2005 Assessment of Cruise Ship Environmental Effects in Washington

Washington State Department of Ecology

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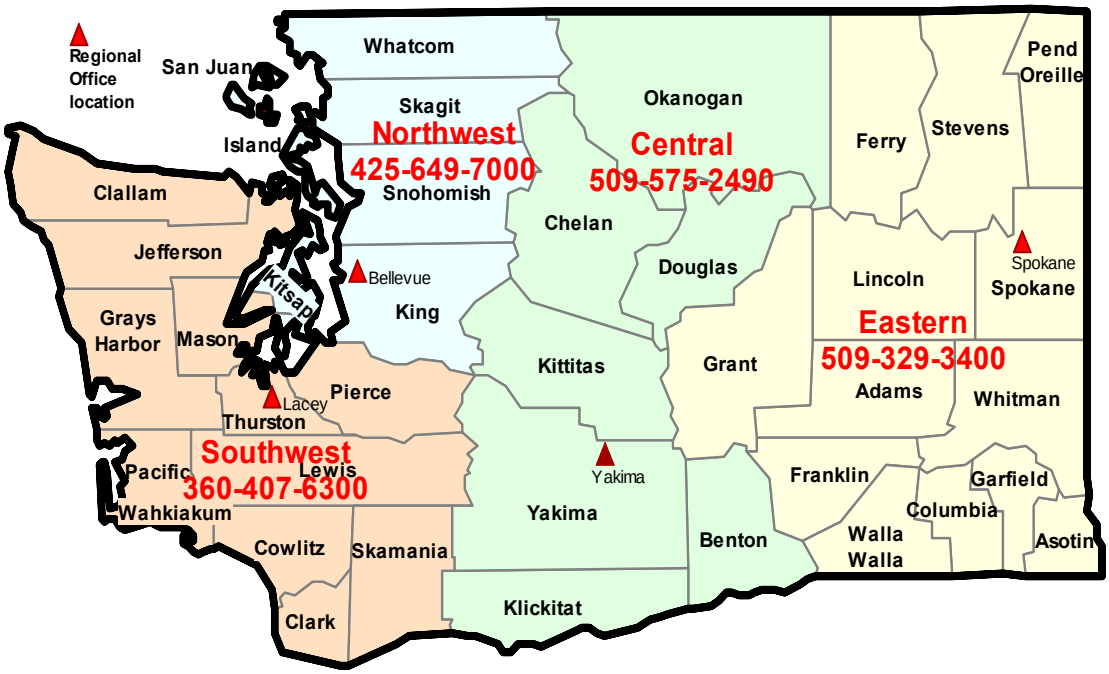

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You will find electronic files of the appendices on our web site at
http://www.ecy.wa.gov/programs/wq/wastewater/cruise_mou/index.html#2005_assessment

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 July 8, 2005, the MOU was amended. Amendments included: 1) changing language to include all ports, not just Seattle; 2) adding requirements to submit annual compliance reports; and 3) adding language referencing pollutant limits from Alaska.

The MOU bans all cruise-ship wastewater discharges (blackwater and graywater), 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.

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.

The goal of the MOU was to increase protection for Washington's marine waters from cruise-ship waste. On the whole, the MOU led to some improvements of the management of wastes during the 2005 season, demonstrating that voluntary agreements can achieve desired environmental results. For example, Washington's MOU goes a step beyond Alaska's requirements by requiring immediate shutdown of discharge when water is turbid. During an inspection of one of the ships in 2005, the effluent was turbid and the automatic shutdown of the discharge was working. This prevented lesser quality water from being discharged in our waters.

The 2005 season under the MOU went very smoothly. Lines of communication with the cruise industry continued to be open. While three cruise ships were approved for discharge during the 2004 cruise ship season, nine of ships requested and received approval for discharge in 2005. This increase in approvals led to more data and information gathered in regards to the large ships. In general, the requirements of the MOU were known and understood by personnel on the vessels. More in-depth inspections were conducted by Ecology in 2005.

While we continue to learn more about the large passenger vessels, more information is needed about the small passenger ships including: which ships are operating in Washington water;

what type of treatment systems are on board; which ships are discharging and where; and the quality of the effluent being discharged. More information is also needed on all sizes of passenger ships regarding how the on-board wastewater systems eliminate viruses and how to better protect shellfish in our waters.

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; air quality issues are not covered by the MOU; and lack of dedicated funding hinders Ecology's ability to monitor implementation.

The Department of Ecology recommends that the MOU remain in effect as a complement to environmental regulations. Ecology should continue to inspect ships that discharge in waters subject to the MOU, including closely looking at wastewater system maintenance as well as how the systems are operating. A funding mechanism for the MOU should be finalized prior to the next season under the MOU. It is also recommended that the Department of Ecology and Washington State Department of Health work together to seek information on wastewater and other environmental practices of smaller passenger vessels.

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 2005 cruise season. The goals of this report are:

1. Analyze the overall compliance with the Memorandum of Understanding;
2. Evaluate the performance of the advanced wastewater treatment systems; and
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, and Princess Cruises, ran regular cruises of large ships between Seattle and Alaska in 2005. Royal Caribbean Cruises Ltd. will also run cruises between Seattle and Alaska in 2006. Most of these large ships have a capacity of about 2100 to 3900 persons on board.

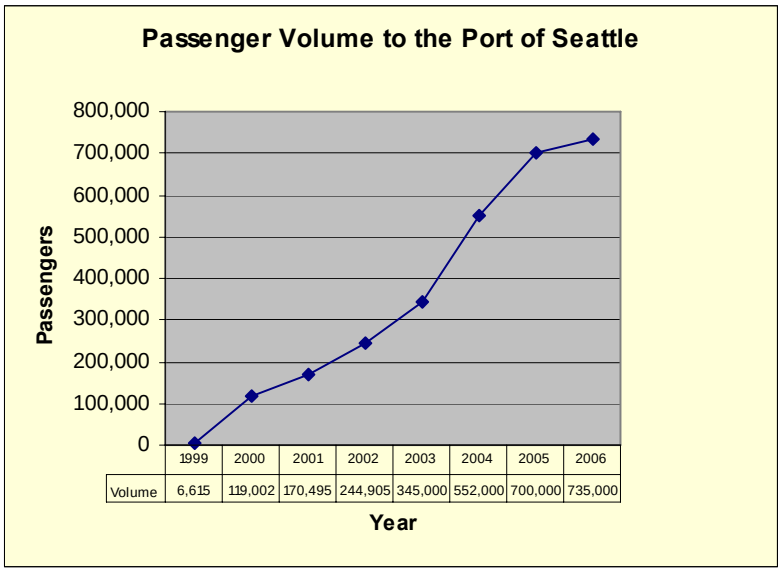
Alaska's Marine Highway runs regular cruises out of Bellingham to Alaska. The ships have a passenger/crew capacity of about 175 to 225.

Some smaller cruise lines, such as CruiseWest and Linblad Expeditions run cruises on the Columbia and Snake River 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 2005 season.

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



Source: Port of Seattle Records and Port of Seattle Cruise Seattle web site November 17, 2005.
2006 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 federal Clean Water Act prevents state and local governments from regulating discharges from Marine Sanitation Devices. State governments can petition for "no discharge" zones for their state waters and can thereby prohibit all discharges within those zones. 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 Industry's trade association, the International Council of Cruise Lines (ICCL).

For the 2005 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 Cruises

In 2005, 96% 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: 2005 Cruise Ships Calling to Ports in Washington

2005 Cruise Ships Visiting Port of Seattle

Vessel Operator	Vessel Name	2005 Number of Port Calls[1]	Total Persons on Board[2]
NWCA MEMBERS			
Celebrity Cruises	*Mercury*	23	2279
Celebrity Cruises	*Summit*	2	3409
Holland America Line	*Amsterdam*	20	2107
Holland America Line	*Ooesterdam*	21	2624
Holland America Line	*Veendam*	2	1854
Holland America Line	*Volendam*	1	2060
Holland America Line	*Zaandam*	1	2080
Norwegian Cruise Line	*Norwegian Dream*	12	2448
Norwegian Cruise Line	*Norwegian Spirit*	18	3600
Norwegian Cruise Line	*Norwegian Star*	20	3340
Norwegian Cruise Line	*Norwegian Sun*	1	2952
Princess Cruise Line	*Diamond Princess*	21	3908
Princess Cruise Line	*Sapphire Princess*	21	3908
Princess Cruise Line	*Sun Princess*	1	2820
NON NWCA MEMBERS			
CruiseWest	*Spirit of the Oceanus*	1	178
Japan Cruise Line, Inc.	*Pacific Venus*	1	750 + crew
America West Steamship	*Empress of the North*	3	320
		169	

[1]Numbers come from Port of Seattle 2005 Cruise Ship Sailing Schedule and the Port of Seattle staff

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

For the 2006 season, all large ships scheduled to visit Seattle are part of the NWCA. The Port of Seattle's schedule for 2006 includes a total of 193 port calls from the following vessels: Celebrity Cruises *Mercury*, Celebrity Cruises *Summit*, Holland America Line *Oosterdam,* Holland America Line *Ryndam*, Holland America Line *Veendam*, Holland America Line *Volendam*, Holland America Line *Westerdam*, Holland America Line *Zaandam*, Norwegian Cruise Line *Star*, Norwegian Cruise Line *Sun*, Princess Cruises *Dawn Princess*, Princess Cruises *Sun Princess*, and Royal Caribbean *Vision of the Seas*.

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 (blackwater and graywater), 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 and reporting 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 July 8, 2005 the MOU was amended. Amendments included: 1) changing language to include all ports, not just Seattle; 2) adding requirements to submit annual compliance reports; and 3) adding language referencing pollutant limits from Alaska. 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.1) is included in Appendix A.

1.4. MOU Funding

Since the inception of the MOU, the Department of Ecology has not received any funding specifically for the costs incurred for the MOU. While the NWCA and its member lines have committed to provide funding based on preliminary estimates, cost recovery has not yet taken place. Ecology, the Port of Seattle, and the NWCA and its member lines have been working on figuring out how to go about cost recovery. Similar types of cost recovery has taken place between Ecology and a number of different entities for costs associated with environmental work. A group of representatives from each of the MOU parties will be meeting and working to finalize an agreement prior to the next cruise season.

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. Due to a discrepancy between how the State of Washington and the U.S. Coast Guard define "Washington waters", areas exist where the shipping industry, as a whole, does not recognize Washington regulatory authority. 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.

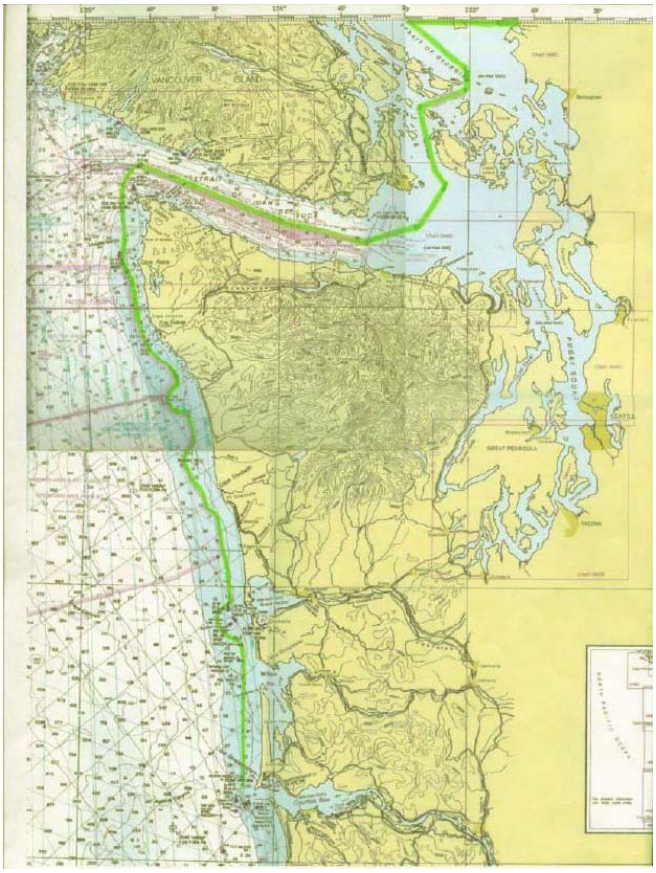


Figure 2: Map of "Waters subject to this MOU"

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©. 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 2005 season by NWCA member ships.

Table 2: 2005 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	*Mercury*	Biopure/Rochem	Mixed with BW	Rochem is a reverse osmosis ultrafiltration system.
Celebrity Cruises	*Summit*	Hamann/Lazarus	None	Hamann/Lazarus is dilution and filtration system
Holland America Line	*Amsterdam*	Unknown	Unknown	
Holland America Line	*Ooesterdam*	Rochem	Rochem	Rochem BW is a bioreactor and ultrafiltration; Rochem GW is reverse osmosis ultrafiltration system.
Holland America Line	*Veendam*	Zenon	Mixed with BW	Zenon is a bioreactor and membrane ultrafiltration system.
Holland America Line	*Volendam*	Zenon	Mixed with BW	Zenon is a bioreactor and membrane ultrafiltration system.
Holland America Line	*Zaandam*	Zenon	Mixed with BW	Zenon is a bioreactor and membrane ultrafiltration system.
Norwegian Cruise Line	*Norwegian Dream*	Scanship	Mixed with BW	Scanship is a biological reactor and ultrafiltration system.
Norwegian Cruise Line	*Norwegian Spirit*	Scanship	Mixed with BW	Scanship is a biological reactor and ultrafiltration system.
Norwegian Cruise Line	*Norwegian Star*	Scanship	Mixed with BW	Scanship is a biological reactor and ultrafiltration system.
Norwegian Cruise Line	*Norwegian Sun*	Scanship	Mixed with BW	Scanship is a biological reactor and ultrafiltration system.
Princess Cruise Line	*Diamond Princess*	Hamworthy Bioreactor	Mixed with BW or held	Hamworthy is a biological reactor and ultrafiltration system.
Princess Cruise Line	*Sapphire Princess*	Hamworthy Bioreactor	Mixed with BW or held	Hamworthy is a biological reactor and ultrafiltration system.
Princess Cruise Line	*Sun Princess*	Hamworthy Bioreactor	Mixed with BW or held	Hamworthy is a biological reactor and ultrafiltration system.
NON NWCA MEMBERS				
CruiseWest	*Spirit of Oceanus*	Hamworthy	None	Hamworthy is a biological reactor and ultrafiltration system.
Japan Cruise Line, Inc.	*Pacific Venus*	Unknown	Unknown	Unknown
West Steamship	*Empress of the North*	Orca	chlorine	Macerator Chlorinating System

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 ≥ one nautical mile away from its berth and ≥ 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, 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.

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 ≥ 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 identity 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* was approved for discharge at one mile or more from berth while traveling at a speed of six or more knots in 2004 and submitted documentation that the system was again certified by the USCG for continuous discharge in Alaska for the 2005 season. A letter detailing approval for the 2005 season was sent by Ecology on June 20, 2005.

The Holland America Line *Veendam*, *Volendam*, 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 for a few end of season visits from the vessels. The vessels received approval to discharge on September 22, 2005.

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

The Norwegian Cruise Line *Star* and *Spirit* were approved for continuous discharge in 2004 and submitted documentation that the system was again certified by the USCG for continuous discharge in Alaska for the 2005 season. A letter detailing approval for the 2005 season was sent on May 23, 2005.

The Norwegian Cruise Line *Dream* submitted documentation that the system was certified by the USCG for continuous discharge in Alaska for the 2005 season. Schematics and other documentation were also provided. Ecology staff reviewed the documentation and on June 27, 2005 sent a letter detailing approval for continuous discharge.

Princes Cruises *Diamond Princess* and *Sapphire Princess* submitted documentation that the system was certified by the USCG for continuous discharge in Alaska for the 2005 season. Schematics and other documentation were also provided. Ecology staff reviewed the documentation and on May 5, 2005 sent a letter detailing approval for continuous discharge.

Table 3: 2005 Approval to Discharge

		Discharging in Washington[1] ≥ 1nm from berth and ≥ 6 knots		Discharging in Washington[1] continuously (at berth or within 1 nm of berth)		
Vessel Operator	**Vessel Name**	**BW**	**GW**	**BW**	**GW**	**Date Approved**
Celebrity Cruises	*Mercury*	NO	NO	NO	NO	
Celebrity Cruises	*Summit*	NO	NO	NO	NO	
Holland America Line	*Amsterdam*	NO	NO	NO	NO	
Holland America Line	*Ooesterdam*	YES	YES	NO	NO	6/2/04 and 05 season

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	
Holland America Line	*Veendam*	YES	YES	NO	NO	9/22/2005
Holland America Line	*Volendam*	YES	YES	NO	NO	9/22/2005
Holland America Line	*Zaandam*	YES	YES	NO	NO	9/22/2005
Norwegian Cruise Line	*Norwegian Dream*	YES	YES	YES	YES	6/27/2005
Norwegian Cruise Line	*Norwegian Spirit*	YES	YES	YES	YES	8/12/04 and 05 season
Norwegian Cruise Line	*Norwegian Star*	YES	YES	YES	YES	8/12/04 and 05 season
Norwegian Cruise Line	*Norwegian Sun*	NO	NO	NO	NO	
Princess Cruise Line	*Diamond Princess*	YES	YES	YES	YES	5/5/2005
Princess Cruise Line	*Sapphire Princess*	YES	YES	YES	YES	5/5/2005
Princess Cruise Line	*Sun Princess*	NO	NO	NO	NO	
CruiseWest	*Spirit of Oceanus*	NO	NO	NO	NO	
Japan Cruise Line, Inc.	*Pacific Venus*	NO	NO	NO	NO	
West Steamship	*Empress of the North*	NO	NO	NO	NO	

BW = Blackwater; GW = Graywater

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

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. 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 WET testing results on October 21, 2005 for the Holland America Line *Oosterdam*. The results are being reviewed and analyzed by Ecology staff.

4.2. Sampling Data

Sampling results were received for the cruise ships that discharged in waters subject to the MOU, Norwegian Cruise Line's *Spirit*, *Star* and *Dream*, Princess Cruises *Diamond Princess* and *Sapphire Princess*, the Holland Line's *Oosterdam*, *Veendam*, *Volendam*, 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 4 below shows the results for the cruise ships during the approval period and within Washington/Alaska voyages.

Table 4: Sample Results - Cruise Ships Discharging into Washington Waters

SHIP: NORWEGIAN SPIRIT		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 WQ Standards[2]		6.5-9.0	NA	NA	13 / 7.5 ug/l	14 / 43	
Sample Date	Location/ Lab						
5/17/05	Juneau/Analytica	7.11	ND< 2	ND< 4	ND< 0.1	ND< 2	
5/21/05	Seattle/Laucks	6.1	ND 5	ND 2	< 0.1	22	
5/24/05	Juneau/Analytica	6.52	ND< 2	ND< 4	0.17	ND< 2	random unannounced inc. other parameters
6/7/05	Juneau/Analytica	6.94	2.29	ND< 4	ND< 0.1	ND< 2	
6/11/05	Seattle/Laucks	6.1	ND 4	ND 2	< 0.1	< 2	
7/12/05	Juneau/Analytica	6.95	9.95	8.20	ND< 0.1	23.3	
7/16/05	Seattle/Laucks	6.60	ND 5	2	< 0.1	2	
7/26/05	Juneau/Analytica	6.87	2.88	ND< 4	ND< 0.1	ND< 2	random unannounced inc. other parameters
8/2/05	Juneau/Analytica	6.88	2.24	ND< 4	ND< 0.1	ND< 2	
8/6/05	Seattle/Laucks	6.8	6.2	5	< 0.1	ND< 2	
9/10/05	Seattle/Laucks	6.8	ND 5	2	< 0.1	ND< 2	
9/10/05	Seattle/NCA	6.68	4.90	ND< 4	ND< 0.02	ND< 1	Taken by Ecology
9/13/05	Juneau/Analytica	6.68	2.57	ND< 4	ND< 0.1	ND< 2	
	MINIMUM	**6.10**	**ND**	**ND**	**ND**	**ND**	Seattle testing met
	AVERAGE		**4.16**	**3.78**	**0.10**		
	MAXIMUM	**7.11**	**9.95**	**8.20**	**0.17**	**23.3**	
	GEOMETRIC MEAN					**2.8**	July's monthly geometric mean = 5

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 WQ Standards[2]		6.5-9.0	NA	NA	13 / 7.5 ug/l	14 / 43	
Sample Date	Location/ Lab						
5/22/05	Seattle/Laucks	6.4	4	6	< 0.1	2	
6/7/05	Juneau/Analytica	6.50	ND< 2	ND< 4	ND< 0.1	ND< 2	
6/12/05	Seattle/Laucks	6.2	7.8	3	< 0.1	< 2	
6/14/05	Juneau/Analytica	6.62	3.64	ND< 4	ND< 0.1	ND< 2	random unannounced inc. other parameters
7/5/05	Juneau/Analytica	7.57	ND< 2	ND< 4	ND< 0.1	ND< 2	
7/17/05	Seattle/Laucks	6.4	14	7	< 0.1	< 2	
7/19/05	Juneau/Analytica	7.74	ND< 2	ND< 4	ND< 0.1	ND< 2	random unannounced inc. other parameters
8/2/05	Juneau/Analytica	6.86	ND< 2	ND< 4	ND< 0.1	ND< 2	
8/14/05	Seattle/Laucks	6.7	11	8	< 0.1	< 2	
8/14/05	Seattle/NCA	6.67	35.9	4.5	0.0250	ND< 1	Taken by Ecology
9/11/05	Seattle/Laucks	6.6	ND< 5	4	< 0.1	< 2	
9/13/05	Juneau/Analytica	6.69	ND< 2	ND< 4	ND< 0.1	ND< 2	
	MINIMUM	**6.20**	**ND**	**ND**	**ND**	**ND**	Seattle testing met
	AVERAGE		**7.61**	**4.7**	**0.094**		
	MAXIMUM	**7.74**	**35.9**	**8.0**	**0.100**	**2**	
	GEOMETRIC MEAN					**2**	

SHIP: NORWEGIAN DREAM												
		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 WQ Standards[2]		6.5-9.0	NA		NA		13 / 7.5 ug/l		14 / 43		
Sample Date	Location/ Lab										
7/11/05	Seattle/Laucks	6.2		21		3	<	0.1	<	2	
7/17/05	Juneau/Analytica	7.31		9.02	ND<	4	ND<	0.1	ND<	2	
7/21/05	Seattle/NCA	6.67		21.2	ND	4		0.0940	ND	1	Taken by Ecology
7/21/05	Seattle/Laucks	6.5		16		6	<	0.1	<	2	
7/24/05	Juneau/Analytica	6.38		12.4	ND<	4	ND<	0.1	ND<	2	random unannounced inc. other parameters
8/22/05	Seattle/Laucks	6.6		36	ND	2	<	0.1		4	
8/28/05	Juneau/Analytica	6.80		18.8		11.4	ND<	0.1	ND<	2	
9/1/05	Seattle/Laucks	6.1		18		2	<	0.1		4	
9/4/05	Juneau/Analytica	7.40		21.4	ND<	4	ND<	0.1	ND<	1	
	MINIMUM	**6.10**		**ND**		**ND**		**ND**		**ND**	Seattle testing met
	AVERAGE			**19.3**		**4.5**		**0.099**			
	MAXIMUM	**7.40**		**36.0**		**11.4**		**0.100**		**4**	
	GEOMETRIC MEAN									**2**	

SHIP: DIAMOND PRINCESS												
		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 WQ Standards[2]		6.5-9.0	NA		NA		13 / 7.5 ug/l		14 / 43		
Sample Date	Location/ Lab										
5/9/05	Juneau/Analytica	7.28		2.08	ND<	4	ND<	0.1	ND<	2	
5/14/05	Seattle/Laucks	6.1		16	ND<	2	<	0.1	<	5	other results also - MBR effluent
5/23/05	Juneau/Analytica	7.27	ND<	2	ND<	4	ND<	0.1	ND<	2	random unannounced inc. other parameters
5/30/05	Juneau/Analytica	7.65	ND<	2	ND<	4	ND<	0.1	ND<	2	
6/6/05	Juneau/Analytica	7.68	ND<	2	ND<	4	ND<	0.1	ND<	2	
6/11/05	Seattle/Laucks	6.8		5	ND<	2	<	0.1	<	2	
6/20/05	Juneau/Analytica	7.64		2.05	ND<	4	ND<	0.1	ND<	2	
6/25/05	Seattle/Laucks	6.7	ND<	5	ND<	2	<	0.1		20	
6/27/05	Juneau/Analytica	8.02		2.05	ND<	4	ND<	0.1		4	
7/4/05	Juneau/Analytica	8.04		13.4	ND<	4	ND<	0.1	ND<	2	
7/9/05	Seattle/Laucks	6.8	ND	5		2	<	0.1	<	2	
7/18/05	Juneau/Analytica	7.77		2.39	ND<	4	ND<	0.1	ND<	2	random unannounced inc. other parameters
7/25/05	Juneau/Analytica	8.12		2.07	ND<	4.0	ND<	0.1		4	
8/1/05	Juneau/Analytica	7.64	ND<	2	ND<	4	ND<	0.1	ND<	2	
8/6/05	Seattle/NCA	7.50		14.1	ND	4	ND	0.0200		1	Taken by Ecology
8/6/05	Seattle/Laucks	7.6		4.8	ND<	2	<	0.1		4	
8/15/05	Juneau/Analytica	7.95		6.44	ND<	4	ND<	0.1	ND<	2	
8/22/05	Juneau/Analytica	7.62		34.1	ND<	4	ND<	0.1	ND<	2	
8/29/05	Juneau/Analytica	7.51	ND<	2	ND<	4	ND<	0.1	ND<	2	
9/10/05	Seattle/Laucks	6.7		12	ND	2	<	0.1		4	
9/12/05	Juneau/Analytica	7.65	ND<	2	ND<	4	ND<	0.1	ND<	1	
9/19/05	Juneau/Analytica	7.78	ND<	2	ND<	4	ND<	0.1		12	
9/27/05	Juneau/Analytica	7.44	ND<	2	ND<	4	ND<	0.1	ND<	1	
	MINIMUM	**6.10**		**ND**		**ND**		**ND**		**ND**	Seattle testing met
	AVERAGE			**6.19**		**3.5**		**0.097**			Oct 04 - Apr 05 on CD
	MAXIMUM	**8.12**		**34.1**		**4.0**		**0.100**		**20**	June monthly geo mean = 4
	GEOMETRIC MEAN									**3**	

SHIP: SAPPHIRE PRINCESS														
		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 WQ Standards[2]		6.5-9.0		NA		NA		13 / 7.5 ug/l		14 / 43		
Sample Date	Location/ Lab											
5/9/05	Juneau/Analytica	7.54		8.44	ND<	4	ND<	0.1		3100	power outages prior to sampling
5/17/05	Ketchikan	7.39		8.97		0.5		0	ND<	2	
5/18/05	Juneau/Analytica	7.51		9.87	ND<	4	ND<	0.1	ND<	2	
5/22/05	Seattle/Laucks	7.3		5		2	<	0.1	<	10	other results also - MBR effluent
5/25/05	Juneau/Analytica	7.89		4.09	ND<	4	ND<	0.1	ND<	2	random unannounced inc. other parameters
6/1/05	Juneau/Analytica	7.46		4.88	ND<	4	ND<	0.1	ND<	2	
6/12/05	Seattle/Laucks										Lab mixed up samples with another client
6/15/05	Juneau/Analytica	7.82		4.48	ND<	4	ND<	0.1	ND<	2	
6/22/05	Juneau/Analytica	7.87	ND<	2	ND<	4	ND<	0.1	ND<	2	
6/26/05	Seattle/Laucks	7.8		10	ND	2	<	0.1	<	2	
6/29/05	Juneau/Analytica	7.93		5.02	ND<	4	ND<	0.1	ND<	2	
7/6/05	Juneau/Analytica	7.83		13.5	ND<	4	ND<	0.1	ND<	2	
7/10/05	Seattle/Laucks	7.2		6	ND	2	<	0.1	<	2	
7/20/05	Juneau/Analytica	8.00		9.73	ND<	4	ND<	0.1	ND<	2	random unannounced inc. other parameters
7/27/05	Juneau/Analytica	7.66		4.60	ND<	4	ND<	0.1	ND<	2	
8/3/05	Juneau/Analytica	7.62		26.4	ND<	4	ND<	0.1	ND<	2	
8/14/05	Seattle/Laucks	7.2		4		3	<	0.1	<	2	
8/14/05	Seattle/NCA	7.21	ND	2	ND	4		0.0360	ND	1	Taken by Ecology
8/17/05	Juneau/Analytica	7.97		2.10	ND<	4	ND<	0.1	ND<	2	
8/24/05	Juneau/Analytica	7.99	ND<	2	ND<	4	ND<	0.1	ND<	2	
8/31/05	Juneau/Analytica	7.79		3.52	ND<	4	ND<	0.1	ND<	2	
9/11/05	Seattle/Laucks	6.7	ND	5	ND	2	<	0.1	<	2	
9/14/05	Juneau/Analytica	7.70		3.84	ND<	4	ND<	0.1	ND<	1	
9/21/05	Juneau/Analytica	7.19	ND<	2	ND<	4	ND<	0.1	ND<	2	
	MINIMUM	**6.70**		**ND**		**ND**		**ND**		**ND**	Seattle testing met
	AVERAGE			**6.41**		**3.5**		**0.093**			Oct 04 - Apr 05 on CD
	MAXIMUM	**8.00**		**26.4**		**4.0**		**0.100**		**3100**	May monthly geo mean = 12
	GEOMETRIC MEAN									**3**	

SHIP: HOLLAND OOSTERDAM														
		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 WQ Standards[2]		6.5-9.0		NA		NA		13 / 7.5 ug/l		14 / 43		
Sample Date	Location/ Lab											
5/9/05	Juneau/Analytica	7.66	ND<	2	ND<	4	ND<	0.1	ND<	2	Black Water
5/9/05	Juneau/Analytica	6.62		5.33	ND<	4	ND<	0.1	ND<	2	Gray Water
5/14/05	Seattle/Laucks	6.9	ND	12	ND	2	<	0.1	<	2	Black Water
5/14/05	Seattle/Laucks	6.7		15	ND	2	<	0.1	<	2	Gray Water
5/16/05	Juneau/Analytica	7.74	ND<	2	ND<	4	ND<	0.1		2	Black Water
5/16/05	Juneau/Analytica	11.6	ND<	2	ND<	4		0.11	ND<	2	Gray Water
5/21/05	Seattle/Laucks	7.1	ND	4	ND	2	<	0.1	<	2	Black Water
5/21/05	Seattle/Laucks	6.4		15	ND	2	<	0.1	<	2	Gray Water
5/23/05	Juneau/Analytica	7.81		2.01	ND<	4		0.15	ND<	2	Black Water
5/23/05	Juneau/Analytica	6.87		23.7	ND<	4	ND<	0.1	ND<	2	Gray Water
5/30/05	Juneau/Analytica	7.63	ND<	2	ND<	4	ND<	0.1	ND<	2	Black Water
5/30/05	Juneau/Analytica	6.82		23.3	ND<	4	ND<	0.1	ND<	2	Gray Water
6/11/05	Seattle/Laucks	7.4	ND	4	ND	2	<	0.1	<	2	Black Water
6/18/05	Seattle/Laucks	6.9		5	ND	2	<	0.1		2	Black Water

6/18/05	Seattle/Laucks	6.2		54		6	<	0.1	<	2	Gray Water
6/20/05	Juneau/Analytica	7.87	ND<	2	ND<	4	ND<	0.1	ND<	2	Combined Black and Gray
6/27/05	Juneau/Analytica	7.52		32.3		6	ND<	0.1		6	Combined Black and Gray; random unannounced inc. other parameters
7/4/05	Juneau/Analytica	7.65		12.3	ND<	4.0	ND<	0.1	ND<	1	Combined Black and Gray
7/11/05	Juneau/Analytica	7.40		19.0	ND<	4	ND<	0.1	ND<	2	Combined Black and Gray
7/16/05	Seattle/Laucks	6.7		9	ND	2	<	0.1	<	2	Black Water
7/16/05	Seattle/Laucks	7.0		12		2	<	0.1	<	2	Gray Water
7/18/05	Juneau/Analytica	7.03		28.5	ND<	4	ND<	0.1	ND<	2	Combined Black and Gray
7/25/05	Juneau/Analytica	7.75		31.2	ND<	4	ND<	0.1	ND<	2	Combined Black and Gray
8/6/05	Seattle/Laucks	7.3		5.6		4	<	0.1		2	Black Water
8/6/05	Seattle/Laucks	7.5		42		2	<	0.1		2	Gray Water
8/8/05	Juneau/Analytica	7.59		14.6	ND<	4	ND<	0.1	ND<	2	Combined Black and Gray; random unannounced inc. other parameters
8/15/05	Juneau/Analytica	7.62		16.8	ND<	4	ND<	0.1		2	Combined Black and Gray
8/22/05	Juneau/Analytica	7.58		4.41	ND<	4	ND<	0.1	ND<	2	Combined Black and Gray
8/29/05	Juneau/Analytica	7.59		22.4	ND<	4	ND<	0.1	ND<	2	Combined Black and Gray
9/5/05	Juneau/Analytica	7.62		50.7	ND<	4	ND<	0.1		2	Combined Black and Gray
9/10/05	Seattle/NCA	7.59		112	ND	4	ND	0.0200		10	Taken by Ecology; Black Water
9/10/05	Seattle/NCA	7.31		27.1	ND	4	ND	0.0200	*		Taken by Ecology; Gray Water; fecal not sampled
9/12/05	Juneau/Analytica	7.65		29.2	ND<	4	ND<	0.1		2	Combined Black and Gray
9/19/05	Juneau/Analytica	7.82		22.4		9.80	ND<	0.1		16.7	Combined Black and Gray
	MINIMUM	**6.20**		**ND**		**ND**		**ND**		**ND**	No September Seattle testing by cruise line
	AVERAGE			**19.6**		**3.8**		**0.097**			
	MAXIMUM	**11.60**		**112**		**9.8**		**0.150**		**16.7**	
	GEOMETRIC MEAN									**2.2**	

SHIP:	**HOLLAND VEENDAM**										
		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 WQ Standards[2]		6.5-9.0	NA		NA		13 / 7.5 ug/l		14 / 43		
Sample Date	**Location/ Lab**										
9/8/05	Juneau/Analytica	7.77	ND<	2	ND<	4	ND<	0.1	ND<	2	
9/22/05	Juneau/Analytica	7.83	ND<	2	ND<	4	ND<	0.1	ND<	2	
	MINIMUM	**7.77**		**ND**		**ND**		**ND**		**ND**	No Sept. Seattle sample
	AVERAGE			**2**		**4**		**0.1**			
	MAXIMUM	**7.83**		**2**		**4**		**0.1**		**2**	
	GEOMETRIC MEAN									**2**	

SHIP:	**HOLLAND VOLENDAM**										
		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 WQ Standards[2]		6.5-9.0	NA		NA		13 / 7.5 ug/l		14 / 43		
Sample Date	**Location/ Lab**										
9/2/05	Juneau/Analytica	7.93		4.45	ND<	4	ND<	0.1	ND<	1	
9/9/05	Juneau/Analytica	7.16	ND<	2	ND<	4	ND<	0.1	ND<	1	
	MINIMUM	**7.16**		**ND**		**ND**		**ND**		**ND**	No Sept. Seattle sample – did not discharge
	AVERAGE			**3.23**		**4**		**0.1**			
	MAXIMUM	**7.93**		**4.45**		**4**		**0.1**		**1**	
	GEOMETRIC MEAN									**1**	

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 WQ Standards[2]		6.5-9.0	NA	NA	13 / 7.5 ug/l	14 / 43	
Sample Date	Location/ Lab						
9/5/05	Juneau/Analytica	7.99	ND< 2	ND< 4	ND< 0.1	ND< 1	
9/12/05	Juneau/Analytica	8.08	ND< 2	ND< 4	ND< 0.1	ND< 1	
	MINIMUM	7.99	ND	ND	ND	ND	No Sept. Seattle sample – did not discharge
	AVERAGE		2	4	0.1		
	MAXIMUM	8.08	2	4	0.1	1	
	GEOMETRIC MEAN					1	

ND = Non Detect, value in box is the detection level
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
[1]MOU/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 colifrom/100 ml and not more than 10% of the samples exceed 40 fecal coliform/100 ml
[2]Washington 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 0.5
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 4. Copies of laboratory results can be obtained through Ecology's public disclosure office.

5. Inspections

5.1. Inspections per the MOU

Six ships were inspected by Ecology staff throughout the 2005 season for vessels that were approved. A list of vessels inspected is included in Table 5. 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, and disinfection system maintenance and gathering other information, as applicable. The inspections 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 disinfection system maintenance and cleaning, turbidity/solids monitoring settings, and notification procedures. Most of the ships did not have proper notification procedures for notifications of noncompliance. Ecology provided the vessels and management with sample notification sheets for use on the vessels. Copies of the inspection reports, without the attachments, are included in Appendix C.

Table 5: 2005 Inspections

Vessels Inspected	**Date Inspected**
Diamond Princess	8/6/05
Holland Oosterdam	9/10/05
Norwegian Dream	7/21/05
Norwegian Spirit	9/10/05
Norwegian Star	8/14/05
Sapphire Princess	8/14/05

6. Compliance

6.1. Compliance with MOU requirements

There were no reported incidents of non-compliance with the MOU by the cruise lines in regards to wastewater. Vessels that discharged in Washington waters requested and received approval to do so. There were no reported incidents of discharges without approval. All documentation required for approval was submitted. All vessels approved for discharge complied with sampling requirements with the exception of the Holland America Line *Oosterdam*, *Veendam*, *Volendam*, and *Zaandam* which failed to conduct testing in Washington in September (Ecology did conduct sampling of the *Oosterdam* in Seattle in September). Sampling results from tests done in both Washington and Alaska were provided to Ecology.

There were no reported incidents of non-compliance in relation to solid waste management, hazardous waste management or any other condition of the MOU.

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

The hazardous waste regulations in Washington are more complex than most states, and the cruise industry has a number of hazardous waste materials that they use on board. It appears that the cruise industry has a good handle on the various requirements and manages the waste streams well. There were no incidents of non-compliance of the MOU that were reported to Ecology as related to hazardous waste.

7. Shellfish and Viruses

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

agencies co-hosted a meeting in May of 2005 with representatives from the cruise industry, shellfish industry, Tribes, and legislative staff. The discussion focused on potential impacts to shellfish beds from cruise ship discharges, and a virus study. The Department of Health is the lead on the virus study. The agencies worked together to create maps depicting where the large cruise ships transit (shipping lanes) and where the shellfish areas are. Appendix E includes the maps titled *Ship Lanes and Shellfish, Washington State Marine Waters*.

Advanced treatment systems can effectively remove fecal coliforms but may not eliminate certain viruses like the norovirus.

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.

7.1. The Virus Study

On May 25, 2005, DOH and Ecology held a meeting with numerous stakeholders. An outline of study options was presented at that meeting and comments requested. As a result, DOH contracted with the University of Washington (UW) to study the impact of norovirus in discharges from large passenger ships. The UW report will be used to determine the size of shellfish closure zones to protect public health. It is possible that the closure zones may be completely inside the passenger ship corridor, creating no impact to shellfish harvesting or passenger ship operations. Thus, these closure zones *may not impact any shellfish growing areas.*

The work that the University of Washington will complete includes assessing:

- Estimation of virus discharge *(How much virus may escape from a ship?*)
- Dilution from ship to shoreline (*How do currents and ship-speed dilute discharge?*)
- Uptake and retention of viral particles by shellfish *(If the virus reaches shellfish, how it might accumulate in shellfish and how long might it be retained?*)
- Risk of disease *(If virus reaches shellfish, what is the risk of human illness from consuming the shellfish?*)

The final UW report will be completed by June 30, 2006. In addition to the UW report, DOH will research discharges from smaller passenger vessels to determine if those impacts should be considered. We are also considering providing test kits for sampling the treated discharge during any Norovirus illness outbreak, which could take until November 2007 (two seasons of sampling).

8. Conclusions

8.1. Overall

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.

The 2005 season under the MOU went very smoothly. Lines of communication with the cruise industry continued to be open. While very few cruise ships were approved for discharge during the 2004 cruise ship season, a number of ships requested and received approval for discharge in 2005. This increase in approvals led to more data and information gathered in regards to the large ships. In general, the requirements of the MOU were known and understood by personnel on the vessels.

The MOU specifies that all of the parties agree to at least one annual meeting to review the effectiveness of the MOU, if feasible during October each year. The annual meeting was held on December 7, 2005. 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, Royal Caribbean/Celebrity Cruises), the Department of Health, representatives from smaller cruise ship operations as well as other interested parties convened for the meeting. Agenda items included compliance for the 2005 season, funding for the MOU, amendments to the MOU, an update on the Department of Health Cruise ship shellfish study, and looking ahead to next season. The meeting notes are included in Appendix F.

Action items from the annual meeting included:

- coordination between the Department of Health and the cruise industry on virus study issues;
- submittal of compliance letters by member lines;
- continuing on working out budget and funding issues for cost recovery with the MOU by forming a sub-group with a goal of finalizing funding by the beginning of April 2006;
- preparing draft amendments to the MOU regarding clarifying language to clearly specify limits for parameters (Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), pH, fecal coliform and residual chlorine), clarifying when Whole Effluent Toxicity testing is required as ships come and go, and adding specific prohibitions on other types of waste discharges (biomedical waste and oily bilge water).

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, air quality issues are not currently covered in the MOU, and lack of funding outside of currently informal agreements to cover Ecology's costs.

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.

8.2. Recommendations

1. The Department of Ecology recommends that the MOU continue to be used as a complement to environmental regulations.

2. Ecology recommends that Ecology continue to inspect ships that discharge in waters subject to the MOU, including closely looking at wastewater system maintenance as well as how the systems are operating.

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 a funding mechanism for the MOU be finalized prior to the next season under the MOU.