



2006 Assessment of Cruise Ship Environmental Effects in Washington



July 2007
Publication Number 07-10-029

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Washington State Department of Ecology

Report prepared by: Amy Jankowiak

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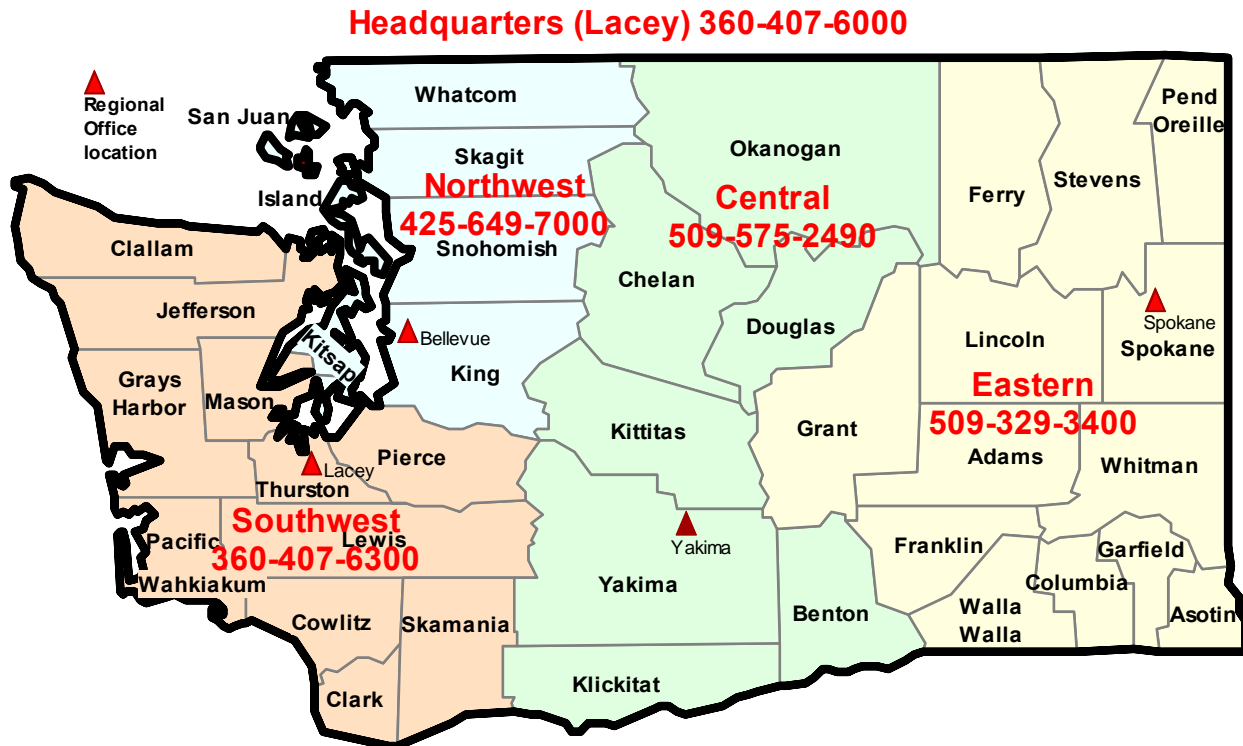
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Executive Summary

On April 20, 2004, a Memorandum of Understanding (MOU) between Department of Ecology (Ecology), the NorthWest CruiseShip Association (NWCA) and the Port of Seattle was signed. The MOU only covers the large passenger ships that are members of the NWCA, and therefore does not cover ships such as the Alaska Marine Highway ferries, shipping vessels, or any of the small passenger ships or boats.

On April 28, 2006 the MOU was amended. Amendments included: 1) adding a requirement to prohibit the discharge of oily bilge water per regulations; 2) adding a definition for residual solids for clarification; 3) adding specific language about what limits must be met for monitoring results; and 4) changing the requirements on WET testing to once per 2 years for homeported vessels and once per 40 calls for other vessels due to the fact that vessels come and go from this route from year to year.

The MOU bans all cruise-ship wastewater discharges (black and gray water), except from vessels with advanced wastewater treatment systems (AWTS). These systems are being installed in cruise ships in the Alaska market in response to requirements by the state of Alaska, and they provide wastewater treatment that meets or exceeds Alaska's requirements under federal law. The MOU allows continuous discharge in Washington waters from these AWTS if stringent requirements are met. The agreement also defines that waters subject to the agreement are consistent with Washington marine waters, requires sampling and allows for vessel inspections by Ecology.

In addition, the MOU provides for other elements:

- Sludge from any type of wastewater treatment system may be discharged only when a ship is more than 12 nautical miles from shore, and it is specifically prohibited from being discharged within a defined portion of the Olympic Coast National Marine Sanctuary.
- The MOU specifies a sampling regimen, testing and reporting requirements, and it requires advanced notification and documentation from ships planning to discharge via an AWTS.
- Cruise ships will comply with Washington's more restrictive hazardous-waste laws and they will not dump garbage into state waters and will discharge oily bilge water per regulation.

The goal of the MOU was to increase protection for Washington's marine waters from cruise-ship waste. The Memorandum of Understanding continues to be a key tool in protecting water quality by having requirements in place to only allow discharges from advanced wastewater treatment systems, allowing for inspections to verify compliance, and building communication with the cruise lines and vessel staff on requirements of the MOU.

The majority of the lines and vessels operating with the MOU had a successful season and were in compliance throughout. The sampling results continue to show excellent effluent quality. In 2006, major non-compliance was discovered in regards to the Celebrity Cruises Inc. MERCURY vessel and discharges that occurred in 2005, and a minor record discrepancy was discovered in regards to the Holland America Line VEENDAM which has since been discovered to be an error. It is the hope of Ecology that the active corrections being made do prevent recurrence of such violations. Ecology will continue to monitor compliance closely.

While we continue to learn more about the large passenger vessels, more information is needed in regards to the small ships including which ships are operating in Washington waters, what type of treatment systems are on board, which ships are discharging and where, and the quality of the effluent being discharged. In 2006, advances were made in researching this information.

The cruise-ship MOU has resulted in several benefits to Washington's environment:

- It ensures that we have a water-quality strategy in place for large passenger vessels.
- It increases Ecology's understanding of the operational practices of the cruise industry and increases the cruise industry's understanding of the environmental concerns in Washington.
- It forges a new and valuable partnership between state regulators, the cruise industry and other interested parties.
- It doesn't lessen the state's authority to enforce Washington's water quality laws.

Admittedly, the MOU also has its limitations: compliance with the MOU is voluntary; its enforceability is limited to those federal and state water quality laws that continue to apply to cruise ships; not every cruise ship that travels through Washington's waters is covered by the MOU, either because it does not make a port call while in Washington waters or because it's not a member of the NorthWest CruiseShip Association; and air quality issues are not covered by the MOU.

Ecology, the Port of Seattle, and the NWCA and its member lines have finalized a process via an agreement to recover costs incurred by Ecology associated with implementing the MOU. A funding agreement for the 2006 season has been signed and implemented. A similar agreement for the 2007 season is being finalized and will be in place prior to the end of the 2007 season for cost recovery for 2007.

Ecology should continue to inspect ships that discharge in waters subject to the MOU, including closely looking at wastewater management and management of other waste streams. The Department of Ecology and Washington State Department of Health should continue to work together to seek information on waste-water and other environmental practices of smaller passenger vessels. In addition, Ecology recommends that the cruise lines conduct a thorough review of records on an on-going basis throughout the season as well as at the end of the system to evaluate compliance, and that all recommendations made in inspection reports be implemented.

1. Introduction

1.1 Assessment report

The purpose of this assessment report is to assess the performance of the cruise industry for environmental impacts for the 2006 cruise season. The goals of this report are to:

1. Analyze the overall compliance with the Memorandum of Understanding.
2. Evaluate the performance of the advanced wastewater treatment systems.
3. Make recommendations in relation to the matters discussed in the report.

This report also presents general background information and detailed appendices of wastewater sampling data, in response to the public interest. Bilge and ballast water issues are a maritime wide concern and are beyond the scope of this report.

1.2 Cruise industry operations in Washington State

Cruise ships are typically categorized into large versus small; large vessels being able to accommodate overnight accommodations for 250 passengers or more, small vessels being able to accommodate overnight accommodations for 50-249 passengers.

Celebrity Cruises, Holland America Line, Norwegian Cruise Line, Princess Cruises, and Royal Caribbean Cruises Ltd. ran regular cruises of large ships between Seattle and Alaska in 2006. Most of these large ships have a capacity of about 1800 to 3400 persons on board.

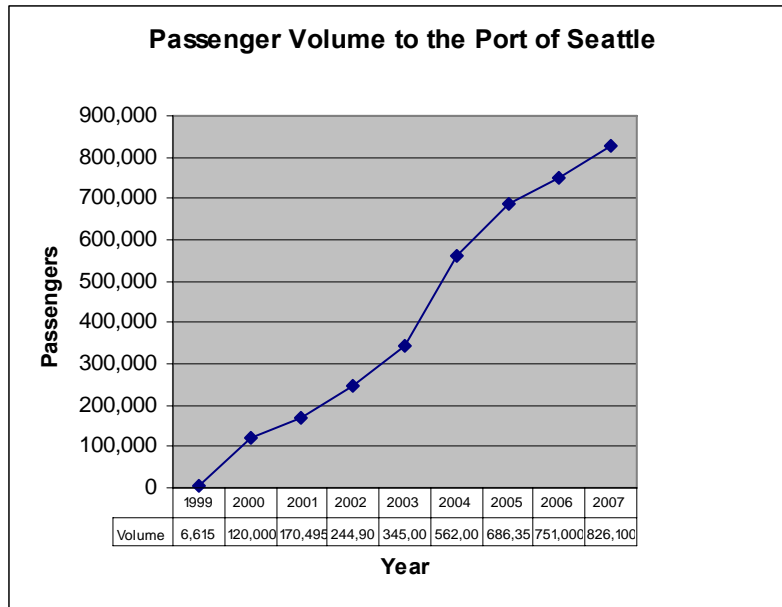
Alaska's Marine Highway runs regular cruises out of Bellingham to Alaska. The ships have a passenger/crew capacity of about 175 to 225.

Some smaller cruise lines, such as CruiseWest and Linblad Expeditions run cruises on the Columbia and Snake River, Puget Sound as well as in British Columbia and Alaska. Linblad Expeditions also runs cruises through the San Juan Islands.

While this report focuses on the operations of the large cruise ships that are covered under a Memorandum of Understanding (MOU) in Washington State, more is being learned about the operations of the smaller passenger vessels.

Large cruise ships have operated out of Seattle since 1999 and the cruise business is one of the fastest growing business segments at the Port of Seattle. The Port has two berthing spots at Terminal 30 and one berth at Pier 66. To accommodate the increased number of port calls by cruise ships, the Port has added sailings departing on Fridays and occasional other weekdays in addition to the traditional Saturday and Sunday departures in the 2006 season.

The figure below shows the increasing number of passengers enjoying Alaska-bound cruises since 1999.



Source: Port of Seattle Cruise Fact Sheet 2007.
2007 values are projected estimates

Figure 1: Passenger Volume

Ecology has historically had little information on the environmental impacts of the cruise industry in Washington. This is due to their regulatory status under the Federal Clean Water Act (CWA). Because of the international nature of the cruise industry, cruise ships and their wastewater treatment systems are excluded from many of the U.S. environmental laws and regulations that land-based industries are required to meet. The United States Coast Guard (USCG) certifies marine sanitation devices meet certain operational criteria for performance but does not monitor wastewater effluent quality. Large ships operate under MARPOL (International Convention for the Prevention of Pollution from Ships), an environmental treaty drafted by the International Maritime Organization (IMO). Annex IV of MARPOL addresses the disposal of sewage. Since the U.S. did not sign Annex IV, it is not mandatory that ships follow Annex IV in the United States. Most large ships have adopted the “Cruise Industry Waste Management Practices and Procedures” as promulgated by the Cruise Lines International Association (CLIA).

For the 2006 season, the NorthWest CruiseShip Association (NWCA) consisted of the following member lines:

- Carnival Cruise Lines
- Celebrity Cruises
- Crystal Cruises
- Holland America Line
- Norwegian Cruise Line
- Princess Cruises
- Radisson Seven Seas
- Royal Caribbean International
- Silversea Cruises

In 2006, 100percent of port calls by large vessels to Seattle were made by NWCA member ships. Table 1 below depicts the member lines, the ships visiting Seattle, the number of port calls and the persons on board.

Table 1: 2006 Cruise Ships Calling to Ports in Washington

2006 Cruise Ships Visiting Port of Seattle			
Vessel Operator	Vessel Name	2005 Number of Port Calls¹	Total Persons on Board²
NWCA MEMBERS			
Celebrity Cruises	<i>Mercury</i>	26	2279
Celebrity Cruises	<i>Summit</i>	1	3409
Holland America Line	<i>Ooesterdam</i>	21	2648
Holland America Line	<i>Ryndam</i>	1	1860
Holland America Line	<i>Veendam</i>	2	1854
Holland America Line	<i>Volendam</i>	1	2080
Holland America Line	<i>Westerdam</i>	21	2648
Holland America Line	<i>Zaandam</i>	22	2080
Norwegian Cruise Line	<i>Norwegian Star</i>	21	3340
Norwegian Cruise Line	<i>Norwegian Sun</i>	20	2952
Princess Cruise Line	<i>Dawn Princess</i>	20	2850
Princess Cruise Line	<i>Sun Princess</i>	20	2820
Royal Caribbean	<i>Vision of the Seas</i>	17	3200
Total		193	
NON NWCA MEMBERS			
		0	

¹Numbers come from Port of Seattle 2006 Cruise Ship Sailing Schedule and the Port of Seattle staff

²Numbers come from Alaska DEC 2005 Large Ship Wastewater Treatment and Discharge Status. Actual # of passengers may vary.

The Port of Seattle’s schedule for 2007 includes a total of 189 port calls from the following vessels: Celebrity Cruises MERCURY, Celebrity Cruises SUMMIT, Holland America Line AMSTERDAM, NOORDAM, OOSTERDAM, ZAANDAM, and ZUIDERDAM, Norwegian Cruise Line PEARL and STAR, Princess Cruises GOLDEN PRINCESS, and SUN PRINCESS, Royal Caribbean RADIENCE OF THE SEAS, SERENADE OF THE SEAS, and VISION OF THE SEAS, Regent Cruises SEVEN SEAS MARINER, and American West EMPRESS OF THE NORTH. All of the vessels with exception of the SEVEN SEAS MARINER, and the EMPRESS OF THE NORTH are part of the NorthWest CruiseShip Association.

1.3 Memorandum of Understanding summary

On April 20, 2004, a Memorandum of Understanding (MOU) between Ecology, the NorthWest CruiseShip Association (NWCA) and the Port of Seattle was signed. The MOU only covers ships that are members of the NWCA, and therefore does not cover ships such as the Alaska Marine Highway ferries, or any of the small ships. The MOU bans cruise-ship wastewater discharges (black and gray water), except from vessels with advanced treatment systems (AWTS). AWTS provides treatment that meets or exceeds Alaska’s requirements under federal law. The MOU allows continuous discharge in Washington waters from these AWTS with stringent provisions. Sludge may only be discharged more than 12 miles from shore and not within a defined portion of the Olympic Coast National Marine Sanctuary. The MOU specifies a sampling regime, testing, reporting and limit requirements and requires advanced notification and documentation from ships planning to discharge. The MOU also specifies that the ships

will comply with Washington's more restrictive hazardous waste laws and stipulates that garbage may not be discharged in state waters.

On April 28, 2006 the MOU was amended. Amendments included: 1) adding a requirement to prohibit the discharge of oily bilge water per regulations; 2) adding a definition for residual solids for clarification; 3) adding specific language about what limits must be met for monitoring results; and 4) changing the requirements on WET testing to once per 2 years for homeported vessels and once per 40 calls for other vessels due to the fact that vessels come and go from this route from year to year. The MOU and related documents are available on Ecology's website at:

http://www.ecy.wa.gov/programs/wq/wastewater/cruise_mou/index.html.

A copy of the current MOU (Amendment No.2) is included in Appendix A.

1.4 MOU funding

Ecology, the Port of Seattle, and the NWCA and its member lines have finalized a process via an agreement to recover costs incurred by Ecology associated with implementing the MOU. A funding agreement for the 2006 season has been signed and implemented. A similar agreement for the 2007 season is being finalized and will be in place prior to the end of the 2007 season for cost recovery for 2007.

2. MOU Requirements

2.1 Description of requirements

Applicability of MOU:

The MOU applies to cruise ships that are part of the NorthWest CruiseShip Association (NWCA) and only to those member ships making a call at a port in Washington. NCWA member ships that do not make a port call in Washington are not subject to the provisions of the MOU while transiting off the Washington coast. All the ships subject to the MOU are engaged in cruise itineraries greater than one-day duration. Considerable care was taken in developing the geographic area in which the terms of the MOU apply. Washington's definition of "waters of the state" reaches to the international border with Canada. The cruise industry agreed to recognize Washington's definition of state waters for the purposes of the MOU. Consequently, the "Waters subject to this MOU" are defined as including the Puget Sound and the Strait of Juan de Fuca south of the international boundary with Canada; and for off the west coast, the belt of seas measured from the line of ordinary low water along that portion of the coast which is in direct contact with the open sea and the line marking the seaward limit of inland waters, and extending seaward a distance of three miles as illustrated in Appendix iii of the MOU. The definition of the "waters subject to this MOU" is inclusive of the marine waters of the state as defined in Washington law. See figure 2 below.

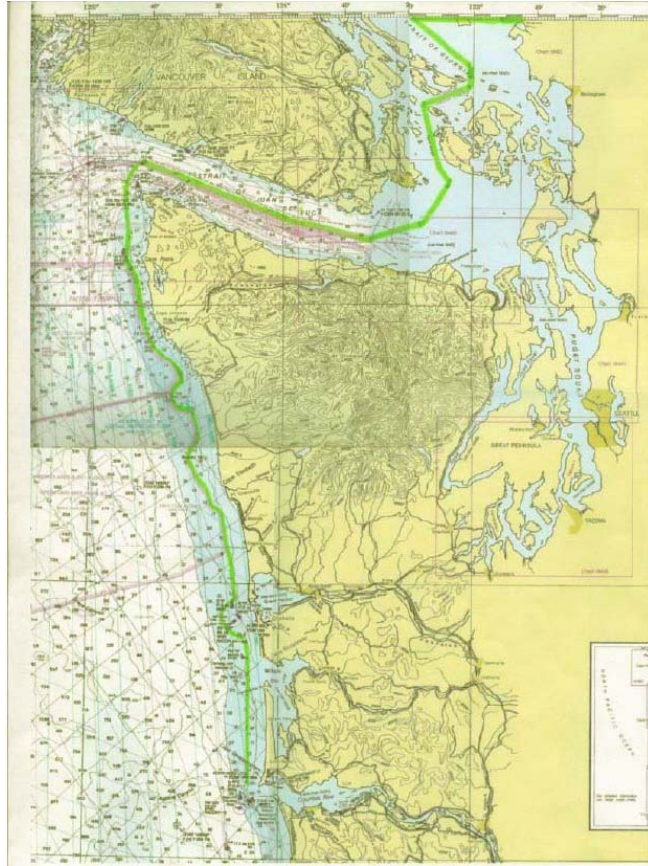


Figure 2: Map of "Waters subject to this MOU"

Wastewater discharges:

The MOU defines "blackwater" as wastes from toilets, urinals, medical sinks and other similar facilities, and "graywater" as including drainage from dishwasher, shower, laundry, bath, galley drains and washbasin drains.

Advanced wastewater treatment systems (AWTS) are systems that meet the higher standards and testing regime as set out in federal law, Title XIV, Certain Alaska Cruise Ship Operations, Section 1404(c). The AWTS are systems such as the Zenon and Hamworthy membrane biological reactor ultrafiltration system, the Scanship biological reactor and ultrafiltration system and the Rochem reverse osmosis ultrafiltration system. Table 2 identifies the type of treatment in use during the 2006 season by NWCA member ships.

Table 2: 2006 Vessels and Wastewater Treatment

Vessel Operator	Vessel Name	Blackwater (BW) Treatment System Manufacturer	Graywater (GW) Treatment System Manufacturer	Type of Treatment System
NWCA MEMBERS				
Celebrity Cruises	<i>Mercury</i>	Biopure/Rochem	Mixed with BW	Non AWTS: Biopure is a marine sanitation device. AWTS: Rochem is a reverse osmosis ultrafiltration system used occasionally.
Celebrity Cruises	<i>Summit</i>	Hamann/Lazarus	None	Hamann/Lazarus is dilution and filtration system
Holland America Line	<i>Ooesterdam</i>	Rochem	Rochem	AWTS: Rochem BW is a bioreactor and ultrafiltration; AWTS: Rochem GW is reverse osmosis ultrafiltration system.
Holland America Line	<i>Ryndam</i>	Zenon	Zenon	AWTS: Zenon is a bioreactor and membrane ultrafiltration system.
Holland America Line	<i>Statendam</i>	Zenon	Zenon	AWTS: Zenon is a bioreactor and membrane ultrafiltration system.
Holland America Line	<i>Veendam</i>	Zenon	Mixed with BW	AWTS: Zenon is a bioreactor and membrane ultrafiltration system.
Holland America Line	<i>Volendam</i>	Zenon	Mixed with BW	AWTS: Zenon is a bioreactor and membrane ultrafiltration system.
Holland America Line	<i>Westerdam</i>	Rochem	Rochem	AWTS: Rochem BW is a bioreactor and ultrafiltration; AWTS: Rochem GW is reverse osmosis ultrafiltration system.
Holland America Line	<i>Zaandam</i>	Zenon	Mixed with BW	AWTS: Zenon is a bioreactor and membrane ultrafiltration system.
Norwegian Cruise Line	<i>Norwegian Star</i>	Scanship	Mixed with BW	AWTS: Scanship is a biological reactor and ultrafiltration system.
Norwegian Cruise Line	<i>Norwegian Sun</i>	Scanship	Mixed with BW	AWTS: Scanship is a biological reactor and ultrafiltration system.
Princess Cruise Line	<i>Dawn Princess</i>	Hamworthy Bioreactor	Mixed with BW or held	AWTS: Hamworthy is a biological reactor and ultrafiltration system.
Princess Cruise Line	<i>Sun Princess</i>	Hamworthy Bioreactor	Mixed with BW or held	AWTS: Hamworthy is a biological reactor and ultrafiltration system.
Royal Caribbean	<i>Vision of the Seas</i>	Hydroxyl	None	AWTS: Hydroxyl bioreactor, oxidation, ozone system.
NON NWCA MEMBERS				
none				

The MOU prohibits discharges of untreated blackwater and untreated graywater within waters subject to the MOU from any type of treatment system. The MOU also prohibits discharges of treated blackwater and treated graywater unless it is from an AWTS which meets the Alaska requirements and under the following conditions:

- The ships are allowed to discharge \geq one nautical mile away from its berth and \geq 6 knots with the submittal of documentation prior to discharge.
- The ships are allowed to discharge within one nautical mile of berth with further documentation and provisions including 24-hour continuous turbidity or equivalent monitoring, emergency shut-down for treatment upsets, and ultraviolet light disinfection immediately prior to discharge.

All ships discharging within waters subject to the MOU must: sample the effluent once per month while in Seattle using a Washington state-certified laboratory, split samples with Ecology upon request, conduct Whole Effluent Toxicity (WET) testing once every two years for homeported vessels and once every 40 calls for other vessels, provide test results provided to Alaska, notify Ecology prior to sampling, allow Ecology to conduct inspections to verify the operating condition of the AWTS and notify Ecology of any material changes made to the system.

The MOU prohibits the discharge of residual solids from the treatment system (sludge) in waters subject to the MOU, within 12 nautical miles from shore, and within the “Area To Be Avoided” off the Washington Coast of the Olympic Coast National Marine Sanctuary.

Oily bilge water is also prohibited if not in compliance with applicable federal and state laws. Vessels typically discharge at less than 15 parts per million, and some are more stringent at 10 or five parts per million.

Hazardous waste:

Per the MOU, Washington and the NWCA agreed to a uniform application procedure for the EPA national identification number in accordance with the Resource Conservation and Recovery Act (RCRA). The MOU specifies that Washington has the right to inspect all records upon request in relation to hazardous waste management. NWCA member lines shall provide an annual report regarding the total hazardous waste offloaded in Washington. NWCA agrees to comply with the guidelines for specific waste streams per Washington regulations.

Solid waste:

The discharge of solid waste (garbage) is prohibited in waters subject to the MOU.

2.2 Alaska requirements, certification

The U.S. Congress enacted Title XIV – Certain Alaskan Cruise Ship Operations in December 2000. The law creates wastewater standards for vessels. The regulations to implement the law (AS 46.03.460 – AS 46.03.490 and 18 AAC 69) became effective in July 2001 and November, 2002 and are enforced by the United States Coast Guard. Under the legislation, large cruise ships may discharge blackwater and graywater in Alaska while underway and law allows continuous discharge of blackwater and graywater that meet more stringent standards through a certification process. A ship approved by the U.S. Coast Guard to discharge continuously must sample their wastewater twice per month.

All of the cruise ships subject to the Washington Cruise MOU are also subject to the Alaska requirements.

3. Documentation of Discharges from Advanced Wastewater Treatment Systems per the MOU

3.1 Documentation required

Discharges \geq one nautical mile and six knots:

Documentation is required for discharges from an AWTS occurring one nautical mile or more away from a ship’s berth. The ship must be moving at a speed at or greater than 6 knots. The documentation must identify the type of treatment system in use on the ship, include schematic diagrams of the system and document that the system is certified by the United States Coast Guard.

Discharges within one nautical mile (continuously):

When the discharge occurs within one nautical mile of berth, cruise ship operator is required to submit the above documentation. In addition, vessel specific information on how the ship’s system meets the provision for 24-hour continuous turbidity or equivalent monitoring, documentation of system design that demonstrates emergency shut-down capacity, documentation that all treated effluent will receive final polishing with ultraviolet light immediately prior to discharge, copies of water quality test results for the preceding six months and a vessel specific plan that identifies storage capacities and notification procedures.

3.2 Approvals

Ship(s) receiving approval to discharge one mile or more from berth while traveling at a speed of 6 or more knots:

The Holland America Line OOSTERDAM, RYNDAM, STATENDAM, VEENDAM, VOLENDAM, WESTERDAM, and ZAANDAM submitted documentation requesting approval to discharge at one mile or more from berth while traveling at a speed of six or more knots. Letters detailing approval for the 2006 season were sent by Ecology for a few end of season visits from the vessels. The vessels received approval to discharge on May 4, 2006 for the RYNDAM, VEENDAM, VOLENDAM and ZAANDAM and on June 22, 2006 for the OOSTERDAM, STATENDAM and WESTERDAM.

Ships receiving approval to discharge while at berth or at a distance less than one nautical mile from berth (continuously):

The Norwegian Cruise Line NORWEGIAN SUN and NORWEGIAN STAR submitted documentation that the systems were certified by the USCG for continuous discharge in Alaska for the 2006 season. Schematics and other documentation were also provided. Ecology staff reviewed the documentation and on May 4, 2006 sent a letter detailing approval for continuous discharge.

The Princess Cruise Line DAWN PRINCESS and SUN PRINCESS submitted documentation that the systems were certified by the USCG for continuous discharge in Alaska for the 2006 season. Schematics and other documentation were also provided. Ecology staff reviewed the documentation and on May 4, 2006 sent a letter detailing approval for continuous discharge.

Table 3: 2006 Approval to Discharge

Vessel Operator	Vessel Name	Discharging in Washington ¹ ≥ 1nm from berth and ≥ 6 knots		Discharging in Washington ¹ continuously (at berth or within 1 nm of berth)		Date Approved
		BW	GW	BW	GW	
Celebrity Cruises	<i>Mercury</i>	NO	NO	NO	NO	NA
Celebrity Cruises	<i>Summit</i>	NO	NO	NO	NO	NA
Holland America Line	<i>Oosterdam</i>	YES	YES	NO	NO	6/22/06
Holland America Line	<i>Ryndam</i>	YES	YES	NO	NO	5/4/06
Holland America Line	<i>Statendam</i>	YES	YES	NO	NO	6/22/06
Holland America Line	<i>Veendam</i>	YES	YES	NO	NO	5/4/06
Holland America Line	<i>Volendam</i>	YES	YES	NO	NO	5/4/06
Holland America Line	<i>Westerdam</i>	YES	YES	NO	NO	6/22/06
Holland America Line	<i>Zaandam</i>	YES	YES	NO	NO	5/4/06

Vessel Operator	Vessel Name	Discharging in Washington ¹ ≥ 1nm from berth and ≥ 6 knots		Discharging in Washington ¹ continuously (at berth or within 1 nm of berth)		Date Approved
		BW	GW	BW	GW	
Norwegian Cruise Line	<i>Norwegian Star</i>	YES	YES	YES	YES	5/4/06
Norwegian Cruise Line	<i>Norwegian Sun</i>	YES	YES	YES	YES	5/4/06
Princess Cruise Line	<i>Dawn Princess</i>	YES	YES	YES	YES	5/4/06
Princess Cruise Line	<i>Sun Princess</i>	YES	YES	YES	YES	5/4/06
Royal Caribbean	<i>Vision of the Seas</i>	NO	NO	NO	NO	NA

BW = Black Water; GW = Gray Water; NA = not applicable

¹Washington waters refers to the "waters subject to this Memorandum of Understanding (MOU)" as defined in the MOU signed April 20, 2004 and as amended.

4. Sampling per the MOU

4.1 Sampling required

Alaska requires twice-monthly sampling of conventional pollutants. Per the MOU, the vessels that are approved for discharge are required to sample the quality of the treated effluent using a Washington state-certified laboratory at least one time per month while at port in Seattle during each cruise season. The cruise lines must use the sampling requirements established per the USCG, Captain of the Port, Southeast Alaska Policy for conventional pollutants continued compliance monitoring regime. Parameters sampled include pH, Biochemical Oxygen Demand (BOD), Fecal Coliform, Total Suspended Solids (TSS), and Residual Chlorine (RC).

Whole Effluent Toxicity (WET) testing is required once every 2 years for homeported vessels (20 or more calls/turnarounds per season) and once per 40 port calls or turnarounds for all other vessels. WET testing guidelines were developed specifically for cruise ships by Ecology and are available on Ecology's website on cruise ships.

http://www.ecy.wa.gov/programs/wq/wastewater/cruise_mou/wet_testing_guide_6-3-04.pdf

Ecology received two WET test reports for sampling taken in the 2005 season and four WET test reports for sampling completed in the 2006 season. The results showed toxicity most likely due to high ammonia and or detergent and surfactant concentrations in the effluent samples. A group is being formed of toxicity testing experts, cruise line representatives, Ecology staff, and Port of Seattle staff to evaluate the testing protocols, results, and testing guidelines. Table 4. shows the WET testing results received thus far. Copies of the test reports can be obtained through Ecology's public disclosure office.

Table 4: Whole Effluent Toxicity Test Reports Received

VESSEL OPERATOR	VESSEL	TEST DATE	TYPE OF WET TEST
Holland America Line	OOSTERDAM	9/17/05	ACUTE
Norwegian Cruise Line	NORWEGIAN STAR	9/27/05	ACUTE
Norwegian Cruise Line	NORWEGIAN STAR	6/4/06	CHRONIC
Holland America Line	ZAANDAM	9/8/06	ACUTE
Holland America Line	OOSTERDAM	9/9/06	ACUTE
Holland America Line	WESTERDAM	9/10/06	ACUTE

4.2 Sampling data

Sampling results were received for the cruise ships that were approved for discharge in waters subject to the MOU, Norwegian Cruise Line's STAR and SUN, Princess Cruises DAWN PRINCESS and SUN PRINCESS, the Holland Line's OOSTERDAM, RYNDAM, STATENDAM, VEENDAM, VOLENDAM, WESTERDAM and ZAANDAM. Sampling results were compared to the limits established by Alaska/the Washington Cruise MOU and are also compared to Washington's water quality standards. Sampling results are summarized for all data received in Appendix B.

Table 5 below shows the results for the cruise ships during the approval period and within Washington/Alaska voyages.

Table 5: Sample Results - Cruise Ships Approved for Discharge into Washington Waters

SHIP: NORWEGIAN SUN							
		pH	BOD	TSS	Chlorine Residual	Fecal Coliform	Comments
		St. Units	mg/l	mg/l	mg/l	#/100 ml	
MOU/Alaska Limits ¹		6-9	30/45	30/45	10 ug/l	20 / 40	
WA State Water Quality Standards ²		6.8-8.7	NA	NA	13 / 7.5 ug/l	14 / 43	
Sample Date	Location/ Lab						
5/16/06	Juneau/Analytica	6.71	26.4	5	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
5/20/06	Seattle/Laucks	6.5	28	8	ND< 0.10	< 2	MIXED BLACK AND GRAY OVERBOARD
5/23/06	Juneau/Analytica	6.93	26.3	8	ND< 0.10	2	MIXED BLACK AND GRAY OVERBOARD unannounced sampling
6/3/06	Seattle/Laucks	6.5	16	4	ND< 0.10	< 2	MIXED BLACK AND GRAY OVERBOARD
6/13/06	Juneau/Analytica	6.70	6.87	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
7/1/06	Seattle/Laucks	6.5	16	5	ND< 0.10	11	MIXED BLACK AND GRAY OVERBOARD
7/11/06	Juneau/Analytica	6.96	18.2	7	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD unannounced sampling
7/18/06	Juneau/Analytica	6.68	12.6	6	ND< 0.13	2	MIXED BLACK AND GRAY OVERBOARD
8/5/06	Seattle/Laucks	7.0	11	6	ND< 0.10	< 2	MIXED BLACK AND GRAY OVERBOARD
8/22/06	Juneau/Analytica	6.99	13.7	4	ND< 0.12	2	MIXED BLACK AND GRAY OVERBOARD
9/2/06	Seattle/Laucks	6.6	6	4	ND< 0.10	< 2	MIXED BLACK AND GRAY OVERBOARD
9/12/06	Juneau/Analytica	6.87	10.8	6	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
MINIMUM		6.50	ND	ND	ND	ND	Seattle testing compliance
AVERAGE			15.99	5.58	0.10		
MAXIMUM		7.00	28.00	8.00	0.13	11	
GEOMETRIC MEAN						2.3	

SHIP: NORWEGIAN STAR							
		pH	BOD	TSS	Chlorine Residual	Fecal Coliform	Comments
		St. Units	mg/l	mg/l	mg/l	#/100 ml	
MOU/Alaska Limits ¹		6-9	30/45	30/45	10 ug/l	20 / 40	
WA State Water Quality Standards ²		6.8-8.7	NA	NA	13 / 7.5 ug/l	14 / 43	
Sample Date	Location/ Lab						
5/9/06	Juneau/Analytica	7.13	2.48	ND< 4	ND< 0.10	ND< 1	MIXED BLACK AND GRAY OVERBOARD
5/14/06	Seattle/Laucks	6.6	18	5	ND< 0.10	< 2	MIXED BLACK AND GRAY OVERBOARD
5/23/06	Juneau/Analytica	7.58	3.24	5	ND< 0.10	* 5000	MIXED BLACK AND GRAY unannounced sampling
5/23/06	Juneau/Analytica	7.57	3.45	4	ND< 0.10	* 5000	MIXED BLACK AND GRAY OVERBOARD unannounced sampling (blind duplicate)

5/28/06	Seattle/Laucks	6.5		6	2	ND<	0.10	<	2	MIXED BLACK AND GRAY OVERBOARD	
6/4/06	Seattle/Laucks	6.7	U	5	U	2	ND<	0.10	<	2	MIXED BLACK AND GRAY OVERBOARD
6/20/06	Juneau/Analytica	7.28	ND<	2	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD
7/2/06	Seattle/Laucks	6.7		5		2	ND<	0.10	<	2	MIXED BLACK AND GRAY OVERBOARD
7/18/06	Juneau/Analytica	7.49		3.37		4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD
8/1/06	Juneau/Analytica	7.49	ND<	2		4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD
8/6/06	Seattle/Laucks	6.7	U	6	U	2	ND<	0.10	<	2	MIXED BLACK AND GRAY OVERBOARD
8/8/06	Juneau/Analytica	6.90	ND<	2		4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD unannounced sampling
9/3/06	Seattle/Laucks	6.8		4		2	ND<	0.10	<	2	MIXED BLACK AND GRAY OVERBOARD
9/5/06	Juneau/Analytica	7.27	ND<	2	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD
	MINIMUM	6.50		ND		ND		ND		ND	Seattle testing compliance
	AVERAGE			4.61		3.4		0.10			* report submitted, believes contaminated sample line
	MAXIMUM	7.58		18.00		5.0		0.10		5000	
	GEOMETRIC MEAN									6	

SHIP: DAWN PRINCESS											
		pH	BOD		TSS	Chlorine Residual	Fecal Coliform	Comments			
		St. Units	mg/l		mg/l	mg/l	#/100 ml				
MOU/Alaska Limits¹		6-9	30/45		30/45	10 ug/l	20 / 40				
WA State Water Quality Standards²		6.8-8.7	NA		NA	13 / 7.5 ug/l	14 / 43				
Sample Date	Location/ Lab										
5/13/06	Seattle/Laucks	7.0		7	2	ND<	0.10		17	MIXED BLACK AND GRAY OVERBOARD	
5/22/06	Juneau/Analytica	7.38	ND<	2	13	ND<	0.10		2	MIXED BLACK AND GRAY OVERBOARD	
5/29/06	Juneau/Analytica	7.19	ND<	2	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD unannounced sampling
6/3/06	Seattle/Laucks	6.7	U	5	U	2	ND<	0.10		2	MBR 1 EFFLUENT (process control sampling)
6/3/06	Seattle/Laucks	6.7	U	5	U	2	ND<	0.10	<	2	MBR 2 EFFLUENT (process control sampling)
6/3/06	Seattle/Laucks	6.9		41	U	2	ND<	0.10	<	2	MBR 3 EFFLUENT (process control sampling)
6/3/06	Seattle/Laucks	6.5	U	5		2	ND<	0.10	<	2	MIXED BLACK AND GRAY OVERBOARD
6/12/06	Juneau/Analytica	7.22		2.25	5	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD	
6/26/06	Juneau/Analytica	6.72	ND<	2	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD unannounced sampling
7/1/06	Seattle/Laucks	6.6	U	3	U	2	ND<	0.10	<	2	MIXED BLACK AND GRAY OVERBOARD
7/10/06	Juneau/Analytica	6.87		5.65	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD
8/5/06	Seattle/Laucks	6.8		9	6	ND<	0.10	<	2	MIXED BLACK AND GRAY OVERBOARD	
8/14/06	Juneau/Analytica	7.50	ND<	2	12	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD	
9/2/06	Seattle/Laucks	6.6	U	4	5	ND<	0.10	<	2	MIXED BLACK AND GRAY OVERBOARD	
9/11/06	Juneau/Analytica	6.92	ND<	2	6	ND<	0.10		18	MIXED BLACK AND GRAY OVERBOARD	
	MINIMUM	6.50		ND		ND		ND		ND	Seattle testing compliance
	AVERAGE			6.46		4.7		0.10			
	MAXIMUM	7.50		41.00		12.0		0.10		18	
	GEOMETRIC MEAN									3	

SHIP: SUN PRINCESS											
		pH	BOD		TSS	Chlorine Residual	Fecal Coliform	Comments			
		St. Units	mg/l		mg/l	mg/l	#/100 ml				
MOU/Alaska Limits¹		6-9	30/45		30/45	10 ug/l	20 / 40				
WA State Water Quality Standards²		6.8-8.7	NA		NA	13 / 7.5 ug/l	14 / 43				
Sample Date	Location/ Lab										
5/14/06	Seattle/Laucks	7.1	U	15	4	ND<	0.10	<	2	MIXED BLACK AND GRAY OVERBOARD	
5/24/06	Juneau/Analytica	7.75	ND<	2	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD unannounced sampling
5/24/06	Juneau/Analytica	7.77	ND<	2.0	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY unannounced sampling (blind duplicate)
5/31/06	Juneau/Analytica	7.18	ND<	2	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD
6/4/06	Seattle/Laucks	6.9	U	5	U	2	ND<	0.10	<	2	MIXED BLACK AND GRAY OVERBOARD
6/14/06	Juneau/Analytica	7.66	ND<	2	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD

6/21/06	Juneau/Analytica	7.83	2.07	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY unannounced sampling	
6/21/06	Juneau/Analytica	8.05	ND<	2.0	ND<	8	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD unannounced sampling (blind duplicate)
7/2/06	Seattle/Laucks	7.2		3	U	2	ND<	0.10	<	2	MIXED BLACK AND GRAY OVERBOARD
7/12/06	Juneau/Analytica	7.91		3.98	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD
8/2/06	Juneau/Analytica	7.89	ND<	2	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY unannounced sampling
8/6/06	Seattle/Laucks	7.1		9		2	ND<	0.10	<	2	MIXED BLACK AND GRAY OVERBOARD
9/3/06	Seattle/Laucks	7.6	U	4	U	2	ND<	0.10		4	MIXED BLACK AND GRAY OVERBOARD
	MINIMUM	6.90		ND		ND		ND		ND	Seattle testing compliance
	AVERAGE			4.16		3.7		0.10			
	MAXIMUM	8.05		15.00		8.0		0.10		4	
	GEOMETRIC MEAN									2	

SHIP: HOLLAND OOSTERDAM											
		pH	BOD	TSS	Chlorine Residual	Fecal Coliform	Comments				
		St. Units	mg/l	mg/l	mg/l	#/100 ml					
MOU/Alaska Limits¹		6-9	30/45	30/45	10 ug/l	20 / 40					
WA State Water Quality Standards²		6.8-8.7	NA	NA	13 / 7.5 ug/l	14 / 43					
Sample Date	Location/ Lab										
6/26/06	Juneau/Analytica	7.56	13.0	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY	
7/1/06	Seattle/Laucks	7.1	33		2	ND<	0.10	<	2	GREY WATER	
7/1/06	Seattle/Laucks	7.2	7		2	ND<	0.10	<	2	BLACK WATER	
7/10/06	Juneau/Analytica	8.77	12.5	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY unannounced sampling	
7/17/06	Juneau/Analytica	7.68	4.81	ND<	4	ND<	0.10		2	MIXED BLACK AND GRAY	
7/24/06	Juneau/Analytica	7.49	15.5		4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY	
7/31/06	Juneau/Analytica	7.64	19.8	ND<	4.0	ND<	0.10	ND<	2	MIXED BLACK AND GRAY	
8/5/06	Seattle/Laucks	6.8	34	U	2	ND<	0.10	<	2	GREY WATER	
8/5/06	Seattle/Laucks	7.4	6		5	ND<	0.10	<	2	BLACK WATER	
8/7/06	Juneau/Analytica	7.78	6.66		6	ND<	0.10		16	MIXED BLACK AND GRAY	
8/14/06	Juneau/Analytica	7.75	19.2		6	ND<	0.10	ND<	2	MIXED BLACK AND GRAY unannounced sampling	
9/2/06	Seattle/Laucks	6.8	20	U	2	ND<	0.10	<	2	GREY WATER	
9/2/06	Seattle/Laucks	7.4	4		6	ND<	0.10		17	BLACK WATER	
9/4/06	Juneau/Analytica	7.99	19.6	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY	
9/11/06	Juneau/Analytica	7.73	8.91	ND<	4	ND<	0.10		38	MIXED BLACK AND GRAY	
	MINIMUM	6.80		ND		ND		ND		ND	Seattle testing compliance
	AVERAGE			14.93		3.93		0.10			
	MAXIMUM	8.77		34.00		6.00		0.10		38	
	GEOMETRIC MEAN									3.2	

SHIP: HOLLAND RYNDAM											
		pH	BOD	TSS	Chlorine Residual	Fecal Coliform	Comments				
		St. Units	mg/l	mg/l	mg/l	#/100 ml					
MOU/Alaska Limits¹		6-9	30/45	30/45	10 ug/l	20 / 40					
WA State Water Quality Standards²		6.8-8.7	NA	NA	13 / 7.5 ug/l	14 / 43					
Sample Date	Location/ Lab										
5/9/06	Juneau/Analytica	7.73	ND<	2	ND<	4	ND<	0.10	ND<	1	MIXED BLACK AND GRAY OVERBOARD
5/16/06	Juneau/Analytica	7.86	ND<	2	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD
6/1/06	Juneau/Analytica	7.04	ND<	2	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD unannounced sampling
6/7/06	Juneau/Analytica	7.40	ND<	2	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD
6/15/06	Juneau/Analytica	7.76	ND<	2	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD
7/5/06	Juneau/Analytica	7.99		5.29	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD
7/19/06	Juneau/Analytica	7.63		6.01	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD
7/27/06	Juneau/Analytica	8.26		12.9	ND<	4	ND<	0.10	ND<	2	MIXED BLACK AND GRAY OVERBOARD

								unannounced sampling
7/27/06	Juneau/Analytica	8.29	12.7	ND< 4	ND< 0.10	ND< 2		MIXED BLACK AND GRAY OVERBOARD unannounced sampling (blind duplicate)
8/10/06	Juneau/Analytica	7.75	ND< 2	ND< 4	ND< 0.10	ND< 2		MIXED BLACK AND GRAY OVERBOARD
8/24/06	Juneau/Analytica	7.91	ND< 2	ND< 4	ND< 0.10	ND< 2		MIXED BLACK AND GRAY OVERBOARD
9/7/06	Juneau/Analytica	8.18	ND< 2	ND< 4	ND< 0.10	ND< 2		MIXED BLACK AND GRAY OVERBOARD
9/19/06	Juneau/Analytica	8.25	ND< 2	ND< 4	ND< 0.10	ND< 2		MIXED BLACK AND GRAY OVERBOARD
	MINIMUM	7.04	ND	ND	ND	ND		Seattle testing not complied with - notification made
	AVERAGE		4.22	4	0.10			
	MAXIMUM	8.29	12.90	4	0.10	2		
	GEOMETRIC MEAN					2		

SHIP: HOLLAND STATENDAM							
		pH	BOD	TSS	Chlorine Residual	Fecal Coliform	Comments
		St. Units	mg/l	mg/l	mg/l	#/100 ml	
MOU/Alaska Limits¹		6-9	30/45	30/45	10 ug/l	20 / 40	
WA State Water Quality Standards²		6.8-8.7	NA	NA	13 / 7.5 ug/l	14 / 43	
Sample Date	Location/ Lab						
6/27/06	Juneau/Analytica	7.82	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
7/11/06	Juneau/Analytica	7.79	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
7/18/06	Juneau/Analytica	8.05	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
8/8/06	Juneau/Analytica	7.59	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
8/9/06	Juneau/Analytica	7.88	ND< 2	ND< 4	ND< 0.10	0	MIXED BLACK AND GRAY OVERBOARD unannounced sampling
8/22/06	Juneau/Analytica	7.57	21.6	9	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
9/5/06	Juneau/Analytica	8.02	ND< 2.0	4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
9/11/06	Juneau/Analytica	7.33	2.46	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
	MINIMUM	7.33	ND	ND	ND	ND	Vessel did not visit Seattle
	AVERAGE		4.51	5	0.10		
	MAXIMUM	8.05	21.60	9	0.10	2	
	GEOMETRIC MEAN					2	

SHIP: HOLLAND VEENDAM							
		pH	BOD	TSS	Chlorine Residual	Fecal Coliform	Comments
		St. Units	mg/l	mg/l	mg/l	#/100 ml	
MOU/Alaska Limits¹		6-9	30/45	30/45	10 ug/l	20 / 40	
WA State Water Quality Standards²		6.8-8.7	NA	NA	13 / 7.5 ug/l	14 / 43	
Sample Date	Location/ Lab						
5/12/06	Seattle/Laucks	7.4	U 8	U 2	ND< 0.10	< 2	MIXED BLACK AND GRAY OVERBOARD
5/17/06	Juneau/Analytica	7.47	2.65	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
5/25/06	Juneau/Analytica	7.34	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD unannounced sampling
5/31/06	Juneau/Analytica	7.57	2.75	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
6/8/06	Juneau/Analytica	7.56	3.13	12	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
6/22/06	Juneau/Analytica	7.75	2.57	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
7/12/06	Juneau/Analytica	8.19	9.90	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
7/20/06	Juneau/Analytica	7.67	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
8/17/06	Juneau/Analytica	7.69	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
8/31/06	Juneau/Analytica	7.91	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
9/14/06	Juneau/Analytica	7.83	6.36	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
9/21/06	Juneau/Analytica	7.41	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
9/25/06	Seattle/Laucks	7.4	8	5	ND< 0.10	< 2	MIXED BLACK AND GRAY OVERBOARD
	MINIMUM	7.34	ND	ND	ND	ND	Seattle testing compliance
	AVERAGE		4.45	5	0.10		
	MAXIMUM	8.19	9.90	12	0.10	2	
	GEOMETRIC MEAN					2	

SHIP: HOLLAND VOLENDAM							
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		pH	BOD	TSS	Chlorine Residual	Fecal Coliform	Comments
		St. Units	mg/l	mg/l	mg/l	#/100 ml	
MOU/Alaska Limits ¹		6-9	30/45	30/45	10 ug/l	20 / 40	
WA State Water Quality Standards ²		6.8-8.7	NA	NA	13 / 7.5 ug/l	14 / 43	
Sample Date	Location/ Lab						
5/12/06	Juneau/Analytica	7.67	4.92	ND< 4	ND< 0.10	ND< 1	MIXED BLACK AND GRAY OVERBOARD
5/19/06	Juneau/Analytica	7.55	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD unannounced sampling
5/26/06	Juneau/Analytica	7.86	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
6/2/06	Juneau/Analytica	8.16	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
6/23/06	Juneau/Analytica	7.65	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
7/7/06	Juneau/Analytica	7.59	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
7/14/06	Juneau/Analytica	7.33	3.66	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
7/28/06	Juneau/Analytica	7.86	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD unannounced sampling
8/11/06	Juneau/Analytica	7.69	ND< 2	4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
8/18/06	Juneau/Analytica	8.24	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
9/15/06	Juneau/Analytica	7.45	6.82	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
9/22/06	Juneau/Analytica	7.77	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
MINIMUM		7.33	ND	ND	ND	ND	Seattle testing compliance
AVERAGE			2.78	4	0.10		
MAXIMUM		8.24	6.82	4	0.10	2	
GEOMETRIC MEAN						2	

SHIP: HOLLAND WESTERDAM							
		pH	BOD	TSS	Chlorine Residual	Fecal Coliform	Comments
		St. Units	mg/l	mg/l	mg/l	#/100 ml	
MOU/Alaska Limits ¹		6-9	30/45	30/45	10 ug/l	20 / 40	
WA State Water Quality Standards ²		6.8-8.7	NA	NA	13 / 7.5 ug/l	14 / 43	
Sample Date	Location/ Lab						
6/28/06	Juneau/Analytica	7.66	24.4	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY
7/2/06	Seattle/Laucks	7.2	32	U 2	ND< 0.10	< 2	GRAY WATER
7/2/06	Seattle/Laucks	7.5	8	U 2	ND< 0.10	2	BLACK WATER
7/5/06	Juneau/Analytica	7.80	11.4	5	ND< 0.10	2	MIXED BLACK AND GRAY
7/12/06	Juneau/Analytica	8.06	11.7	4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY
7/19/06	Juneau/Analytica	7.81	27.2	ND< 4	ND< 0.10	2	MIXED BLACK AND GRAY unannounced sampling
7/26/06	Juneau/Analytica	7.89	20.6	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY
8/2/06	Juneau/Analytica	7.82	18.6	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY
8/6/06	Seattle/Laucks	6.7	37	U 2	ND< 0.10	2	GRAY WATER
8/6/06	Seattle/Laucks	7.6	U 12	2	ND< 0.10	< 2	BLACK WATER
8/9/06	Juneau/Analytica	7.81	20.5	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY
8/16/06	Juneau/Analytica	7.39	23.4	ND< 4	ND< 0.10	6	MIXED BLACK AND GRAY
9/3/06	Seattle/Laucks	7.0	35	U 2	ND< 0.10	7	GRAY WATER
9/3/06	Seattle/Laucks	7.5	7	U 2	ND< 0.10	4	BLACK WATER
9/6/06	Juneau/Analytica	8.03	21.3	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY
MINIMUM		6.70	ND	ND	ND	ND	Seattle testing compliance
AVERAGE			20.67	3	0.10		
MAXIMUM		8.06	37.00	5	0.10	7	
GEOMETRIC MEAN						2	

SHIP: HOLLAND ZAANDAM							
		pH	BOD	TSS	Chlorine Residual	Fecal Coliform	Comments
		St. Units	mg/l	mg/l	mg/l	#/100 ml	

MOU/Alaska Limits ¹		6-9	30/45	30/45	10 ug/l	20 / 40	
WA State Water Quality Standards ²		6.8-8.7	NA	NA	13 / 7.5 ug/l	14 / 43	
Sample Date	Location/ Lab						
5/5/06	Seattle/Laucks	7.4	U 5	4	ND< 0.10	< 2	MIXED BLACK AND GRAY OVERBOARD
5/14/06	Juneau/Analytica	7.39	4.24	ND< 4	0.24	ND< 2	MIXED BLACK AND GRAY OVERBOARD unannounced sampling
5/28/06	Juneau/Analytica	7.35	ND< 2	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
6/2/06	Seattle/Laucks	7.2	U 8	10	ND< 0.10	< 2	MIXED BLACK AND GRAY OVERBOARD
6/11/06	Juneau/Analytica	7.76	8.08	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
7/7/06	Seattle/Laucks	7.2	U 5	U 10	ND< 0.10	< 2	MIXED BLACK AND GRAY OVERBOARD
7/30/06	Juneau/Analytica	7.56	7.43	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
8/4/06	Seattle/Laucks	7.2	U 6	U 2	ND< 0.10	< 2	MIXED BLACK AND GRAY OVERBOARD
8/9/06	Juneau/Analytica	7.97	6.50	ND< 4	ND< 0.10	0	MIXED BLACK AND GRAY OVERBOARD unannounced sampling
8/13/06	Juneau/Analytica	7.73	14.4	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
9/1/06	Seattle/Laucks	7.4	8	U 2	ND< 0.10	< 2	MIXED BLACK AND GRAY OVERBOARD
9/17/06	Juneau/Analytica	7.46	6.71	ND< 4	ND< 0.10	ND< 2	MIXED BLACK AND GRAY OVERBOARD
	MINIMUM	7.20	ND	ND	ND	ND	Seattle testing compliance
	AVERAGE		6.78	5	0.11		
	MAXIMUM	7.97	14.40	10	0.24	2	
	GEOMETRIC MEAN					2	

ND = Non Detect, value in box is the detection level; U = analyte not detected to the limit of detection

Unannounced sampling includes other parameters not listed above.

BOD = Biochemical Oxygen Demand - or organics; TSS = Total Suspended Solids
mg/l = milligrams per liter; ug/l = micrograms per liter; #/100 ml = coliforms per 100 milliliters

¹MOU/Alaska limits from Title XIV, Certain Alaska Cruise Ship Operations,
Section 1404(c) /40CFR 133.102

BOD and TSS: 30-day average shall not exceed 30 mg/l, 7-day average shall not exceed 45 mg/l

Fecal Coliform: geometric mean of any 30-day period shall not exceed 20 fecal coliform/100 ml and not more than 10% of the samples exceed 40 fecal coliform/100 ml

²Washington State Water Quality Standards for Surface Waters of the State of
Washington Chapter 173-201A WAC

Fecal Coliform: shall not exceed a geometric mean of 14 colonies/100 ml and not more than 10% of a samples shall exceed a geometric mean of 43 colonies/100 ml

pH: 7-8.5 with a human-caused variation within less than 0.2

chlorine: 13 ug/l is the acute limit (1-hour average); 7.5 ug/l is the chronic limit (4-day average)

For the ships that discharged from the AWTS's, the results were in compliance with the Washington MOU and Alaska limits. However, when the samples were compared to Washington's water quality standards, pH, and chlorine residual would have violated the standards at the point of discharge. The discharges from the cruise ships does not account for a mixing zone. On-land sewage treatment plants do have mixing zones. The results from the cruise ships are of a far better quality than most of the on-land plants.

Random, unannounced samples were taken by the Alaska Department of Environmental Conservation in Alaska throughout the season. The samples taken included other parameters than the conventional pollutants detailed in Table 5. Copies of laboratory results can be obtained through Ecology's public disclosure office.

Table 6 below compares the various advanced wastewater treatment systems results as averaged. All result received are included in the averages.

Table 6: Comparison of Advanced Wastewater Treatment Systems and Result Averages

Total Number of Samples = 204	pH	BOD	TSS	Chlorine Residual	Fecal Coliform
Treatment System (number of samples)	Standard Units	mg/l	mg/l	mg/l	#/100 ml
	AVG	AVG	AVG	AVG	Geometric Mean
Scanship (26)	6.91	9.86	4.4	<0.1	3.8
Rochem (88)	7.32	17.60	3.6	<0.1	3.2
Hamworthy (28)	7.20	5.39	4.3	<0.1	2.3
Zenon (62)	7.68	4.53	4.0	<0.1	1.9

5. Inspections per the MOU

Ten different vessels were inspected by Ecology staff throughout the 2006 season. A list of vessels inspected is included in Table 7. The inspections were per the MOU and included a walk-through of the wastewater systems, a review of discharge records, a review of notification procedures, gathering information on discharge procedures, monitoring, system shutdown during upset conditions, equipment maintenance, process control, and disinfection system maintenance and gathering other information, as applicable. The inspections typically also included sampling. Results are included in the inspection reports.

In general, the ship's wastewater systems were operating well with high quality effluent. Some recommendations were made in regards to details of discharge procedures, and calibration and cleaning of equipment.

Several of the vessels had extensive on-board process control and effluent testing for monitoring and adjusting the wastewater treatment systems. Having a laboratory on-board and conducting the testing is ideal for operating the wastewater systems.

There were two vessels for which discrepancies in the log books were noted.

During the inspection of the Celebrity Cruises Inc. MERCURY on September 15, 2006, it was discovered that, although the vessel is not approved to discharge in Washington waters, the vessel did discharge during part of the 2005 season. The discharges were mostly untreated graywater and some treated blackwater from the holding tank of the vessel. The discharge of untreated graywater into Washington State Waters is a violation of state regulations (Revised Code of Washington (RCW) 90.48.080 and Washington Administrative Code (WAC) 173-201A). Full copies of records from the 2004 season, the 2005 season, and the 2006 season to date were requested and received. On October 10, 2006 a second inspection of the vessel with sampling was conducted. It was discovered that there were additional discharges of treated wastewater from the advanced wastewater treatment system at the Port of Seattle in Elliott Bay on three occasions, in violation of the MOU. A full investigation was conducted.

During the inspection of the Holland America Line VEENDAM on September 25, 2006, the discharge record books were reviewed and checked for discharges in MOU waters and locations. One of the discharges on September 26, 2005 in MOU/Washington waters was recorded at a speed of five knots. The MOU and the approval requires six knots minimum. A discharge of 5 knots would be in violation of the MOU. The discharge was treated effluent from the Zenon advanced Wastewater Treatment system at a volume of 23m³. Holland America Line immediately conducted an investigation into the discharge recorded at five knots. Based on the investigation, it was determined that the vessel was actually moving at a speed of at least 11.25 knots, and that the entry of five knots was made by mistake. This conclusion was made based on several factors including the deck logbook, automated event/alarm list and times and positions of the vessel, and discussion with the engineer who logged the entry. Holland America Line is conducting training with staff on its vessels pursuant to the MOU and data entry procedures on discharge logs. With the discharge actually being at greater than 6 knots, the speed is not in violation of the MOU. It is recommended that closer attention be paid to discharge records throughout the season as well as at the end of the season in preparation of the compliance letter submitted to Ecology per the MOU.

Copies of the inspection reports, without the attachments (can be provided upon public disclosure request), are included in Appendix C.

Table 7: 2006 Vessel Inspections

Vessels Inspected	Date Inspected
NORWEGIAN SUN	06/24/06
DAWN PRINCESS	07/22/06
HOLLAND OOSTERDAM	07/22/06
SUN PRINCESS	07/30/06
NORWEGIAN STAR	07/30/06
HOLLAND WESTERDAM	08/27/06
HOLLAND ZAANDAM	09/01/06
ROYAL CARIBBEAN VISION OF THE SEAS	09/01/06
CELEBRITY CRUISES MERCURY	09/15/06
HOLLAND VEENDAM	09/25/06
CELEBRITY CRUISES MERCURY	10/06/06

6. Compliance with MOU Requirements

Celebrity Cruises Inc. MERCURY:

During the inspection of the Celebrity Cruises Inc. MERCURY on September 15, 2006, it was discovered that, although the vessel is not approved to discharge in Washington waters, the vessel did discharge during part of the 2005 season. The discharges were mostly untreated graywater and some treated blackwater from the holding tank of the vessel. The discharge of untreated graywater into Washington State Waters is a violation of state regulations (Revised Code of Washington (RCW) 90.48.080 and Washington Administrative Code (WAC) 173-201A). Full copies of records from the 2004 season, the 2005 season, and the 2006 season to

date were requested and received. On October 10, 2006 a second inspection of the vessel with sampling was conducted. It was discovered that there were additional discharges of treated wastewater from the advanced wastewater treatment system at the Port of Seattle in Elliott Bay on three occasions, in violation of the MOU. A full investigation was conducted. An annual compliance letter was received by Ecology on December 1, 2005 stating that the MERCURY held all gray and black water onboard until the ships were outside the waters included in the MOU and that after a thorough review of ship's logs and records, the cruise line certified that their ships complied with the provisions of the MOU.

The discharge of untreated graywater into Washington State Waters is a violation of state regulations (Revised Code of Washington (RCW) 90.48.080 and Washington Administrative Code (WAC) 173-201A). A Notice of Penalty was issued on November 14, 2006 of \$100,000 for the discharge violations. Celebrity Cruises Inc. has submitted an Application for Relief (appeal to Department of Ecology) for the Notice of Penalty. The application is under review.

All discharges, treated or untreated, that took place in "waters subject to this Memorandum of Understanding" in the 2005 season from the MERCURY were in violation of the MOU as approval for discharge was neither requested nor approved. The submittal of the compliance letter with false statement in regards to holding discharges that were not held is in violation of the MOU.

Holland America Line RYNDAM:

In the annual compliance letter, Holland America Line noted that for the one call to MOU waters that the RYNDAM made in 2006, sampling was not conducted. It was reported that a sample was scheduled, but due to a misunderstanding by the lab's sampling technician, the sample was not taken. To preclude further instances of missed sampling opportunities, the sample takers have been instructed to contact their supervisors or Holland America Line when there is a sampling problem.

Norwegian Cruise Line NORWEGIAN SUN:

In the annual compliance letter, Norwegian Cruise Line noted that prior to initial entry to Washington, the NORWEGIAN SUN conducted a deep ocean exchange of ballast. During each voyage, the vessel also exchanged some ballast tanks south of the 50-deg N latitude, but was forced, due to design and safety considerations, to discharge limited quantities of Canadian ballast water in Seattle. Prior to each arrival, the vessel submitted the appropriate Ballast Report Form indicating the exemption.

There were no reported incidents of non-compliance in relation to solid waste management, hazardous waste management or any other condition of the MOU not listed above.

Letters detailing compliance with the MOU from member lines are included in Appendix D.

7. Shellfish and Viruses

The Department of Ecology and the Department of Health (lead), have been working together to examine the issues of cruise ship discharges and how that might impact shellfish.

The federal National Shellfish Sanitation Program (NSSP) lays out the requirements for the sanitary harvest of commercial shellfish. The NSSP requires that any state that exports shellfish, assess the potential risks associated with discharges from sewage treatment plants and other outfalls of public health significance. The NSSP requires that a “closure zone” be established adjacent to each outfall. The closure zone must take into consideration a possible interruption in the treatment of the sewage being discharged. Because passenger ships traveling through Puget Sound pass numerous shellfish beds, the NSSP requires that the risk of contaminating shellfish beds by discharges from such ships be assessed. In 2005, the legislature appropriated \$100,000 to the Department of Health (DOH) to undertake this study. DOH has been working with experts from the University of Washington on the study. The status of the study is that the data needs to be funneled into a closure analysis, and the study should be finalized prior to the legislatures November 2007 deadline.

8. Conclusions

8.1 Overall

The Memorandum of Understanding continues to be a key tool in protecting water quality by having requirements in place to only allow discharges from advanced wastewater treatment systems, allowing for inspections to verify compliance, and building communication with the cruise lines and vessel staff on requirements of the MOU.

While we continue to learn more about the large passenger vessels, more information is needed in regards to the small ships including which ships are operating in Washington waters, what type of treatment systems are on board, which ships are discharging and where, and the quality of the effluent being discharged. In 2006, advances were made in researching this information.

The majority of the lines and vessels operating with the MOU had a successful season and were in compliance throughout. The sampling results continue to show excellent effluent quality. In 2006, major non-compliance was discovered in regards to the Celebrity Cruises Inc. MERCURY vessel and discharges that occurred in 2005, and a minor record discrepancy was discovered in regards to the Holland America Line VEENDAM which has since been discovered to be an error. It is the hope of Ecology that the active corrections being made do prevent recurrence of such violations. Ecology will continue to monitor compliance closely.

The MOU specifies that all of the parties agree to at least one annual meeting to review the effectiveness of the MOU. The annual meeting was held on December 8, 2006. The Port of Seattle, the Department of Ecology, representatives from the NorthWest CruiseShip Association and some of its member lines (Princess Cruises, Norwegian Cruise Line, Holland America Line, and Royal Caribbean/Celebrity Cruises), the Department of Health, as well as other interested parties convened for the meeting. Agenda items included:

- Introductions and MOU introduction
- Compliance with 2006 season

- Shellfish/Virus Study Update
- Funding for the MOU
- Biosolids and MOU amendments
- Looking ahead
- Comments/Discussion from interested parties

The meeting notes are included in Appendix E.

Advantages to the MOU include having something in place to protect water quality, building a partnership with the cruise industry and other key stakeholders, and being able to inspect and evaluate the quality of treatment from the ships that discharge. Limitations of the MOU include the inability to effectively enforce on what is essentially a voluntary agreement, the lack of coverage under the MOU for large passenger ships that are not members of the NorthWest CruiseShip Association, and air quality issues are not currently covered in the MOU.

The disposal of sludge from cruiseships, although outside of Washington's waters of the state, is of concern in that sludge has the potential of being used in a more beneficial way. Most on land treatment systems treat their sludge for usage to be applied on land for agronomic soil amendments, or it is turned into compost for widespread use. A group is being formed which will include Ecology biosolids experts, King County and City of Seattle representatives, cruise line representatives, and the Port of Seattle to consider options for sludge handling on-land for beneficial use.

8.2 Recommendations

1. The Department of Ecology recommends that the MOU continue to be used as a complement to environmental regulations until regulations specific to cruise ship waste management in Washington State are put in place.
2. Ecology recommends that Ecology continue to inspect ships that discharge in waters subject to the MOU, including closely looking at wastewater management and the management of other waste streams.
3. It is recommended that the Department of Ecology and Washington State Department of Health work together to seek information on smaller passenger vessels.
4. It is recommended that the cruise lines conduct a thorough review of records on an on-going basis throughout the season as well as at the end of the system to evaluate compliance, and that all recommendations made in inspection reports be implemented.