,000	ND/0.2
Blk ballast # 2	NA	NA	NA	7.5	NA	>24,000,000	0.1/0.2
Blk ballast # 3	NA	NA	NA	8.3	NA	1,700,000	ND/ND
Blk STP # 1 (chlorinator tank)	NA	NA	NA		NA	8	ND/1.0
Blk STP # 1 (aeration tank)	NA	NA	NA	8	NA	3,500,000	NA/NA
Blk STP # 1,3 (composite)	250	1480	52	7.3	NA	NA	?
Blk STP # 3	NA	NA	NA	8	NA	7,000	1.0/2.0

Appendix C cont.

	BOD	TSS	Total Ammonia as N	pH	COD	Fecal Coliform	Free/Total Chlorine
Waste Stream	**(mg/l)**	**(mg/l)**	**(mg/L**		**(mg/l)**	**(FC/100 ml)**	**(mg/l)**
Cruise ship C (sampled							
Gry composite	730	190	0.12	7.5	440	NA	NA/NA
Gry accommodations	NA	NA	NA	NA	NA	<2	ND/ND
Gry laundry	NA	NA	NA	NA	NA	<2	ND/0.5
Gry galley	NA	NA	NA	NA	NA	<2	4.0/4.0
Blk composite	150	1430	66	7.6	1400	NA	NA/NA
Blk unit 1	NA	NA	NA	NA	NA	23,000	ND/ND
Blk unit 2	NA	NA	NA	NA	NA	110,000	0.2/0.5
Blk unit 3	NA	NA	NA	NA	NA	2,400,000	ND/ND
Cruise ship D (sampled							
Gry in ballast # 6	200	110	5.1	6.6	380	>16,000,000	ND/ND
Gry in ballast-galley	1010	320	1.3	4	1500	170,000	ND/ND
Gry overboard	4.3	27	0.37	8.1	425	28,000	ND/ND
Blk in ballast 4	340	130	53	6.7	NA	5,000,000	ND/ND
Blk overboard	49	130	76	6.4	NA	800,000	ND/ND
Cruise ship D (sampled 9/20/00)							
Gry laundry coll. tank	NA	NA	NA	NA	NA	<2	0.8/1.0
Gry ballast #6	NA	NA	NA	NA	NA	170,000	ND/ND
Gry galley ballast 11	NA	NA	NA	NA	NA	50,000	ND/ND
Gry coll tank F	NA	NA	NA	NA	NA	170,000	ND/ND
Gry(?) ballast composite	420	250	30	5.9	1020	NA	NA/NA
Gry laundry/accom composite	69	30	0.61	7.3	240	NA	NA/NA
Blk ballast # 4	NA	NA	NA	NA	NA	300,000*	ND/ND
Blk STP A	NA	NA	NA	NA	NA	110,000	ND/0.2
Blk STP B	NA	NA	NA	NA	NA	<2	>3.5/>3.5
Blk STP C	NA	NA	NA	NA	NA	16,000,000	ND/ND
Blk STP D	NA	NA	NA	NA	NA	30,000	0.3/3.5
Blk STP E	NA	NA	NA	NA	NA	2	0.1/0.1
Blk STP A-E comp.	49	300	74	7.7	NA	NA	NA/NA
Cruise ship E (sampled 8/3/00)							
Gry holding tank	86	171	1.7	4.7	1250	1,300,000	ND/ND
Gry laundry	85	19	3	9.2	300	700	ND/ND
Gry galley	1720	257	1.6	6.1	1090	>24,000,000	ND/ND
Blk TBW # 3	140	589	520	8.4	NA	1,400,000	ND/ND
Cruise ship E (sampled 9/21/00)							
Gry (?) in ballast	1190	2060	48	7.2	2760	5,000,000	ND/ND
Gry tank 7	180	110	2.1	6.6	370	280,000	ND/ND
Blk STP # 3	320	950	730	8.7	NA	700,000	ND/0.2

Appendix C cont.

	BOD	TSS	Total Ammonia as N	pH	COD	Fecal Coliform	Free/Total Chlorine
Waste Stream	**(mg/l)**	**(mg/l)**	**(mg/L**		**(mg/l)**	**(FC/100 ml)**	**(mg/l)**
Cruise ship F (sampled 8/25/00)							
Gry overboard	>4500	3000	3.8	3.8	15,700	7,000	ND/ND
Blk/Gry ballast	650	380	0.19	5	230	50,000	ND/ND
Blk STP A	NA	NA	NA	NA	NA	50,000	NA/NA
Blk STP B	NA	NA	NA	NA	NA	700	NA/NA
Blk STP C	NA	NA	NA	NA	NA	30	NA/NA
Blk STP D	NA	NA	NA	NA	NA	2300	NA/NA
Blk STP E	NA	NA	NA	NA	NA	<2	NA/NA
Blk STP composite B-E	58	200	45	6.7	NA	NA	0.4/>3.5
Cruise ship F (sampled 9/22/00)							
Gry galley ballast tank #11	110	55	0.18	6.4	280	900,000	NA/ND
Gry collection tank A	150	69	1.2	7	410	70,000	NA/ND
Blk STP A						<2	NA/5.6
Blk STP B						2	NA/6.2
Blk STP C						23	NA/15 (!)
Blk STP D						<2	NA/7.6
Blk STP E						<2	NA/>20 (!)
Blk STP composite A-E	58	250	44	4.6	510	NA	NA/NA
Cruise ship G (sampled 7/30/00)							
Blk/Gry treated	220	40	57	5.9	395	35,000	NA/NA
Cruise ship G (sampled 9/10/00)							
Blk/Gry RO treated, sample 1	80	ND	1.22	5.9	130	ND	ND/ND
Blk/Gry RO treated, sample 2	75	ND	1.24	6.1	130	ND	ND/ND
Cruise ship H [also labeled ship Z] (sampled 8/19/00)							
Gry/Blk aft	110	130	8.1	7.5	670	4000	0.2/1.0
Gry/Blk foreward	130	92	13	7.4	710	510	0.75/1.3
Cruise ship H [also labeled ship Z] (sampled 8/29/00)							
Gry/Blk aft	72	89	3.7	7.8	135	30,000	0.7/1.1
Gry/Blk forward	150	150	8.5	7.6	135	60,000	0.75/1.1
Cruise ship J (sampled 8/5/00)							
Gry starboard stabilizer room	170	57	0.5	6.4	350	16,000,000	ND/0.1
Gry port stabilizer room	89	37	0.99	6.8	410	22,000	ND/0.2
Gry fuel treatment room	440	98	0.45	10.3	850	490,000	NA/NA
Gry shaft tunnel	780	294	0.26	4.7	1160	9,200,000	NA/NA
Gry laundry	180	140	11	7.1	430	>24,000,000	NA/NA
Gry/Blk ballast tank 4P	110	55	17	7	710	16,000,000	NA/NA
Blk port STP (sample # 1)	30	80	75	8	NA	3300*	ND/0.2
Blk port STP (sample # 2)	110	160	96	8.1	NA	9,200,000	ND/ND
Blk stboard STP (sample #1)	600	1610	98	7.4	NA	940,000	ND/ND
Blk stboard STP (sample # 2)	71	140	94	8.2	NA	790,000	NA/NA

Appendix C cont.

	BOD	TSS	Total Ammonia as N	pH	COD	Fecal Coliform	Free/Total Chlorine
Waste Stream	**(mg/l)**	**(mg/l)**	**(mg/L**		**(mg/l)**	**(FC/100 ml)**	**(mg/l)**
Cruise ship J (sampled8/12/00)							
Gry starboard stabilizer	130	54	0.52	7.7	380	800,000	ND/ND
Gry fuel treatment room	150	67	2	9.1	170	220,000	ND/ND
Gry shaft tunnel	810	150	1.1	5.7	1190	1600	ND/ND
Gry laundry room	290	420	10	3	1310	ND	ND/ND
Gry/Blk starboard ballast tank	180	110	13	6.3	680	3,000,000	ND/ND
Blk port STP	47	280	70	7.7	NA	1,100,000	ND/ND
Blk stboard STP	90	590	62	7.6	NA	500,000	ND/ND
Cruise ship K (sampled 9/6/00)							
Gry galley	11	21	2	7.3	25	NA*	ND/ND
Gry laundry	86	46	ND	7.6	270	NA*	ND/ND
Gry accommodations	500	110	0.88	9	800	NA*	ND/ND
Blk STP # 1	68	290	98	7.2	NA	NA*	ND/ND
Blk STP # 2	91	350	120	7.4	NA	NA*	ND/0.5
Blk STP # 3	79	390	77	7.9	NA	NA*	ND/2.0
Blk STP # 4	83	320	93	7.7	NA	NA*	ND/2.0
Cruise ship K (sampled8/29/00)							
Gry tank 5	130	51	2.1	7.2	250	8000	ND/ND
Gry tank 10 galley	490	160	9.5	6.9	790	28,000	ND/ND
Gry laundry	120	39	0.17	7.6	400	8,000	ND/ND
Blk SPT # 1	NA	NA	NA	NA	NA	5	3.5/>3.5
Blk SPT # 2	NA	NA	NA	NA	NA	170	3.5/>3.5
Blk SPT # 3	NA	NA	NA	NA	NA	110,000	ND/ND
Blk SPT # 4	NA	NA	NA	NA	NA	5,000,000	ND/ND
Blk SPT composite	65	330	109	7.8	NA	NA	NA
Cruise ship L (sampled 8/9/00)							
Gry in ballast tank 3C	260	180	0.26	6.6	550	9,000,000	ND/ND
Blk STP # 1	NA	NA	NA	NA	NA	17,000	ND/ND
Blk STP # 2	NA	NA	NA	NA	NA	ND	0.50/2.0
Blk STP # 3	NA	NA	NA	NA	NA	9,000,000	0.20/1.0
Blk STP composite	130	1260	100	6.9	NA	NA	NA/NA
Cruise ship L (sampled 9/20/00)							
Gry collection tank port	150	51	2.9	7.6	290	<2	0.6/1.2
Gry ballast tank 3C	230	72	ND	6.7	480	<2	ND/ND
Blk STP # 1	NA	NA	NA	NA	NA	>16,000,000	15/125 (!)
Blk STP # 2	NA	NA	NA	NA	NA	300	0.7/17 (!)
Blk STP # 3	NA	NA	NA	NA	NA	<2	3.5/21 (!)
Blk STP # 1-3 composite	140	860	50	7.4	NA	NA	NA

Appendix C cont.

	BOD	TSS	Total Ammonia as N	pH	COD	Fecal Coliform	Free/Total Chlorine
Waste Stream	**(mg/l)**	**(mg/l)**	**(mg/L**		**(mg/l)**	**(FC/100 ml)**	**(mg/l)**
Cruise ship M (sampled 8/9/00)							
Gry tank 1	40	62	ND	7.9	400	ND	3.5/>3.5
Gry tank 5P	350	250	0.59	9.9	750	ND	>3.5/NA
Blk STP # 1	NA	NA	NA	NA	NA	2	3.5/>3.5
Blk STP # 2	NA	NA	NA	NA	NA	ND	>3.5/>3.5
Blk STP # 3	NA	NA	NA	NA	NA	500,000	ND/ND
Blk STP composite	170	1230	110	7.5	NA	NA	NA/NA
Cruise ship M (sampled 9/14/00)							
Gry collection tank 2	270	73	ND	6.6	360	2,200,000	ND/ND
Gry in ballast tank 5S	230	87	2	7.2	445	5,000,000	ND/ND
Gry in ballast pump 5S	260	100	ND	6.8	615	3,000,000	ND/ND
Blk STP # 1	NA	NA	NA	NA	NA	500,000	ND/ND
Blk STP # 1	NA	NA	NA	NA	NA	>16,000,000	ND/ND
Blk STP # 1	NA	NA	NA	NA	NA	500,000	ND/ND
Blk STP 1-3 composite	82	280	140	8.2	NA	NA	NA
Cruise ship N (sampled 9/2/00)							
Gry galley	330	190	ND	5.6	785	9,000,000	ND/ND
Gry laundry	98	38	0.75	10.2	300	<2	0.4/1.0
Blk strbrd STP	150	200	180	7.6	1210	80	>3.5/>3.5
Cruise ship N (sampled 9/18/00)							
Gry galley	NA	NA	NA	NA	NA	130,000	ND/ND
Gry laundry tank	NA	NA	NA	NA	NA	30	ND/ND
Gry pump accom.	NA	NA	NA	NA	NA	1,200	ND/ND
Gry galley/laundry/pump accom. composite	230	230	1.4	8	400	NA	NA/NA
Blk STP port	110	300	130	6.7	NA	ND	2.0/3.0
Cruise ship O (sampled 9/9/00)							
Gry forward strbrd	170	110	26.9	6.8	470	110,000	ND/NA
Gry galley	3190	4500	2.37	6.8	10,420	5	1.2/NA
Blk STP forward	NA	NA	NA	NA	NA	14	1.3/NA
Blk STP strbrd	NA	NA	NA	NA	NA	4	2.5/NA
Blk STP midship	NA	NA	NA	NA	NA	2,800,000	ND/NA
Blk composite	250	980	155	7.5	NA	NA	NA/NA
Cruise ship O (sampled 9/18/00)							
Gry accommodations	210	800	49	7.8	1340	9*	ND/1.5
Gry galley	37,030	29,400	8.2	3.7	69,080	rejected	ND/ND
Blk Trident # 1	160	1010	65	7.7	NA	9,000	ND/0.7
Blk Trident # 2	140	630	58	7.7	NA	5	2.0/4.1
Blk Trident # 3	280	660	102	8.2	NA	7	ND/4.0
Blk Trident # 4	73	270	0.25	6.8	NA	<2	>10/>10

Appendix C cont.

	BOD	TSS	Total Ammonia as N	pH	COD	Fecal Coliform	Free/Total Chlorine
Waste Stream	**(mg/l)**	**(mg/l)**	**(mg/L**		**(mg/l)**	**(FC/100 ml)**	**(mg/l)**
Cruise ship P (sampled 8/6/00)							
Gry in ballast	360	120	0.76	5.5	780	>16,000,000	ND/ND
Gry/Blk	250	320	200	8.3	1030	5,000,000	ND/ND
Blk in ballast	210	220	150	8	NA	16,000,000	ND/ND
Blk Trident # 2	120	280	160	8.5	NA	23	<0.5/9.0
Cruise ship P (sampled 8/15/00)							
Gry ballast 8P	NA	NA	NA	NA	NA	>16,000,000	ND/ND
Gry ballast 8S	NA	NA	NA	NA	NA	5,000,000	ND/ND
Gry port/strbrd composite	1030	500	1.3	4.8	1530	NA	ND/ND
Blk in ballast 2P	167	97	150	7.8	690	3,000,000	ND/ND
Cruise ship Q (sampled 8/7/00)							
Gry/Blk in ballast	130	120	1.4	7.5	550	ND	ND/>3.5
Blk STP # 1	NA	NA	NA	6.2	NA	ND	>3.5/>3.5
Blk STP # 2	NA	NA	NA	6.5	NA	ND	>3.5/>3.5
Blk STP # 3	NA	NA	NA	6.1	NA	ND	2.5/>3.5
Blk STP # 4	NA	NA	NA	5.1	NA	ND	>3.5/>3.5
Blk STP composite	55	310	1.4	NA	NA	NA	NA
Cruise ship Q (sampled9/18/00)							
Gry galley/accom-modations	NA	NA	NA	NA	NA	1,400,000	ND/ND
Gry accommodations	NA	NA	NA	NA	NA	5,000,000	ND/ND
Gry laundry	NA	NA	NA	NA	NA	280,000	ND/ND
Gry composite	250	120	1.3	6.3	790	NA	NA/NA
Blk STP # 1	NA	NA	NA	NA	NA	13	2.0/1.0(?)
Blk STP # 2	NA	NA	NA	NA	NA	<2	0.5/10 (!)
Blk STP # 3	NA	NA	NA	NA	NA	<2	ND/3.0
Blk STP # 4	NA	NA	NA	NA	NA	13,000	ND/ND
Blk composite STP #1-4	100	630	120	7.8	NA	NA	NA/NA
Cruise ship R (sampled 9/15/00)							
Gry HTS composite	270	48	0.96	6.3	460	NA	ND/ND
Gry DHTS composite	600	68	0.88	5	910	NA	ND/ND
Blk overboard disch.	480	1180	160	7.8	2720	NA	1.0/2.0
Cruise ship R (sampled 9/21/00)							
Gry HTS composite	240	41	0.48	6.1	500	NA	ND/ND
Gry DHTS composite	610	210	0.85	5.1	1150	NA	ND/ND
Blk overboard	310	580	170	8.2	2400	NA*	>3.0/>3.0

Appendix C cont.

	BOD	TSS	Total Ammonia as N	pH	COD	Fecal Coliform	Free/Total Chlorine
Waste Stream	**(mg/l)**	**(mg/l)**	**(mg/L**		**(mg/l)**	**(FC/100 ml)**	**(mg/l)**
Cruise ship S (sampled 9/20 and 9/22/00)							
Gry laundry	230	67	0.27	10.1	400	NA*	NA/NA
Gry galley	1200	540	ND	5.2	1890	NA*	NA/NA
Gry accommodations	160	66	0.47	6.4	310	NA*	NA/NA
Gry/Blk in ballast	250	270	14	6.7	990	NA*	NA/NA
Blk STP # 1						ND	1.37/NA
Blk STP # 2						6700	2.20/NA
Blk STP # 3						260,000	0.7/NA
Blk STP composite							
# 1-3	43	260	110	7	480	NA	NA/NA
Cruise ship S (sampled 9/26/00)							
Gry galley	1320	930	0.34	4.9	7200	1,100,000	ND/ND
Gry accommodations	77	65	0.38	6.5	160	1,100,000	ND/ND
Gry laundry	50	38	0.15	10.5	200	<2	0.2/0.3
Blk STP # 1	NA	NA	NA	NA	NA	<2	ND/0.8
Blk STP # 2	NA	NA	NA	NA	NA	<2	ND/1.0
Blk STP # 3	NA	NA	NA	NA	NA	1,700,000	ND/0.5
Blk STP composite							
# 1-3	220	1110	120	7.1	NA	NA	NA/NA
Cruise ship T (sampled 8/10/00)							
Gry in ballast	220	160	64	7	690	350,000	ND/ND
Gry laundry	63	42	0.37	9.8	300	130	ND/ND
Blk STP # 1	50	140	91	7.1	NA	170,000	ND/ND
Blk STP # 2	52	120	140	8.3	NA	5000	1.0/4.5
Blk STP # 3	58	290	160	7.9	NA	5,000,000	ND/ND
Cruise ship T (sampled 8/18/00)							
Gry overboard	450	170	4.4	6.3	1160	11,000	ND/NA
Gry (?) in ballast tank 8	280	55	3.2	6.5	455	900,000	ND/NA
Blk overboard	70	220	75	7.4	455	NA	0.75/NA
Blk STP # 1 spigot	NA	NA	NA	NA	NA	13	NA/NA
Blk STP # 2 spigot	NA	NA	NA	NA	NA	<2	NA/NA
Blk STP # 3 spigot	NA	NA	NA	NA	NA	140,000	NA/NA
Blk STP # 4 spigot	NA	NA	NA	NA	NA	13	NA/NA
Cruise ship U (sampled 8/24/00)							
Gry tank # 1	NA	NA	NA	NA	NA	50,000	ND/ND
Gry tank # 4	NA	NA	0.44	NA	455	220,000	ND/ND
Gry tank # 1 and # 4 composite	160	35	NA	6.5	NA	NA	ND/ND
Gry in ballast 913	72	64	ND	7	595	220,000	ND/ND
Blk # 1	610	350	540	7.6	NA	1,700,000	ND/ND

Appendix C cont.

	BOD	TSS	Total Ammonia as N	pH	COD	Fecal Coliform	Free/Total Chlorine
Waste Stream	**(mg/l)**	**(mg/l)**	**(mg/L**		**(mg/l)**	**(FC/100 ml)**	**(mg/l)**
Cruise ship U (sampled 9/8/00)							
Gry composite	820	330	0.31	6.2	1710	NA	NA/NA
Gry galley	NA	NA	NA	NA	NA	170,000	NA/NA
Gry laundry	NA	NA	NA	NA	NA	8	NA/NA
Gry accommodation tank 4	NA	NA	NA	NA	NA	>16,000,000	NA/NA
Blk	1240	3580	765	8.1	3950	>16,000,000	ND/ND
Cruise ship V (sampled 9/3/00)							
Reverse Osmosis treated Blk/Gry	120	ND	2.5	5.6	170	<2	ND/ND
Reverse Osmosis treated Blk/Gry	110	ND	2.4	5.6	170	<2	ND/ND
Cruise ship V (sampled 9/11/00)							
Reverse Osmosis treated Blk/Gry	84	ND	2.24	5.7	120	ND	ND/ND

***Sample Exceeded Holding Time**

Appendix D: ACSI Steering Committee and Work Group Members

Steering Committee Members

Rear Admiral Thomas J. Barrett, 17th Coast Guard District Commander
U.S. Coast Guard

Dean Brown
North West Cruiseship Association

Michele Brown, Commissioner
Alaska Department of Environmental Conservation

Loren Gerhard, Executive Director
Southeast Conference (Representing Alaskan Communities)

Ron Kreizenbeck, Director, Office of Enforcement and Compliance
U.S. Environmental Protection Agency

Randy Ray
U.S. Cruise Ship Association

Oil Spill Response Work Group Members

Bob Mattson, Co-Chair
Environmental Specialist, Alaska Department of Environmental Conservation

Commander Rob Lorigan, Co-Chair
Commanding Officer, U.S. Coast Guard Marine Safety Office, Juneau

Commander Stephen J. Ohnstad, Co-Chair
U.S. Coast Guard

Don Habeger
Cruise Line Agencies of Alaska

John Hansen
North West Cruise Ship Association

Rick Janelle, 17th Coast Guard District Response Action Team
U.S. Coast Guard

Lt. Cecil McNutt, Chief, Port Operations
U.S. Coast Guard Marine Safety Office, Juneau

David Owings
Southeast Alaska Petroleum Resource Organization, Inc. (SEAPRO)

Bill Sharp
Holland America Line Westours Inc.

Oil Spill Response Work Group Members continued

Rich Softye, Vice President, Compliance Programs
Holland America Line

Jim Studley
NSE Local Emergency Planning Committee

Scot Tiernan, Environmental Specialist, Southeast Alaska Response Team
Alaska Department of Environmental Conservation

Chuck Young, Chief Ranger
Glacier Bay National Park & Preserve, Glacier Bay National Park

Air and Water Quality Work Group Members

Chair - David Rogers, Director, Division of Air and Water Quality
Alaska Department of Environmental Conservation

John Pavitt, Air Work Group Co-Chair
U.S. Environmental Protection Agency

LCDR Spencer Wood Water Work Group Co-Chair
U.S. Coast Guard

Hans Antonsen
Southeast Alaska Pilots' Association

David Banks
Nature Conservancy

Lt. Jim Bartlett
U.S. Coast Guard

Bob Berto
Cruise Line Agencies

LCDR John Bingaman
17th Coast Guard District, USCG

Michelle Bonnet, Environmental Specialist
Alaska Department of Environmental Conservation

David Brown
Princess Cruises

Gershon Cohen
Campaign to Safeguard America’s Waters

Michael Conway, Director, Statewide Public Service
Alaska Department of Environmental Conservation

Amy Crook
Alaska Conservation Alliance

Air and Water Quality Work Group Members continued

Steven Daugherty
Department of Law

Tom Dow
Princess Cruises

Dave Eley, Contractor Support to Work Group
Consultant Cape Decision Int'l. Services

Kenwyn George, Environmental Engineer
Alaska Department of Environmental Conservation

Loren Gerhard
Southeast Conference

Tom Greene
Crystal Cruises

Gerry Guay, Environmental Engineer
Alaska Department of Environmental Conservation

Don Habeger
Cruise Line Agencies of Alaska

John Hansen
Northwest Cruise Ship Association

Richard Heffern, Chemist
Alaska Department of Environmental Conservation

Paul Johnsen, Port Engineer
Alaska Marine Highway System, Alaska Department of Transportation

Michael O. Jones
Special Expeditions Marine

Tim June
Lynn Canal Conservation

Sarah Keeney
Southeast Alaska Conservation Council

Gretchen Keiser, Legislative Aide
Representative Kerttula's Office

Ted Kellogg
Southeast Alaska Pilots' Association

Annette Kreitzer, Legislative Assistant
Senator Leman's Office

Air and Water Quality Work Group Members continued

Mike Krieber, Chair
House Transportation

John Kuterbach, Environmental Conservation Manager
Alaska Department of Environmental Conservation

Pat Lavin
National Wildlife Federation

Amber Lee, Legislative Secretary
Senator Kim Elton's Office

Don McGlothlin, Engineer
Alaska Department of Environmental Conservation

Katy McKerney, Environmental Specialist
Alaska Department of Environmental Conservation

Kim Metcalfe-Helmar
Downtown Neighborhood Association/Community
Southeast Conference

Glenn Miller, Engineer, Solid Waste Program
Alaska Department of Environmental Conservation

Commander Stephen Ohnstad
U.S. Coast Guard

Commander Ed Page
17th Coast Guard District
Al Parrish

Andrew Phillips
Norwegian Cruise Line

Representative Jim Powell
City & Borough of Juneau

Randy Ray
U.S. Cruise Ship Association

Robert Reges
Alaska Conservation Council & Cruise Control, Inc.

Kira Schmidt
Bluewater Network

Jim Schoeneman
World Explorer Cruises

Nick Schoengerdt
Holland America

Air and Water Quality Work Group Members continued

Stan Senner, Executive Director
Audobon Society

Mary Siroky, Environmental Conservation Manager
Alaska Department of Environmental Conservation

John Sisk, Staff Assistant
Governor's Office

Rich Softye, Director Compliance
Holland America Line

Heather Stockard, Environmental Conservation Manager
Alaska Department of Environmental Conservation

Cliff Stone, Legislative Assistant
Senator Austerman's Office

Chip Thoma
Alaska Conservation Alliance

Steve Torok
Environmental Protection Agency

Anthony Turrini
National Wildlife Federation

Joe Valenti
Crystal Cruises

Dr. Richard Wade, Vice President
Princess Cruises

Jim Walsh
Carnival Cruise Line

Nancy Wheatley
Royal Caribbean Cruises, Ltd.

George Wright
Princess Cruises

Environmental Leadership Work Group Members

Chair - Tom Turner, Compliance Assistance
Statewide Public Service, ADEC

Frank Homan, Co-Chair
Southeast Conference

Kris Balliet
Alaska Conservation Alliance

Environmental Leadership Work Group Members continued

Stan Deno
International Council of Cruise Lines (ICCL)

Dave Eley – Contractor Support to Work Group
Consultant Cape Decision Int'l. Services

Tom Greene
Crystal Cruises

John Hansen
North West Cruiseship Association

Kjell Hjartnes
Norwegian Cruise Lines

Capt. Michael Jones
Special Expeditions Marine

Greg Kellog, Alaska Operations Office
U.S. Environmental Protection Agency

Rob Lorigan, Commander
U.S. Coast Guard

John Pavitt, Alaska Operations Office
U.S. Environmental Protection Agency

Brian Peter, LCDR
U.S. Coast Guard

Randy Ray
U.S. Cruise Ship Association

Rich Softye, Director of Compliance
Holland America Line

Paula Terrel
Alaska Conservation Alliance

Joe Valenti
Crystal Cruises

Ron Valentine
World Explorer

Dr. Richard Wade, Vice President
Princess Cruises

Jim Walsh
Carnival Cruise Line

Nancy Wheatley
Royal Caribbean Celebrity

Appendix E: Core Members of the Science Panel

Marlin Atkinson: Professor of Oceanography, University of Hawaii. Specialty: Nutrient input, physical transport models, remote sensing, and point/non-point pollution.

C-J Beegle-Krause: Oceanographer, National Oceanic and Atmospheric Administration. Specialty: Modeling chemical transport in oceans.

Kenwyn George: Environmental Engineer for Wastewater Discharge for Alaska Department of Environmental Conservation. Specialty: Dispersion modeling, fate and effects of wastewater discharge.

Kenneth Hall: Professor, University of British Columbia (Department of Civil Engineering and Institute for Resources and Environment). Specialty: Water quality, water pollution (non-point source, impact analysis).

Lincoln Loehr: Environmental analyst for a law firm. Specialty: Dispersion models and mixing zones, municipal wastewater permitting.

Charles McGee: Laboratory Supervisor, Orange County (CA) Sanitation District. Specialty: Microbiology, wastewater treatment.

Alan Mearns: Senior Staff Scientist, Hazardous Materials Response Division, National Oceanic and Atmospheric Administration. Specialty: Marine ecology, benefits and consequences of waste treatment technologies.

Michael S. Stekoll: Professor of Chemistry and Biochemistry, University of Alaska. Specialty: Ocean pollution, shoreline impacts of pollution.

Michael Watson: Senior toxicologist for US Environmental Protection Agency, Region 10. Specialty: Marine ecology, toxicology.

Dave Eley: Consultant for the Alaska Cruise Ship Initiative, Secretary and Facilitator for the Science Panel. Specialty: Industrial toxicology and environmental health, water ways management, marine environmental protection.

Appendix F: Steering Committee Member Endorsement

The following are written endorsements submitted by members of the Alaska Cruise Ship Initiative Steering Committee.