

HB

164



Assessment of Cruise Ship and Ferry Wastewater Impacts in Alaska

Alaska Department of Environmental Conservation

Commercial Passenger Vessel Environmental Compliance Program

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Executive Summary

Cruise ships by their sheer size and passenger number are a highly visible industry in Alaska. Concerns about cruise ship pollution led to the creation of the Alaska Cruise Ship Initiative (ACSI) in 2000. Wastewater samples taken as part of the ACSI in 2000 indicated that the blackwater¹ treatment systems were not working properly and that graywater² quality was similar to blackwater. This information led to state and federal laws that now regulate cruise ship and ferry blackwater and graywater discharge in Alaska.

Before the passage of the state cruise ship law, blackwater and graywater from large cruise ships did not meet Alaska Water Quality Standards for ammonia, free chlorine, fecal coliform, copper, and zinc at the end of pipe. These ships would have exceeded Alaska Water Quality Standards for free chlorine, fecal coliform, and dissolved copper if they discharged while stationary. However, Alaska Water Quality Standards, except fecal coliform, were probably met in the receiving water while ships discharged underway due to substantial dilution.

Since the passage of the state law in 2001 and federal cruise ship law in 2000, most large cruise ships discharging into Alaska waters³ have installed advanced wastewater treatment systems. The effluent quality produced by the advanced systems has dramatically improved from waste water discharged from most ships in 2000-2002. Therefore ADEC considered the 2003 data to assess the impact of large cruise ship effluent in receiving waters. In 2003, these systems produced wastewater that met Alaska Water Quality Standards for most tested pollutants at the end of pipe. After applying a conservative dilution factor, Alaska Water Quality Standards were met in receiving water for all tested pollutants. Whole Effluent Toxicity (WET) testing conducted during 2003 in conjunction with dilution estimates indicates that effluent from ships with advanced wastewater treatment systems does not pose a risk to aquatic organisms, even during stationary discharge. No tested pollutant is present in concentrations that cause risks to human health.

Small cruise ships and Alaska Marine Highway System (AMHS) ferries use traditional treatment, not advanced systems to treat their blackwater. The quality of small ship effluent has remained relatively consistent from 2001 to 2003. Therefore, ADEC used all the data available to assess the impact of small vessel effluent on receiving waters. The wastewater produced by small vessels frequently exceeds eight (ammonia, free chlorine, fecal coliform, arsenic, copper, nickel, selenium, and zinc) Alaska Water Quality Standards at the end of pipe. After applying a conservative dilution factor, four (free chlorine, fecal coliform, copper, and zinc) Alaska Water Quality Standards may be exceeded in receiving water during stationary discharge. The discharge met Alaska Water Quality Standards for all tested pollutants in the receiving water during underway discharge due to the large dilution factor. In addition, WET testing conducted on six small vessels in conjunction with the sampling results indicates that small ship stationary effluent does pose some risk to the marine environment. Due to the high concentration of fecal coliform, the effluent from some small ships may pose a risk to human health in areas where aquatic life is harvested for raw consumption.

¹ Black water is sewage.

² Graywater originates from showers, galley, laundry, etc.

³ Alaska water is defined as 3 nautical miles from shore and the waters of the Alexander Archipelago defined in AS 46.03.290(18).

The wastewater samples taken from large and small vessels to date indicate that hazardous chemicals are not being discharged through these wastewater systems.

ADEC recommends that small vessels remain in the commercial passenger vessel program. Small vessels were granted three years to come into compliance with the cruise ship wastewater effluent standards. Further, in 2004, these vessels may submit an interim protection plan that, if approved by ADEC, extends the time for compliance with the effluent standards. This plan must detail the steps that the owner is taking to comply with the wastewater discharge limits including a description of the practices used to limit the adverse impacts of their discharges. Violations and fines could be levied against ships that are found violating the terms of their approved plan.

1. INTRODUCTION

1.1. Assessment Report

The 2001 state cruise ship legislation directed the Alaska Department of Environmental Conservation (ADEC) to submit a report to the Governor assessing commercial passenger vessels' discharges in Alaska marine waters. Using information from the 2000 – 2003 cruise ship seasons and other sources, this report satisfies the requirements to:

1. Characterize, to the extent possible, the risks to the marine and human environments posed by the discharge of sewage and graywater from commercial passenger vessels;
2. Evaluate the sewage and graywater treatment systems and technologies on the vessels, including an evaluation of whether small commercial passenger vessels should be made subject to the discharge limitations in AS 46.03.463; and
3. Recommend further action by the state 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 numerous requests received by ADEC staff from industry, environmental groups, and other government agencies. Bilge and ballast water issues are a maritime wide concern and are beyond the scope of the 2001 legislation and this report.

1.2. Cruise Ship Industry Trends in Alaska

The first steamships began carrying tourists to Alaska in 1884,⁴ making tourism one of Alaska's oldest industries. The number of cruise ship passengers that visit Alaska has increased by almost three and a half times since 1990. In 1990, 235,000 passengers traveled to Southeast Alaska. By 2003, the number of cruise ship passengers in Southeast Alaska increased to roughly 800,000⁵ with tens of thousands of crew (Figure 1). By comparison, the state's population is approximately 650,000.⁶ Roughly 95% of the current cruise ship traffic is concentrated in Southeast Alaska, a region with a population of approximately 73,000 people.⁷ This makes the cruise ship industry extremely visible in the region. For example, Skagway - with a summer population of 1,200 people - often has more than 12,000 people visiting in a day. The other 5% of cruise ship traffic is directed primarily toward Southcentral Alaska, but a few small cruise ships visit Western Alaska.

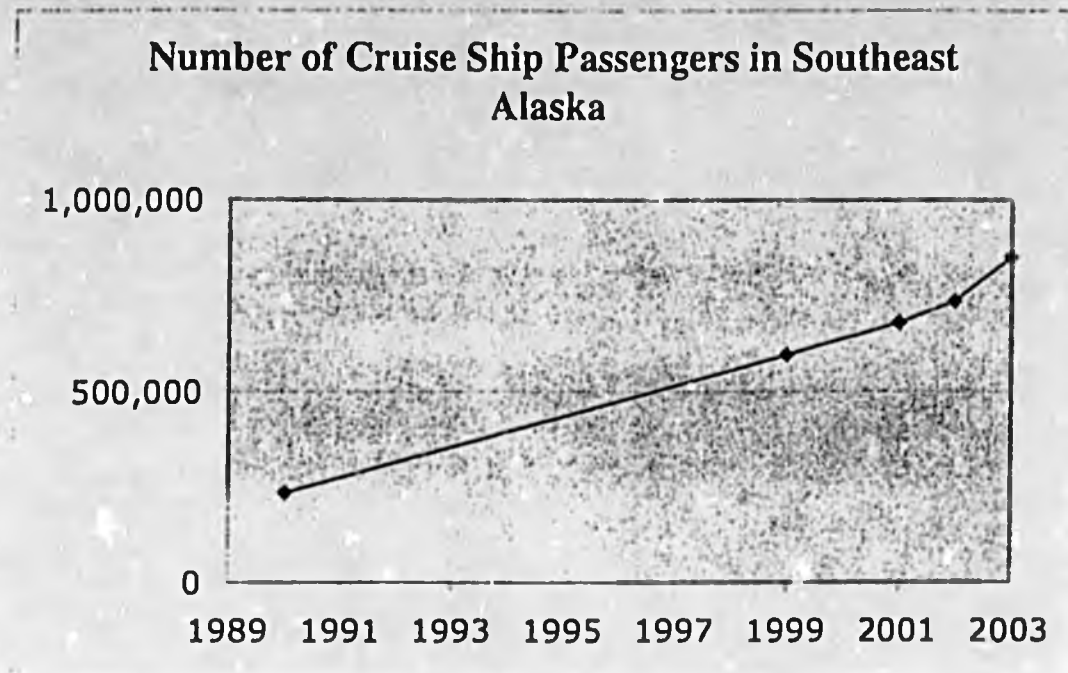
⁴ Alaska Permanent Fund Corporation Alaska History Page <http://www.apfc.org/library/AKHistoryDefn/s05>

⁵ ADEC 2003 registration information

⁶ Alaska Department of Labor and Workforce Development, Workforce Info Home Page <http://almlis.labor.state.ak.us/PAGEID=7&SUBID=115>

⁷ Alaska Department of Labor and Workforce Development, Borough & Census Area Estimates 2000 – 2003, <http://146.61.75.SI/Research/req/estimates/02/2-1.xls>

Figure 1. Cruise Ship Passenger Increase in Southeast Alaska



Source: Southeast Conference Report and ADEC Registration Statistics

The three most popular large cruise ship ports are Juneau, Ketchikan, and Skagway. Large ships tend to stop at the main Southeast Alaska ports and a large tidewater glacier (Glacier Bay or Hubbard). Some large cruise lines have trips that start in Southcentral Alaska (Seward) travel through southeast Alaska and end in Vancouver. The next voyage is reversed.

Alaska Marine Highway System (AMHS) ferries travel between Southeastern Alaska communities including Ketchikan, Juneau, and Skagway. These calls generally only last an hour or two. Small cruise lines explore remote bays and channels. They call on smaller Alaska ports and Native villages as well as the larger ports for most of a day. The small ships may venture from Alaska ports across the Bering Sea to the Russian Far East. The most popular ports for small ships are Sitka, Bartlett Cove, Skagway, Ketchikan, and Juneau.

Table 1 shows the number of cruise ship visits per port per year in 2003.⁸ There are often multiple ships in a port in a single day.

⁸ These numbers are derived from the 2003 Cruise Line Agencies of Alaska ship schedule. The actual visits may have varied slightly.

Table 1. Cruise Ship Visits Per Port in 2003

Place Name	Description	Number of small ship visits per year	Number of large ship visits per year
Adak	Port in Aleutian Islands	1	0
Anchorage	Port in Southcentral Alaska	8	0
Attu	Port in the Aleutian Islands	5	
Baranof Warm Springs	Port in Southeast Alaska	1	0
Bartlett Cove	Port inside Glacier Bay National Park	122	0
Cold Bay	Remote site	1	0
College Fjord	Tidewater Glacier in South central Alaska	7	147
Cordova	Port in Southcentral Alaska	16	0
Dutch Harbor	Unalaska Island (one of the Fox Is.) in the Aleutian Is.	7	3
Elfin Cove	Port in Southeast Alaska	25	0
Glacier Bay	Tidewater Glaciers, National Park in SE AK	See Bartlett Cove	207
Haines	Port in Southeast Alaska (Northern Lynn Canal)	67	13
Homer	Port in Southcentral (western Kenai Peninsula)	10	2
Hubbard Glacier	Tidewater Glacier near Yakutat on Gulf of Alaska	0	151
Icy Bay	Tidewater Glacier near Yakutat on Gulf of Alaska	0	2
Juneau	Port in Southeast Alaska	96	448
Ketchikan	Port in Southeast Alaska	100	408
Kodiak	Port in Kodiak Island (South central Alaska)	4	3
Misty Fjords	National Monument near Ketchikan	50	33
Nome	Western Alaska	2	3
Petersburg	Port in Southeast Alaska	96	0
Seward	Port in South Kenai Peninsula	0	98
Sitka	Port in Southeast Alaska (outside coast)	140	140
Skagway	Port in Southeast Alaska (Northern Lynn Canal)	100	328

Place Name	Description	Number of small ship visits per year	Number of large ship visits per year
St. Matthew	Island in the Bering Sea	9	0
St. Paul	Island in the Bering Sea	9	0
Tracy Arm	Tidewater Glacier in Southeast Alaska (between Juneau & Wrangell)	100	128
Valdez	Port in South central Alaska	16	0
Whittier	Port in South central Alaska	32	0
Wrangell	Port in Southeast Alaska	32	8

1.3. Concern about Cruise Ship Industry Environmental Practices

Tourism shares the rich marine environment with commercial fisheries, one of Alaska's largest private employers. Over 50% of America's seafood (5.1 billion of 9.4 billion pounds) is harvested from Alaska's waters.⁹ The commercial fishing industry depends on the perception and actuality that Alaskan fish come from uncontaminated waters.

Alaska's Native peoples subsist off the bounty of the sea, relying heavily upon marine resources for nutrition, sustenance, cultural integrity, and spiritual well being. Alaska Natives were alarmed over potential cruise ship pollution and the fouling of especially vulnerable food items such as filter feeding mollusks.

In July 1999, Royal Caribbean Cruise Lines (RCCL) entered a federal criminal plea agreement involving total penalties of \$6,500,000 for 1994 and 1995 environmental violations in Alaska including knowingly discharging oil and hazardous substances (dry-cleaning and photo processing chemicals) and making false entries in federally required Oil Record Books. RCCL admitted to a "fleet-wide practice of discharging oil contaminated bilge waste" and to submitting false statements in numerous jurisdictions. The \$6,500,000 for Alaska violations was part of a larger \$18,000,000 total federal plea agreement. In January 2000, RCCL entered into a state civil settlement for the Alaska violations. The state settlement required RCCL expenditures of over \$3,325,000. This illegal discharge outraged many Alaskans, who began to question whether cruise ships met Alaska Water Quality Standards enforced by the Alaska Department of Environmental Conservation (ADEC).

Because of its international nature, the cruise industry was excluded from many of the U.S. environmental laws and regulations that land-based industries are required to meet. EPA did not issue a permit under the federal Clean Water Act for cruise ship wastewater discharges because of a marine vessels exemption that dates from the 1970s. The U.S. Coast Guard certifies marine sanitation devices (MSDs) for American flagged ships and checks to ensure that all applicable vessels have certified MSDs during ship inspections. They did not, however, monitor the wastewater effluent quality.

Large cruise ships operate under MARPOL (International Convention for the Prevention of Pollution from Ships), an environmental treaty drafted by the International Maritime

⁹ "Fisheries in the United States 2002." September 2003. National Marine Fisheries Service, NOAA, U.S. Dept. of Commerce

Organization (IMO), an agency of the United Nations. Annex IV of MARPOL addresses the disposal of sewage. Since the United States did not sign Annex IV, it is not mandatory, that ships follow Annex IV in the United States.¹⁰

1.4. Alaska Cruise Ship Initiative (ACSI)

In December 1999, ADEC responded to public concern and convened a forum to review and discuss the cruise industry's waste management and disposal practices in Alaska. The participants included the U.S. Coast Guard, the U.S. Environmental Protection Agency (EPA), Southeast Alaska communities, industry, Tribes, environmental groups, and concerned Alaskans. This effort became known as the Alaska Cruise Ship Initiative (ACSI). Goals of the ACSI included:

- (1) identifying cruise ship waste streams,
- (2) developing pollution prevention and waste management solutions,
- (3) assessing and verifying compliance of volunteer wastewater sampling, and
- (4) keeping the Alaskan public informed.

Voluntary sampling of large cruise ships in 2000 indicated that the marine sanitation devices (MSD) on most ships did not function well. U.S. Coast Guard regulations require that effluent from the type II MSD treatment systems installed on cruise ships contain no more than 200 fecal coliforms per 100 ml and 150 mg/l total suspended solids at installation.¹¹ Surprisingly, the fecal coliform results were as high as 16 million¹² in blackwater and 32 million in graywater.¹³

1.5. Alaska Specific Legislation

As a result of the ACSI efforts, the U.S. Congress enacted Title XIV – Certain Alaskan Cruise Ship Operations on December 21, 2000.¹⁴ The law creates wastewater standards for vessels with 500 or more overnight passengers, and prohibits cruise ships from discharging raw sewage in areas that are more than 3 nautical miles from shore but still within the Inside Passage. These "donut holes" are now closed to discharge. (See Figure 2.) The regulations to implement the law became effective in July 2001¹⁵ and are enforced by the U.S. Coast Guard.

¹⁰ EPA MARPOL 73/78 overview <http://www.epa.gov/atl/WOW/OC/PCD/marpol.html>

¹¹ 33 CFR Part 159 – Marine Sanitation Devices

<http://www.uscg.mil/d14/units/msohome/references/cfr/cfr.htm#200/part%20159.htm>

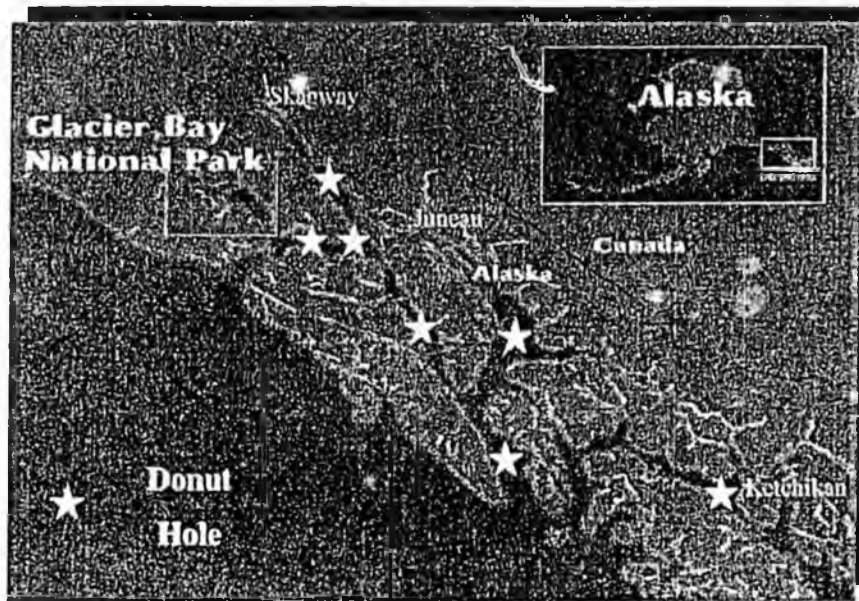
¹² The geometric mean of fecal coliform samples was 1,824 for blackwater and 1,163,188 for graywater. See Appendix B Large Ship Sampling Data Tables 47B & 51

¹³ Blackwater originates in toilets. Graywater comes from showers, sinks, kitchens, and laundry.

¹⁴ "Title XIV—Certain Alaskan Cruise Ship Operations" of the Miscellaneous Appropriations Bill (H.R. 5666) on December 21, 2000 in the Consolidated Appropriations Act of 2001 (P.L. 106-554)

¹⁵ 33 CFR Part 159 Subpart E – Discharge of Effluents in Certain Alaskan Waters by Cruise Vessel Operations

Figure 2. Donut Holes Closed by Federal Cruise Ship Legislation



Under the federal legislation, large cruise ships may discharge blackwater and graywater in Alaska while underway.¹⁶ During an underway discharge, blackwater effluent must contain no more than 200 fecal coliforms per 100 ml and no more than 150 mg/l total suspended solids. There are currently no federal effluent standards for underway graywater discharges.¹⁷ Ships that discharge blackwater in Alaska while underway must take at least two blackwater samples per cruise ship season. The federal law allows continuous discharge of blackwater and graywater that meet more stringent standards (Table 2). A ship approved by the U.S. Coast Guard to discharge continuously must sample their wastewater twice per month

State of Alaska cruise ship legislation, AS 46.03.460 – AS 46.03.490,¹⁸ was passed during a 2001 special session of the Alaska Legislature and became effective on July 1, 2001. The legislation establishes the Commercial Passenger Vessel Environmental Compliance (CPVEC) program in the ADEC. The regulations to implement the program, 18 AAC 69, were effective November 15, 2002.¹⁹

The state law sets standards and sampling requirements for the underway discharge of blackwater in Alaska that are identical to the blackwater standards in the federal law (Table 2). Because of the high fecal coliform counts detected in graywater during 2000, the state law also set graywater standards (Table 2). It also has provisions regarding the disclosure of solid waste and hazardous waste disposal information.

¹⁶ Traveling at least 6 knots while at least 1 nautical mile from shore

¹⁷ The Administrator of the EPA may promulgate different wastewater effluent standards in the future. EPA recently began the process of evaluating whether the current federal standards are consistent with Alaska Water Quality Standards.

¹⁸ Available at: <http://old-www.legis.state.ak.us/cgi-bin/folioisa.dll/statu01/query=as+46!2E03!2E460/doc!@176771?>

¹⁹ Regulations were drafted by stakeholder committee and brought through formal rule making process. They are available at <http://www.state.ak.us/dec/title18/wpfiles/69nms.doc>

The CPVEC program applies to both large and small commercial passenger vessels. A small commercial passenger vessel provides overnight accommodations for 50 to 249 passengers. State law defines a large commercial passenger vessel as one that provides overnight accommodations for 250 or more passengers.²⁰ Several key aspects of the CPVEC program, such as payment of environmental compliance fees and compliance with wastewater discharge standards, did not apply to small commercial passenger vessels until January 1, 2004.²¹ These vessels did, however, have to adhere to the wastewater sampling, record keeping, and reporting requirements as soon as the law was effective.

Table 2. Comparison of State and Federal Laws

Law	State	Federal
# Overnight Passengers	50+	500+
Discharge Limits	At Least 1 mile from shore @ min. 6 knots	
	BW & GW	BW only
Fecal Coliform/100 ml	Geometric Mean of 200	200
Total Suspended Solids (mg/l)	150	150
Discharge Limits	Continuous Discharge (at anchor)	
	BW & GW	BW & GW
Fecal Coliform/100 ml	Refers to Fed Law	Geometric Mean of 200
Chlorine (mg/l)		10
Total Suspended Solids (mg/l)		30

1.6. Science Advisory Panel

During the ACSI, a Science Advisory Panel was organized to independently address the scientific questions surrounding the impact of cruise ship waste in Alaska. The Science Advisory Panel is a group of scientists and engineers whose work and conclusions are not subject to government or industry approval. The nine core members of the Panel include an oceanography professor, NOAA physical oceanographer, ADEC environmental engineer, civil engineering professor, oceanographer for a law firm, microbiologist, NOAA senior staff scientist, chemistry professor, and an EPA senior toxicologist. While Panel members were not compensated, a paid facilitator, who is a retired U.S. Coast Guard Captain-of-the-Port and industrial toxicologist, supported the Panel's work.

²⁰ AS 46.03.490

²¹ Small ship owners/operators may obtain an extension of time for compliance with AS 46.03.463(a) - (d) by submitting an approved plan for interim protective measures. See 18 AAC 69.045 for details.

The North West Cruiseship Association funded the facilitator and travel expenses for non-governmental panel members in 2000 - 2001. ADEC funded the facilitator and travel expenses for non-governmental panel members in 2002. The efforts of the Science Advisory Panel culminated in the publication of *The Impact of Cruise Ship Wastewater Discharge on Alaska Waters*²² in November 2002 and several other papers available on the following website: <http://www.state.ak.us/dec/press/cruise/documents/sciencepanel.htm> Science Advisory Panel work is referenced throughout this report.

²² <http://www.state.ak.us/dec/press/cruise/documents/impactcruise.htm>

2. WASTEWATER SAMPLING DESIGN, RATIONALE, and STATISTICS

2.1. Data Reliability and Representative Nature

It is crucial that wastewater sample data is reliable²³ and representative.²⁴ This data is used to determine compliance with the cruise ship laws and to conduct scientific analysis. Large vessels that discharge in Alaska take at least two compliance samples per cruise ship season to satisfy both state and federal cruise ship laws. ADEC, U.S. Coast Guard, and the Northwest Cruiseship Association have established a Quality Assurance/Quality Control (QAQC) plan that ensures that the sample results are reliable.²⁵

The QAQC plan includes standard sampling and laboratory quality control elements with additional instructions tailored to a maritime facility. It lists all the pollutants to be tested and the EPA analytical methods to be used. The QAQC requirements include duplicate sampling, sampling audits, and a lab technical systems audit. The U.S. Coast Guard cruise ship regulations require third party sampling. ADEC regulations are consistent with other state wastewater programs and allow industry to collect samples using their own staff. However, large cruise ships sample to satisfy the requirements of both the federal and state law. Therefore, a third party sampler takes all required large vessel wastewater samples. Small ship operators are not bound by the federal law but have also chosen to use third party samplers.

ADEC also performs independent compliance sampling and analysis. ADEC tests for pollutants listed in the QAQC plan as well as other pollutants of concern.

Because each ship is configured differently and follows unique wastewater management practices, the state also requires the owner/operator to submit a vessel specific sampling plan (VSSP). The VSSP plan, approved by ADEC before sampling begins, must demonstrate that the sample will be representative of the wastewater discharged from the particular ship.

From 2001 through 2002, wastewater sampling on large cruise ships was dictated by the ability to discharge underway and to get the samples to the laboratory within the EPA mandated six hour holding time for fecal coliform analysis. This frequently meant that wastewater samples were taken in the middle of the night when the volume of wastewater was low. The ideal wastewater sample would have been taken during daytime when the volume of wastewater production was high. These samples did not sample the treatment abilities at normal flow conditions and therefore are not representative. By 2003, only large cruise ships with advanced wastewater treatment systems discharged wastewater in Alaska. These vessels were approved for continuous discharge and were sampled during the day in port while the vessel was discharging into receiving water. These continuous discharge samples should be representative of the wastewater effluent produced by the wastewater treatment systems and discharged into receiving water.

²³ Reliability reflects the degree of certainty.

²⁴ The objective of representative sampling is to ensure a sample or group of samples accurately characterizes site conditions. ASTM Method 6044-96 Standard Guide for Representative Sampling for Management of Wastes and Contaminated Media. <http://www.astm.org/cgi-bin/SofiCart.exe/DATABASE.CART/PAGES/D6044.htm?L+mystore+nhpu4885>

²⁵ The most current version, "Northwest CruiseShip Association, Discharge of Effluents in Certain Alaska Waters by Cruise Vessel Operations, 2003 Operating Season Quality Assurance/Quality Control Plan For Sampling and Analysis of Treated Sewage and Graywater From Commercial Passenger Vessels," is available at: <http://www.state.ak.us/dec/press/cruise/pdf/03qaqc.pdf>

Small cruise ships are sampled in port because of the economic hardship it would cause if third party samplers traveled with the vessels. The time spent in Juneau, where small cruise ships do their wastewater sampling, is often used to disembark passengers and to get ready for the next cruise. There is usually little to no wastewater produced during this day. State cruise ship regulations³⁶ effective November 2002 gave small ships the ability to have their crew sample their wastewater and submit it to a laboratory for analysis. This would enable underway sampling; however, none of the ships have exercised this option. Despite these issues, the data obtained over the last three seasons, when considered in its entirety, does provide a reasonable picture of the pollutants that are present in small cruise ship wastewater discharges.

Alaska Marine Highway System ferries were usually sampled in port; however, there were usually passengers still aboard the vessel. The wastewater samples from the ferries were therefore representative of the wastewater effluent produced by its wastewater treatment system.

2.2. Sampling Program Evolution from 2000 - 2003

The sampling strategy that guided the voluntary sampling program in 2000 differs from the regulatory program existing today. Table 3 and Table 4 highlight the evolution of the sampling program. The pollutants with asterisks are defined as conventional pollutants in 40 CFR Part 401.16 and are typically tested in the effluent of wastewater treatment plants. On the advice of the Science Advisory Panel, ADEC expanded this sampling list. This group is referred to as conventional pollutants throughout this report. Priority pollutants refer to an EPA list of 126 specific pollutants that include heavy metals and specific organic chemicals.

Table 3. Conventional Pollutants

Pollutant	2000	2001	2002	2003
Ammonia	√	√	√	√
pH*	√	√	√	√
Biochemical Oxygen Demand (BOD)*	√	√	√	√
Chemical Oxygen Demand (COD)	√	√	√	√
Total Suspended Solids (TSS)*	√	√	√	√
Total and Free Chlorine	√	√	√	√
Fecal Coliform*	√	√	√	√
Settleable Solids		√	√	√
Oil and Grease ³⁶		√	√	√
Total Organic Carbon (TOC)		√	√	√
Conductivity		√	√	√

³⁶ 18 AAC 69, <http://www.state.ak.us/deq/ttitle18/wpfiles/69max.pdf>

Pollutant	2000	2001	2002	2003
Alkalinity		√	√	√
Total Nitrogen ²⁷		√	√	√
Total Phosphorus		√	√	√

Table 4. Priority Pollutants

Pollutant	2000	2001	2002	2003
Base, Neutral, Acids (BNAs)	√	√	√	√
Pesticides ²⁸	√			
Polychlorinated Biphenyls (PCBs)	√	√	√	
Volatile Organic Chemicals (VOC)	√	√	√	√
Trace Metals	√	√	√	√
Cyanide	√			

2000 Season's Voluntary Program

The voluntary ACSI program in 2000 applied to large ships only. The goals of the 2000 sampling program were to characterize wastewater quality and to determine if hazardous substances were discharged to receiving water through the wastewater systems. The voluntary program included two samples per season.

2001 Season - Moving from Voluntary Sampling to Compliance Sampling

In 2001, the purpose of the sampling shifted to assess compliance with the laws as well as conducting scientific impact analyses. All ships discharging in Alaska water are required by Alaska statute²⁹ to sample twice a year. On the advice of the Science Advisory Panel, ADEC increased conventional pollutants monitoring requirements. The pesticides and their metabolites on the 2000 priority pollutant list³⁰ have not been used in the U.S. for many years and were not detected in any of the 2000 samples. The U.S. Coast Guard and ADEC therefore removed pesticides from the priority pollutant list in 2001.

2002 Season

The sampling strategy for the majority of the large ships was the same as in 2001. However, six of seven large ships, with advanced wastewater treatment systems, had U.S. Coast Guard

²⁷ Total nitrogen includes ammonia, nitrate, nitrite, and total kjeldahl nitrogen (TKN)

²⁸ aldrin, chlordane, dieldrin, 4,4'-DDT, 4,4'-DDE, 4,4'-DDD, alpha endosulfan, beta endosulfan, endosulfan sulfate, endrin, endrin aldehyde, heptachlor, heptachlor epoxide, alpha BHC, beta BHC, gamma BHC, delta BHC and toxaphene

²⁹ AS 46.03.465(d)

approval for continuous discharge and were sampled in port.³¹ Small ships took their first priority pollutant samples in 2002 and began sampling for the expanded list of conventional pollutants.

2003 Season

In 2003, the wastewater data from large ships reflected the continued increase in the number of large vessels with advanced treatment technology, from seven of 25 (28%) in 2002 to eighteen³² of 32 (56%) in 2003. Small vessels continued to discharge and be sampled in port.

As in previous years, one of the two sampling events included testing for priority pollutants. ADEC and U.S. Coast Guard dropped PCBs from the priority pollutant sampling list for 2003 season because of the 2000 - 2002 history of non-detects. The priority pollutants (Base/Neutrals & Acids, Volatile Organic Chemicals, and Trace Metals) analyzed in 2003 are listed in Appendix A.

At the recommendation of the Science Panel, ADEC also tested vessel wastewater for commonly used organophosphorus pesticides at the end of 2003 season. No pesticides were detected. ADEC will continue to test for organophosphorus during the 2004 cruise ship season.

³¹ The following ships had advanced wastewater treatment systems that were approved for continuous discharge by the U.S. Coast Guard: *Celebrity Mercury* and *Holland America Ryndam, Statendam, Volendam, Veendam, and Zaandam*. The *Radisson Seven Seas Mariner* had an advanced system, but it was not approved for continuous discharge.

³² *Princess - Star Princess, Sun Princess, Dawn Princess, Coral Princess, Pacific Princess, Island Princess*
Celebrity - Mercury
Holland America - Ryndam, Statendam, Maasdam, Volendam, Veendam, Zaandam
Carnival - Carnival Spirit (graywater only)
Norwegian - Norwegian Sun, Norwegian Sky, Norwegian Wind
Radisson - Seven Seas Mariner

3. APPLYING ALASKA WATER QUALITY STANDARDS TO RECEIVING WATER

The State of Alaska has Water Quality Standards adopted in regulation. These standards help protect human health and the environment. ADEC tested for pollutants in samples taken at the discharge point inside the vessel. These effluent samples are also referred to as "end of pipe" samples. Discharges from the ship mix with the receiving water. ADEC, therefore, applied modeled dilution factors to the vessels' end of pipe sample results to determine whether Water Quality Standards were met in receiving waters.

In this document, ADEC refers to the Water Quality Standards located in *ALASKA WATER QUALITY CRITERIA MANUAL FOR TOXIC AND OTHER DELETERIOUS ORGANIC AND INORGANIC SUBSTANCES* amended through May 15, 2003, TABLE IV. AQUATIC LIFE CRITERIA FOR MARINE WATERS.³³ ADEC took a conservative approach and applied the more stringent chronic rather than acute water quality standards.

³³ This document is available at <http://www.state.ak.us/dec/dawq/wqs/documents/70wqsmanual.doc>

4. WASTEWATER CHARACTERISTICS – LARGE SHIPS

4.1. Statistics

Since 2000, ADEC has collected substantial amounts of wastewater sampling data on cruise ships and ferries subject to the Commercial Passenger Vessel Environmental Compliance Program. In order to characterize the central tendency of the large quantity of data, the median was used. The median is the middle of a distribution: half the scores are above the median and half are below the median. The median is less sensitive to extreme scores than an average and is thus a better measure for skewed distributions. Medians are used to present all pollutant data in this report except for fecal coliform. Much of the fecal coliform data was highly skewed so a geometric mean was used to summarize this data.

Geometric Mean

When distributions are more highly skewed, a geometric mean is used. A geometric mean moderates the effect of a single high value. A geometric mean is computed as follows:

$$(X_1 X_2 \dots X_n)^{1/n} =$$

Example:

$$(1 \times 2 \times 10 \times 10,000)^{1/4} = 21$$

4.2. Summary of Conventional Pollutant Data

2000 Sampling Data

Table 5 compares the median and geometric mean values of conventional pollutants tested in 2000 wastewater samples. Appendix B Large Ship Sampling Data presents the detailed sampling results from individual ships. Table 5 and subsequent tables also present the applicable Alaska Water Quality Standards³⁴ for comparison.

³⁴ ADEC, Alaska Water Quality Criteria Manual For Toxic and other Deleterious Organic & Inorganic Substances May 15, 2003, Table IV located at: <http://www.state.ak.us/local/akpages/ENV.CONSERV/dawq/wqs/documents/70wqsmmanual.doc>. Fecal coliform standards and pH standards from ADEC Water Quality Standards, 18 AAC 70, <http://www.state.ak.us/dec/title18/wpfiles/70mas.pdf>. The most conservative standard is listed.

Table 5. 2000 Large Ship Conventional Pollutant Data

The values for all pollutants, except fecal coliforms, are medians. Fecal coliform information is represented as a geometric mean.

Water Type (# samples) Large Ship Appendix - Table #	Collected from	Fecal Coliform (MPN/100 ml)	TSS mg/l	BOD mg/l	COD mg/l	Ammonia mg/l	pH	Total Cl mg/l	Free Cl mg/l
	AK WQS	14	n/a	n/a	n/a	17.00 ¹⁵	6.5-8.5	0.0075*	0.0075*
	MDL	2	1.3	2	3.0	0.03	0.1	0.10	0.10
GW - Accommodations & Laundry (3) Table 51.	CT	6	138.7	61	240.0	25.12	6.8	0.37	0.26
GW - Accommodations (3) Table 52.	CT	104	455.0	355	1,340.0	24.94	8.4	0.78	ND
GW - Laundry (10) Table 53.	CT	8	39.0	86	300.0	0.39	9.2	0.23	ND
GW - Galley (11) Table 54	CT	13,750	223.5	850	940.0	2.19	6.9	ND	ND
Mixed GW (24) Table 55	CT	118,052	92.0	170	405.0	1.40	6.8	ND	ND
Mixed GW (13) Table 56.	DB	1,163,188	250.0	450	940	0.20	5.95	ND	ND
BW&GW (11) Table 60.	DB	12,824	110.0	130	395.0	8.50	7.0	ND	ND
BW (22) Table 61	MSD	18,213	407.0	130	1,210.0	100.00	7.6	0.33	ND

MPN = Most Probable Number MDL = Method Detection Limit GW = Graywater BW = Blackwater

CT= Collecting Tank DB=Double Bottom Tank

MSD = Marine Sanitation Device ND= Non Detect

*Note that the MDL for chlorine is higher than the chronic water quality standard

The graywater sampled from accommodations & laundry, accommodations only, and laundry only had low fecal coliform counts. Galley graywater and mixed graywater had very high levels of fecal coliforms. Graywater sampled from double bottom tanks had higher fecal coliform results than the corresponding wastewater type sampled from collecting tanks. This is illustrated in Table 7.

¹⁵ The ammonia Water Quality Standard is for unionized ammonia. All samples were analyzed for total ammonia. Salinity, temperature, and pH affect the unionized portion of total ammonia. ADEC used TABLE IX, TOTAL AMMONIA CHRONIC CRITERIA FOR SALTWATER AQUATIC LIFE to calculate the total ammonia that corresponds to the unionized ammonia Water Quality Standard. Southeast Alaska port conditions were used for this calculation: 10 psu salinity, pH of 7.0, and temperature of 12.5 degrees Celsius. Using these ambient conditions, the total ammonia equivalency to the unionized Water Quality Standard is 17 mg/L.

The treated blackwater results included two samples that had been treated with a reverse osmosis treatment system before being stored in the double bottom tank. These samples had results below the limit of detection for fecal coliforms, which lowered the geometric mean substantially. Even with the addition of these two samples, the treated blackwater had a high geometric mean of fecal coliform, 18,213 MPN/100ml, as well as a high median of ammonia, 100.0 mg/l, and COD, 1,210.0 mg/l. These results indicate that the blackwater treatment systems were not functioning properly.

2001 Sampling Data

The state cruise ship law was effective in the summer of 2001. From this year forward, blackwater samples were taken primarily to ensure compliance with effluent standards. (When blackwater and graywater are mixed, it is considered blackwater.) Graywater was phased into the state program. Any graywater discharged in the state needed to be sampled as of 2001 but was not subject to the effluent standards until 2003. This is the cause of the disparity between the graywater effluent samples and the blackwater effluent samples presented in Table 6.

The low fecal coliform and TSS level of the mixed black and graywater occurred because 12 of the 16 samples were taken from advanced wastewater treatment systems on the *Celebrity Mercury* and *Holland America Statendam*. No fecal coliforms or TSS were detected in the effluent from those systems. The other ship that sampled its mixed black and graywater discharged outside Alaska water and was sampled voluntarily.

Table 6. 2001 Large Ship Conventional Pollutant Data

The values for all pollutants, except fecal coliforms, are medians. Fecal coliform information is represented as a geometric mean.

Water Type (# samples) Large Ship Appendix B Table #	Collected from	Fecal Coliform (MPN/ 100 ml)	TSS mg/l	BOD mg/l	COD mg/l	Ammonia mg/L	pH	Total Cl mg/L	Free Cl mg/l
	AK WQS	14	n/a	n/a	n/a	17.00	6.5-8.5	0.0075*	0.0075*
	MDL	2	1.3	2	3.0	0.03	0.1	0.10	0.10
GW - Accommodations (15) Table 32	DB	10,896	66.0	217	460.0	0.11	6.8	ND	ND
GW - Accommodations (15) Table 33	CT	2,189	55.5	170	300.0	0.99	7.6	3.00	0.30
GW - Galley (10) Table 34	DB	784,072	383.0	1,300	1,707.0	0.65	4.4	ND	ND
GW - Galley (23) Table 35	CT	402**	766.0	740	1,410.0	1.00	7.0	4.00	1.30
Mixed GW (4) Table 36	DB	649,994	151.3	194	289.0	0.32	6.5	ND	ND
Mixed GW (13) Table 37	CT	38,933	76.5	220	520.0	0.48	7.2	ND	ND
GW - Laundry (7) Table 38	DB	651,460	43.0	160	410.0	0.40	8.3	0.20	ND
GW - Laundry (2) Table 39	CT	30	22.0	100	650.0	Not taken	8.4	1.03	1.03
Mixed BW&GW (16) Table 46	MSD	2	0.7	3	11.5	0.63	7.1	ND	ND

*Note that the MDL for chlorine is higher than the chronic water quality standard.

** Some samples did not meet the fecal coliform 6 hour holding time and were not analyzed.

Assessment of Cruise Ship and Ferry Wastewater Impacts in Alaska

<u>Water Type (# samples) Large Ship Appendix B Table #</u>	<u>Alkalinity mg/l</u>	<u>Conductivity (Umhos/cm)</u>	<u>Oil & Grease mg/l</u>	<u>Phosphorous Total mg/l</u>	<u>Nitrate as N mg/l</u>	<u>TOC mg/l</u>	<u>Total Kjeldahl Nitrogen mg/l</u>	<u>Settleable Solids mg/l</u>
AK WQS								
MDL	0.5	1	1.5	0.01	1.0	1.0	1.0	0.1
GW (15) Table 40.	59.6	883	47.0	5.54	0.0	305.0	12.0	0.2
BW (5) Table 47.	125.4	3,590	0.2	9.05	0.6	100.0	27.8	4.5

MPN = Most Probable Number MDL = Method Detection Limit GW = Graywater BW = Blackwater

CT= Collecting Tank DB =Double Bottom Tank

MSD = Marine Sanitation Device ND= Non Detect

Table 7 compares 2000 and 2001 samples of wastewater that were held for up to 20 hours in double bottom (DB) tanks with wastewater collected and discharged immediately from collecting tanks (CT). The concentration of fecal coliform, TSS, and BOD increased when wastewater was stored in the double bottom tanks indicating a degradation of the effluent quality.

Table 7. Comparison of 2000 and 2001 Large Ship Wastewater Samples Held in Double Bottom vs. Collecting Tanks

# Samples	Sample Date	Sample From	Waste Type	Fecal ³⁶	TSS	BOD	COD	Ammonia	pH	Total Cl	Free Cl
			Units	MPN/100ml	mg/l	mg/l	mg/l	mg/l			mg/l
			AK WQS	14	n/a	n/a	n/a	17.00	6.5-8.5	0.0075	0.0075
			MDL	2	1.3	2	3.0	0.03	0.1	0.10	0.10
13	2000	DB	Mixed Gray water	1,163,188	250.0	450	940	0.20	5.95	ND	ND
15	2001	DB	GW accommodation	10,896	66.0	217	460.0	0.11	6.8	ND	ND
10	2001	DB	GW Galley	784,072	383.0	1,300	1,707.0	0.65	4.4	ND	ND
4	2001	DB	Mixed GW	649,994	151.3	194	289.0	0.32	6.5	ND	ND
7	2001	DB	GW laundry	651,460	43.0	160	410.0	0.40	8.3	0.20	ND
11	2000	DB	BW&GW	12,824	110.0	130	395.0	8.50	7.0	ND	ND
3	2000	CT	GW Accommodation and Laundry	6	138.7	61	240.0	25.12	6.8	0.37	0.26
3	2000	CT	GW accommodation	104	455.0	355	1,340.00	24.94	8.4	0.78	ND
10	2000	CT	GW laundry	8	39.0	86	300.0	0.39	9.2	0.28	ND
11	2000	CT	GW galley	13,750	223.5	850	940.0	2.19	6.9	ND	ND
24	2000	CT	Mixed GW	118,052	92.0	170	405.0	1.40	6.8	ND	ND
15	2001	CT	GW Accommodation	2,189	55.5	170	300.0	0.99	7.6	3.00	0.30
23	2001	CT	GW Galley	402	266.0	740	1,410.0	1.00	7.0	4.00	1.30
13	2001	CT	Mixed GW	38,933	76.5	220	520.0	0.48	7.2	ND	ND
2	2001	CT	GW laundry	30	22.0	100	650.0	Not taken	8.4	1.03	1.03
			Median DB	194,343	130.7	206	435.0	0.36	6.7	ND	ND
			Median CT	587	92.0	170	520.0	1.20	7.2	.37	ND

2002 Sampling Data

In 2002, the graywater from large ships was still exempt from the fecal coliform and total suspended solids standards. The graywater effluent quality that year was still quite poor. The median and geometric mean values of both the 2002 graywater and blackwater are presented in Table 8.

³⁶ This value is geometric mean not median.

Table 8. 2002 Large Ship Conventional Pollutant Data

The values for all pollutants, except fecal coliforms, are medians. Fecal coliform information is represented as a geometric mean.

Water Type (# samples) Large Ship Appendix B Table #	Collected from	Fecal Coliform (MPN/100 ml)	TSS mg/l	BOD mg/l	COD mg/l	Ammonia mg/L	pH	Total Cl mg/l	Free Cl mg/l
	AK WQS	14	n/a	n/a	n/a	17.00	6.5-8.5	0.0075*	0.0075*
	MDL	2	1.3	2	3.0	0.03	0.1	0.10	0.10
GW - Galley (7) Table 21	DB or CT	6,279	1,320.0	2,790	5,110.0	2.66	4-11	ND	ND
GW - Accom & Laundry (12) Table 23	DB or CT	47,357	130.5	367	615.0	1.07	6.72	ND	ND
Mixed GW (19) Table 25	CT or DB	38,603	190.0	328	621.0	1.00	6.14	ND	ND
BW (21) Table 15	Various	5	0.1	3	61.6	18.80	7.5	ND	ND

Water Type (# samples) Large Ship Appendix B Table #	Collected From	Alkalinity mg/l	Conductivity (Umhos/cm)	Oil & Grease mg/l	Phosphorous Total mg/l	Nitrate as N mg/l	TKN mg/L	TOC mg/l	Settleable Solids mg/l
	AK WQS								
	MDL	0.5	1	1.5	0.01	1.0	1.0	1.0	0.1
GW - Galley (7) Table 22	DB or CT	0.25	1,810	520.0	14.10	0.2	0.2	1,600.0	44.0
Accom. & Laundry (12) Table 24	DB or CT	73.5	5,090	140.0	5.50	0.2	0.2	209.5	0.1
Mixed GW (19) Table 26	CT or DB	53.4	1,920	95.0	3.99	0.2	0.2	162.5	0.5
BW (21) Table 15	DB, CT, or MSD	135.0	685	0.9	3.21	0.1	0.1	23.0	0.1

MPN = Most Probable Number MDL = Method Detection Limit GW = Graywater BW = Blackwater

CT = Collecting Tank DB = Double Bottom Tank

MSD = Marine Sanitation Device ND = Non Detect

*Note that the MDL for chlorine is higher than the chronic water quality standard

Galley graywater showed lower levels of fecal coliform bacteria than the accommodations or mixed graywater but the levels of BOD, COD, and TSS are much higher. Galley graywater is a more complex wastewater to treat than laundry or domestic wastewater because of the high amount of oil, grease, and solids.

The conventional pollutant results for blackwater were much lower than the graywater results with the exception of a high ammonia median of 18.80 mg/l. The seven ships that discharged blackwater in Alaska had advanced wastewater treatment systems,³⁷ which resulted in a low fecal coliform geometric mean of 5 MPN/100ml and median TSS of 0.1 mg/l

2003 Sampling Data

In 2003, large cruise ship graywater and blackwater were subject to the fecal coliform and total suspended solids standards. The median and geometric mean values of pollutants detected in graywater and blackwater are presented in Table 9.

³⁷ The following ships had advanced wastewater treatment systems that were approved for continuous discharge by the U.S. Coast Guard: *Celebrity Mercury* and *Holland America Ryndam, Statendam, Volendam, Veendam, and Zaandam*. The *Radisson Seven Seas Mariner* had an advanced system, but it was not approved for continuous discharge.

Table 9. 2003 Large Ship Conventional Pollutant Data

The values for all pollutants, except fecal coliforms, are medians. Fecal coliform information is represented as a geometric mean.

Water Type (# samples) Large Ship Appendix B Table #	Fecal Coliform (MPN/100 ml)	TSS mg/l	BOD mg/l	COD mg/l	Ammonia mg/l	pH	Total Cl mg/l	Free Cl mg/l
AK WQS	14	n/a	n/a	n/a	17.00	6.5- 8.5	0.0075*	0.0075*
MDL	2	1.3	2	3.0	0.03	0.1	0.10	0.10
Graywater (3) Table 3.	7	0.0	23	67.0	1.30	7.3	ND	ND
Blackwater (57) Table 1.	1	0.0	4	72.0	25.10	7.4	ND	ND

Water Type (# samples) Large Ship Appendix B Table #	Alkalinity mg/l	Conductivity (Umhos/cm)	Oil & Grease mg/l	Phosphorous Total mg/l	Nitrate as N mg/l	TOC mg/l	Total Kjeldahl Nitrogen mg/l	Settleable Solids mg/l
AK WQS								
MDL	0.5	1	1.5	0.01	1.0	1.0	1.0	0.1
Graywater (3) Table 4.	34.1	199	6.2	0.23	0.0	12.7	4.8	0.0
Blackwater (57) Table 2	219.5	987	0.0	3.60	0.0	19.4	29.0	0.0

MPN = Most Probable Number MDL = Method Detection Limit GW = Graywater BW = Blackwater

CT = Collecting Tank DB = Double Bottom Tank

MSD = Marine Sanitation Device ND = Non Detect

*Note that the MDL for chlorine is higher than the chronic water quality standard

Only one ship, the *Carnival Spirit*, discharged graywater in Alaska. The graywater from this ship was treated through a reverse osmosis advanced wastewater treatment system. This was the cause of the dramatic improvement in the 2003 graywater quality. It should be noted, however, that the COD level was still high.

In 2003, the number of ships with advanced wastewater treatment systems increased to 18.³⁸ These ships discharged their wastewater in Alaska. Most of these ships mixed their graywater

³⁸ Princess - *Star Princess, Sun Princess, Dawn Princess, Coral Princess, Pacific Princess, Island Princess*
 Celebrity - *Mercury*
 Holland America - *Ryndam, Statendam, Maasdam, Volendam, Veendam, Zaandam*
 Carnival - *Carnival Spirit* (graywater only)
 Norwegian - *Norwegian Sun, Norwegian Sky, Norwegian Wind*
 Radisson - *Seven Seas Mariner*

and blackwater together resulting in blackwater. The blackwater effluent was of high quality but still had elevated levels of ammonia and COD.

4.3. Pollutants in Effluent that Exceed Alaska Water Quality Standards

The medians of most pollutants in effluent were below Alaska Water Quality Standards. Table 10 draws upon Table 5 – 9 for conventional pollutants and Appendix C. Summary of Large Ship Sampling for Priority Pollutants to highlight the medians that do not meet Alaska Water Quality Standards at the end of pipe. A shaded cell indicates that the concentration in effluent was below the standard.

Table 10. End of Pipe - Large Ship Pollutant Medians that Do Not Meet Alaska Water Quality Standards

			Blackwater				Graywater			
Pollutant	Units	AWQS	2003	2002	2001	2000	2003	2002	2001	2000
Ammonia	mg/l	17.00	25.10	18.80		100.00				25.12
Free Chlorine	mg/l	0.0075							1.30	0.26
Fecal Coliform	MPN/100 ml	14.0				18,213		47,357	784,072	1,163,188
Copper, dissolved	ug/l	3.1	10.70	7.72	133.85	225.00		31.65	255	31.01
Nickel, dissolved	ug/l	8.2	12.60	16.70	20.50			12.70	15.0	
Zinc, dissolved	ug/l	81.0	109.5	195.5	169.5	425.0		262.0	270.0	

Note: Fecal coliform information is a geometric mean.

4.4. Pollutants that Exceed Alaska Water Quality Standards in Receiving Water

The Science Advisory Panel concluded in their November 2002 *The Impact of Cruise Ship Wastewater Discharge on Alaska Waters* report that even the wastewater discharged in 2000 from vessels moving at a minimum of 6 knots, 1 mile from shore, met Alaska Water Quality Standards in the receiving water.³⁹ For large ships, this is due to a minimum underway dilution factor of 50,000.⁴⁰

ADEC therefore focused on the impact that cruise ship wastewater effluent has on the receiving waters during stationary discharge. ADEC modeled the dilution of large cruise ship effluent during stationary discharge during a very conservative scenario, a neap tide⁴¹ in Skagway, using the EPA approved Visual Plumes model and information provided by operators in their Vessel Specific Sampling Plans. ADEC calculated a dilution factor for each ship's discharge. (More detailed information on the model used to calculate the dilution factor is included in Appendix D. Cruise Ship Stationary Discharge Modeling.) The lowest dilution factor calculated by the model was 8 for blackwater and 5 for graywater. The concentration of a pollutant in Table 10 was divided by these factors to arrive at the pollutant concentration that is expected in the receiving waters (Table 11). If the pollutant concentration met the Alaska Water Quality Standards in receiving water after applying the dilution factor, the cell is shaded.

Table 11. Modeled Large Ship Median Pollutant Concentrations in Receiving Waters during Stationary Discharge (Fecal coliform information is a geometric mean.)

Pollutant	Units	AWQS	Blackwater				Graywater			
			2003	2002	2001	2000	2003	2002	2001	2000
Free Chlorine	mg/l	0.0075							0.26	0.052
Fecal Coliform	MPN/100 ml	14.0				2,276.63		9,471	156,814	232,638
Copper, dissolved	ug/l	3.1			16.73	28.13		6.33	51.0	6.2

Of the many (176) pollutants that were tested in effluent during 2003, none are expected to exceed Alaska Water Quality Standards in the receiving water during stationary discharge.

4.5. Whole Effluent Toxicity Testing

Whole Effluent Toxicity (WET) testing is an alternative to directly analyzing environmental samples for individual constituents. WET testing addresses the effect that simultaneous exposure to a mixture of pollutants has on an organism.

³⁹ Science Advisory Panel "The Impact of Cruise Ship Wastewater Discharge on Alaska Waters", November 2002 <http://www.state.ak.us/dec/press/cruise/documents/impact/executivesummary.htm>

⁴⁰ Large Cruise Ship Dilution factor = $4 \times (\text{ship width} \times \text{ship draft} \times \text{ship speed}) / (\text{volume discharge rate}) 4 \times (30 \text{ m} \times 8 \text{ m} \times 3.10 \text{ m sec}^{-1}) / (0.06 \text{ m}^3 \text{ sec}^{-1}) = 50,000$

⁴¹ A tide of minimum range occurring at the first and the third quarters of the moon.

There are two ways to perform the WET test: static non-renewal and static renewal. In a static non-renewal test, organisms are exposed to a single portion of the solution for the duration of the test. In a static renewal test, organisms are exposed to fresh changes of the test water every day. This testing method is more conservative because the organisms are exposed to the effluent at the same strength for a longer time period. ADEC conducted WET testing using the static renewal method on commercial passenger vessels in 2002⁴² and again in 2003.⁴³

2002 Testing

This test was designed to simulate exposure to the concentration of pollutants that could be found in the receiving waters behind a moving cruise ship. Because of the high dilution rates associated with moving cruise ships, the dilution series started at 50% effluent and increased by a factor of 10 such that the percent effluent progressively decreased. The concentrations tested were 50%, 5%, 0.5%, 0.05%, 0.005%, and 0.0005% effluent. The dilution series represented concentrations that are attained in receiving waters with dilution factors (df) of 2, 20, 200, 2,000, 20,000, and 200,000. A typical large cruise ship discharging 200 cubic meters per hour while traveling at 6 knots (11 km/hour) would have a dilution factor of about 50,000.⁴⁴

WET results are presented in Table 12. The percentages represent the highest effluent concentration at which the tests exhibited no observable acute or chronic effects. Values in parentheses show dilution factors associated with the no observed effect concentrations (NOEC).

Table 12. Large Ship 2002 No Observed Effect Concentration (NOEC) and Dilution Factor (df)

Vessel	Treatment System	Mysid Acute NOEC	Topsmelt Acute NOEC	Bivalve Larvae NOEC	Echinoderm Fertilization NOEC
<i>Dawn Princess</i> Graywater	Chlorine added to collection tanks	5% (df=20)	5% (df=20)	0.5% (df=200)	0.5% (df=200)
<i>Mercury Mixed</i> Effluent	Reverse Osmosis	50% (df=2)	50% (df=2)	50% (df=2)	50% (df=2)
<i>Volendam</i> Mixed Effluent	Aerated Membrane (Ultrafiltration)	50% (df=2)	5% (df=20)	5% (df=20)	5% (df=20)

The *Dawn Princess* graywater demonstrated some effect at 50% concentration (one part sea water to one part wastewater) in the acute test and some effect at 5% wastewater concentration in the chronic tests. This limited toxicity occurred despite the fact that no residual chlorine was found in the sample. However, the ammonia concentration was 10 mg/L. Samples from the *Mercury* did not demonstrate any toxicity, even at a 1:2 dilution. The *Volendam* sample

⁴² Science Advisory Panel "Review and Comment Regarding Whole Effluent Toxicity Test Results for Five Commercial Passenger Vessels in Alaska July 2002" <http://www.state.ak.us/dec/press/cruise/documents/wetfinal.htm> and "Lab results for Whole Effluent Toxicity test (WET) - August 2002" <http://www.state.ak.us/dec/press/cruise/documents/wetreport.htm>

⁴³ ADEC "2003 Whole Effluent Toxicity Results for Commercial Passenger Vessels in Alaska" [http://www.state.ak.us/dec/press/cruise/documents/wet/2003%20Whole%20Effluent%20Toxicity%20\(WET\)%20Test%20Discussion.pdf](http://www.state.ak.us/dec/press/cruise/documents/wet/2003%20Whole%20Effluent%20Toxicity%20(WET)%20Test%20Discussion.pdf)

⁴⁴ The Panel has developed a formula for predicting dilution/dispersion in the wake of large cruise ships.
Dilution factor = $4 \times (\text{ship width} \times \text{ship draft} \times \text{ship speed}) / (\text{volume discharge rate})$

demonstrated an effect at 50% for the Topsmelt acute test and on both chronic test species but had no effect on the Mysid acute test with as little as a 1:2 dilution.

The observed WET values would not be of concern during underway discharge because dilution factors of greater than 1:200 would be easily achieved in the receiving water. During 2002, *Dawn Princess* discharged its graywater underway a minimum one nautical mile from shore going at least 6 knots. The vessel held its blackwater until it was outside Alaska waters. As of 2003, this vessel mixes its accommodations graywater with its blackwater and then treats it through an advanced wastewater treatment system that meets the stringent standards for continuous discharge. (See Table 2.) Wastewater from the *Mercury* and *Volendam* continue to be discharged in port. *Mercury* effluent is diluted by a factor of 18 and *Volendam* effluent is diluted by a factor of 60, even during stationary discharge during a neap tide. (See Appendix D, Cruise Ship Stationary Discharge Modeling Table 4.) Therefore, the effluent from these three ships is not expected to cause toxicity to marine organisms.

2003 Testing

From the period of June through September 2003, ADEC conducted WET testing on the following large vessels: *Norwegian Wind*, *Sun Princess*, *Carnival Spirit*, and *Ryndam*. These ships represented all four of the advanced treatment systems operated on cruise ships in Alaska. These large vessels had obtained U.S. Coast Guard certification to discharge wastewater any time anywhere, including in port.

ADEC designed the 2003 WET test to determine if there are any negative effects to the marine environment during stationary discharges when dilution factor will be low. Therefore, the dilution series only increased by a factor of 2 instead of 10. The dilution series was 50%, 25%, 12.5%, 6.25%, 3.125%, and 1.5% effluent. This series represented concentrations that are attained in receiving waters with dilution factors (df) of 2, 4, 8, 16, 32, and 66.7.

ADEC calculated the ship specific dilution factors during a worst case scenario, a stationary discharge during a neap tide in Skagway, using the Visual Plumes model.⁴⁵ (See Appendix D, Cruise Ship Stationary Discharge Modeling.) When the ship specific dilution factor calculated by the Visual Plumes model is greater than the No Observed Effect Concentration dilution factor (df), no toxicity is expected.

⁴⁵ ADEC used the Visual Plumes mode UM3 with the Brooks far field solution. For more information on this model go to <http://www.epa.gov/ceampubl/swater/xplume/>

Table 13. Large Ship 2003 Whole Effluent Toxicity Test Results & Ship Specific Dilution Factor during Neap Tide

No Observed Effect Concentration (NOEC) and Dilution Factor (df)

Vessel	Treatment System	Ship Specific Dilution Factor from Visual Plumes model	Mysid Acute NOEC	Topsmelt Acute NOEC	Bivalve Larvae NOEC		Echinoderm Fertilization NOEC
					Normality ⁴⁶	Survival	
<i>Norwegian Wind</i> Mixed Effluent	Scanship Bioreactor/ultra-filtration	24	>50% (df=2)	12.5% (df=8)	6.25% (df=16)	50% (df=2)	25% (df=4)
<i>Ryndam</i> Mixed Effluent	Aerated Membrane (Ultrafiltration)	60	>50% (df=2)	50% (df=2)	12.5% (df=8)	50% (df=2)	50% (df=2)
<i>Sun Princess</i> Mixed Effluent	Hamworthy Bioreactor and Ultrafiltration	15	12.5% (df=8)	12.5% (df=8)	<1.5% ⁴⁷ (unknown)	50% (df=2)	<1.5% (unknown)
<i>Spirit</i> Graywater	Reverse Osmosis	5	>50% (df=2)	50% (df=2)	25% (df=4)	50% (df=2)	Unable to run ⁴⁸

These results indicate that large ships' wastewater effluent will not cause toxicity in receiving waters, even during periods of minimal tidal flux.

4.6. Summary of Large Ship Data 2000 – 2003

Wastewater production volumes depend primarily on the number of passengers and crew on a vessel. The volumes are also affected by ship waste management practices and configuration. The average large cruise ship with 2,500 people (including crew) produces 800 cubic meters or 211,200 gallons of wastewater per day. Between 90-95% of that wastewater is graywater.

Before the passage of the state cruise ship law, blackwater and/or graywater from large cruise ship samples taken at the end of pipe did not meet Alaska Water Quality Standards for ammonia, free chlorine, fecal coliform, copper, and zinc (Table 10). Wastewater effluent is diluted by a small factor during stationary discharge. If large ships discharged while stationary, the Water Quality Standards would have been exceeded for free chlorine, fecal coliform, and copper in the receiving water. However due to substantial dilution, all Alaska Water Quality Standards, except fecal coliform, were met in the receiving water while ships discharged underway.

⁴⁶ Normality measures the normal development of the bivalve larvae.

⁴⁷ *S. propuratus* gametes is not a bivalve but was substituted because the mussels and oysters would not spawn due to elevated summer temperatures.

⁴⁸ The organisms were not available when the sample arrived in September.

The state cruise ship law, effective in July 2001, allowed large cruise ships to seek interim protective measures that extended the time for compliance with the graywater standards until January 1, 2003.⁴⁹ All ships that discharged graywater in state water from 2000 through 2002 sought and were granted this extension. Under the interim protective measures, the ships could only discharge graywater while underway. In contrast, the blackwater discharged from large ships was subject to the state effluent standards in July 2001. This is the cause of the drastic difference in the effluent quality of the gray and blackwater until 2003 when the standards applied to both wastewater types.

In 2001, the data reflect that 21 of the 24 large ships stopped discharging blackwater into Alaska water. The fecal coliform levels in blackwater fell drastically because the two ships⁵⁰ that continued to discharge blackwater in Alaska waters had advanced wastewater treatment technology. The other ship⁵¹ treated blackwater through a traditional macerator chlorination system. The graywater results, especially the galley water, continued to indicate poor effluent quality.

The 2000 and 2001 data also indicate that holding water in double bottom tanks for later discharge increases the concentration of fecal coliform, TSS, and BOD. It is possible that the double bottom tanks were contaminated with blackwater and that fecal coliform multiplied in the warm holding environment.

In 2002, the overall quality of the graywater was still poor. Seven ships⁵² had advanced wastewater treatment systems and discharged blackwater in Alaska. The blackwater quality was dramatically better than the graywater but still had elevated levels of ammonia.

In 2003, the only large ships that discharged wastewater in Alaska had advanced wastewater treatment systems. Most of these systems treated blackwater but one system treated graywater. Most tested pollutants met Water Quality Standards at the end of pipe without dilution. Even considering the minimal dilution that occurs during stationary discharge during a neap tide, the concentration of tested pollutants met all Alaska Water Quality Standards in receiving water. (See Table 11.)

The quality of large cruise ship wastewater reflected the continued increase in the number of vessels that installed advanced treatment technology, from two of 24 (8%) in 2001 to seven of 25 (28%) in 2002 to eighteen⁵³ of 32 (56%) in 2003.

⁴⁹ AS 46.03.40-40.50.

⁵⁰ *Celebrity Mercury* and *Holland America Statendam*.

⁵¹ *Universe Explorer*.

⁵² The following ships had advanced wastewater treatment systems that were approved for continuous discharge by the U.S. Coast Guard: *Celebrity Mercury* and *Holland America Ryndam, Statendam, Volendam, Veendam, Zaandam*. The *Radisson Seven Seas Mariner* had an advanced system, but it was not approved for continuous discharge.

⁵³ *Princess - Star Princess, Sun Princess, Dawn Princess, Coral Princess, Pacific Princess, Island Princess*.

Celebrity - Mercury

Holland America - Ryndam, Statendam, Maasdam, Volendam, Veendam, Zaandam

Carnival - Carnival Spirit (graywater only)

Norwegian - Norwegian Sun, Norwegian Sky, Norwegian Wind

Radisson - Seven Seas Mariner

Risk Characterization

ADEC expects that only large cruise ships with advanced wastewater treatment systems will discharge wastewater in Alaska in the future. WET testing results and a comparison of sample results with Alaska Water Quality Standards indicate that the effluent from these advanced systems is not expected to cause toxicity to the marine environment. No human health risk is posed by the low concentration of tested pollutants found in wastewater samples.

The wastewater samples indicate that hazardous materials are not being discharged through these wastewater treatment systems.

5. WASTEWATER CHARACTERISTICS – SMALL SHIPS

5.1. Statistics

Since 2001, ADEC has collected substantial amounts of wastewater sampling data on cruise ships and ferries subject to the Commercial Passenger Vessel Environmental Compliance Program. In order to characterize the central tendency of the large quantity of data, the median was used. The median is the middle of a distribution: half the scores are above the median and half are below the median. The median is less sensitive to extreme scores than an average and is thus a better measure for skewed distributions. Medians are used to present all pollutant data in this report. Much of the fecal coliform data was highly skewed so a geometric mean was used to summarize this data.

Geometric Mean

When distributions are more highly skewed, a geometric mean is used. A geometric mean moderates the effect of a single high value. A geometric mean is computed as follows:

$$(X_1 X_2 \dots X_n)^{1/n} =$$

Example:

$$(1 \times 2 \times 10 \times 10,000)^{1/4} = 21$$

5.2. Summary of Conventional Pollutant Data

There were only three small ship wastewater samples taken in 2000, too few to analyze. Only a short list of conventional pollutants was sampled during 2001. In 2002 and 2003, small ship wastewater samples were analyzed for the expanded list of conventional pollutants as well as for priority pollutants.

Small vessel conventional pollutant data taken in 2001 through 2003 is summarized according to wastewater effluent type in Table 14. Detailed sampling results from individual ships can be found in Appendix E: Small Ship Sampling Data.

Table 14. Small Ship Conventional Pollutants

The values for all pollutants, except fecal coliform, are medians. Fecal coliform information is represented as a geometric mean.

	Number of Samples	Ammonia total (as N)	pH	BOD5	COD	TSS	Total Chlorine Residual	Fecal Coliform	Free Chlorine Residual
Year Wastewater Type Small Ship Appendix E Table #		mg/l		mg/l	mg/l	mg/l	mg/l	MPN/10 0	Mg/l
MDL		0.03	0.10	2	3.0	1.3	0.10	2	0.10
AK WQS		17.00	6.5 – 8.5	n/a	n/a	n/a	0.0075*	14	0.0075*
2001 GW Table 30	25	1.03	7.5	212	525.0	49.6	ND	103	ND
2002 GW Table 16	11	0.31	7.2	175	400.0	54.1	0.65	222 ⁵⁴	ND
2003 GW Table 1	23	0.46	7.3	199	330.0	55.6	0.70	48	ND
2001 BW Table 32	16	3.30	7.8	60	863.0	115.8	0.03	10,561	ND
2002 BW Table 20	12	16.15	7.5	137	805.5	133.0	ND	11,582	ND
2003 BW Table 5	21	11.50	7.9	39	625.0	87.1	ND	500	ND
2001 BW&GW Mixed Table 31	10	7.72	7.3	130	814.0	108.0	1.00	3,720	0.10
2002 BW&GW Mixed (Table 18)	17	16.80	7.5	154	835.0	77.0	0.25	5,487	1.10 ⁵⁵
2003 BW&GW Mixed Table 3	18	29.1	7.0	346	545.0	128.5	ND	56,513	ND

*Note that the MDL for chlorine is higher than the chronic water quality standard.

MPN = Most Probable Number MDL = Method Detection Limit GW = Graywater BW = Blackwater

ND= Non Detect

⁵⁴ Results skewed by one result of 16,000,000.

⁵⁵ In several instances only free chlorine was tested. This resulted in higher medians for free than total chlorine.

	Number of Samples	Conductivity	Oil & Grease	Total Organic carbon	Alkalinity	Total Nitrate and Nitrite as N	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settleable Solids
		µmhos/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
MDL		1.0	1.5	1.0	0.5	1.0	0.01	1.0	0.1
WQS		n/a							
2002 GW (Table 17)	1	369	52.0	352.0	61.0	0.5	0.86	0.4	0.1
2003 GW (Table 2)	23	429	15.0	68.9	76.3	0.0	1.60	6.3	0.0
2002 BW (Table 21)	1	34,500	8.5	299.0	116.0	0.5	2.33	5.7	0.1
2003 BW (Table 6)	21	28,800	7.3	29.7	125.0	0.0	3.30	39.0	2.0
2002 BW&GW Mixed (Table 19)	4	29,750 ^{5b}	20.0	305.0	77.9	0.5	1.36	23.2	0.1
2003 BW&GW (Table 4)	18	17,900	62.0	158.5	204.5	0.0	3.50	35.0	2.4

MPN = Most Probable Number MDL = Method Detection Limit GW = Graywater BW = Blackwater

ND= Non Detect

Fecal coliform was at its lowest level in graywater and blackwater during 2003.

In the mixed black and graywater, there is a substantial increase in the concentration of fecal coliform from 3,720 MPN/100 ml in 2001 to 56,513 MPN/100 ml in 2003.

5.3. Pollutants in Effluent that Exceed Alaska Water Quality Standards

The medians of most pollutants in effluent were below Alaska Water Quality Standards. Table 15 draws from Table 14 for conventional pollutants and Appendix F. Summary of Small Ship Sampling for Priority Pollutants to highlight the pollutant medians that do not meet Alaska Water Quality Standards at the end of pipe. A shaded cell indicates that the concentration in the effluent was below the standard.

^{5b} Eight samples were analyzed for conductivity

Table 15. End of Pipe - Small Ship Pollutants Medians that Do Not Meet Alaska Water Quality Standards

Pollutant	Units	AWQS	Graywater		Treated Blackwater		Treated Blackwater & Graywater Mixed	
			2003	2002	2003	2002	2003	2002
Ammonia	mg/l	17.00					29.00	
Free Chlorine	mg/l	0.0075	ND	ND				1.10
Fecal Coliform	MPN/100 ml	14	48	222	500	11,582	56,513	5,487
Arsenic	ug/l	36.0			42.8	44.9		
Copper	ug/l	3.1	74.8	27.4	6.4	11.1	22.0	76.3
Nickel	ug/l	8.2			13.0	14.9	12.2	16.6
Selenium	ug/l	71.0			171.0	170.0	98.2	134.0
Zinc	ug/l	81.0	150.0	86.9			98.5	165.0

Note: Fecal coliform information is a geometric mean.

5.4. Pollutants that Exceed Alaska Water Quality Standards in Receiving Water

The Science Advisory Panel concluded in *The Impact of Cruise Ship Wastewater Discharge on Alaska Waters* report that the wastewater discharges from vessels moving at a minimum of 6 knots, 1 mile from shore, would meet Alaska Water Quality Standards in the receiving water.⁵⁷

ADEC therefore focused on the impact that cruise ship wastewater effluent has on receiving waters during stationary discharge. ADEC modeled the dilution of small ship effluent during stationary discharge during a very conservative scenario, a neap tide⁵⁸ in Skagway, using the EPA approved Visual Plumes model and the information provided by operators in their Vessel Specific Sampling Plans. ADEC calculated a dilution factor for each ship's discharge. (More detailed information on the model used to calculate the dilution factor can be found in Appendix D Cruise Ship Stationary Discharge Modeling.) The lowest dilution factor calculated by the model was 1.5 for graywater, 38 for blackwater, and 8 for mixed wastewater. The concentration of a pollutant in Table 15 was divided by these factors to arrive at the pollutant concentration that is expected in the receiving waters (Table 16). If the predicted pollutant concentration met the Alaska Water Quality Standards in receiving water after applying the dilution factor, the cell is shaded.

⁵⁷ Science Advisory Panel "The Impact of Cruise Ship Wastewater Discharge on Alaska Waters," November 2002
<http://www.state.ak.us/dec/press/cruise/documents/impact/executivesummary.htm>

⁵⁸ A tide of minimum range occurring at the first and the third quarters of the moon.

Table 16. Modeled Small Ship Median Pollutant Concentrations in Receiving Waters during Stationary Discharge

			Graywater		Treated Blackwater		Mixed Blackwater & Graywater	
Pollutant	Units	AKWQS	2003	2002	2003	2002	2003	2002
Free Chlorine	mg/l	.0075						0.14
Fecal Coliform	MPN/100 ml	14	32	148		305	7,064	686
Copper	ug/l	3.1	49.8	18.3				9.5
Zinc	ug/l	81.0	100.0					

Note: Fecal coliform information is a geometric mean

In 2003, of all the pollutants that were tested (176), only three pollutants are expected to regularly exceed Water Quality Standards during stationary discharge.

5.5. Whole Effluent Toxicity Testing

Whole Effluent Toxicity (WET) testing is an alternative to directly analyzing environmental samples for individual constituents. WET testing addresses the effect that simultaneous exposure to a mixture of pollutants has on an organism.

There are two ways to perform the WET test: static non-renewal and static renewal. In a static non-renewal test, test organisms are exposed to a single portion of the solution for the duration of the test. In a static renewal test, test organisms are exposed to fresh changes of water every day for the duration of the test. Static renewal testing is more conservative because the test organisms are exposed to the effluent at the same strength for a longer time period. ADEC conducted WET testing using the static renewal method on commercial passenger vessels in 2002⁵⁹ and again in 2003.⁶⁰

2002

This test was designed to simulate exposure to the concentration of pollutants that would likely be found in the receiving waters behind a moving ship. Because of the high dilution rates associated with moving ships, the dilution series started at 50% effluent and increased by a factor of 10 such that the percent effluent tested progressively decreased. The concentrations tested were 50%, 5%, 0.5%, 0.05%, 0.005%, and 0.0005% effluent. The dilution series represented

⁵⁹ Science Advisory Panel "Review and Comment Regarding Whole Effluent Toxicity Test Results for Five Commercial Passenger Vessels in Alaska July 2002" <http://www.state.ak.us/dec/press/cruise/documents/wetfinal.htm> and "Lab results for Whole Effluent Toxicity test (WET) - August 2002" <http://www.state.ak.us/dec/press/cruise/documents/wetreport.htm>

⁶⁰ ADEC "2003 Whole Effluent Toxicity Results for Commercial Passenger Vessels in Alaska" <http://www.state.ak.us/dec/press/cruise/documents/wet/2003%20Whole%20Effluent%20Toxicity%20WET%20Test%20Discussion.pdf>

concentrations that are attained in receiving waters with dilution factors (df) of 2, 20, 200, 2,000, 20,000, and 200,000. For comparison, a small cruise ship with a width of 10 meters and a draft of 1 meter, discharging 0.4 cubic meters per hour (0.0001 cubic meters per second) while traveling at 6 knots (3.09 m/s) multiplied by the small ship factor of 3 would give a dilution factor of about 927,000.⁶¹

WET test results are presented in Table 17. The percentages represent the highest effluent concentration at which the tests exhibited no observable acute or chronic effects. Values in parentheses show dilution factors associated with the no observed effect concentrations (NOEC).

Table 17. Small Ship 2002 No Observed Effect Concentration (NOEC) and Dilution Factor (df)

Vessel	Treatment System	Mysid Acute NOEC	Topsmelt Acute NOEC	Bivalve Larvae NOEC	Echinoderm Fertilization NOEC
<i>Kennicott</i> Mixed Effluent	Macerator/ Chlorinator	5% (df=20)	5% (df=20)	5% (df=20)	0.5% (df=200)
<i>Yorktown</i> <i>Clipper</i> Blackwater	Macerator/ Chlorinator	50% (df=2)	50% (df=2)	50% (df=2)	50% (df=2)
<i>Yorktown</i> <i>Clipper</i> Graywater	Chlorine injection	0.5% (df=200)	0.5% (df=200)	0.5% (df=200)	0.05% (df=2,000)

The WET tests indicated that acute or chronic toxic effects on marine organisms are not expected to occur in receiving water when vessels discharge underway. However, the *Kennicott* mixed effluent could cause chronic effects (echinoderm fertilization) during stationary discharge, even when considering the ship specific dilution factor of 23 calculated by the Visual Plumes model. The *Yorktown Clipper* blackwater effluent would not cause toxicity even during stationary discharge. The *Yorktown Clipper* graywater effluent could cause both chronic and acute toxicity during stationary discharge, even when ship specific dilution factor of 1.5 is applied. (See Appendix D. Cruise Ship Stationary Discharge Modeling Table 5 for ship specific dilution factors.) The chronic toxicity of the *Kennicott* mixed effluent and the *Yorktown Clipper* graywater may be explained by the excessive chlorination of the effluent. Alaska's Water Quality Standard for total residual chlorine is 7.5 ug/l. The total residual chlorine in the *Kennicott* mixed effluent and the *Yorktown Clipper* graywater was 30,300 ug/l and 16,200 ug/l respectively.

⁶¹ The Science Panel has developed a formula for predicting dilution/dispersion in the wake of small cruise ships.

$Dilution\ factor = 3 \times (ship\ width \times ship\ draft \times ship\ speed) / (volume\ discharge\ rate);$

<http://www.state.ak.us/dec/press/cruise/documents/impact/dilutionwastewater.htm>

The dilution factor is large for small ships compared to large ships because of the much smaller volume discharge rate.

2003

ADEC designed the 2003 WET test to determine the likelihood of negative effects to the marine environment during stationary discharges when dilution factor will be low. Therefore, the dilution series only increased by a factor of 2 instead of 10. The dilution series was 50%, 25%, 12.5%, 6.25%, 3.125%, and 1.5% effluent. This series represented concentrations that are attained in receiving waters with dilution factors of 2, 4, 8, 16, 32, and 66.7.

ADEC calculated the dilution factors during a worst case scenario, a stationary discharge during a neap tide in Skagway, using the Visual Plumes model.⁶² (See Appendix D. Cruise Ship Stationary Discharge Modeling.) When the ship specific dilution factor calculated by the Visual Plumes model is greater than the No Observed Effect Concentration dilution factor (df), no toxicity is expected.

Table 18. Small Ship 2003 Whole Effluent Toxicity Test Results & Dilution Factor during Neap Tide

No Observed Effect Concentration (NOEC) and Dilution Factor (df)

Vessel	Treatment System	Ship Specific Dilution Factor from Visual Plumes model	Mysid Acute NOEC	Topsmelt Acute NOEC	Bivalve Larvae NOEC		Echinoderm Fertilization NOEC
					Normality ⁶³	Survival	
<i>Spirit of Oceanus</i> Mixed Effluent	BW Biological GW untreated	8	25% (df=4)	12.5% (df=8)	<1.5% (unknown)	12.5% (df=8)	<1.5% (unknown)
<i>Spirit of Columbia</i> Blackwater	Macerator/ Chlorinator	50 ⁶⁴	>50% (df=2)	50% (df=2)	50% (df=2)	50% (df=2)	25% (df=4)
<i>Spirit of Columbia</i> Graywater	Untreated	2.5 ⁶⁵	12.5% (df=8)	25% (df=4)	6.25% (df=16)	25% (df=4)	<1.5% (unknown)

On the *Spirit of Oceanus*, the blackwater is treated with a biological system and the graywater is untreated. The effluent is mixed before it is discharged. The mixed effluent is only expected to receive a dilution factor of 8 in the receiving water during stationary discharge. We do not expect the mixed effluent would cause acute toxicity even at this small dilution factor. The tests show that the effluent exhibits some chronic toxicity (bivalve larvae normality and echinoderm

⁶² ADEC used the Visual Plumes mode UM3 with the Brooks far field solution. For more information on this model go to <http://www.epa.gov/ccampubl/swater/vplume/>

⁶³ Normality is the normal development of the bivalve larvae.

⁶⁴ *Spirit of Columbia*'s blackwater is discharged from a pump under the waterline, which increases dilution.

⁶⁵ *Spirit of Columbia*'s graywater is discharged directly from drains by means of gravity, which decreases dilution.

fertilization) at this dilution rate. However, in practice this vessel only discharges while underway when the effluent is expected to be diluted by a factor of approximately 100,000.⁶⁶ Therefore no toxicity to marine organisms is expected to result under normal operating procedures.

The *Spirit of Columbia* blackwater should not cause acute or chronic effects to marine organisms in receiving waters, even during stationary discharge.

The *Spirit of Columbia* graywater may cause acute and chronic effects on marine organisms while discharging in port. There is little dilution of its graywater because it is discharged above waterline. Graywater from this vessel is not expected to cause toxicity in receiving water during underway discharge because of the high dilution factor experienced while underway.

5.6. Summary of Small Ship Data 2001 – 2003

The state defines small ships as vessels that carry between 50 and 249 overnight passengers for hire. The average small cruise ship with 100 people (including crew) produces 9.5 cubic meters or 2,500 gallons of waste water per day. Of that amount 830 gallons is seawater used for toilets. There is roughly 16.7 gallons of graywater used per person or 1,670 gallons total.⁶⁷

Small cruise ships and Alaska Marine Highway System (AMHS) ferries treat their blackwater with marine sanitation device (MSD). Some mix their blackwater and graywater together and then treat the wastewater through a MSD. Some vessels treat their graywater with chlorine before discharge while others discharge untreated graywater.

In 2001, small ships were only sampled for a short list of conventional pollutants. In 2002 and 2003, small ships sampled for the expanded list of conventional pollutants as well as for priority pollutants. Graywater effluent usually met the fecal coliform and total suspended solids effluent standards established by the state law. Blackwater and mixed black and graywater usually met the total suspended solids standards but exceeded the fecal coliform standard.

Risk Characterization

The wastewater samples indicate that hazardous chemicals are not being discharged through these wastewater systems. However, small ship effluent may not meet Alaska Water Quality Standards for free chlorine, fecal coliform, copper, and zinc in receiving water during stationary discharge.

The 2003 WET results were less toxic than those of 2002. In both years, the level of toxicity did not present a concern during underway discharge but graywater would, in all likelihood, cause marine toxicity during stationary discharge.

⁶⁶ Dilution calculation for small ships Dilution factor = $3 \times (\text{ship width} \times \text{ship draft} \times \text{ship speed}) / (\text{volume discharge rate}) = 3 \times (\text{_____m} \times \text{_____m} \times \text{_____m sec}^{-1}) / (\text{_____m}^3 \text{sec}^{-1})$, the vessel's width is 15.3 m with a maximum draft of 4.15 m. ADEC assumed ship speed at 6 knots (3.09 m sec^{-1}) and the discharge rate of $0057 \text{ m}^3 \text{sec}^{-1}$.
Science Advisory Panel "The Impact of Cruise Ship Wastewater Discharge on Alaska Waters" November 2002, Section I located at <http://www.state.ak.us/dec/press/cruise/documents/impact/dilutionwastewater.htm>

⁶⁷ Figures taken from Wilderness Discoverer 2003 VSSP. Small ship water production varies with ship capacity and configuration.

During stationary discharge, small ship effluent may pose a risk to human health in areas where aquatic life is harvested for raw consumption due to the high concentration of fecal coliform.

Maceration-chlorination systems often produce effluent that does not meet the Alaska commercial passenger vessel fecal coliform standard. (See Section 4 "Wastewater Characteristics - Small Ships.") Another disadvantage of this system is that operators tend to chlorinate in excess of the manufacturer's recommendations in order to meet this standard. Marine life is very sensitive to chlorine. The chlorine concentration in ambient water must be less than 7.5 ug/l to protect aquatic life.⁷⁰ Whole Effluent Toxicity (WET) Testing conducted in July 2002 demonstrated that chlorine level in wastewater effluent can be toxic to marine life.⁷¹

Alaska Marine Highway System (AMHS) ferries present an interesting case study on the importance of properly operating maceration-chlorination systems as well as sampling in the proper location in the treatment cycle. In April 2002, AMHS engineers discovered that their wastewater had been sampled before it had sufficient chlorine contact time, and subsequently began sampling in the correct location. This explains the high geometric mean of fecal coliform in samples taken prior to May 1, 2002 (4,212 MPN/100 ml) versus those samples taken during the remainder of 2002 (94 MPN/100 ml).⁷² (See Table 19.) Samples taken from May through December 2002 also had lower chemical oxygen demand (COD) and total suspended solids (TSS) and higher chlorine residual.

In 2003 however, wastewater samples had the highest level of fecal coliform and lowest level of chlorine of all three years. ADEC audited the samplers during a July 29, 2003 sampling event. The sampler took the sample 15 minutes into the pumping cycle and the fecal coliform result was 11,000 MPN/100 ml. This seems to suggest that the timing of the sample did not make any difference as was suggested comparing the 2001 with the 2002 data. The AMHS information indicates that maceration-chlorination treatment systems are sensitive devices that produce variable results depending upon operation. However, the 2002 data demonstrated that maceration-chlorination systems can achieve fecal coliform levels that are in compliance with the state cruise ship law.

⁷⁰ ADEC Saltwater Aquatic Life Criteria Comparison

<http://www.state.ak.us/dec/dawq/wqs/documents/saltwateraquaticlifecriteria.htm>

⁷¹ The Science Panel interpretation of the WET test is located at <http://www.state.ak.us/dec/press/cruise/documents/wetfinal.htm>

The laboratory results for the WET test are located at <http://www.state.ak.us/dec/press/cruise/documents/wetreport.htm>.

⁷² This number is different than the number in Section 9 of "The Impact of Cruise Ship Wastewater Discharge on Alaska Waters" November 2002 by Science Advisory Panel. ADEC wrote Section 9 with all sampling data received by September 30, 2002. This report includes additional data points for 2002.

Table 19. Alaska Marine Highway System Samples

All values are medians except fecal coliform which is expressed as a geometric mean.

Date (Table in Appendix E)	Number of Samples	Total Ammonia as N	BOD 5- Day	COD	Fecal coliform	Free chlorine	pH	Total chlori ne	TSS
		mg/L	mg/L	mg/L	MPN/10 0 ml	mg/L		mg/L	mg/ L
	MDL	0.03	2.0	3.0	2	0.10	0.1	0.10	1.3
January 2001 - April 2002 (Table 38)	8	7.61	99	765.0	4,212	0.55	7.5	1.10	89.4
May 2002 - December 2002 (Table 37)	10	9.50	102	557.0	94	2.25	7.5	1.78	64.8
January - December 2003 (Table 36)	9	11.00	185	365.0	13,990	0.00	7.2	0.00	99.2

Biological And Chemical Disinfecting Systems

Marine biological treatment systems are similar to land based municipal treatment systems. A marine biological treatment system has three steps: (1) aeration; (2) clarification & filtration; and (3) final chemical disinfecting.⁷³ All sludge is re-circulated to the activated sludge aeration section.⁷⁴

The raw sewage passes through a screen, which removes grit, then enters the marine sanitation device (MSD) aeration chamber. The raw sewage mixes with a large concentration of active aerobic bacteria that consume the organic waste in the sewage. The chamber contains air diffusers that provide oxygen to keep the aerobic bacteria healthy.

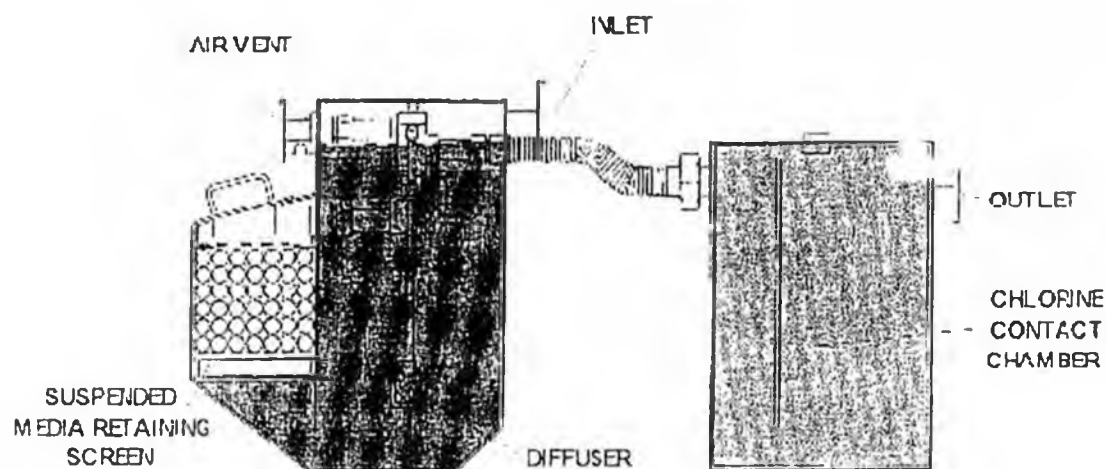
The wastewater flows from the aeration chamber into the clarification and filtration chambers. The filter media removes larger pieces of organic waste not consumed by bacteria in the aeration chamber. The aerobic bacteria also consume the biomass on the filter. After clarification and filtration, wastewater flows into the chlorine contact chamber. The wastewater stays in this chamber until virtually all bacteria are killed resulting in a chlorine residual of 1 – 2 mg/l (ppm).

Unlike a land based biological system, marine systems process a concentrated blackwater stream without dilution from graywater or storm water. Biological systems thrive on a constant, even flow of nutrients and constant pH. This constant flow is difficult to achieve since the demand on a ship's treatment system is intermittent with periods of low or no flow.

⁷³ Fox-Pac MSD home page <http://www.redfoxenviro.com/foxpacmarinemsd.html>

⁷⁴ Waste treatment systems: <http://www.hamworthyksc.com/docGallery/29 PDF>

Figure 4. Biological and Chemical Disinfection System⁷⁵



6.2. Advanced Treatment Systems

The fecal coliform and total suspended solids standards in the state and federal cruise ship laws have prompted large ships to either install advanced treatment systems that meet secondary treatment standards or to hold all of their wastewater for discharge outside of Alaska. Large cruise ship operators have evaluated several advanced wastewater treatment designs. These include chemical treatment and mechanical decanting; activated oxidation and oxidant disinfection; reverse osmosis filtration, and bio-reactor/filtration. The overall value and efficiency of each system, which includes evaluation of the installation cost, maintenance, operator training and monitoring, continues to be a subject of research by the cruise lines.

Generally, cruise ships using advanced technology have combined enhanced aerobic digestion with filtration to clean shipboard wastewater. These treatment systems do not use chlorine in the normal treatment process; however, some ships may use chlorine to control fecal re-growth that occurs in the discharge piping.

These treatment systems all produce solid sludge, which is discharged 12 miles from shore, incinerated, or offloaded to land based disposal sites.

Chemical treatment and mechanical decanting

This system uses chemical treatment and a mechanical decanter, followed up by a UV purifier. The design is used successfully in shore-based applications and showed promise in large-scale laboratory tests. However, the pilot program on a cruise ship indicated that modifications were necessary for a fully operational treatment system.⁷⁶ No additional information is available to ADEC on this system.

⁷⁵ Fox-Pac MSD home page <http://www.redfoxenviro.com/foxpacmainemmsd.html>

⁷⁶ From a wastewater technology paper prepared by David Eley for the Governor's Briefing Papers and Alaska Regional Response Team updated June 2002. For more information contact Mr. Eley at 907-586-2685 or capedec@alaska.com

Activated Oxidation Process

This treatment process is currently operated on ten small ferries in British Columbia.⁷⁷ It has four major components: (1) a primary screening system, (2) a primary solids separation and oxidizing system, (3) a secondary oxidation tank, and (4) oxidant generation equipment, which eliminate the need for chlorine disinfection. Ozone disinfection presents fewer known environmental and health effects than chlorine and its byproducts.⁷⁸ It is more effective than chlorine at killing bacteria and viruses. In addition, ozone is unstable in the environment and decomposes to oxygen in a short period of time.⁷⁹

An enhanced system with a biological oxidation component has been installed on Royal Caribbean's *Vision of the Seas*.⁸⁰ A polymer is also added to the preliminary stage to cause the solids to clump together and form a sludge "mat". The process removes the mat before the effluent enters the treatment system.⁸¹ The treatment system is comprised of six main system components: (1) primary solids separation/oxidation tank; (2) bioreactors (Hydroxyl-F³R); (3) secondary solids separation; (4) oxidation/disinfection tank; (5) controls and oxidant generation equipment; and (6) sludge dewatering and drying equipment.

The sludge is dewatered and incineration onboard or offloaded to shore. No discharge at sea is necessary. The system manufacturer is conducting tests on the *Vision of the Seas* to ensure that it meets U. S. Coast Guard discharge standards for stationary discharge in Alaska. ADEC has not yet received wastewater effluent data from this system.

Reverse Osmosis Filtration

Osmotic theory dictates that pure water will move across a semi-permeable membrane into wastewater until the contaminant concentrations of both liquids are equal. However, if external pressure is exerted on the contaminant solution, water will flow in the reverse direction from the wastewater into the pure water. This phenomenon is known as reverse osmosis (RO). Reverse osmosis treatment systems have been installed on two ships⁸² operating in Alaska. Both systems use ultraviolet (UV) disinfection after the RO unit and were approved by the U.S. Coast Guard for stationary discharge during 2003. The effluent from both systems has a slightly low pH which requires some buffering. *Mercury's* treatment system includes a final run through activated charcoal canisters before discharge. The sample points on both ships are less than 50 feet from the overboard discharge point.

⁷⁷ Hydroxyl Systems B.C Ferry Services Inc. case study website: <http://www.hydroxyl.com/marine/index.html>

⁷⁸ EPA/625/1-86/021 EPA Design Manual Municipal Wastewater Disinfection

⁷⁹ EPA 832F99063, EPA Ozone Fact Sheet, September 1999 <http://www.epa.gov/npdes/pubs/ozon.pdf>

⁸⁰ Hydroxyl Systems *Vision of the Seas* case study website: <http://www.hydroxyl.com/marine/index.html>

⁸¹ Hydroxyl system described on website <http://www.hydroxyl.com/index.html>

⁸² Celebrity *Mercury* black water and Carnival *Spirit* graywater

Table 20. Samples Taken after RO/UV Treatment Unit (2003)

	pH	BOD5	TSS	total chlorine residual	free chlorine residual	fecal coliform
Number of Samples = 21		mg/L	mg/L	Mg/L	mg/L	MPN/100
Minimum	6.6	0	0.0	0.00	0.00	0
Median	7.3	15	0.0	0.00	0.00	0
Maximum	9.1	27	0.0	0.00	0.00	4

Large Ship Sampling Data Appendix B, Table 5

Bio-reactor/filtration

These units employ an integrated system of enhanced aerobic digestion and low-pressure membrane filtration to treat blackwater and graywater. Currently, sixteen large cruise ships operating in Alaska have installed this process using Zenon, Scanship, or Hamworthy systems.⁸³

After only a brief holding period in the bio-reactor, the Zenon system passes the influent through membrane filtration modules that have very large surface area and an extremely small pore size (0.035 micron or 0.035×10^{-6} meters).⁸⁴ Wastewater then passes through a UV disinfection unit. Samples are taken immediately after the UV unit. The distance from the UV unit to the discharge point varies from vessel to vessel.

Table 21. Zenon/UV Treatment System (2003)⁸⁵

Number of Samples = 24	pH	BOD5	TSS	Total Chlorine Residual	Free Chlorine Residual	Fecal Coliform
Units		Mg/L	mg/L	mg/L	mg/L	MPN/100
Minimum	7.2	0	0.0	0.00	0.00	0
Median	7.6	0	0.0	0.00	0.00	0
Maximum	8.4	5	0.0	0.00	0.00	0

Large Ship Sampling Data Appendix B, Table 6

The Scanship system relies more heavily on biological digestion. This unit enhances the capacity and effectiveness of the bio-reactor with plastic carrier elements (biofilm) suspended in the wastewater to increase reactor surface area with eventual polishing microfiltration and UV

⁸³ ADEC, 2003 Large Commercial Passenger Vessels Discharge Status and Wastewater Treatment, <http://www.state.ak.us/dec/press/cruise/documents/2003largeshipwtable.htm>

⁸⁴ From a wastewater technology paper prepared by David Eley for the Governor's Briefing Papers and Alaska Regional Response Team, updated June 2002 and discussions with Rick Softy former VP of Holland America. For more information contact Mr. Eley at 907-586-2685 or capedec@alaska.com

⁸⁵ Holland America *Maasdam*, *Ryndam*, *Statendam*, *Veendam*, *Volendam*, and *Zuandam*

disinfection.⁸⁶ At the beginning of the season, samples were taken after the UV. By mid-season, the samples were taken at the end of the discharge line before the overboard port.

Table 22. Scanship/UV (2003)⁸⁷

Number of Samples = 18	pH	BOD5	TSS	Total Chlorine Residual	Free Chlorine Residual	Fecal Coliform
Units		mg/L	mg/L	mg/L	mg/L	MPN/100
Minimum	6.3	5	0.0	0.00	0.00	0
Median	6.9	11	7.0	0.00	0.00	0
Maximum	7.6	26	28.6	0.00	0.00	240

Large Ship Sampling Data Appendix B, Table 7

In a Hamworthy system, wastewater is passed through an aerobic biological treatment system and ultrafiltration units. It is then chlorinated to kill remaining bacteria. The chlorine levels in the effluent were occasionally over the 10 mg/l limit for continuous discharge allowed by the U.S. Coast Guard and the Alaska Water Quality Standard of 7.5 ug/l. Princess has installed UV on two of their ships with the Hamworthy system and is considering substituting UV for chlorine disinfection on all ships in the future. Samples of this system were taken on the discharge line near the overboard port. Some samples indicated that there was fecal contamination within the discharge line.

Hamworthy (2003)⁸⁸

Number of Samples = 53	pH	BOD5	TSS	Total Chlorine Residual	Free Chlorine Residual	Fecal Coliform
Units		mg/L	mg/L	mg/L	mg/L	MPN/100
Minimum	6.6	0	0.0	0.00	0.00	0
Median	7.3	2	0.0	0.00	0.00	0
Maximum	8.1	86	19.1	55.00	50.00	220

Large Ship Sampling Data Appendix B, Table 8

All four of the treatment systems listed above regularly satisfy the requirements necessary to maintain U.S. Coast Guard continuous discharge certification. (See Table 2.)

⁸⁶ Scanship Environmental website: <http://www.scanship.no/>

⁸⁷ Norwegian Sky, Sun, and Wind

⁸⁸ Princess Dawn, Island, Pacific, Star and Sun, Radisson Seven Seas Mariner

Table 23. Comparison of Advanced Treatment System Medians

Number of Samples = 58	pH	BOD5	TSS	Total Chlorine Residual	Free Chlorine Residual	Fecal Coliform
Units		mg/L	mg/L	mg/L	mg/L	MPN/100
RO (21)	7.28	14.9	0.0	0.00	0.00	0
Zenon (24)	7.64	0.0	0.0	0.00	0.00	0
Scanship (18)	6.94	10.9	7.0	0.00	0.00	0
Hamworthy (58)	7.33	2.2	0.0	0.00	0.00	0

Sample data demonstrated that fecal coliform contamination of the effluent sometimes occurred in the discharge pipe. The probability of fecal contamination increased as the pipe length increased. ADEC will therefore require that samples be taken within 50 feet of the overboard discharge location in the future.

7. RISK CHARACTERIZATION

7.1. Toxicological Profile of Detected Pollutants

Sections 3 and 4 discuss the large ship and small ship wastewater data. Table 11 and Table 16 list the pollutants that exceed water quality standards in receiving water. This section will discuss those pollutants in greater detail.

CONVENTIONAL POLLUTANTS

Ammonia

Ammonia is present in two forms in saltwater: un-ionized ammonia (NH_3) and the ammonium ion (NH_4^+). The un-ionized ammonia form has been demonstrated to be the more toxic form of ammonia.⁸⁹ Ammonia affects the life cycle as well as survival of some species.⁹⁰ Water quality parameters, particularly pH and temperature, but also salinity, affect the proportion of un-ionized ammonia.

Ammonia at concentrations slightly less than those chronically toxic to animals may stimulate growth and reduce reproduction of a red macroalgal species.⁹¹

Ammonia has a strong and suffocating odor. Ammonia's short term human health effects include lung irritation, causing coughing and/or shortness of breath. Higher exposures cause fluid buildup in the lungs (pulmonary edema), which can cause death. In addition, ammonia is a corrosive chemical, which can severely burn the eyes and skin. Repeated exposure to ammonia can cause chronic irritation of the eyes, nose, mouth, and throat.

Chlorine

Free residual chlorine is described as the portion of the chlorine injected into water that remains as molecular chlorine, hypochlorous acid, or hypochlorite ions after the solution has reached a state of equilibrium. Combined residual chlorine is described as the portion of chlorine injected into water that remains combined with ammonia or nitrogenous compounds after the equilibrium has been reached. Both free and residual chlorine have a very short half-life in marine waters, therefore, it is difficult to assess the effects of chlorine on aquatic life.⁹² ADEC saltwater criteria for chlorine are 13 µg/L (acute criterion) and 7.5 µg/L (chronic criterion).⁹³

In humans, ingestion of large doses of chlorine may cause gastrointestinal irritation, including vomiting and nausea. If dehydration occurs, body temperature increases and circulatory and central nervous system damage may result. Exposure of the eyes to sodium chloride may cause

⁸⁹ EPA 440/5-88-004 Ambient Aquatic Life Water Quality Criteria, page 7

⁹⁰ Details of the testing results is located in EPA 440/5-88-004 located at <http://www.epa.gov/waterscience/pc/ambientwqc/ammoniasalt1989.pdf>

⁹¹ EPA 1989, Ambient Water Quality Criteria for Ammonia (Saltwater)-1989, EPA Office of Water, Regulations and Standards Division, Washington DC. EPA 440/5-88-004

⁹² EPA January 1985, Ambient Water Quality Criteria for Chlorine, Office of Water, EPA 440/5-84-030

⁹³ ADEC, Alaska Water Quality Criteria Manual for Toxic and other Deleterious Organic & Inorganic Substances, May 15, 2003, Table IV or V available at <http://www.state.ak.us/local/akpages/ENV/CONSERV/dawq/wqs/pdf/70wqsmmanual.pdf>

stinging while exposure to other forms of chlorine, including free and residual chlorine, may cause stinging or irritation of the skin.

Fecal Coliform

Bacteria water quality standards are set to protect human health from diseases associated with water that has been contaminated with feces. The presence of fecal coliforms usually indicates the presence of pathogens. Shellfish concentrate fecal coliform bacteria and other pathogens that may be present with coliform bacteria. Shellfish beds are closed to harvesting when the geometric mean of fecal coliform bacteria exceeds 14 colonies per 100 milliliters of water. While most fecal coliform bacteria are harmless to humans, exposure to some may cause short-term adverse effects, including rash, ear infections, gastrointestinal pain, nausea, diarrhea, vomiting, and fever.⁹⁴

PRIORITY POLLUTANTS

Copper

Copper is highly toxic in aquatic environments. Copper will bio-concentrate in many different organs in fish and mollusks. Copper is an effective algacide. Free ions of copper are the lethal agent. Single cell and filamentous algae and cyanobacteria are more susceptible to the acute effects, which include reductions in photosynthesis and growth, loss of photosynthetic pigments, disruption of potassium regulation, and mortality. Mammals are not as sensitive to copper as are other aquatic organisms. The predominant mammalian effects include hepatic and renal toxicity, and fetal mortality.⁹⁵ However, high doses are usually required to elicit these effects in mammals.

Alaska has a water quality standard of 3.1 µg/L dissolved copper in saltwater based on chronic effects to aquatic life.

Low levels of copper are essential for humans. Exposure to high levels of copper may cause mouth and eye irritation and may induce vomiting, nausea, and intestinal pain.⁹⁶

Zinc

Zinc is very soluble in water and is almost never found free in nature. It is one of the most mobile of the heavy metals. Most of the zinc introduced into the aquatic environment is partitioned into the sediments by sorption onto hydrous iron, manganese oxides, clay, and organic materials.⁹⁷ Variables affecting the mobility of zinc include the concentration and composition of suspended and bed sediments, dissolved and particulate iron and manganese concentrations, pH, salinity, concentration of ions or molecules that bind to transition-metal ions, and the concentration of zinc.

⁹⁴ Washington State Department of Ecology, March 2002, *Focus: Fecal coliform bacteria and Washington's water quality standards*, Publication No. 02-10-010

⁹⁵ EPA, 2002a. National Recommended Water Quality Criteria – Correction, EPA Office of Water, Washington, DC, EPA 822-Z-99-001

⁹⁶ Agency for Toxic Substances and Disease Registry (ATSDR), United States Department of Health and Human Services, Center for Disease Control, September 2002, ToxFAQs for Copper.

⁹⁷ EPA 440/5-87-003 EPA Ambient Water Quality Criteria for Zinc February 1987.

Most organisms need some minimum concentration of zinc to function properly. Toxicity of zinc to an organism depends on feeding habits. Plants and most fish would not be adversely affected, but many invertebrates could be affected by ingestion of sufficient quality of particulates containing zinc. The toxicity of zinc, as well as other metals, is reported to be influenced by a number of chemical factors including cadmium, magnesium, hardness, pH, and ionic strength. These factors appear to affect the toxicity of zinc by influencing the proportion of available zinc or by inhibiting the sorption or binding available by biological tissues. Alaska has a water quality standard of 81.0 µg/L of dissolved zinc in saltwater based on chronic effects to aquatic life.

As with copper, zinc is an essential element in humans at low doses. Human ingestion of zinc is generally not a concern. The Recommended Daily Allowances for adults is 15 mg/day.⁹⁸

7.2. Cumulative Impact

Large Ships

Since the passage of the Alaska cruise ship laws, large cruise ships installed advanced wastewater treatment systems that meet the stringent U.S. Coast Guard requirements for continuous discharge. The quality of the wastewater on large ships has therefore improved dramatically. During 2003, all the large cruise ships that discharged wastewater in Alaska had these advanced systems. Ships that did not have advanced systems discharged outside 3 nautical miles. The 2003 data is the most representative of the wastewater quality that ADEC expects in the future. Therefore, we will focus on the risks presented by the 2003 data.

In 2003, ships were sampled for 16 conventional pollutants and 160 priority pollutants. **The vast majority of these pollutants were not detected.** Only ammonia, copper, nickel, and zinc did not regularly meet Alaska Water Quality Standards at the end of pipe (Table 10).

The Science Advisory Panel concluded in *The Impact of Cruise Ship Wastewater Discharge on Alaska Waters* that effluent from a typical large ship will be diluted by a factor of at least 50,000 during underway discharge.⁹⁹ By applying this dilution factor, the concentration of all pollutants would meet Alaska Water Quality Standards in the receiving water during underway discharge.

ADEC was concerned about the impacts on the receiving water caused by stationary wastewater discharge. In order to address this issue, ADEC calculated the dilution factor during stationary discharge for each large ship during a worst case scenario. (See Appendix D Cruise Ship Stationary Discharge Modeling for more information.) The lowest dilution value for each effluent type was then used to calculate the anticipated concentration of each pollutant in receiving water during stationary discharge (Table 11). After applying the dilution factor, no tested pollutant would exceed Water Quality Standards.

Whole Effluent Toxicity (WET) testing was done in 2003 on 4 of the 18 large ships that discharged in Alaska. Test results indicate that **wastewater effluent from large ships with advanced wastewater treatment systems does not pose a risk to aquatic organisms, even**

⁹⁸ EPA 440/5-80-079 October 1980 Ambient Water Quality Criteria for Zinc.

⁹⁹ Science Advisory Panel "The Impact of Cruise Ship Wastewater Discharge on Alaska Waters," November 2002
<http://www.state.ak.us/dee/pressroom/documents/impact/dilutionwastewater.htm>

during stationary discharges. ADEC will continue WET testing on the advanced wastewater treatment systems during 2004. This test gives insight into the wastewater's effect on marine organisms. This test indicates that exceedances of ammonia, copper, nickel and zinc Water Quality Standards at the end of pipe are not harming aquatic life.

None of the pollutants mentioned above are present in concentrations should cause risks to human health.

Small Ships

ADEC reviewed data collected from small commercial passenger vessels from 2001 through 2003. These ships have not installed new wastewater treatment systems on their vessels and the effluent quality has remained relatively consistent.

During the evolution of the sampling protocol, pollutants have been added and deleted as appropriate. In 2003, ships were sampled for 16 conventional pollutants and 160 priority pollutants. **The vast majority of these pollutants were not detected.** The eight (8) pollutants that did not regularly meet Alaska Water Quality Standards at the end of pipe are included in Table 15.

The Science Advisory Panel concluded that the dilution factor caused by the underway discharge by a small ship would be based on the width, draft, and speed of the vessel divided by the discharge rate and multiplied by a factor of 3.¹⁰⁰ With the aid of this dilution, we would expect all pollutants to meet Alaska Water Quality Standards during underway discharge.

ADEC was concerned about the impacts on the receiving water caused by stationary wastewater discharge. In order to address this issue, ADEC calculated the dilution factor caused by stationary discharge for each small ship during a worst case scenario. (See Appendix D Cruise Ship Stationary Discharge Modeling for more information.) The lowest dilution value for each effluent type was then used to calculate the expected concentration of each pollutant in receiving water during stationary discharge (Table 16). Even with the benefit of dilution, we predict the stationary discharge of wastewater from small ships contain concentrations of free chlorine, fecal coliform, copper, and zinc that exceed Alaska Water Quality Standards.

The marine environment is very sensitive to the concentrations of free chlorine. In fact the water quality standards are below the methods of detection for chlorine. The concentration of chlorine in mixed blackwater and graywater during 2002 was found in excess of 100 times the Alaska Water Quality Standards. The predicted concentration of chlorine from this discharge was 10 times the standard in receiving water and therefore did pose a risk to aquatic life during stationary discharges.

The fecal coliform concentrations in receiving water indicate that it is important for these ships to avoid anchoring in areas used for shellfish aquaculture or areas frequently used for subsistence and recreational shellfish harvesting. Most of the shellfish farms in Southeast Alaska are located between Ketchikan and Petersburg. ADEC evaluated the small ship routes and the location of

¹⁰⁰ The Science Panel has developed a formula for predicting dilution/dispersion in the wake of small cruise ships.

Dilution factor = $3 \times (\text{ship width} \times \text{ship draft} \times \text{ship speed}) / (\text{volume discharge rate})$;
<http://www.state.ak.us/dec/press/cruise/documents/impact/dilutionwastewater.htm>

registered commercial shell fish beds and found that small ships do not currently moor or dock near these sites.

Copper is highly toxic in aquatic environments. This toxicity is reflected in the low Alaska Water Quality Standard of 3.1 µg/L dissolved copper in saltwater. The predicted concentration of copper in receiving water during small ship stationary discharge can be as high as 10 times this standard and therefore does pose a likely risk to aquatic life.

Most organisms need a minimum concentration of zinc to function properly. Alaska has a water quality standard of 81.0 µg/L for dissolved zinc in saltwater based on chronic effects to aquatic life. In 2003, the level of dissolved zinc found in receiving water during graywater discharge slightly exceeds Water Quality Standards, and therefore poses some risk to aquatic life.

The Whole Effluent Toxicity (WET) testing done in 2002 and 2003 in conjunction with the information above indicates that **the wastewater effluent from small ships poses some risk to the marine environment during stationary discharges.**

The concentration of fecal coliform in the effluent during stationary discharge would pose a risk to human health in areas where aquatic life is harvested for raw consumption.

7.3. Comparison to other Marine Discharges

Cruise ship's wastewater systems can be compared to municipal treatment systems that serve small Alaskan cities. Cruise ships are excluded from obtaining permits under the Clean Water Act. However, their marine sanitation devices (MSDs) must meet effluent standards set in Section 312. This section set the Type II MSD standards for blackwater at 200 fecal coliform/100 ml and 150 mg/L total suspended solids (TSS). In Alaska, cruise ships must also adhere to state and federal wastewater effluent standards and discharge conditions (Table 2).

Municipalities must obtain permits under the Clean Water Act before discharging wastewater. The Act uses both water quality effluent standards and technology based limits to protect water quality¹⁰⁰. It has been termed a technology-forcing statute because of the rigorous demands placed on the regulated community to improve effluent quality through treatment technology. The Act required municipalities to upgrade systems to secondary treatment, (85% removal of biological oxygen demand (BOD) and total suspended solids (TSS)), by July 1, 1988. Eighty-six percent (86%) of municipalities met that date. Cities that discharged wastes into the marine environment were eligible for case-by-case EPA waivers of the secondary treatment requirement. These waivers, referred to as 301(h) waivers, require 30% removal of BOD and TSS. In order to be eligible for these waivers, natural factors such as tides and currents must provide significant elimination of traditional forms of pollution, protect shell fish, fish, and other aquatic life, and comply with water quality standards. Waivers were only granted, with certain exceptions, if a waiver application was filed by December 29, 1982.

Juneau and most other Alaskan cities adhere to secondary treatment standards and have limits that do not allow the exceedance of a monthly geometric mean of 200 fecal coliforms per 100 ml if chlorine is used for disinfection and a monthly geometric mean of 400 fecal coliform bacteria if ultraviolet light is used for disinfection. However, many communities in Southeast Alaska including the popular cruise ship ports of Ketchikan, Skagway, and Sitka have waivers from

¹⁰⁰ Copeland, Claudia. CRS Report for Congress, Clean Water Act: A Summary of the Law, January 20, 1999

secondary treatment. These treatment systems have been assigned very large mixing zones to allow for dilution in the receiving water. These cities have effluent limits with a daily maximum of 1.5 million fecal coliforms/100 ml and a monthly geometric mean of 1 million fecal coliforms/100 ml. These are the highest limits that have been allowed in Alaska.

Domestic and industrial discharges in Alaska usually exceed water quality standards at the end of pipe. Under the State of Alaska and the National Pollutant Discharge Elimination System (NPDES) permit systems, these entities are granted mixing zones - areas where they may legally exceed water quality standards while dilution and decay or die-off occur. Outside of the mixing zone, water quality standards must be met. ADEC uses information from the discharge source such as wastewater volume, velocity, temperature, and salinity as well as pipe diameter and depth, and receiving water uses and sensitivity to determine the size of the mixing zone. These dischargers must monitor at the edge of mixing zone specified in their permit to ensure that they are meeting the water quality standards. Because other dischargers are typically granted a mixing zone, ADEC considered the effect of dilution on cruise ship effluent to assess its impact on water quality.

There are numerous potential sources of pollution that impact the Alaska marine environment. They include private vessels, commercial fishing vessels, day trip charter vessels, commercial passenger vessels that have less than 50 overnight passengers for hire, yachts, residential shore based dischargers, runoff and wildlife, (including marine animals). The effects of these other sources have not yet been quantified.

8. ADEC RECOMMENDATIONS

8.1. Recommendations for future study

Sampling

At the recommendation of the Science Advisory Panel, ADEC tested vessel wastewater for commonly used organophosphorus pesticides at the end of 2003 season. No pesticides were detected in the four samples. The ADEC will continue organophosphorus testing during the 2004 season.

Cyanide was dropped from the Quality Assurance/Quality Control (QAQC) Plan after 2000 even though there were high concentrations in some of the 2000 samples. We believe the exclusion from the sampling protocol was premature. ADEC will resume sampling for cyanide in 2004 when the state goes on board and samples the ship wastewater discharges.

In general, fecal coliforms survive for shorter periods than other enteric microorganisms in marine water. The absence of fecal coliform bacteria does not guarantee the absence of viruses and other pathogens.¹⁰² EPA recommends using enterococci for bacteria monitoring in marine waters.¹⁰³ ADEC will sample vessel wastewater for *Escherichia coli* (*E. coli*) and enterococci, in 2004.

The current method detection limits (MDL) for chlorine exceeds Alaska Water Quality Standards. As part of the QAQC Plan for 2004, ADEC will require using a more sensitive test that can measure as low as 20 ug/l, instead of the current MDL of 100 ug/l. This sensitive method, however, will still not be able to detect the Alaska Water Quality chronic standard of 7.5 ug/l.

During 2003, some large ship samples were taken from the sampling port right after the treatment system but at a distance between 50 to 400 feet from the overboard discharge port. The 2003 data indicated that fecal contamination and growth occasionally occurs during the transit from the treatment system to the overboard port. In 2004, ADEC will only approve Vessel Specific Sampling Plans where samples are taken from sample ports located within 50 feet of the overboard discharge port.

State cruise ship regulations,¹⁰⁴ effective November 2002, allowed small ships to have a qualified crew member sample the vessel's wastewater. ADEC will encourage small vessel operators to use their own staff to sample their vessel as it comes into port. These samples will be more representative since ships will still be full with passengers and the treatment system will be operating normally. ADEC can provide sampling training to operators upon request. ADEC would audit the vessel samplers.

¹⁰² Commission on Geosciences, Environment and Resources, 1993 "Managing Wastewater in Coastal Urban Areas" pg. 67 <http://books.nap.edu/books/0309048265/html/67.html>

¹⁰³ EPA 440/5-88/007 Bacteria Water Quality Standards Criteria Summaries: A Compilation of State/Federal Criteria. September 1988.

¹⁰⁴ 18 AAC 69.090, <http://www.state.ak.us/dec/title18/wpi/files/69mas.pdf>

Section 5.1 discusses traditional treatment systems. The sampling results from the Alaska Marine Highway System (AMHS) ferries' macerator chlorinating systems were extremely variable from 2001 through 2003. ADEC recommends that AMHS sample for fecal coliform, total suspended solids (TSS) and chlorine at timed intervals such as: 1) at the discharge pump start; 2) 5 minutes into the pumping cycle; 3) 10 minutes into the pumping cycle; 4) 15 minutes into the pumping cycle; and 5) at the end of the discharge cycle. This experiment would check the fecal coliform variability throughout the pumping cycle. This information may indicate the correct location for the sample port in the treatment cycle.

New Studies

ADEC made assumptions about ambient water quality for the dilution model. It is important to check these assumptions with real data. ADEC will conduct ambient marine monitoring in Southeast Alaska in coordination with the Western States Coastal Environmental Monitoring and Assessment Program (EMAP) project during the summer of 2004.¹⁰⁵ The EMAP project will also include sediment and fish tissue sampling for heavy metals and PCBs. ADEC will use this information in future modeling efforts.

After applying the dilution factor calculated by the Visual Plumes model to effluent data, small ships exceed four Alaska Water Quality Standards (free chlorine, fecal coliform, copper, and zinc) in receiving water during stationary discharge. When a ship discharges above the waterline, the dilution factor is decreased, exacerbating the problem. The Visual Plumes model that is used to estimate the dilution factors in this report was not designed to model discharges from vessels. ADEC may perform a dye study in the future to determine the dilution factor caused by small ships during stationary discharge.

8.2. Recommendations for Best Management Practices

When large and small vessels discharge wastewater underway, they are able to meet all Alaska Water Quality Standards. The 2003 data indicates that large vessels with advanced wastewater treatment systems meet Alaska Water Quality Standards for all tested pollutants in receiving water during stationary discharges. Large vessels should use discharge ports that are less than 12 inches in diameter to create a jet like propulsion that will increase dilution. Large vessels should avoid discharging above the water line because this decreases dilution. ADEC also wants to encourage the continued use of ultraviolet light instead of chlorine as a disinfectant on large ships. It is also important that the discharge port be located within 50 feet of the wastewater treatment system to decrease the likelihood of fecal coliform contamination in the discharge line.

Small ships regularly exceed four Alaska Water Quality Standards in receiving water during stationary discharge. Vessels that have holding capacity should not discharge while stationary. Holding water while in port is ideal. Most small ships can hold their blackwater and mixed blackwater and graywater for up to 24 hours while stationary (Table 24). This is important since blackwater and mixed blackwater and graywater have the highest fecal coliform counts.

However, only one ship can hold their graywater, the majority of wastewater volume, for even 12 hours while stationary (Table 24). According to the Vessel Specific Sampling Plans,

¹⁰⁵ For more information on EMAP, visit the EPA EMAP Research Strategy Report, July 2002 at http://www.epa.gov/emf/ohc/html/pubs/docs/resdocs/EMAP_Research_Strategy.pdf

graywater is not plumbed to blackwater holding tanks. Therefore, excess blackwater holding capacity can not be used to store graywater.

Small ships need to develop strategies to limit their graywater discharge while stationary. Small vessels should not do laundry to minimize their waste water production. Small vessels could also schedule to arrive in port or at anchor after the morning high water usage periods (8-10 a.m.) or leave before the evening high water usage (6 p.m.).

Table 24. Small Ship Holding Tank Capacity

Company	Ship Name	Number of passengers and crew	Blackwater (gallons per day)				Graywater (gallons per day)			
			Produced	Holding capacity	Hold 24hr	Hold 12 hr	Produced	Holding capacity	Hold 24hr	Hold 12 hr
AMHS	Columbia	223	6,690	23,800	Yes	Yes	GW is mixed with BW. See BW.			
AMHS	Kennicott	204	6,120	8,800	Yes	Yes	GW is mixed with BW. See BW.			
AMHS	Malaspina	188	5,640	8,006	Yes	Yes	GW is mixed with BW. See BW.			
AMHS	Matanuska	186	5,580	8,281	Yes	Yes	GW is mixed with BW. See BW.			
AMHS	Taku	97	2,910	3,360	Yes	Yes	GW is mixed with BW. See BW.			
Glacier Bay	Wilderness Adventurer	95	2,920	2,400	No	Yes	GW is mixed with BW. See BW.			
Glacier Bay	Wilderness Discoverer	120	3,130	2,400	No	Yes	GW is mixed with BW. See BW.			
America West Steamship	Empress of the North	320	8,730	26,800	Yes	Yes	GW is mixed with BW. See BW.			
CruiseWest	Spirit of Discovery	105	500	1,700	Yes	Yes	2,500	30	No	No
CruiseWest	Spirit of Alaska	99	495	334	No	Yes	2,250	182	No	No
CruiseWest	Spirit of Columbia	99	400	3,600	Yes	Yes	2,260	478	No	No
CruiseWest	Spirit of Endeavour	130	600	934	Yes	Yes	3,600	934	No	No
CruiseWest	Spirit of 98	120	3,600	12,700	Yes	Yes	3,000	0	No	No
CruiseWest	Spirit of Oceanus	178	19,875	14,460	No	Yes	GW is mixed with BW. See BW.			
Lindblad	Sea Bird	96	3,000 ¹¹⁶	1,150	No	No	2,100	735	No	No
Lindblad	Sea Lion	98	3,000 ¹¹⁷	1,255	No	No	2,100	735	No	No
New World Ship Management	Clipper Odyssey	204	612	606	Yes	Yes	16,500	28,800	Yes	Yes
New World Ship Management	Yorktown Clipper	175	2,728 ¹¹⁸	2,996	Yes	Yes	12,000 ¹¹⁹	2,996	No	No

Source: Table created from information submitted by small ship owner and operators in their 2003 Vessel Specific Sampling Plans

¹¹⁶ Includes saltwater for flushing.

¹¹⁷ Includes saltwater for flushing.

¹¹⁸ Includes saltwater for flushing.

¹¹⁹ This vessel does laundry which accounts for 2,000 gallons per day. This vessel should not do laundry in port.

8.3. Evaluation of Whether Small Ships Should Remain in the Program

Based on the wastewater testing results, ADEC recommends that small ships remain in the Commercial Passenger Vessel Environmental Compliance program. The Science Advisory Panel recommended in their November 2002 report that these ships should avoid stationary discharge, particularly in small fjords and embayments where the movement or flux of water is limited, because of the high levels of fecal coliform and suspended solids in their wastewater.¹¹⁰ ADEC WET test results in conjunction with conventional and priority pollutant testing indicate that these small ships pose some risk to the marine environment during stationary discharge. Small ships that discharge blackwater or blackwater and graywater mixed while stationary may pose a risk to human health in areas where people collect shellfish for raw consumption.

Small vessels were granted three years to come into compliance with the state cruise ship law wastewater effluent standards.¹¹¹ As of March 1, 2004, these vessels may submit an interim protection plan that, if approved by ADEC, extends the time for compliance with the effluent standards. This plan should include a description of Best Management Practices, such as avoiding stationary discharges in areas of limited water movement, that the operator is undertaking to limit the adverse impacts of their discharges.¹¹² Violations and fines could be levied against ships that are found violating the terms of their approved plan.

¹¹⁰ Science Advisory Panel, November 2002, "The Impact of Cruise Ship Wastewater Discharge on Alaska Waters," Executive Summary, <http://www.state.ak.us/dec/press/cruise/documents/impact/executivesummary.htm>

¹¹¹ Alaska Statute 46.03.460 - 490 Section 7

¹¹² 18 A AC 69.045 Interim Protective Measures Plan, <http://www.state.ak.us/local/akpages/ENV.CONSERV/title18/wpfiles/69mas.pdf>

Date: July 11, 2006

Time: 09:30-11:00

Vessel: Norwegian Sun

Port: Juneau

Written by: Moana Leirer (ADEC Inspector)

OBSERVATIONS:

On Tuesday July 11, 2006 09:30, I met David Wetzel and Tessina Davidson with Admiralty Environmental at the AJ dock in Juneau Alaska. My purpose was to observe the sampling procedures used for large passenger vessels under Alaska's Commercial Passenger Vessel Environmental Compliance Program. I also took additional samples for enterococcus, cyanide and PCBs. David and Tessina were sampling for conventional and priority pollutants from a mixed blackwater and graywater treatment system for the Norwegian Sun's second random unannounced sampling event.

David and Tessina arrived with one medium sized cooler and one small cooler which were used to haul sample bottles grouped together within a clear plastic garbage bag. The coolers did not have ice in them at this time.

David, Tessina and I stopped at ship security and stated our purpose. The vessel took our Alaska ID's and replaced them with visitor passes. The security officials called the engine control room, and we were met by the environmental officer (EO) Karl Hergeselle. At this time David verified verbally that the vessel was currently discharging overboard. The EO brought us to the galley area for ice where David took the sample bottles out of the clear plastic bag and filled the bag with ice for the medium cooler. Tessina filled the small cooler $\frac{3}{4}$ full with ice and added some water to create an ice water bath for the fecal coliform sample. I filled my cooler with ice at this time as well.

Mixed Blackwater and Graywater Sampling Event:

The USCG certified this system to discharge continuously.

The EO escorted us to the overboard sampling port, which is located with two feet from the overboard hull penetration. The sample port was sterilized and flushed (Figure 1) with an adequate amount of effluent from the discharge line.

The sampling began at 10:15

David and Tessina donned safety gear, including:

- Protective lab coat
- Ear protection
- Safety glasses
- Latex gloves

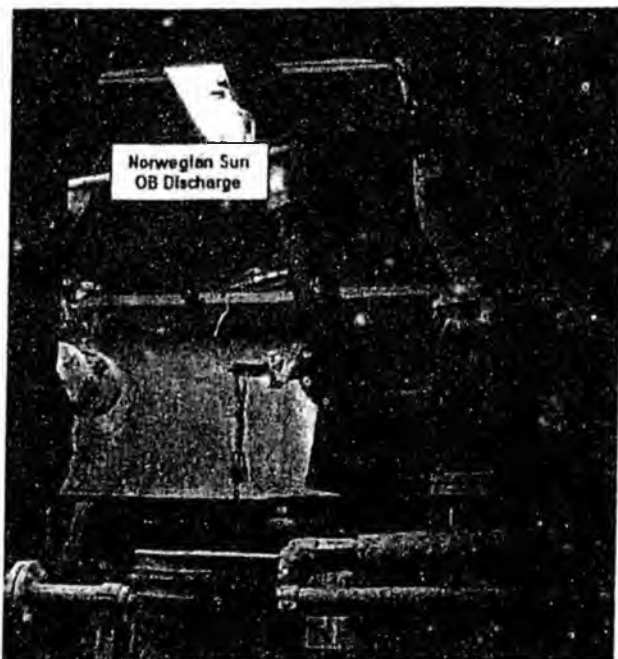


Figure 1: Norwegian Sun overboard sample port being flushed with treated effluent.

While the port was flushing, David removed the ice bag from the cooler and began labeling the sample bottles with the date, analyses, and sampler initials. At this time, Tessina prepared the field test kit and began filling out the chain of custody. Prior to sampling, David filled the test vial used to detect free chlorine and passed it on to Tessina. David put the sample time on the bottles and filled (Figure 2) them in the following order:

- Settable Solids (1 liter)
- Field Test Bottle (120 ml)
- Fecal Coliform- 100 ml
- Wet Chemistry- BOD, Alkalinity, pH, conductivity, TSS (1 liter)
- Metals (1 liter)
- Preserved Wet chemistry- NO_2/NO_3 , Ammonia, COD, and Total Phosphorus (250 ml)
- TKN (500 ml)
- Oil and Grease (1 liter-glass)
- BNA
- TOC (250 ml-glass)
- VOC (4 40ml vials glass)

After filling the sample bottle for Fecal Coliform, David put the bottle in a plastic "Ziploc" and immediately put sample in the ice water bath along with the 120 ml temperature blank. After all the bottles were filled David transferred the bottles to the medium cooler and emptied the bag of ice over the sample bottles. The large temperature blank was added to the cooler at this time as well. Once David had filled all of his bottles, I proceeded to fill my bottles.



Figure 2: David Wetzel taking a sample from the Norwegian Sun's overboard discharge port.

Tessina tested the sample (test vial) to check for free chlorine. When the reagent was added to the test vial it appeared to have a slight pink color to it indicating a small amount of free chlorine. However, the chlorine meter gave a reading of zero free chlorine. Tessina dumped the sample and added new sample and reagent to the test vial. The second time the chlorine meter gave a reading of 0.05 mg/L. The amount of free chlorine is not enough to affect the VOC analysis. Therefore, David rinsed the ascorbic acid out of the decanting bottle before he used it to fill the VOC bottles. Ascorbic acid was not added to the BNA sample bottle.

Tessina began field tests immediately after David filled field test bottle. Tessina took the temperature of the large and small temperature blanks before they were placed in the cooler with ice. Tessina then measured the temperature of the sample in the field test bottle immediately after it was filled and recorded the information in her field notes. The final field tests conducted was pH and total chlorine. Tessina entered the field results into her notebook, and then proceeded to take pictures of the sample port.

Results of Field tests & method included:

Mixed Blackwater and Graywater	
Time	10:15
Temperature C°	32.2
Total Chlorine	0.08
Free Chlorine	0.05
pH	6.43

Tessina used a *HACH* Pocket Colorimeter to detect total and free chlorine. Tessina rinsed the test vials for the *HACH* equipment with water and replaced into test kit. Liquid wastes were dumped into a 1 liter container retained by the samplers. The pH field test was conducted using a calibrated *Oakton Instruments pH Tester 2*, and was wiped clean with a *Kimwipes* tissue after use.

All debris, including used gloves and tissues were placed in the 1 liter waste container and taken off the ship. David acquired the signature of the EO in the field notes and on the chain of custody form, and secured the documents in the sample kit Pelican case. We then proceeded to the engine control room where David retrieved a copy of the discharge log from the EO.

I accompanied Tessina to the lab for sample delivery. Tessina relinquished the samples to Robin Jung of Analytica at 11:25 am. Robin unloaded the coolers and measured the temperature blank of both coolers and recorded them on the chain of custody. The temperature of the medium cooler was 4.2°C and the small cooler's temperature was 1.4°C. Robin then proceeded to check for bubbles in the VOC vials; there were no bubbles present. Robin moved all samples to the receiving refrigerator and made a copy of the chain of custody for Tessina's records.

Recommendations

This was an excellent sample event and I can only think of a one improvement:

- Alcohol or some kind of bactericide should be used to clean equipment after field tests are conducted for each sampling event.

**Commercial Passenger Vessel Environmental Program
ADEC Oversight Checklist**

During Water Sample Collection

- ☐ Were the samples collected from appropriate and representative locations at appropriate times? **Yes.**
- ☐ Was the sample collection time representative of the maximum usage of the wastewater treatment and discharge system? **Yes**
- ☐ Did the sampler collect the required ship records and logs, particularly the Graywater & Sewage Discharge Record Book which identifies tanks, estimates volumes and calculates discharge rates (if any) at the time the sample was drawn? **Yes**
- ☐ Did the ship representative indicate any problems with the wastewater treatment system? **No.**
- ☐ Did the samplers work in twos to assure that proper sampling techniques and note-taking? **Yes**
- ☐ Did the sampler/s use sanitary techniques? **Yes, but equipment should be sterilized with a bactericide after each sampling event.**
- ☐ Did the sampler/s wear disposable gloves, safety eye gear, tie-back suit and proper foot gear? **Yes**
- ☐ Did the sampler/s remain aware of potential safety and biohazards present? **Yes.**
- ☐ Were sample bottles all correctly prepared? **Yes.**
- ☐ Were the samples identified clearly on the sample bottles and the chain of custody form? **Yes.**
- ☐ Were the specified field measurements taken (pH, temperature, chlorine residual)? **Yes.**
- ☐ Were priority pollutant samples taken? **Yes**
- ☐ Was a volume of water equal to at least ten times the volume of the sample discharge line first discharged into a bucket or similar container, to clear the line of standing water and possible contamination? **Yes.**
- ☐ Were the sample bottles filled and sealed correctly? **Yes.**

- ☐ Were sample bottles cooled immediately in an ice-water bath to 4° degrees C, and placed into a cooler containing frozen blue ice to maintain a sample temperature of 2-6 degrees C? Yes
- ☐ Except for the VOC bottles, were the sample bottles filled to the shoulder of the bottle, leaving a small space for expansion and mixing? Yes
- ☐ Did the sample bottles for ammonia, COD, fecal coliform, oil and grease, TOC, nitrogen and phosphorus have the appropriate preservative added in the laboratory? Yes.
- ☐ If chlorine residual is detected during field measurement of chlorine, did the sampler add the sodium thiosulfate to the BNA, PCB and pesticide sample bottles until no chlorine is detected? N/A; chlorine was not detected in significant amount
- ☐ Was the chain of custody form correctly completed? Yes. Were any collection anomalies noted? N/A
- ☐ Did the sampler use a field log book? Yes. Note any sampling anomalies? N/A
- ☐ Did the sampler transcribe or receive copies of the required documents from the ship sewage and graywater discharge record book (recording times, volumes, and vessel location where the waste is discharged for each graywater and treated sewage discharge port)? Yes,
- ☐ Were the sample holding times met? (See QAQC) Yes.
- ☐ Did the sampler dispose of liquid and solid waste correctly? Yes
- ☐ Was sample custody maintained until delivery to lab? Yes.
- ☐ Latitude/longitude and speed at time of discharge being sampled, Yes

Date: June 12, 2006

Time: 04:00-05:30

Vessel: Seven Seas Mariner

Port: Underway from Skagway to Sitka

Written by: Moana Leirer (ADEC Inspector)

OBSERVATIONS:

On Sunday June 11, 2006 I flew to Skagway via Skagway Air with David Wetzel of Admiralty Environmental. My purpose was to observe the underway sampling procedures used for large passenger vessels under the Commercial Passenger Vessel Environmental Compliance program. David and I planned on sailing with the ship from Skagway to Sitka. David was sampling for conventional pollutants from a mixed blackwater and graywater treatment system for the Seven Seas Mariner's first unannounced sampling event.

Since this sampling event was conducted while the ship was in route to Sitka, the sample bottles were flown back to Juneau for analyses except for the fecal coliform (FC) sample. The FC sample was dropped off at the Sitka Wastewater Treatment plant for analysis in their certified laboratory. David carried a medium sized cooler in which he used to haul the sample bottles to the laboratory in Juneau. David also carried a small Pelican case that held his field testing equipment.

David and I stopped at ship security and stated our purpose. The security officials contacted the engine control room, and we were met by the Environmental Engineer (EE) Stephane Billy. At this time the EE assigned cabins for both David and I to stay in while on board the vessel. Once our accommodations were taken care of we proceeded to the engine control room and met with the Chief Engineer Germain Bouver and the EE to arrange the sampling location and time. We agreed to meet at 4:00am to conduct the sampling at the overboard discharge sampling port. David placed his gel packs in the freezer that would be used later when the samples were shipped back to Juneau.

Mixed Blackwater and Graywater Sampling Event:

At approximately 04:15 am I met with David, and the EE in the engine control room. At this time David verified with the EE that the ship was discharging overboard. David asked the EE for a small bag of ice for the FC sample to be placed in after sampling.

While the EE retrieved the ice David labeled the sample bottles with ship name, sample point, and date. We then proceeded to the overboard discharge port to begin sampling. The overboard sample port is located approximately 12 feet from the overboard hull penetration.

The sample port was sterilized with a propane heat gun and then flushed (Figure 1) with an adequate amount of wastewater. While the sample port was being sterilized David began filling out his field notes. David then took the required picture of the sample port that included a sign with vessel name, date, and sampling event (Figure 2).

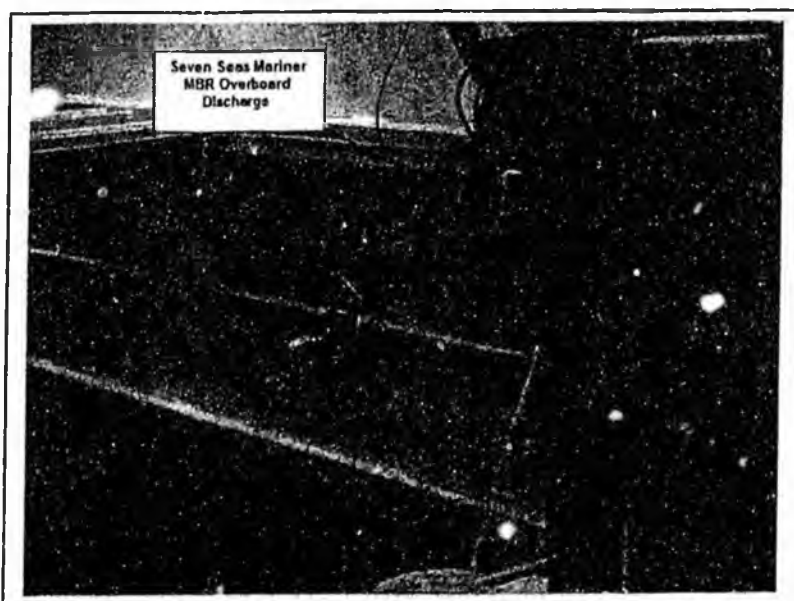


Figure 1: Overboard sample port in the process of being flushed with waste water prior to sampling.

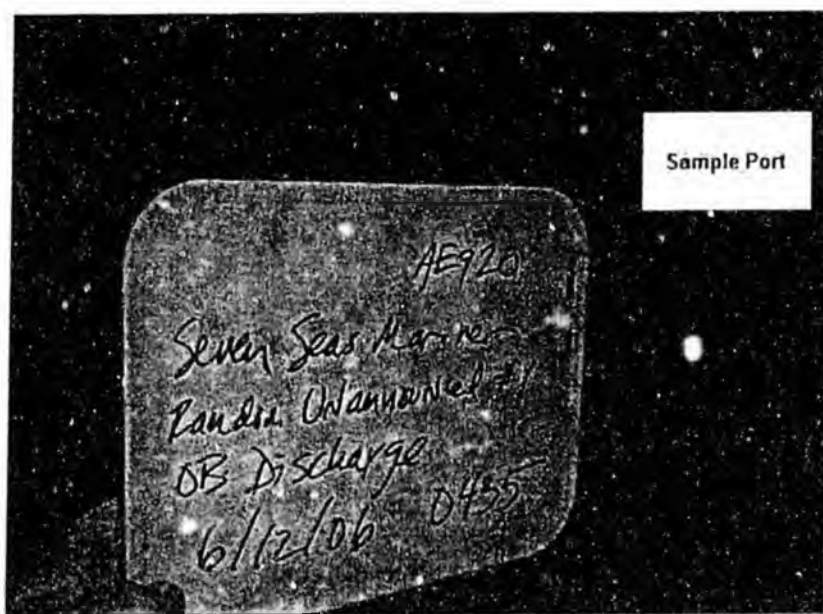


Figure 2: Required sampling event photo taken by David Wetzel.

The sampling began at 04:35 am
David donned safety gear, including:

- Laboratory Coat
- Ear Plugs
- Latex gloves

David recorded the time sampling began on each bottle and then filled the sample bottles (Figure 3) in the following order:

- Field Test Bottle (120 ml)
- Preservative Wet chemistry- NO_2/NO_3 , Ammonia, COD and Total Phosphorus (250 ml)
- Wet Chemistry- BOD, Alkalinity, pH, conductivity, TSS (1 liter)
- TKN (500 ml)
- Settable Solids (1 liter)
- Oil and Grease (1 liter-glass)
- TOC (250 ml-glass)
- Fecal Coliform- 100 ml

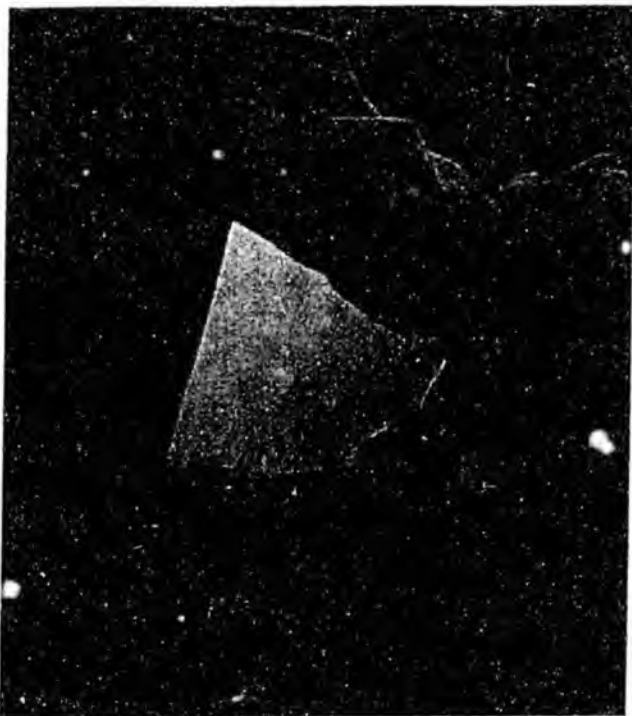


Figure 3: Seven Seas Mariner June 12, 2006 sampling event.
David Wetzel filling the sample bottle for Oil & Grease analyses.

Sample bottles were placed in the empty cooler without ice except for the FC sample which was placed in the bag of ice provided by the EE. David then proceeded with the field tests. He first took the sample temperature, which was conducted approximately 8 minutes after the filled bottle was filled with sample. Chlorine and pH were then tested for following the proper procedures per the equipment manufacturer's guidelines. The field test results were recorded in David's field notes.

Results of Field tests:

Mixed Blackwater & Graywater	
Time	04:35
Temperature	32.8
Total Chlorine	Non-detect
Free Chlorine	Non-detect
pH	7.18

David used a *HACH Pocket Colorimeter* to detect total and free chlorine. Free chlorine was tested for first with the idea that the residual may dissipate more quickly than the total chlorine. After the chlorine tests were conducted, David wiped the *HACH* equipment with *Kimwipes* lab tissue. Liquid wastes were dumped into wastewater bucket used to flush sample port. The pH field test was conducted using a calibrated *Oakton Instruments pH Tester 2* and was also wiped clean with a *Kimwipes* tissue after use.

David acquired the signature of the EE in his field notes and on the chain of custody form, and secured the documents in the sample kit Pelican case. We then proceeded to the engine control room and David immediately put samples on gel ice in the sample cooler. David then obtained a copy of the discharge log from the EE and recorded the ships position when the sampling began.

All debris except for David's gloves was placed in the cooler with the sample bottles. We disembarked in Sitka and I did not accompany David to the lab.

Recommendations

This was an excellent sample event and I can only think of a few improvements:

- The samples taken on this event were shipped back to Juneau via airplane in a cooler with gel ice packs; can't use wet ice on commercial flights. Although the FC sample was immediately placed on ice, the remaining samples were not. Not until we returned to the engine control room did the sampler add gel ice to the cooler. The sampler should put all of the samples immediately on wet ice to bring the temperature down and then replace the wet ice with gel ice upon shipping. Wet ice will bring the sample temperature down faster than gel ice and keep the samples cooler overall.
- The FC sample was placed immediately in a bag of ice, but the FC sample should be placed in an ice water bath to bring the temperature down to 4°C.
- Sampler should take the temperature of the sample with a thermometer immediately after the sample bottle (field test bottle) is filled. Typically the field test bottle is filled last and the temperature is taken right away.
- Alcohol or some kind of bactericide should be used to clean equipment after field tests are conducted for each sampling event.

**Commercial Passenger Vessel Environmental Program
ADEC Oversight Checklist**

During Water Sample Collection

- ☐ Were the samples collected from appropriate and representative locations at appropriate times? **Yes.**
- ☐ Was the sample collection time representative of the maximum usage of the wastewater treatment and discharge system? **Yes**
- ☐ Did the sampler collect the required ship records and logs, particularly the Graywater & Sewage Discharge Record Book which identifies tanks, estimates volumes and calculates discharge rates (if any) at the time the sample was drawn? **Yes**
- ☐ Did the ship representative indicate any problems with the wastewater treatment system? **No.**
- ☐ Did the samplers work in twos to assure that proper sampling techniques and note-taking? **No, ADEC approved the sampling of the Seven Seas Mariner with only one sampler.**
- ☐ Did the sampler/s use sanitary techniques? **Yes, but equipment should be sterilized with a bactericide after each sampling event.**
- ☐ Did the sampler/s wear disposable gloves, safety eye gear, tie-back suit and proper foot gear? **Yes**
- ☐ Did the sampler/s remain aware of potential safety and biohazards present? **Yes.**
- ☐ Were sample bottles all correctly prepared? **Yes.**
- ☐ Were the samples identified clearly on the sample bottles and the chain of custody form? **Yes.**
- ☐ Were the specified field measurements taken (pH, temperature, chlorine residual)? **Yes.**
- ☐ Were priority pollutant samples taken? **No**
- ☐ Was a volume of water equal to at least ten times the volume of the sample discharge line first discharged into a bucket or similar container, to clear the line of standing water and possible contamination? **Yes.**
- ☐ Were the sample bottles filled and sealed correctly? **Yes.**
- ☐ Were sample bottles cooled immediately in an ice-water bath to 4° degrees C, and placed into a cooler containing frozen blue ice to maintain a sample temperature of 2-6 degrees C? **Yes/NO, only the FC sample was cooled immediately.**
- ☐ Except for the VOC bottles, were the sample bottles filled to the shoulder of the bottle, leaving a small space for expansion and mixing? **Yes**

- ☐ Did the sample bottles for ammonia, COD, fecal coliform, oil and grease, TOC, nitrogen and phosphorus have the appropriate preservative added in the laboratory? Yes.
- ☐ If chlorine residual is detected during field measurement of chlorine, did the sampler add the sodium thiosulfate to the BNA, PCB and pesticide sample bottles until no chlorine is detected? N/A
- ☐ Was the chain of custody form correctly completed? Yes. Were any collection anomalies noted? N/A
- ☐ Did the sampler use a field log book? Yes. Note any sampling anomalies? N/A
- ☐ Did the sampler transcribe or receive copies of the required documents from the ship sewage and graywater discharge record book (recording times, volumes, and vessel location where the waste is discharged for each graywater and treated sewage discharge port)? Yes,
- ☐ Were the sample holding times met? (See QAQC) Yes.
- ☐ Did the sampler dispose of liquid and solid waste correctly? Yes
- ☐ Was sample custody maintained until delivery to lab? Yes.
- ☐ Latitude/longitude and speed at time of discharge being sampled, Yes

Date: July 19, 2006

Time: 09:45-11:00

Vessel: Westerdam

Port: Juneau

Written by: Moana Leirer (ADEC Inspector)

OBSERVATIONS:

On Wednesday July 19, 2006 09:45, Albert Faure and I met David Wetzel and Ryan Kubota with Admiralty Environmental at the Cruiseship Terminal in Juneau Alaska. My purpose was to observe the sampling procedures used for large passenger vessels under Alaska's Commercial Passenger Vessel Environmental Compliance Program. I also took additional samples for enterococcus, cyanide and PCBs. David and Ryan were sampling for conventional and priority pollutants from a mixed blackwater and graywater treatment system for the Westerdam's second random unannounced sampling event.

David and Ryan arrived with three coolers; a large, medium, and small cooler which were used to haul sample bottles grouped together within clear plastic garbage bags. The coolers did not have ice in them at this time. David and Ryan were using the extra large cooler for additional on board sampling requested by the vessel. Albert and I did not audit that portion of the sampling as it was an internal event and not for compliance purposes.

We stopped at ship security and stated our purpose. The vessel took our Alaska ID's and replaced them with visitor passes. The security officials called the engine control room, and we were met by the environmental officer (EO) Roy Powell. The EO brought us to the engine control room (ECR) where we met with the Environmental Engineer (EE) Danny Van Dijk to coordinate the sampling event. At this time the EE brought David and I to the crew mess area to get ice; Ryan and Albert waited in the ECR. David took the sample bottles out of the clear plastic bag and filled the bag with ice for the medium cooler. I filled my cooler with ice and during this time David labeled the sample bottles with sample name, vessel name, analyses and sampler identification. Once I was finished filling my cooler with ice, David prepared an ice water bath in the small cooler for the fecal coliform sample.

David and I returned to the ECR to meet up with Ryan and Albert. The EE then escorted us to the sample port. The large cooler was left in the ECR for later sampling.

Mixed Blackwater and Graywater Sampling Event:

The USCG certified this system to discharge continuously.

The EO escorted us to the overboard sampling port, which is located within 1 meter from the overboard hull penetration. The sample port was sterilized and flushed with an adequate amount of effluent from the discharge line.

David and Ryan donned safety gear, including:

- Protective lab coat
- Ear protection
- Safety glasses
- Latex gloves

While the port was flushing, David removed the ice bag from the cooler staged the bottles for sampling. At this time Ryan, prepared the field test kit and recorded the temperature of the 1 liter and 120ml temperature blanks for the large and small cooler respectively. Prior to sampling, David filled the test vial used to detect free chlorine and passed it on to Ryan.

The sampling began at 10:15am.

David put the sample time on the bottles and filled them with effluent in the following order:

- Settable Solids (1 liter)
- Wet Chemistry- BOD, Alkalinity, pH, conductivity, TSS (1 liter)
- Preserved Wet chemistry- TKN, NO₂/NO₃, Ammonia, COD, and Total Phosphorus (1 liter)
- Metals (1 liter)
- BNA
- Oil and Grease (1 liter-glass)
- TOC (250 ml-glass)
- VOC (4 40ml vials glass)
- Fecal Coliform- 100 ml
- Field Test Bottle (120 ml)

After filling the sample bottle for Fecal Coliform, David put the bottle in a plastic "Ziploc" and immediately put the sample bottle in the ice water bath along with the 120 ml temperature blank. After all the bottles were filled David transferred the bottles to the medium cooler and emptied the bag of ice over the sample bottles. The large temperature blank was added to the cooler at this time as well. Once David had filled all of his bottles, I proceeded to fill my bottles.

Ryan tested the sample (test vial) to check for free chlorine. The result for free chlorine was 0.0 mg/L. Therefore, David rinsed the ascorbic acid out of the decanting bottle before he used it to fill the VOC bottles. Ascorbic acid was not added to the BNA sample bottle.

Ryan began the field tests immediately after David filled the field test bottle. Temperature was measured immediately after the field test bottle was filled. Ryan then proceeded with the remaining tests for pH and total chlorine. Ryan recorded the field results into his notebook, and then proceeded to take get signatures from the EE, Albert and myself.

Results of Field tests & method included:

Mixed Blackwater and Graywater	
Time	10:15
Temperature C°	29.0
Total Chlorine	0.00
Free Chlorine	0.00
pH	7.34

Ryan used a *HACH Pocket Colorimeter* to detect total and free chlorine. Liquid wastes were dumped into a 1 liter container retained by the samplers. The pH field test was conducted using a calibrated *Oakton Instruments pH Tester 2*. All field test equipment was rinsed with deionized water and sterilized with alcohol after use. All debris, including used gloves and tissues were placed in the 1 liter waste container and taken off the ship.

David took a picture of the sampling port with a sign identifying the sample port, sampling event and date. We then proceeded to the engine control room where David retrieved a copy of the discharge log from the EO.

Recommendations

This was an excellent sample event and I can't think of any improvements.

**Commercial Passenger Vessel Environmental Program
ADEC Oversight Checklist**

During Water Sample Collection

- ☐ Were the samples collected from appropriate and representative locations at appropriate times? **Yes.**
- ☐ Was the sample collection time representative of the maximum usage of the wastewater treatment and discharge system? **Yes**
- ☐ Did the sampler collect the required ship records and logs, particularly the Graywater & Sewage Discharge Record Book which identifies tanks, estimates volumes and calculates discharge rates (if any) at the time the sample was drawn? **Yes**
- ☐ Did the ship representative indicate any problems with the wastewater treatment system? **No.**
- ☐ Did the samplers work in twos to assure that proper sampling techniques and note-taking? **Yes**
- ☐ Did the sampler/s use sanitary techniques? **Yes**
- ☐ Did the sampler/s wear disposable gloves, safety eye gear, tie-back suit and proper foot gear? **Yes**
- ☐ Did the sampler/s remain aware of potential safety and biohazards present? **Yes.**
- ☐ Were sample bottles all correctly prepared? **Yes.**
- ☐ Were the samples identified clearly on the sample bottles and the chain of custody form? **Yes.**
- ☐ Were the specified field measurements taken (pH, temperature, chlorine residual)? **Yes.**
- ☐ Were priority pollutant samples taken? **Yes**
- ☐ Was a volume of water equal to at least ten times the volume of the sample discharge line first discharged into a bucket or similar container, to clear the line of standing water and possible contamination? **Yes.**
- ☐ Were the sample bottles filled and sealed correctly? **Yes.**

- ☐ Were sample bottles cooled immediately in an ice-water bath to 4° degrees C, and placed into a cooler containing frozen blue ice to maintain a sample temperature of 2-6 degrees C? **Yes**
- ☐ Except for the VOC bottles, were the sample bottles filled to the shoulder of the bottle, leaving a small space for expansion and mixing? **Yes**
- ☐ Did the sample bottles for ammonia, COD, fecal coliform, oil and grease, TOC, nitrogen and phosphorus have the appropriate preservative added in the laboratory? **Yes.**
- ☐ If chlorine residual is detected during field measurement of chlorine, did the sampler add the sodium thiosulfate to the BNA, PCB and pesticide sample bottles until no chlorine is detected? **N/A; chlorine was not detected**
- ☐ Was the chain of custody form correctly completed? **Yes.** Were any collection anomalies noted? **N/A**
- ☐ Did the sampler use a field log book? **Yes.** Note any sampling anomalies? **N/A**
- ☐ Did the sampler transcribe or receive copies of the required documents from the ship sewage and graywater discharge record book (recording times, volumes, and vessel location where the waste is discharged for each graywater and treated sewage discharge port)? **Yes,**
- ☐ Were the sample holding times met? (See QAQC) **Yes.**
- ☐ Did the sampler dispose of liquid and solid waste correctly? **Yes**
- ☐ Was sample custody maintained until delivery to lab? **Yes.**
- ☐ Latitude/longitude and speed at time of discharge being sampled, **Yes**

Date: July 21, 2006

Time: 14:15-15:45

Vessel: Silver Shadow

Port: Juneau

Written by: Moana Leirer (ADEC Inspector)

OBSERVATIONS:

On Friday July 21, 2006 14:15 I met David Wetzel and Diana Cote with Admiralty Environmental at the Alaska Steamship Dock in Juneau Alaska. My purpose was to observe the sampling procedures used for large passenger vessels under Alaska's Commercial Passenger Vessel Environmental Compliance Program. David and Diana were sampling for conventional and priority pollutants from a mixed blackwater and graywater treatment system for the Silver Shadow's second random unannounced sampling event. David and Diana arrived with a medium and small cooler which were used to haul sample bottles grouped together within a clear plastic garbage bag. The coolers did not have ice in them at this time.

I was already on board the vessel conducting an ADEC vessel inspection so the Environmental Officer (EO) Marco Taccarelli escorted me to the security gate to meet with David and Diana. David and Diana cleared vessel security and we all proceeded to the engine control room (ECR). The EO then escorted us to get ice. David took the sample bottles out of the clear plastic bag and filled the bag with ice for the medium cooler. David then prepared an ice water bath in the small cooler for the fecal coliform sample.

Mixed Blackwater and Graywater Sampling Event:

The ADEC has approved this vessel to discharge continuously under AS 46.063.462(c).

The EO escorted us to the overboard sampling port, which is located within 3 feet from the overboard hull penetration. The sample port was sterilized and flushed with an adequate amount of effluent from the discharge line.

David and Diana donned safety gear, including:

- Protective lab coat
- Ear protection
- Safety glasses
- Latex gloves

While the port was flushing, David removed the ice bag from the cooler and staged the bottles for sampling. Prior to sampling, David filled the test vial used to detect free chlorine and passed it on to Diana. At this time Diana prepared the field test kit and recorded the temperature of the 1 liter and 120ml temperature blanks for the large and small cooler respectively.

The sampling began at 14:45. David put the sample time on the bottles and filled them with effluent in the following order:

- Setttable Solids (1 liter)
- Preserved Wet chemistry-TKN, NO_2/NO_3 , Ammonia, COD, and Total Phosphorus (1 liter)
- Oil and Grease (1 liter-glass)
- Wet Chemistry- BOD, Alkalinity, pH, conductivity, TSS (1 liter)
- BNA
- Metals (1 liter)
- TOC (250 ml-glass)
- Fecal Coliform- 100 ml
- VOC (6- 40ml vials glass)
- Field Test Bottle (120 ml)

After filling the sample bottle for Fecal Coliform, David put the sample bottle in a plastic "Ziploc" and immediately put it in the ice water bath along with the 120 ml temperature blank. After all the bottles were filled except for the VOC vials, David transferred the bottles to the medium cooler and emptied the bag of ice over the sample bottles. The large temperature blank was added to the cooler at this time as well. David then filled the VOC vials (Figure 1), ensured no bubbles were present and put them in the cooler with ice. David took a picture (Figure 2) of the sampling port with a sign identifying the sample port, sampling event, and date.

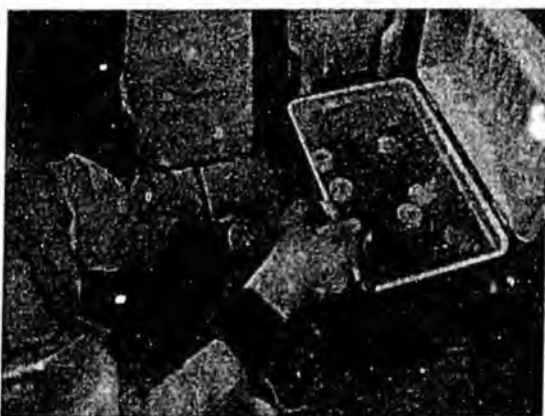


Figure 1: David Wetzel filling the VOC vials.

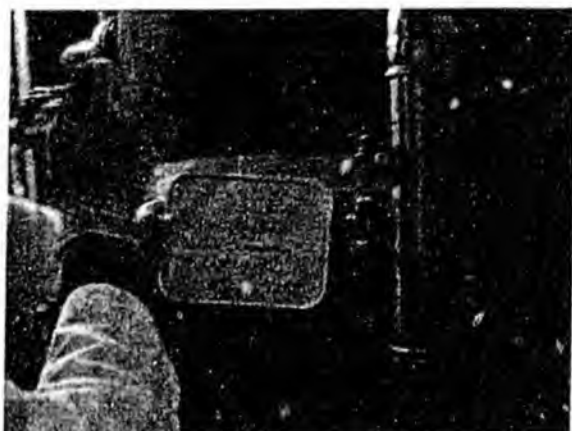


Figure 2: Picture of the sample port with sampling event information.

Diana tested the sample (test vial) to check for free chlorine prior to sampling. The result for free chlorine was 0.02 mg/L. Therefore, David rinsed the ascorbic acid out of the decanting bottle before he used it to fill the VOC bottles. Ascorbic acid was not added to the BNA sample bottle.

Diana began the field tests immediately after David filled the field test bottle (Figure 3). Temperature was measured immediately after the field test bottle was filled. Diana then proceeded with the remaining tests for pH and total chlorine. Diana recorded the field results into her notebook and on the chain of custody.

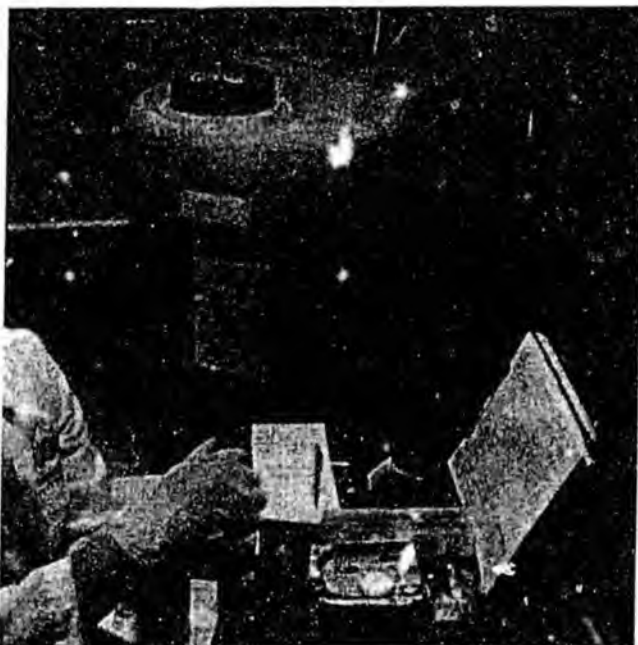


Figure 3: Diana Cote conducting field tests.

Results of Field tests included:

Mixed Blackwater and Graywater	
Time	14:45
Temperature C°	14.7
Total Chlorine	0.02
Free Chlorine	0.02
pH	6.92

Diana used a *HACH Pocket Colorimeter* to detect total and free chlorine. Liquid wastes were dumped into a 1 liter container retained by the samplers. The pH field test was conducted using a calibrated *Oakton Instruments pH Tester 2*. All field test equipment was rinsed with deionized water and sterilized with alcohol after use. All debris, including used gloves and tissues were placed in the 1 liter waste container and taken off the ship.

After the sampling was complete we proceeded to the engine control room where David retrieved a copy of the discharge log from the EO and the necessary signatures to complete the documentation.

I did not accompany David and Diana to the lab.

Recommendations

This was an excellent sample event and I can't think of any improvements.

**Commercial Passenger Vessel Environmental Program
ADEC Oversight Checklist**

During Water Sample Collection

- ☐ Were the samples collected from appropriate and representative locations at appropriate times? **Yes.**
- ☐ Was the sample collection time representative of the maximum usage of the wastewater treatment and discharge system? **Yes**
- ☐ Did the sampler collect the required ship records and logs, particularly the Graywater & Sewage Discharge Record Book which identifies tanks, estimates volumes and calculates discharge rates (if any) at the time the sample was drawn? **Yes**
- ☐ Did the ship representative indicate any problems with the wastewater treatment system? **No.**
- ☐ Did the samplers work in twos to assure that proper sampling techniques and note-taking? **Yes**
- ☐ Did the sampler/s use sanitary techniques? **Yes**
- ☐ Did the sampler/s wear disposable gloves, safety eye gear, tie-back suit and proper foot gear? **Yes**
- ☐ Did the sampler/s remain aware of potential safety and biohazards present? **Yes.**
- ☐ Were sample bottles all correctly prepared? **Yes.**
- ☐ Were the samples identified clearly on the sample bottles and the chain of custody form? **Yes.**
- ☐ Were the specified field measurements taken (pH, temperature, chlorine residual)? **Yes.**
- ☐ Were priority pollutant samples taken? **Yes**
- ☐ Was a volume of water equal to at least ten times the volume of the sample discharge line first discharged into a bucket or similar container, to clear the line of standing water and possible contamination? **Yes.**
- ☐ Were the sample bottles filled and sealed correctly? **Yes.**

- ☐ Were sample bottles cooled immediately in an ice-water bath to 4° degrees C, and placed into a cooler containing frozen blue ice to maintain a sample temperature of 2-6 degrees C? Yes
- ☐ Except for the VOC bottles, were the sample bottles filled to the shoulder of the bottle, leaving a small space for expansion and mixing? Yes
- ☐ Did the sample bottles for ammonia, COD, fecal coliform, oil and grease, TOC, nitrogen and phosphorus have the appropriate preservative added in the laboratory? Yes.
- ☐ If chlorine residual is detected during field measurement of chlorine, did the sampler add the sodium thiosulfate to the BNA, PCB and pesticide sample bottles until no chlorine is detected? N/A; chlorine was not detected at a significant amount.
- ☐ Was the chain of custody form correctly completed? Yes. Were any collection anomalies noted? N/A
- ☐ Did the sampler use a field log book? Yes. Note any sampling anomalies? N/A
- ☐ Did the sampler transcribe or receive copies of the required documents from the ship sewage and graywater discharge record book (recording times, volumes, and vessel location where the waste is discharged for each graywater and treated sewage discharge port)? Yes,
- ☐ Were the sample holding times met? (See QAQC) Yes.
- ☐ Did the sampler dispose of liquid and solid waste correctly? Yes
- ☐ Was sample custody maintained until delivery to lab? Yes.
- ☐ Latitude/longitude and speed at time of discharge being sampled, Yes

Date: July 27, 2006

Time: 09:30-2:00

Vessel: Ryndam

Port: Juneau

Written by: Moana Leirer (ADEC Inspector)

OBSERVATIONS:

On Thursday July 27, 2006 09:30, Albert Faure and I met David Wetzel and Tessina Davidson of Admiralty Environmental at the Alaska Steamship Dock in Juneau Alaska. Our purpose was to observe the sampling procedures used for large passenger vessels under Alaska's Commercial Passenger Vessel Environmental Compliance Program. David and Tessina were sampling for conventional and priority pollutants from a mixed blackwater and graywater treatment system for the Ryndam's second random unannounced sampling event. They were took a blind duplicate sample as per the 2006 Northwest Cruise Association's (NWCA) Quality Assurance Quality Control Plan (QAQCP).

David and Tessina arrived with one large cooler and one small cooler. The large cooler was used to haul sample bottles grouped together within clear plastic garbage bags. The large and small cooler also contained a 1 liter and 120 ml liter temperature blank respectively. The cooler did not have ice in it at the time. They also had a 10 liter cubitainer to use for the duplicate sampling.

We stopped at ship security and stated our purpose. The vessel took our Alaska ID's and received them with visitor passes. The security officials called the engine control room, and we were met by the environmental officer (EO) Eddy Swift. The EO brought us to the galley to get ice. David took the sample bottles out of the clear plastic bags and filled the bags with ice for the large cooler. At this time Tessina removed the temperature blanks from the coolers and put them in her lab coat pocket. David prepared an ice water bath in the small cooler for the fecal coliform samples. The bags of ice and sample bottles were then placed into the cooler for transport.

We then proceeded to the engine control room (ECR) and on to the overboard discharge sample port.

Mixed Blackwater and Graywater Sampling Event:

The USCG certified this system to discharge continuously.

The EO escorted us to the overboard sampling port post UV at Frame 151. The sampling port is located within 11.5 meters (~37 feet) from the overboard hull penetration. The sample port was flushed for approximately 45 seconds draining an adequate amount of effluent from the discharge line.

David and Tessina donned safety gear, including:

- Protective lab coat
- Ear protection
- Safety glasses
- Latex gloves

David first filled the small test vial for Free chlorine testing and handed it over to Tessina; Tessina then tested the effluent for Free chlorine. David verified with the EO that the ship was actually discharging and began to stage out the sample bottles to be filled.

The sampling began at 10:16am.

David began to fill the 10 liter cubitainer, which he would use to fill the Conventional Pollutant sample bottles. Once the cubitainer was filled David shook the container to mix the effluent within.

The Ryndam's sample bottles were pre-labeled with vessel name, date, sampling event and sampler names. Prior to sampling, David put the time on the Ryndam's sample bottles. The blind duplicate sample bottles did not include the vessel name or the sample time. David did include the sample time for both sample sets within the field notes. David then filled the sample bottles from the 10 liter cubitainer in the following order:

- Field Test Bottle (120 ml)
- Field Test Bottle (120 ml)- **DUPLICATE**
- Wet Chemistry- BOD, Alkalinity, pH, conductivity, TSS (1 liter)
- Wet Chemistry- BOD, Alkalinity, pH, conductivity, TSS (1 liter)- **DUPLICATE**
- Preserved Wet Chem. -TKN, NO₂/NO₃, Ammonia, COD, & T. Phosphorus (1 liter)
- Preserved Wet Chem-TKN, NO₂/NO₃, Ammonia, COD, & T. Phosphorus (1 liter)- **DUPLICATE**
- Oil and Grease (1 liter-glass)
- Oil and Grease (1 liter-glass)- **DUPLICATE**
- TOC (250 ml-glass)
- TOC (250 ml-glass)- **DUPLICATE**
- Settable Solids (1 liter)
- Settable Solids (1 liter) **DUPLICATE**
- Fecal Coliform- 100 ml
- Fecal Coliform- 100 ml **DUPLICATE**

Note: the fecal coliform sample bottles were filled directly from the sample port.

David then filled the 10 liter cubitainer a second time to fill the Priority Pollutant bottles. David shook the effluent within the 10 liter cubitainer and filled the sample bottles in the following order:

- Metals (1 liter)
- Metals (1 liter) **DUPLICATE**
- BNA
- BNA **DUPLICATE**
- VOC (4 40ml vials glass)

- VOC (4 40ml vials glass) **DUPLICATE**

After filling the sample bottles for fecal coliform, David put the bottles in a plastic "Ziploc" and immediately put them in the ice water bath along with the 120 ml temperature blank. After all the bottles were filled David transferred the bottles to the large cooler and emptied the bag of ice over the sample bottles. The large temperature blank was added to the cooler at this time as well.

Tessina tested the sample (test vial) to check for free chlorine. The result for free chlorine was 0.03 mg/L. Therefore, David rinsed the ascorbic acid out of the decanting bottle before he used it to fill the VOC bottles. Ascorbic acid was not added to the BNA sample bottle.

Tessina began the field tests immediately after David filled the field test bottles. Temperature was measured immediately after the field test bottle was filled. Tessina then proceeded with the remaining tests for pH and total chlorine. Tessina recorded the field results into their notebook, and proceeded to take get signatures from the EO.

Prior to placing the temperature blanks in the coolers, Tessina recorded the ambient temperatures of the 1 liter and 120ml temperature blanks, which were 22.0°C and 23.3°C respectively.

Results of Ryndam sample field tests included:

Mixed Blackwater and Graywater Ryndam Sample	
Time	10:16
Temperature C°	31.6
Total Chlorine	0.00
Free Chlorine	0.03
pH	7.82

Results of Duplicate sample field tests included:

Mixed Blackwater and Graywater Duplicate Sample	
Time	10:16
Temperature C°	31.4
Total Chlorine	0.00
Free Chlorine	0.03
pH	7.78

Tessina used a *HACH Pocket Colorimeter* to detect total and free chlorine. Liquid wastes were dumped into a 1 liter container retained by the samplers. The pH field test was conducted using a calibrated *Oakton Instruments pH Tester 2*. All field test equipment was rinsed with deionized water and sterilized with alcohol after use. All debris, including used gloves and tissues were placed in the 1 liter waste container and taken off the ship.

Tessina took a picture of the sampling port with a sign identifying the sample port, sampling event and date. We then proceeded to the engine control room where David retrieved a copy of the discharge log from the EO.

In order for the blind duplicates to remain unknown to the laboratory, David and Tessina sampled the m/v *Infinity* for Conventional and Priority Pollutants immediately after the Ryndam event. The idea is that when the samplers arrive at the lab they will have three sets of Conventional and Priority Pollutant sample bottles. One set for the *Infinity*, one for the *Ryndam* and one for the blind duplicate.

The chain of custody (COC) for the blind duplicate sample did not include the sample time or field test results. Therefore, the laboratory can not determine whether the blind duplicate samples belong to the *Infinity* or the *Ryndam*. The samplers retain the blind duplicate information in their field notes for reference.

I met up with Tessina after the *Infinity* sampling event and accompanied her to the lab for sample delivery. Tessina relinquished the samples to Sally Wanstall of Analytica at 14:00. The *Ryndam* and the *Infinity* samples were in the same cooler (large cooler) and the blind duplicate samples were in a cooler alone. All of the fecal coliform samples were in the small cooler together. Sally unloaded the coolers and measured the temperature blank of all three coolers and recorded them on the chain of custody's. The temperature of the large cooler was 0.5°C. The blind duplicate cooler temperature was 6.0°C, and the fecal coliform cooler's temperature was 1.0°C.

Sally checked the pH level in the preserved sample containers to ensure proper preservation. All samples had a pH less than 2. Sally also checked the VOC vials for bubbles; there were no bubbles present. Sally moved all samples to the receiving refrigerator and made a copy of the chain of custody for Tessina's records.

Recommendations

This was an excellent sample event and I can't think of any improvements.

**Commercial Passenger Vessel Environmental Program
ADEC Oversight Checklist**

During Water Sample Collection

- ☐ Were the samples collected from appropriate and representative locations at appropriate times? Yes.
- ☐ Was the sample collection time representative of the maximum usage of the wastewater treatment and discharge system? Yes
- ☐ Did the sampler collect the required ship records and logs, particularly the Graywater & Sewage Discharge Record Book which identifies tanks, estimates volumes and calculates discharge rates (if any) at the time the sample was drawn? Yes
- ☐ Did the ship representative indicate any problems with the wastewater treatment system? No.
- ☐ Did the samplers work in twos to assure that proper sampling techniques and note-taking? Yes
- ☐ Did the sampler/s use sanitary techniques? Yes
- ☐ Did the sampler/s wear disposable gloves, safety eye gear, tie-back suit and proper foot gear? Yes
- ☐ Did the sampler/s remain aware of potential safety and biohazards present? Yes.
- ☐ Were sample bottles all correctly prepared? Yes.
- ☐ Were the samples identified clearly on the sample bottles and the chain of custody form? Yes.
- ☐ Were the specified field measurements taken (pH, temperature, chlorine residual)? Yes.
- ☐ Were priority pollutant samples taken? Yes
- ☐ Was a volume of water equal to at least ten times the volume of the sample discharge line first discharged into a bucket or similar container, to clear the line of standing water and possible contamination? Yes.
- ☐ Were the sample bottles filled and sealed correctly? Yes.

- ☐ Were sample bottles cooled immediately in an ice-water bath to 4° degrees C, and placed into a cooler containing frozen blue ice to maintain a sample temperature of 2-6 degrees C? Yes
- ☐ Except for the VOC bottles, were the sample bottles filled to the shoulder of the bottle, leaving a small space for expansion and mixing? Yes
- ☐ Did the sample bottles for ammonia, COD, fecal coliform, oil and grease, TOC, nitrogen and phosphorus have the appropriate preservative added in the laboratory? Yes.
- ☐ If chlorine residual is detected during field measurement of chlorine, did the sampler add the sodium thiosulfate to the BNA, PCB and pesticide sample bottles until no chlorine is detected? N/A; chlorine was not detected
- ☐ Was the chain of custody form correctly completed? Yes. Were any collection anomalies noted? N/A
- ☐ Did the sampler use a field log book? Yes. Note any sampling anomalies? N/A
- ☐ Did the sampler transcribe or receive copies of the required documents from the ship sewage and graywater discharge record book (recording times, volumes, and vessel location where the waste is discharged for each graywater and treated sewage discharge port)? Yes,
- ☐ Were the sample holding times met? (See QAQC) Yes.
- ☐ Did the sampler dispose of liquid and solid waste correctly? Yes
- ☐ Was sample custody maintained until delivery to lab? Yes.
- ☐ Latitude/longitude and speed at time of discharge being sampled, Yes

Responsibilities outlined in NWCA 2006 QAQC Plan

The sampler

- notified the ADEC of its intent to sample at least 36 hours prior to sample collection. YES
- identified sample name clearly on the chain of custody and sample bottles. YES
- Collected field notes in bound field notebooks with numbered pages. YES
- On-board staff will witness the sampling and will initial the field notes. YES

**Passenger Vessel Wastewater Sampling Procedures Inspection
Review for Priority Pollutants**

For the

Volendam @ Juneau Dock

Conducted May 19, 2006, 3:35 PM

Observations and Concerns

**Passenger Vessel Wastewater Sample Login Procedures
Inspection Review for Priority Pollutants**

For the

Norwegian Sun and Norwegian Star @ Juneau Dock

Conducted May 23, 2006, 4:00 PM

Observations and Concerns

Submitted by

Lisa Hoferkamp
University of Alaska Southeast
Dept. Natural Sciences
11120 Glacier Highway
Juneau, AK 99801
May 28, 2006

Attachments:

Completed "2006 Cruise Ship Wastewater Discharge Monitoring Program Quality Assurance/Quality Control Sampling Audit Checklist" and "Sample Check-in Audit Checklist"

Note: The Sampling Audit (Volendam) and the Sample Login Audit (Norwegian Sun and Norwegian Star) were completed on different dates. Reference to each specific audit is clearly indicated within the body of this report.

Observations:

Sampling Audit of M/S Volendam on 5/19/06

At 3:00 PM, Friday, May 17, 2005, the QA/QC officer arrived at the Junczu, AK docking point of the M/V Volendam. At 3:25 PM sampling personnel Tessina Davidson and Ryan Kubota of Admiralty Environmental Inc joined me at the gangway with the sampling containers and equipment. We boarded the ship, were issued identification cards and were then met by David Carlisle, engineering assistant for the Volendam. The group then proceeded to a galley area to secure ice for the sampling coolers. It was noted that the main sampling cooler was charged with ice while the smaller cooler (for fecal coliform sample) was charged with ice and a small amount of water. After charging the coolers with ice the entire group proceeded below deck to the sampling port. Mr. Kubota confirmed that the ship was currently discharging. At this point Mr. Carlisle produced discharge logs and Mr. Kubota reviewed them. Sampling personnel donned the following safety gear:

- TYVEK suit
- safety glasses
- latex gloves
- hearing protection

The sampling port was opened and allowed to purge. After adequate purge, a sample was collected by Mr. Kubota and passed to Ms. Davidson. As Ms. Davidson began shipboard measurements of temperature, pH and chlorine with this sample, Mr. Kubota proceeded to collect samples for off-site testing purposes. Ms. Davidson began the collection of shipboard notes, recording temperature, pH, residual and free chlorine as she completed these tests. It was noted that all waste was collected in an appropriately labeled polyethylene bottle and removed from the ship by the sampling team.

Field Tests:

A 120 mL polypropylene bottle was used for onsite measurement of pH, temperature and residual chlorine. The following tests were conducted onboard with a waste-stream sample and the results entered into the field notebook and onto the Chain of Custody form:

pH – handheld meter
pH = 7.78
residual Cl_2 – test kit.
residual/total Cl_2 = 0.06/0.03
temperature – handheld electronic probe

The calibration date on the pH meter, the visible spectrometer used in Cl_2 determinations and the temperature probe was requested. Calibration dates (5/01/06) were in agreement with the 2006 QA/QC Plan.

The QA/QC officer did not specifically hear either of the sampling personnel verify the location of the sampling port relative to the UV treatment and discharge point (within 50 ft). When asked about the location of the sampling port by the QA/QC officer, Mr. Carlisle pointed to a sign located above the sampling port indicating that port to be the one specified in the Volendam VSSP.

Sampling containers used in sample collection had been previously labeled with date and nature of sample. The type of sampling container, headspace and the presence of the appropriate preservative was verified (see attached audit checklist). It was noted that the preservative for the TOC sample differed from that listed in the 2006 QA/QC Plan. Once samples were collected, Mr. Kubota placed temperature blanks into both coolers followed by the filled sample bottles.

Treated wastewater sampling (points of interest are indicated by *):

- BOD/TSS/pH/EC/Alkalinity
 - ◆ The bottle was properly labeled.
 - ◆ The proper headspace and preservative requirements were verified.
- COD/ $\text{NH}_3/\text{N}_2/\text{NO}_3/\text{P}(\text{total})$
 - ◆ The bottle was properly labeled.
 - ◆ The proper headspace and preservative requirements were verified.
- TKN
 - ◆ The bottle was properly labeled.
 - ◆ The proper headspace and preservative requirements were verified.
- TOC
 - ◆ A 125 mL amber bottle was properly labeled.
 - ◆ The proper headspace was verified.
 - * Ascorbic acid was used as preservative.
- Settleable Solids
 - ◆ The bottle was properly labeled.
 - ◆ The proper headspace and preservative requirements were verified.

- Oil and Grease
 - ◆ The bottle was properly labeled.
 - ◆ The proper headspace and preservative requirements were verified.
- Fecal Coliforms
 - ◆ The bottle was properly labeled.
 - ◆ The proper headspace and preservative requirements were verified.
 - * The temperature blank for this sample was not checked prior to introduction of the sample.

After completing sample collection, a placard containing appropriate sampling information was placed in front of the sampling port and Mr. Kubota photographed the sampling port. Mr. Kubota then began the Chain of Custody form for this sampling event with the appropriate reference information and collected the appropriate signatures (from shipboard assistant) for the CoC form and the shipboard notes. The samplers then removed sampling safety apparel, collected coolers and any waste and followed Mr. Carlisle back to the entry gangway where we returned identification cards and exited the ship.

Circumstances did not allow the QA/QC officer to follow the samplers to the contracting laboratory for the sample check-in audit so it was agreed that sampling events scheduled for 5/23/06 would be used for the sample check-in audit.

Recommendations:

- The preservative for the TOC sample listed in the 2006 QA/QC Plan should be amended from H_2SO_4 to ascorbic acid.
- The temperature blanks for both receiving coolers should be installed immediately upon charging the coolers with ice.
- The temperatures of the receiving coolers should be verified prior to placing samples into the coolers.

Sample Login Audit for samples collected from M/V Norwegian Sun and Norwegian Star on 5/23/06

On 5/23/06 at 4:00 PM, the QA/QC officer met Admiralty Environmental Inc. sampling personnel Tessina Davidson and Ryan Kubota at Analytica Alaska Inc, Juneau, AK. Ms. Davidson and Mr. Kubota had just completed conventional sampling of the M/V Norwegian Star and had earlier that day completed conventional sampling of the M/V Norwegian Sun and were submitting the samples from both of these events to the contracting laboratory for testing. In total there were 3 coolers containing samples and the QA/QC officer observed Ms. Davidson and Mr. Kubota relinquish custody of these three coolers to Analytica Inc. sample custodian Sally Wanstall at approximately 4:05 PM. None of the coolers were sealed with custody tape. Upon relinquishing the coolers Mr. Kubota informed Ms. Wanstall that there were three sets of samples and that one of those sets was a duplicate sample. Mr. Kubota did not reveal which of the conventional

sampling events was duplicated and nowhere on the duplicate bottle's labeling was it apparent which of the two ship's samples had been duplicated. Mr. Kubota gave the Chain of Custody forms to Ms. Wanstall and signatures were checked.

Upon receiving the coolers Ms. Wanstall, assisted by Levi Wanstall proceeded to check temperature blanks, check pH on the samples preserved with acid and complete the chain of custody forms. Temperature blanks on all coolers were within the limits defined in the 2006 QA/QC Plan. Clean techniques were followed during pH verification. The temperature blank data was entered onto the relevant Chain of Custody form and dates and other relevant information completed. The samples were logged and fecal coliform samples were promptly refrigerated. The temperatures of the refrigerators used for sample storage were within the limits defined in the 2006 QA/QC Plan (F.C. = 4.2°C, other = 5°C). It was noted that the remaining samples requiring refrigeration would be further processed and if required, cooled within the hour.

Recommendations:

- When more than one ship is sampled and it is necessary to delay delivery of the first set of samples to the contracting laboratory, custody tape should be used to seal coolers containing this first set of samples given that this cooler will most likely not remain within the sampler's line of sight at all times prior to submission to the contracting laboratory.
- As per the 2006 QA/QC Plan, Chain of Custody forms are to be placed into the cooler containing the relevant samples.

The Admiralty Environmental Inc. sampling team works together very efficiently and shows great care and attention in performing the sampling tasks. Analytica Alaska Inc. personnel demonstrate very professional and efficient processing of field samples.

Clarification on any portion of this report may be directed to:

Lisa Hoferkamp
Dept. Natural Sciences
University of Alaska Southeast
11120 Glacier Highway
Juneau, AK 99801
(907) 465-8538
jflh@uas.alaska.edu

**Passenger Vessel Wastewater Sampling and Sample Login
Procedures Inspection Review for Priority Pollutants**

for the

Island Princess @ Juneau Dock

Conducted June 23, 2006, 10:25 AM

Observations and Concerns

Submitted by

Lisa Hoferkamp
University of Alaska Southeast
Dept. Natural Sciences
11120 Glacier Highway
Juneau, AK 99801
July 4, 2006

Attachments:

Completed "2006 Cruise Ship Wastewater Discharge Monitoring Program Quality Assurance/Quality Control Sampling Audit Checklist"

Observations:

At 10:00 AM, Friday, June 23, 2006, I arrived at the Juneau, AK docking point of the M/V Island Princess. Sampling personnel Tessina Davidson and David Wetzel of Admiralty Environmental Inc arrived at the gangway with the sampling containers and equipment at 10:25 AM. The three of us boarded the ship and after obtaining the proper shipboard passes, were met by Mr. Krasimer, Environmental Officer for the Island Princess. Mr. Wetzel then proceeded to explain that this particular sampling event would take place in two parts. The first part involved collection of a sample from a point immediately after the UV treatment that would be used for comparison and validation of the Island Princess' independent wastewater testing methods. I did not audit this part of the sampling event. The second part of the sampling event involved collection and testing of wastewater samples immediately prior to overboard discharge in compliance with the 2006 Cruise Ship Wastewater Discharge Monitoring Program. The second part of the sampling event was that which is described in this report. Before beginning the sampling event, Mr. Wetzel requested ice for the sampling coolers which was then obtained from the ice machine of a nearby galley. The group went to the engine room where Mr. Wetzel verified that the ship was currently discharging. The group then proceeded below deck to the location of the first part of the sampling event. At this point Admiralty Environmental personnel donned the appropriate safety gear (see below) and proceeded to carry out on-site testing of Island Princess wastewater. Safety gear used in this sampling event included:

- TYVEK suit
- safety glasses
- latex gloves
- hearing protection

Upon completing the first part of the sampling event, the group proceeded to the sampling port described within the 2006 Island Princess VSSP and Mr. Wetzel confirmed the location of the sampling port (within 50 ft of the overboard discharge). Mr. Krasimer then opened the sampling port and allowed it to purge into a catch basin. While the sampling port was purging Mr. Wetzel and Ms. Davidson prepared sampling containers. The correct labeling, type of each container and presence of appropriate preservative was verified (see sampling checklist). At 11:25 AM Mr. Wetzel collected a sample from the wastewater stream which he passed to Ms. Davidson. Ms. Davidson proceeded to conduct on-site field tests on this wastewater sample. Results from these field tests follow.

- pH = 6.97
- T = 37.8 °C

- Cl_2 (free) = 0.01 ppm
- Cl_2 (free) = 0.09 ppm

Ms. Davidson was careful to rinse probes and containers adequately thus avoiding any major cross contamination. She very efficiently completed field tests and accurately recorded results in the field notebook. Waste from field tests was properly collected and removed from the ship. Calibration dates for field equipment was readily available and acceptable according to the 2006 QA/QC Plan. It was noted that the method used for introduction of the Cl_2 reagent may result in cross contamination but at the levels under investigation, this does not constitute a significant source of error.

While Ms. Davidson completed field tests, Mr. Wetzel collected the remaining samples required under the 2006 Cruise Ship Waste Water Discharge Monitoring Program. During sample collection, I verified that the appropriate headspace for each of the samples was as per the QA/QC plan (see sampling checklist). Once collected, samples were placed into the coolers along with the temp blanks. The temperature of the temp blanks was verified (24°C and 26°C for F.C.) and recorded in the field notebook. A photograph of the sample port was obtained along with the required initials from the assisting environmental officer (field notes and Chain of Custody). Mr. Wetzel also completed an Admiralty Environmental sampling checklist.

Upon completing sample collections and field parameter determinations the group proceeded to the control room where the ship's discharge logs with relevant tank volumes were obtained.

Ms. Davidson, Mr. Wetzel and I exited from the ship and returned to Analytica Alaska Inc. (5438 Shaune Dr., Juneau, AK). I observed Mr. Wetzel relinquish custody of the sample coolers to sample custodian Sally Wanstall at 12:30 PM. Sample holding times were met. The temperature of the sample blank representing the bulk of the samples was noted at 2.1°C while the sample blank representing the fecal coliform sample was noted at 0.7°C . The fecal coliform sample was transferred to a storage refrigerator maintained at 3.4°C . VOC vials were checked for air bubbles and their absence or presence noted (one VOC vial contained a small air bubble). The pH of samples to be used for TKN and total phosphorous was confirmed. Except for samples to be used for SS, BOD and metals determinations, all bottles were transferred to a holding refrigerator maintained at 5°C . SS, BOD and metals samples were left on the benchtop in order to warm to room temperature. It was verified that upon attaining RT, the metals sample would be divided, one-half filtered and both halves then properly preserved. SS and BOD samples would also be properly processed upon reaching RT.

Recommendations:

- No changes to sampling and processing practices are recommended at this time.

The Admiralty Environmental Inc. and Analytica Alaska Inc. personnel are commended for their professional and efficient collection and processing of field samples.

Clarification on any portion of this report may be directed to:

Lisa Hoferkamp
Dept. Natural Sciences
University of Alaska Southeast
11120 Glacier Highway
Juneau, AK 99801
(907) 796-6538
iflh@uas.alaska.edu

STATE OF ALASKA

**DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF WATER
COMMERCIAL PASSENGER VESSEL ENVIRONMENTAL COMPLIANCE PROGRAM**

SARAH PALIN, GOVERNOR
410 Willoughby Avenue, Suite 303
P.O. Box 111800
Juneau, Alaska 99811-1800
PHONE: (907) 465-5300
FAX: (907) 465-5274
<http://www.state.ak.us/DEC/>

February 28, 2007

Subject: Alaska's Commercial Passenger Vessel Annual Registration and Reporting Large Vessels

Dear Sir or Madam:

Thank you for choosing Alaska as a destination for your vessel.

The Commercial Passenger Vessel Environmental Compliance (CPVEC) Program is established by Alaska Statute (AS) 46.03.460 – 46.03.490 and 18 AAC 69. The Alaska Department of Environmental Conservation (ADEC) Division of Water administers this program, which addresses wastewater discharges, hazardous wastes and solid wastes, and directly monitors air opacity of vessels operating in Alaska waters.

Under the CPVEC program, vessel owners or operators who intend to operate in Alaska marine waters in 2007 are required to submit several documents listed in Table 1.

In an effort to reduce paper consumption, ADEC will NOT send hardcopies of the registration documents via certified mail to the 2006 vessel contacts as we have done in the past. The 2007 registration includes an on-line registration system; the on-line registration allows vessel owners or operators to attach the support documentation. Please note that the ADEC website at http://www.dec.state.ak.us/water/cruise_ships/07reg/CPVEC_reg_step_by_step.pdf includes a complete (printable) set of instructions "2007 Registration Step by Step".

The only document the vessel owner or operator must send through the mail is the original notarized vessel owner or operator's signature page.

The 2007 on-line registration includes per voyage¹ fee requirements for:

- The Environmental Compliance Fee for commercial passenger vessels pursuant A.S. 46.03.480; and
- The Ocean Ranger Fee for large commercial passenger vessels (\$4 per berth) pursuant to 46.03.476 and AS 46.03.480(d).

Please note that for the 2007 season ADEC will accept registrations till March 31, 2007.

As you may be aware, ADEC is developing program changes to implement Ballot Measure 2 (the "Cruise Ship Initiative"), including development of wastewater discharge permits and an Ocean Rangers program. Vessels that discharge wastewater in Alaska this season may need to submit additional information to ADEC for authorization under a new general permit for large commercial passenger vessels. ADEC intends to issue a general permit this cruise season. Opportunity for public comment will be included in the review of the draft permit. Other forums for public comment on the Ocean Ranger program are planned as ADEC proceeds with ballot measure implementation.

¹ A voyage is defined as "vessel trip to or from one or more ports of call in the state with the majority of passengers for hire completing the entire vessel trip; a vessel trip involving stops at more than one port of call is considered a single voyage so long as the majority of passengers for hire complete the entire trip." (AS 46.03.490(17))

Documents are available both in PDF and WORD versions, and are available at the ADEC website http://www.dec.state.ak.us/water/cruise_ships/07regletter.htm or upon request.

Table 1. Schedule and Description of CPVEC Requirements

Document	Authority	Due Date ²
Registration	AS 46.03.461, 18 AAC 69.010	March 31, 2007
Quality Assurance/ Quality Control Plan (QAQCP)	AS 46.03.465(b), 18 AAC 69.025	March 31, 2007
Non-hazardous Solid Waste Offloading and Disposal Plan	AS 46.03.475(e)(1), 18 AAC 69.035	March 31, 2007
Hazardous Waste and Substance Offloading Plan	AS 46.03.475(e)(2), 18 AAC 69.040	March 31, 2007
Environmental Compliance Fee	AS 46.03.480, 18 AAC 69.015	June 1, 2007
Vessel Specific Sampling Plan (VSSP)	18 AAC 69.030	21 days before sampling as required under AS 46.03.465

Vessel owners/operators discharging wastewater into the marine waters of the state³ are required to take and pay for at least two wastewater samples in accordance with an ADEC-approved technique (QAQCP). Vessel owners or operators can use the 2007 Northwest Cruise Ship Association (NWCA) Quality Assurance/Quality Control Plan available at http://www.state.ak.us/dec/water/cruise_ships/industrylinks.htm or submit their own QAQCP for ADEC approval. Owners or operators following the 2007 NWCA QAQCP must contact Analytica Alaska directly at (907) 780-6668 to arrange sampling for the 2007 season.

ADEC is authorized to take additional wastewater samples, but these samples do not count toward the two required samples. It is imperative that the samples are taken *while the vessel is discharging*. A copy of the discharge log will be required for the day that the sample was taken.

Please submit all CPVEC correspondence, support documents, and reports to:

Mr. Albert Faure

Commercial Passenger Vessel Environmental Compliance Program

Alaska Department of Environmental Conservation

410 Willoughby Avenue, Suite 303

P.O. Box 111800

Juneau, AK 99811-1800

albert_faure@dec.state.ak.us

² For the 2007 Season only ADEC will accept registrations until March 31, 2007.

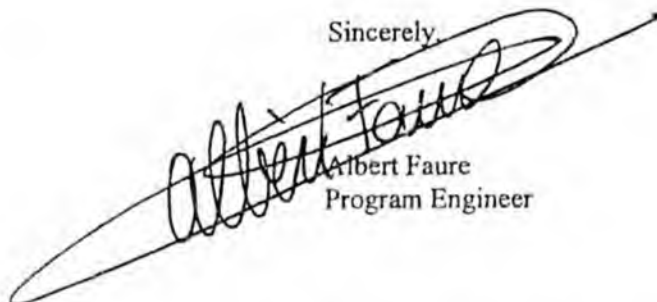
³ Marine waters of the state are generally defined as three nautical miles from coast and all waters of the Alexander Archipelago (Inside Passage). For specific latitude and longitude, see Alaska statute 46.03.490.

Other documents included with this letter contain pertinent information for vessels operating in Alaska. For example, attached is information on Alaska's marine emission standard and a document describing ADEC Spill Prevention and Response's program to prevent oil spills from non-tank vessels including the required Alaska Certificate of Financial Responsibility (COFR) and Contingency Plan (C-Plan) information and application. Also included with this letter a list of URL links to useful state websites.

Please feel free to contact me at (907) 465-5279 or by e-mail to discuss CPVEC program requirements.

We appreciate your cooperation and willingness to work with us in the past and look forward to working with you during 2007.

Sincerely,

A handwritten signature in black ink, appearing to read 'Albert Faure', is written over a horizontal line. The signature is stylized and cursive.

Albert Faure
Program Engineer

Attachments: 2007 On-line registration "2007 registration Step by Step"
Useful State Websites
Support Documents:
Description of Required Plans
2007 Vessel Specific Sampling Plan Form
Alaska Opacity and Excess Emissions Regulations
Marine Vessel Excess Emission Notification Form
COFR and C-Plan Requirements

Useful State websites

Wastewater

The CPVEC program

http://www.state.ak.us/dec/water/cruise_ships/index.htm

Pay special attention to the owner and operator page

http://www.state.ak.us/dec/water/cruise_ships/industrylinks.htm

2007 Cruise Ship Registration Step by Step

http://www.dec.state.ak.us/water/cruise_ships/07reg/CPVEC_reg_step_by_step.pdf

Alaska Statute (46.03.460- 46.03.490)

[http://www.legis.state.ak.us/cgi-](http://www.legis.state.ak.us/cgi-bin/folioisa.dll/stattx02/qucry=[group+title46]/doc/{@61}/hits_only?)

[bin/folioisa.dll/stattx02/qucry=\[group+title46\]/doc/{@61}/hits_only?](http://www.legis.state.ak.us/cgi-bin/folioisa.dll/stattx02/qucry=[group+title46]/doc/{@61}/hits_only?)

CPVEC program regulations (18 AAC 69)

[http://www.legis.state.ak.us/cgi-](http://www.legis.state.ak.us/cgi-bin/folioisa.dll/aac/query=%5Bgroup+title18chap69!3A%5D/doc/%7B@1%7D/hits_only?)

[bin/folioisa.dll/aac/query=%5Bgroup+title18chap69!3A%5D/doc/%7B@1%7D/hits_only?](http://www.legis.state.ak.us/cgi-bin/folioisa.dll/aac/query=%5Bgroup+title18chap69!3A%5D/doc/%7B@1%7D/hits_only?)

Visible Emissions (Opacity Requirements)

Air Quality regulations 18 AAC 50

http://www.state.ak.us/dec/water/cruise_ships/Law%20and%20Regs/lawregs.htm

Cruise Ship Excess Emission Form under Cruise Ship Excess Emissions Self Report

http://www.state.ak.us/dec/water/cruise_ships/industrylinks.htm

Oil Spill Prevention Requirements (COFR and C-Plan)

Non-tank Vessel Certificate of Financial Responsibility (COFR) program and Contingency Plan (C-Plan) information can be found at the following websites:

COFR INFO:

http://www.state.ak.us/dec/spar/ipp/fr_nontank.htm, and

A blank Alaska COFR application form is available on-line at:

<http://www.state.ak.us/dec/spar/ipp/fr&pi.htm#forms>

See: Non-tank Vessel Financial Responsibility Application (PDF 103K)

C-Plan INFO:

<http://www.state.ak.us/dec/spar/ipp/nontank.htm>

A blank Alaska C-Plan application form is available on-line at:

<http://www.state.ak.us/dec/spar/ipp/docs/revdocs/nteqapp.pdf>

Instruction Sheet

<http://www.state.ak.us/dec/spar/ipp/docs/revdocs/ntvslinst.pdf>

Alaska Statute 46.04.055, covering non-tank vessel financial responsibility and c-plans can be found at the following website:

<http://touchngo.com/lglcntr/akstats/Statutes/Title46/Chapter04/Section055.htm>

Financial Responsibility regulations 18 AAC 75 Article 2 can be found at the following website:

Beginning on pg. 19 of: <http://www.state.ak.us/dec/regulations/pdfs/75mas.pdf>

**Alaska's Requirements for Non-tank Vessels
Certificate of Financial Responsibility (COFR) and
Contingency Plans (C-Plans)**

Alaska law requires owners and operators of non-tank vessels over 400 Gross Registered Tons to submit an application form and proof of financial responsibility in order to be awarded an Alaska Certificate of Financial Responsibility (COFR). This proof shows ADEC that the owner or operator has sufficient funds to clean up an oil spill from their vessel, should one occur. ADEC must also approve a non-tank vessel Oil Discharge Prevention and Contingency Plan, which demonstrates that resources and personnel will be available to clean up a spill.

COFR INFO: <http://www.dec.state.ak.us/spar/ipp/fr&pi.htm>

A blank Alaska COFR application form is available online:

<http://www.dec.state.ak.us/spar/ipp/docs/ntapplic.pdf>

1) Companies with vessels not currently holding a valid Alaska COFR will need to send a completed and notarized new application form (download it from the website above) and proof of financial responsibility, such as a Certificate of Entry from a P&I Club for the 2006-2007 P&I year, so that the package arrives in the ADEC office below at least 15 days prior to the vessel's entry into Alaska waters.

2) Companies with vessels currently holding a valid, unexpired Alaska COFR are requested to apply 30 days prior to the COFR's expiration date, and at a minimum 15 days prior to arrival in Alaska waters.

3) Alaska regulations do not allow deductibles (aggregate or otherwise) over \$50,000 on your P&I. Please check your terms and ensure you are in compliance prior to sending your application.

You are encouraged to send applications by fax or email prior to sending the hard copy - this will allow us to review your application and get back to you if there are any problems, before you commit the notarized original to a courier service.

Point of Contact for COFRs:

(Ms.) Clare Pavia
Financial Responsibility Program
Alaska Department of Environmental Conservation
Division of Spill Prevention and Response
P. O. Box 111800
Juneau, AK 99811-1800
United States of America
Tel: +1 907 465 5283
Fax: +1 907 465 5245
email: Clare_Pavia@dec.state.ak.us

C-Plan INFO: <http://www.dec.state.ak.us/spar/ipp/marine.htm>

A blank Alaska Streamlined C-Plan application form is available online:

<http://www.dec.state.ak.us/spar/ipp/docs/revdocs/ntvslapp.pdf>

Instruction Sheet:

<http://www.dec.state.ak.us/spar/ipp/docs/revdocs/ntvslinst.pdf>

1) A Streamlined C-Plan application must be submitted at least 5 days before a vessel enters state waters (we recommend a longer lead time). An operator must contract cleanup and incident management services for the plan and may hire a Response Planning Facilitator (RPF) to secure response contracts, prepare the C-Plan application, and submit it for approval. Please contact the Marine Vessels office for a list of approved RPFs and/or response contractors.

2) Plan approvals are generally valid for 5 years, however, most response contracts must be renewed annually. Please check the approval status of existing plans at the beginning of each year.

For more C-Plan information, please contact Rosanna Dickens:

Marine Vessels Section

Department of Environmental Conservation

Division of Spill Prevention and Response

555 Cordova St.

Anchorage, AK 99501

Tel +1 907 269 7681

Fax +1 907 269 8403

email: Rosanna_Dickens@dec.state.ak.us

Vessel Specific Sampling Plan (VSSP) Rev:**2007 Season****Vessel Specific Sampling Plan****M/V**

The sampler will use the VSSP as a guide to identify the specific onboard locations to be sampled. To satisfy the VSSP requirement, you may fill in the blanks in this form starting on page 2 or you may submit an existing updated VSSP if it contains the components listed in 18 AAC 69.030(b).

Please note that ADEC will not approve sampling locations that are more than 50 feet from the overboard discharge port. Samples taken in 2003 indicate that samples taken directly after the ultraviolet disinfection unit were not of the same quality as samples taken at the overboard discharge pipe.

The two wastewater samples that are taken to satisfy the state requirements must reflect the quality of the effluent that is being discharged into Alaska waters during standard operating procedures. Only ships that discharge continuously may take the two samples for the state program. In port, vessels that have obtained continuous discharge certification from the U.S. Coast Guard but choose not to discharge in port as part of their standard operating procedures, must sample while the vessel is underway.

If you have questions concerning the components of the VSSP, please contact Albert Faure (907-465-5279 or by email albert_faure@dec.state.ak.us)

Table on this page is for ADEC use only.

☐	ADEC approved as written on _____ /
☐	ADEC approved with the redlined changes on _____ /
☐	ADEC does not approve, please resubmit _____ /
The plan is missing or insufficient in the following areas:	

Vessel Specific Sampling Plan (VSSP) Rev:

2007 Season

Vessel Name: _____

Facility contact name and info or attach business card.

(Note: Remember to include all units. Example cubic meters, gallons, cubic meters per second.)

Year ship joined fleet		
Gross tonnage		
Passenger capacity(#)/voyage		
Crew capacity(#)/voyage		
MSD system (USCG type)		
Number of MSD units		
Other water treatment units (type & capacity)		
Blackwater treatment (type & capacity)		
Treated blackwater holding tank capacity & location (holding capacity includes double bottom tanks)		
Graywater treatment (type & capacity)		
Graywater collection tank capacity & location		
Graywater holding tanks capacity & location		
Mixed graywater/treated blackwater holding tank capacity & location		
Maximum discharge flow rate per discharge port ¹ and discharge pump type		
Average discharge flow rate per discharge port ¹ and discharge pump type		
List of overboard discharge ports and location on vessel (Starboard/Port) & discharge line diameter and distance below/above waterline		
Blackwater generation per day		
Graywater generation per day	Accommodations	
	Galley	
	Laundry	
Daily water use/individual		
Seawater usage per day		

¹ The pump(s) rate and discharge line diameter must be given to check the flow rate.

Peak water use per hour	
Hours of peak water use	

Wastewater Treatment

Please provide a description and capacity of the wastewater treatment system(s) on this vessel:

Discharges

Please provide the individual vessel rules or procedures for discharging wastewater.

Wastewater Samples To Be Analyzed For Conventional Pollutants At Least Twice Per Season

Please describe the vessel's sample port location(s), where the sampling should occur (in port or underway) and the time of day that the sampling should take place. The owner/operator needs to explain why these selected sampling sites and times give the most representative sample. The sample section should be adequately mixed and homogenous. All samples need to be taken from wastewater as it is discharging overboard, unless deemed impractical by ADEC.

Wastewater Samples To Be Analyzed For Priority Pollutants Once Per Season

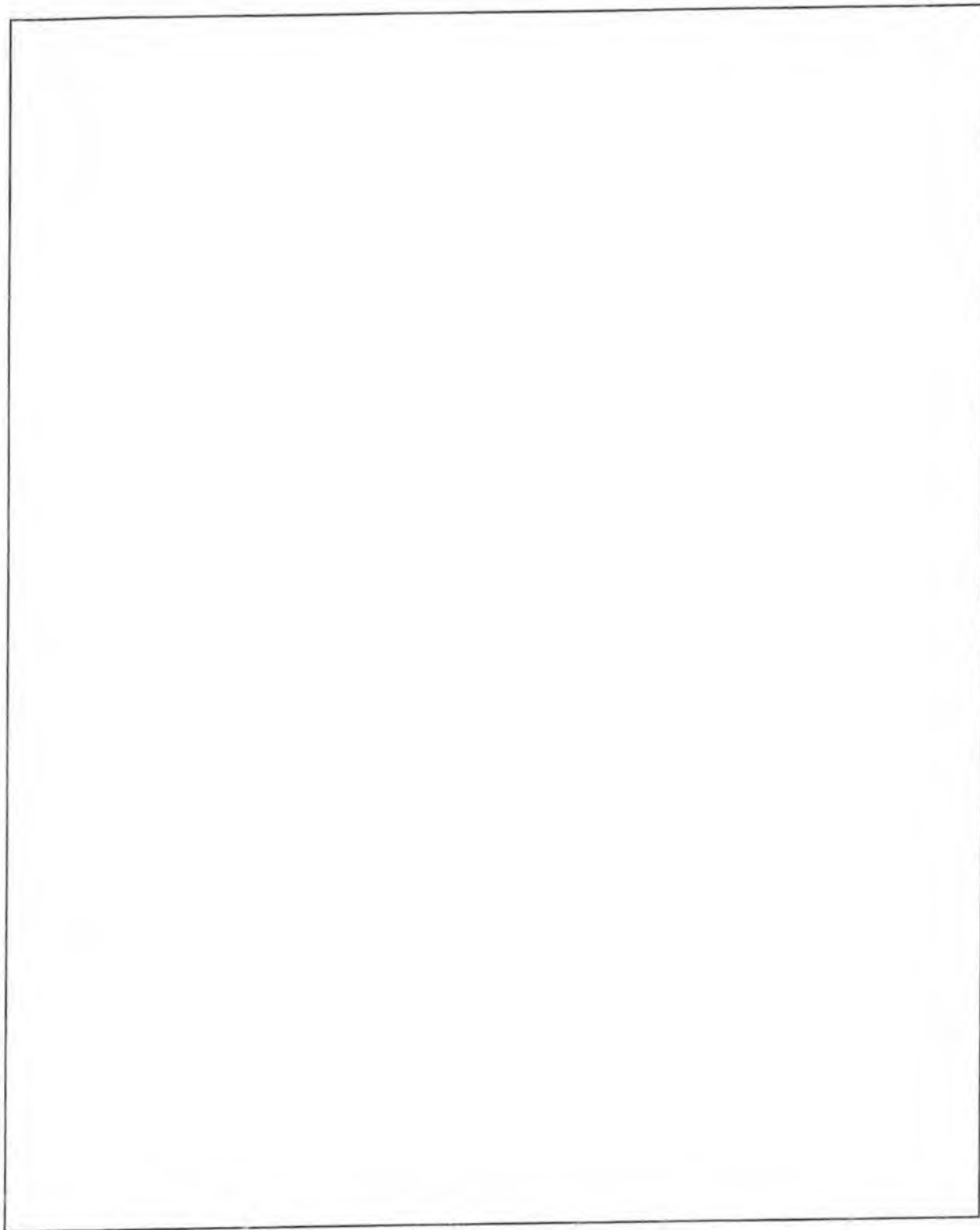
See description for conventional pollutants above.

Description of the standards the owner or operator will use to determine a deviation from the plan.

Vessel Specific Sampling Plan (VSSP) Rev:

2007 Season

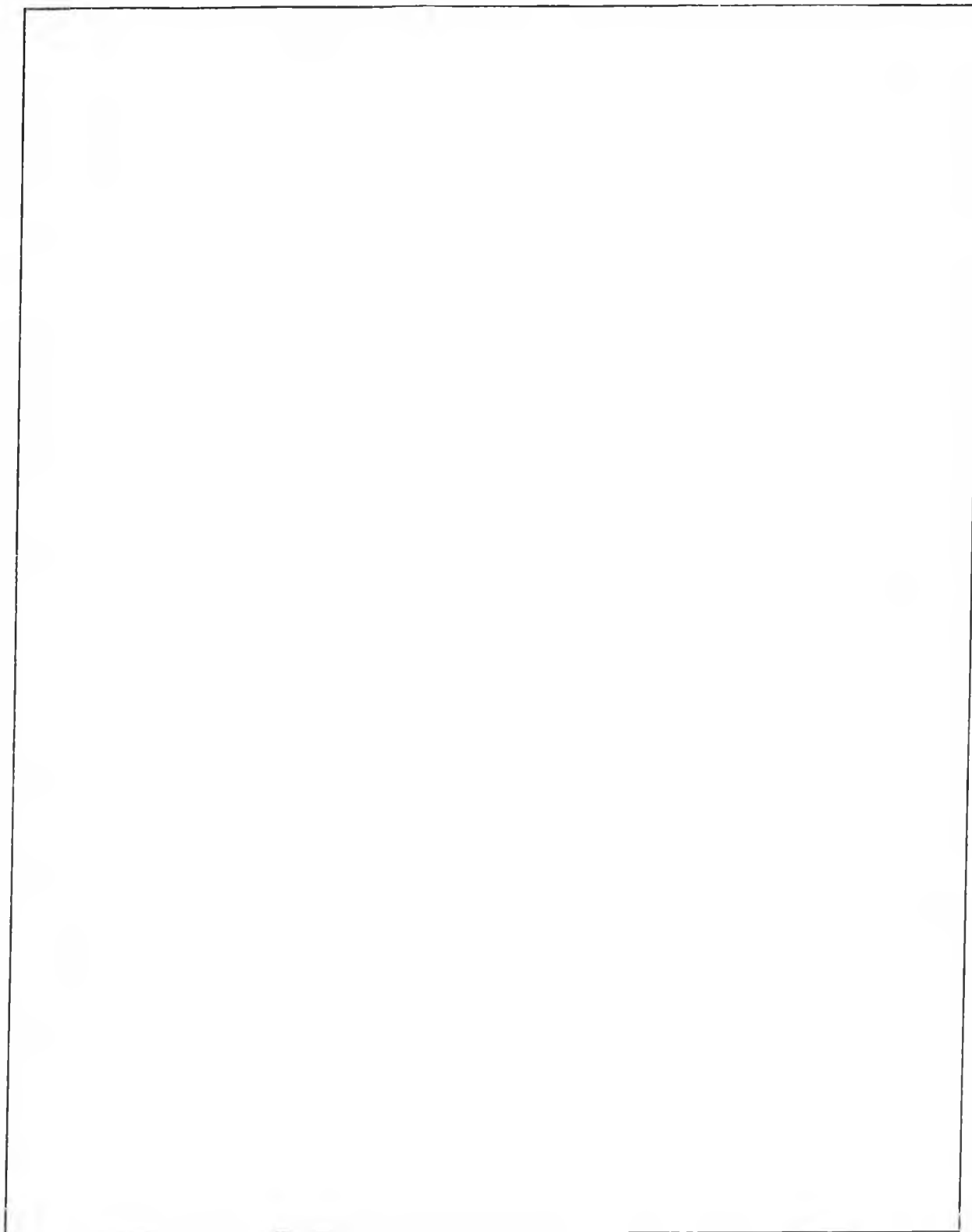
Attach sketch of vessel with treatment system, tanks, discharge pumps, discharge lines, sampling locations, and overboard ports.



Vessel Specific Sampling Plan (VSSP) Rev:

2007 Season

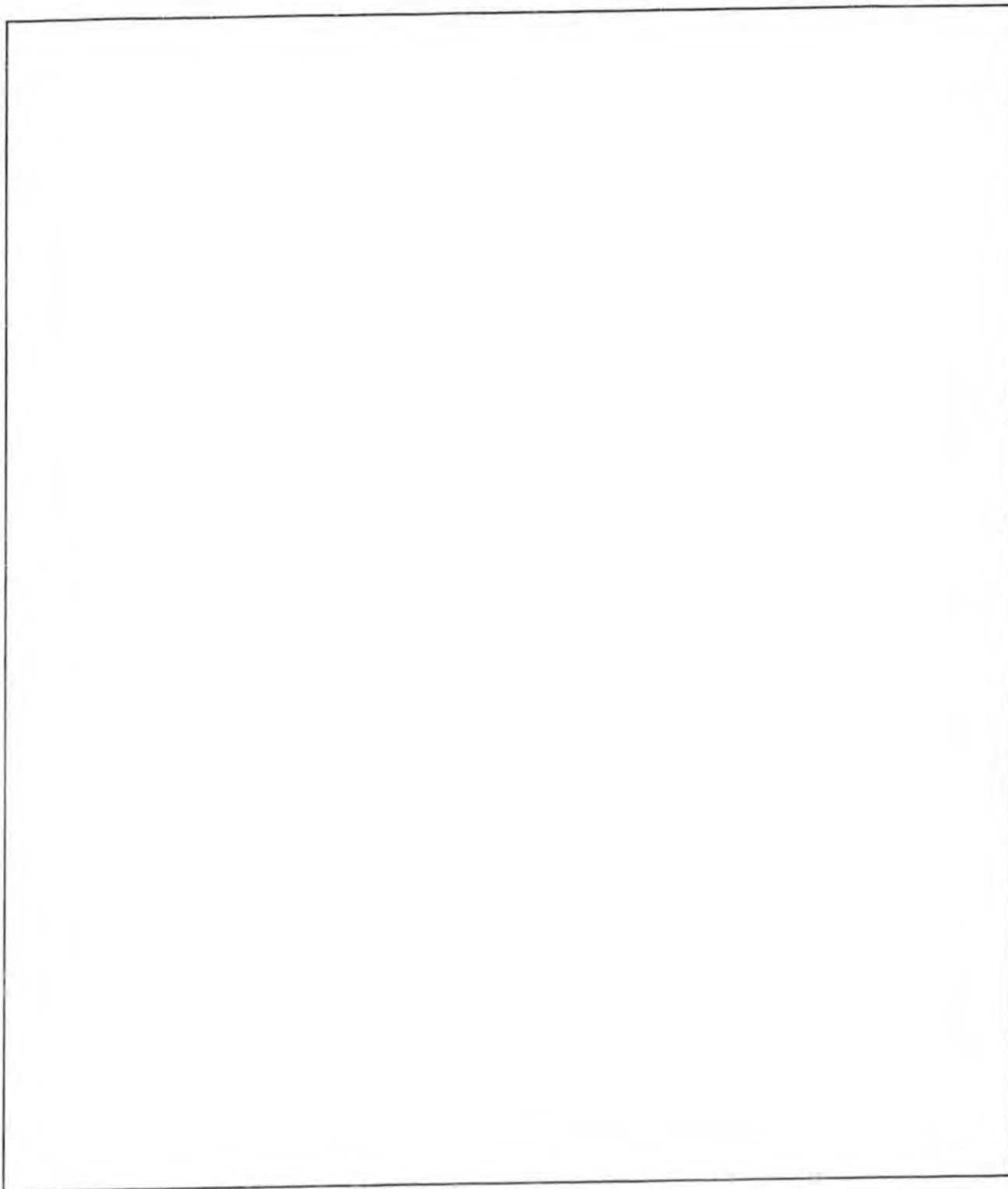
Attach sketch of vessel with treatment system, tanks, discharge pumps, discharge lines, sampling locations, and overboard ports.



Vessel Specific Sampling Plan (VSSP) Rev:

2007 Season

Attach sketch of vessel with treatment system, tanks, discharge pumps, discharge lines, sampling locations, and overboard ports.



Regulated Conventional Pollutants

Wastewater	Sample Type	Parameters ²	Bottles (preserved with)	Sample Location	Time & Dates Of ALL Appropriate Sample
Graywater (GW) AND Blackwater (BW)	Grab	BOD, TSS, pH*, EC Alkalinity	1 liter HDPE		
		Chlorine Residual*	From BOD, ASAP in field		
		COD, NH ₃ , N ₂ O ₃ Total Phosphorus	250 ml HDPE (H ₂ SO ₄)		
		TKN	500 ml HDPE (H ₂ SO ₄)		
		Total Organic Carbon	2 40-ml VOC vials (H ₂ SO ₄)		
		Settleable Solids	1 liter HDPE		
		Oil and grease	1 liter glass (H ₂ SO ₄)		
		Fecal Coliforms	100 ml sterile plastic (Sodium Thiosulfate)		

**pH, free and total chlorine residuals will be field tested by the sampler while on the ship*

Priority Pollutants

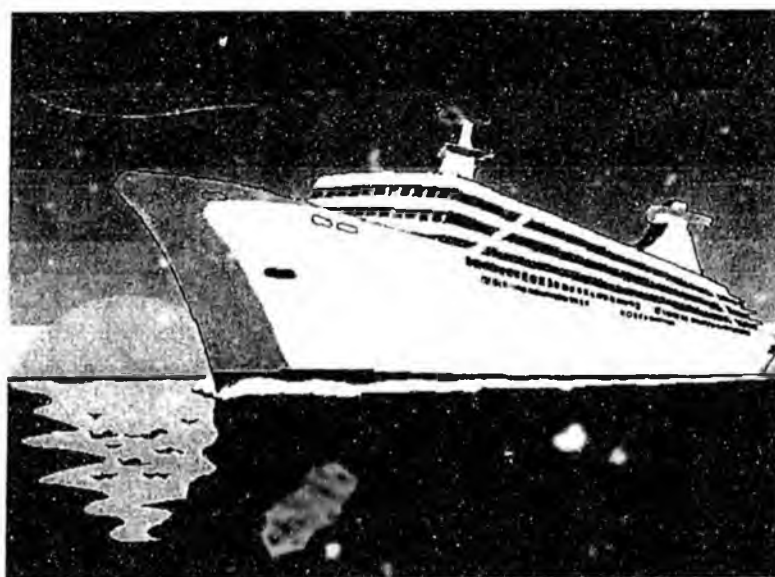
Wastewater	Sample Type	Parameters ³	Bottles (preserved with)	Sample Location	Time & Dates Of ALL Appropriate Sample
Graywater (GW) AND Blackwater (BW)	Grab	BNA	1 L amber (unpreserved)		
		VOCs	40 mL VOA x2 (HCl)		
		Total Rec. Metals	500 mL poly (HNO ₃)		
		Dissolved Metals	500 mL poly (unpreserved)		

² Parameters will be finalized in the Quality Assurance/Quality Control Plan.

³ Parameters will be finalized in the Quality Assurance/Quality Control Plan.

Vessel Sanitation Program Operations Manual

August 2005



U.S. Public Health Service
Centers for Disease Control
and Prevention
National Center for Environmental Health



Department of Health and Human Services
Centers for Disease Control and Prevention
National Center for Environmental Health
Vessel Sanitation Program
Atlanta, GA and Ft Lauderdale, FL

Vessel Sanitation Program
Centers for Disease Control and Prevention
4770 Buford Highway, NE F-23
Atlanta, GA 30341-3724
Phone: (770) 488-7070
Fax: (770) 488-4127
E-mail: vsp@cdc.gov

Vessel Sanitation Program
Centers for Disease Control and Prevention
1850 Eller Drive, Suite 101
Ft Lauderdale, FL 33316-4201
Phone: (800) 323-2132 or (954) 356-6650
Fax: (954) 356-6671
E-mail: vsp@cdc.gov

The *VSP Operations Manual* and updates are available at www.cdc.gov/nceh/vsp.

Forward

The Centers for Disease Control and Prevention (CDC) established the Vessel Sanitation Program (VSP) in the 1970's as a cooperative activity with the cruise ship industry. The program assists the cruise ship industry in fulfilling its responsibility for developing and implementing comprehensive sanitation programs in order to minimize the risk of gastrointestinal diseases. Every vessel that has a foreign itinerary and carries 13 or more passengers is subject to twice-yearly inspections and, when necessary, re-inspection.

The VSP operated continuously at all major U.S. ports from the early 1970's through 1986, when CDC terminated portions of the program. Industry and public pressures resulted in Congress directing CDC through specific language included in CDC appropriations to resume the VSP. The National Center for Environmental Health (NCEH) at CDC became responsible for the VSP in 1986.

The NCEH held a series of public meetings to determine the needs and desires of the public and cruise ship industry and on March 1, 1987, a restructured program began. In 1988, the program was further modified by introducing user fees to reimburse the U.S. government for costs. A fee based on the vessel's size is charged for inspections and re-inspections. A *VSP Operations Manual* based on the FDA 1976 model code for food service and the World Health Organization's *Guide to Ship Sanitation* was published in 1989 to assist the cruise ship industry in educating shipboard personnel.

In 1998, it became apparent that it was time to update the 1989 version of the *VSP Operations Manual*. Changes in the FDA *Food Code*, new science on food safety and protection, and new technology in the cruise ship industry contributed to the need for a revised Operations Manual. During the 2 years following, the VSP solicited comments from and conducted public meetings with representatives of the cruise industry, general public, FDA and international public health community to ensure that the 2000 manual would appropriately address current public health issues related to cruise ship sanitation.

Although the previous VSP Operations Manual was in use for 5 years, we have seen new technology, advanced food science, and emerging pathogens which require the manual to be updated. This document represents the comments and corrections submitted by all those cooperative partners in government, private industry, and the public. We would like to thank all those who submitted comments and participated throughout this process.

As new information, technology, and input is received, we will continue to review and record that information and maintain a public process to keep the Manual current.

The *VSP Operations Manual - 2005* continues the 30 year tradition of government and industry working together to achieve a successful and cooperative Vessel Sanitation Program that benefits millions of travelers each year.

David Forney
Vessel Sanitation Program

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INFORMATION TO ASSIST THE USER ON THE MANUAL FORMAT

organization

The *Vessel Sanitation Program Operations Manual* is divided into chapters and then sections that focus on each operational area important to safeguarding public health aboard vessels.

keywords

Each of the guidelines is formatted with a keyword or phrase on the left side of the page to assist the user in quickly locating a specific section.

section number

The international numbering system is used to organize the guidelines in this document.

description

The public health compliance recommendation is provided in this statement.

italics

Portions of some sections of these guidelines are written in *italics*. These provisions are not requirements, but are provided to convey relevant information about specific exceptions and alternative means for compliance.

inspection report number

The individual inspection report item number that will be found in violation if this recommendation is not followed is shown to the right of the description.

criticals

Critical compliance items are designated in these guidelines with a C to the right of the inspection report number which is also highlighted in red along with the section number.

noncritical items

Noncritical compliance items are the other items in this manual.

1.0 Introduction

1.1 Introduction and Background

1.2 Activities

1.3 Operations Manual

1.1 Introduction and Background

1.1.1 Cooperative Activity

history 1.1.1.1 The Centers for Disease Control and Prevention (CDC) established the Vessel Sanitation Program (VSP) in 1975, as a cooperative activity with the cruise ship industry. This program assists the cruise ship industry in fulfilling its responsibility for developing and implementing comprehensive performance-based systems to protect the health of the traveling public.

cooperation 1.1.1.2 The program fosters cooperation between the cruise ship industry and government to define and reduce health risks associated with vessels and to ensure a healthful and clean environment for vessels' passengers and crew. The industry's aggressive and ongoing efforts to achieve and maintain high standards of food safety and environmental sanitation are critical to the success of protecting public health.

1.2 Activities

1.2.1 Prevention

inspections 1.2.1.1 The VSP conducts a comprehensive food safety and environmental sanitation inspection on vessels that have a foreign itinerary, call on a U.S. port, and carry 13 or more passengers.

surveillance 1.2.1.2 The program conducts ongoing surveillance of gastrointestinal illness and coordinates / conducts outbreak investigations on vessels.

	1.2.2	Information
<i>training</i>	1.2.2.1	The VSP provides food safety and environmental sanitation training seminars for vessel and shore operations management personnel.
<i>plan review</i>	1.2.2.2	The program provides consultative services for reviewing plans for renovations and new construction.
<i>construction inspections</i>	1.2.2.3	The program conducts construction inspections at the shipyards and when the vessel makes its initial call at a U.S. port.
<i>information</i>	1.2.2.4	The program disseminates information to the public.
	1.3	Operations Manual
	1.3.1	Revisions
<i>manual</i>	1.3.1.1	The Operations Manual for the VSP has been modified as a result of emerging public health issues, industry recommendations, introduction of new technologies within the industry, new guidance from sources used in the previous edition, and CDC's experience.
<i>program guidance</i>	1.3.1.2	The program operations and inspections are based on this manual.
<i>periodic review</i>	1.3.1.3	The Operations Manual will be reviewed annually in the public meeting with written submissions for revision based on emerging public health issues and new technologies that may better address the public health issues on vessels.

2.0 Authority

2.1 Public Health Service Act

2.1.1 Communicable Disease Prevention

*communicable
disease
prevention*

2.1.1.1 Although cooperation by vessels with the VSP is voluntary, the Public Health Service (PHS) is authorized by the Public Health Service Act (42 U.S.C. Section 264. Quarantine and Inspection - Regulations to control communicable diseases) to take measures necessary to prevent the introduction, transmission, or spread of communicable diseases into the United States from a foreign country.

*regulation
promulgation*

2.1.1.2 In addition, the Public Health Service Act (42 U.S.C. Section 269. Quarantine and Inspection - Bills of health.) authorizes the promulgation of regulations applicable to vessels for preventing the introduction into the United States of "any communicable disease by securing the best sanitary condition of such vessels, their cargoes, passengers, and crews."

inspections

2.1.1.3 Regulations promulgated to carry out these duties authorize the PHS to conduct sanitary inspections on carriers traveling to a U.S. port from a foreign area (42 CFR Section 71.41. General Provisions, Foreign Quarantine - Requirements Upon Arrival at U.S. Ports: Sanitary Inspection). This purpose of the inspection is to determine the existence of vermin, contaminated food or water, or other insanitary conditions that may contribute to the introduction, spread, or transmission of communicable disease.

3.0 Definitions

3.1 Scope

3.2 Definitions

3.1 Scope

3.1.1 Definitions provided in the Operations Manual are provided to clarify terminology commonly used in public health.

3.1.2 The terms defined are shown in relation to Operations Manual chapters where they are used, but they may also pertain to other chapters in this manual.

3.2 Definitions

Authority

"USPHS or PHS" means the U.S. Public Health Service.

Potable Water

"Air-break" means a piping arrangement in which a drain from a fixture, appliance, or device discharges indirectly into another fixture, receptacle, or interceptor at a point below the flood-level rim.

"Air-gap" means the unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or other device and the flood-level rim of the receptacle or receiving fixture. The air-gap must be at least twice the diameter of the supply pipe or faucet or at least 25 mm (1 inch), whichever is greater.

"Atmospheric vacuum breaker" means an approved backflow prevention device that is necessary on a potable water outlet designed for an attachment that does not have a shutoff downstream from the attachment to preclude the possibility of backflow. Means an approved backflow prevention plumbing device utilized on potable water lines where shut-off valves do not exist downstream from the device. *The device is not approved for use when it is installed in a manner that will cause it to be under continuous water pressure.* An atmospheric vacuum breaker must be installed at least 152 mm (6 inches) above the flood level rim of the fixture or container to which it is supplying water.

"Backflow" means the flow of water or other liquids, mixtures, or substance into the distribution pipes of a potable supply of water from any source or sources other than the source of potable water supply. Back-siphonage is one form of backflow.

"Backflow, check, or non-return valve" means a mechanical device installed in a waste line to prevent the reversal of flow under conditions of back pressure. In the check valve type, the flap should swing into a recess when the line is flowing full, to preclude obstructing the flow.

"Backflow preventer" means an approved backflow prevention plumbing device that must be used on potable water distribution lines where there is a direct connection or a potential connection between the potable water distribution system and other liquids, mixtures, or substances from any source other than the potable water supply. Some devices are designed for use under continuous water pressure, whereas others are non-pressure types. To ensure proper protection of the water supply, a thorough review of the water system shall be made to confirm that the appropriate device is selected for each specific application. *The VSP only accepts vented devices.*

"Back-siphonage" means the flowing back of used, contaminated, or polluted water from a plumbing fixture or vessel or other source into a water supply pipe as a result of negative pressure in the pipe.

"Black water" means waste from toilets, urinals, medical sinks, and other similar facilities.

"Cross-connection" means any unprotected actual or potential connection or structural arrangement between a public or a consumer's potable water system and any other source or system through which it is possible to introduce into any part of the potable system, any used water, industrial fluid, gas, or substance other than the intended potable water with which the system is supplied. Bypass arrangements, jumper connection, removable section, swivel or change-over devices, and other temporary or permanent devices which or because of which backflow can occur are considered to be cross-connections.

"Gray water" means all water including drainage from galleys, dishwashers, showers, laundries, and bath and washbasin drains. It does not include black water or bilge water from the machinery spaces.

"Halogen" means the group of elements including fluorine, chlorine, bromine, and iodine used for the disinfection of water.

"Harbor area" means that portion of a harbor set aside for vessel anchorage or for ports including wharves, piers, quays, and service areas, the boundaries are the high-water shore line, and others as determined by legal definition, citation of coordinates, or other means.

"Hose connection vacuum breaker" means an approved backflow prevention plumbing device that attaches directly to a hose bib by way of a threaded head. This device uses a single check valve and vacuum breaker vent. It is not approved for use under continuous pressure (when a shut-off valve is located downstream from the device).

"mg/L" means milligrams per liter, which is the metric equivalent of parts per million (ppm).

"Non-potable fresh water" means fresh water that may or may not be halogenated, but is intended for use in technical and other areas where potable water is not required (laundries, engine room, toilets and waste-treatment areas, and for washing decks in areas other than the vessel's hospital, food service, preparation, or storage areas).

"Pollution" means the presence in water of any foreign substance (organic, inorganic, radiologic, or biologic) that tends to degrade water quality to create a health hazard.

"Potable water" means fresh water intended for drinking, washing, bathing, or showering; for use in freshwater swimming pools and whirlpool spas; for use in the vessel's hospital; for handling, preparing, or cooking food; and for cleaning food storage and preparation areas, utensils, and equipment.

"Potable water tanks" means all tanks in which potable water is stored from bunkering and production for distribution and use as potable water.

"Reduced pressure principle backflow prevention assembly (RP Assembly)" means an assembly containing two independently acting approved check valves together with a hydraulically operating, mechanically independent pressure differential relief valve located between the check valves and at the same time below the first check valve. The unit shall include properly located resilient seated test cocks and tightly closing resilient seated shutoff valves at each end of the assembly.

"Sewage" means any liquid waste containing animal or vegetable matter in suspension or solution, including liquids containing chemicals in solution.

"Specialty backflow preventer" means an approved backflow device used in low hazard situations that has two independent check valves with an intermediate vacuum breaker and relief valve.

"Spa Pool" means a fresh or saltwater supplied pool with water temperatures and turbulence comparable to a whirlpool spa, but a water depth and volume more comparable to a pool (ie. 30-40 °C or 86-104 °F, bubbling or jetted water effects which physically break at the water surface, depth over 1 m (3 feet), shape is normally non-circular, and volume exceeds 6 tons of water).

"Technical water" means fresh water NOT intended for 1) drinking, washing, bathing, or showering; 2) use in the vessel's hospital; 3) handling, preparing, or cooking food; and 4) cleaning food storage and preparation areas, utensils, and equipment.

Food Safety

Additive.

(a) **"Food additive"** has the meaning stated in the Federal Food, Drug, and Cosmetic Act, §201(s) and 21 CFR 170.

(b) **"Color additive"** has the meaning stated in the Federal Food, Drug, and Cosmetic Act, §201(t) and 21 CFR 70.

"Accessible" means capable of being exposed for cleaning and inspection with the use of simple tools such as a screwdriver, pliers, or an open-end wrench.

"Adulterated" has the meaning stated in the Federal Food, Drug, and Cosmetic Act, §402.

"Approved" means acceptable to the VSP based on a determination of conformity with principles, practices, and generally recognized standards that protect public health such as ANSI/NSF standards, ASSE standards, federal regulations or equivalent international standards and regulations.

" a_w " means water activity which measures the free moisture in a food. It is the quotient of the water vapor pressure of the substance divided by the vapor pressure of pure water at the same temperature.

"Beverage" means a liquid for drinking, including water.

"Blast Chiller" means a unit specifically designed for rapid intermediate chilling of food products from 60 °C (140 °F) to 21 °C (70 °F) within two hours and 21 °C (70 °F) to 5 °C (41 °F) within an additional 4 hours.

"Bottled drinking water" means water that is sealed in bottles, packages, or other containers and offered for sale and that is safe for human consumption, including bottled mineral water.

"Certification number" means a unique combination of letters and numbers assigned by a shellfish-control authority to a molluscan shellfish dealer according to the provisions of the National Shellfish Sanitation Program.

"CIP" means cleaned in place by circulating or flowing mechanically through a piping system of a detergent solution, water rinse, and sanitizing solution onto or over equipment surfaces that require cleaning, such as the method used, in part, to clean and sanitize a frozen dessert machine.

"CIP" does not include the cleaning of EQUIPMENT such as band saws, slicers, or mixers that are subjected to in-place manual cleaning without the use of a CIP system.

"CFR" means Code of Federal Regulations. Citations in this Code to the CFR refer sequentially to the Title, Part, and Section numbers, such as 21 CFR 178.1010 refers to Title 21, Part 178, Section 1010.

"Code of Federal Regulations" means the compilation of the general and permanent rules published in the Federal Register by the executive departments and agencies of the federal government which:

(a) Is published annually by the U.S. Government Printing Office; and

(b) Contains FDA rules in 21 CFR, USDA rules in 7 CFR and 9 CFR, EPA rules in 40 CFR, and Wildlife and Fisheries rules in 50 CFR.

"Comminuted" means reduced in size by methods including chopping, flaking, grinding, or mincing.

"Comminuted" includes fish or meat products that are reduced in size and restructured or reformulated such as gefilte fish, gyros, ground beef, and sausage; and a mixture of 2 or more types of meat that have been reduced in size and combined, such as sausages made from 2 or more meats.

"Confirmed disease outbreak" means a foodborne or waterborne disease outbreak in which laboratory analysis of appropriate specimens identifies a causative agent and epidemiologic analysis implicates the food or water as the source of the illness.

"Consumer" means a person who is a member of the public, takes possession of food, is not functioning in the capacity of an operator of a food establishment or food processing plant, and does not offer the food for resale.

"Corrosion-resistant material" means a material that maintains acceptable surface cleanability characteristics under prolonged influence of the food to be contacted, the normal use of cleaning compounds and sanitizing solutions, and other conditions of the environment where the material is used.

"Coved" means a concave surface, molding, or other design that eliminates the usual angles of 90 degrees or less.

"Critical-control point" means a point or procedure in a specific food system where loss of control may result in an unacceptable health risk.

"Critical limit" means the maximum or minimum value at a critical-control point to which a physical, biologic, or chemical parameter must be controlled to minimize the occurrence of risk from an identified food safety hazard.

"Deck sink" means a sink recessed into the deck, sized to contain waste liquids from tilting kettles and pans.

"Disinfection" means the destruction of all vegetative cells (not spores) in or on inanimate objects.

"Drinking water" means water that meets 40 CFR 141 National Primary Drinking Water Regulations.

"Drinking water" is traditionally known as "potable water."

"Drinking water" includes the term "water" except where the term used connotes that the water is not potable, such as "boiler water," "mop water," "rainwater," "wastewater," and "nondrinking" water.

"Dry-storage area" means a room or area designated for the storage of packaged or containerized bulk food that is not potentially hazardous and dry goods such as single-service items.

"Easily cleanable" means a characteristic of a surface that:

- (a) Allows effective removal of soil by normal cleaning methods;
- (b) Is dependent on the material, design, construction, and installation of the surface; and
- (c) Varies with the likelihood of the surface's role in introducing pathogenic or toxigenic agents or other contaminants into food based on the surface's approved placement, purpose, and use.

"Easily cleanable" includes a tiered application of the criteria that qualify the surface as easily cleanable as specified under Subparagraph (a) of this definition to different situations in which varying degrees of cleanability are required such as:

- (a) The appropriateness of stainless steel for a food preparation surface, compared with the lack of need for stainless steel to be used for floors or for tables used for consumer dining; or
- (b) The need for a different degree of cleanability for a utilitarian attachment or accessory in the kitchen, compared with a decorative attachment or accessory in the consumer dining area.

"Easily movable" means:

- (a) Portable; mounted on casters, gliders, or rollers; or provided with a mechanical means to safely tilt a unit of equipment for cleaning; and
- (b) Having no utility connection, a utility connection that disconnects quickly, or a flexible utility connection line of sufficient length to allow the equipment to be moved for cleaning of the equipment and adjacent area.

"EPA" means the U.S. Environmental Protection Agency.

"Equipment" means an article used in the operation of a food establishment, such as a freezer, grinder, hood, ice maker, meat block, mixer, oven, reach-in refrigerator, scale, sink, slicer, stove, table, temperature measuring device for ambient air, vending machine, or warewashing machine.

***"Equipment"** does not include items used for handling or storing large quantities of packaged foods that are received from a supplier in a cased or overwrapped lot, such as hand trucks, forklifts, dollies, pallets, racks, and skids.*

"Fish" means fresh or saltwater finfish, crustaceans, and other forms of aquatic life (including alligator, frog, aquatic turtle, jellyfish, sea cucumber, and sea urchin and the roe of such animals) other than birds or mammals, and all mollusks, if such animal life is intended for human consumption.

"Fish" includes an edible human food product derived in whole or in part from fish, including fish that have been processed in any manner.

"Floor sink" see deck sink.

"Food" means a raw, cooked, or processed edible substance, ice, beverage, or ingredient used or intended for use or for sale in whole or in part for human consumption, or chewing gum.

"Foodborne disease outbreak" means an incident in which:

- (a) 2 or more nonrelated persons experience a similar illness after ingesting a common food; and
- (b) Epidemiologic analysis implicates the food as the source of the illness.

"Foodborne disease outbreak" also includes a single case of illness such as 1 person ill from botulism or chemical poisoning.

"Food-contact surface" means:

- (a) A surface of equipment or a utensil with which food normally comes into

contact; or

(b) A surface of equipment or a utensil from which food may drain, drip, or splash into a food, or onto a surface normally in contact with food.

"Food employee" means a person working with unpackaged food, food equipment or utensils, table linens, or food-contact surfaces.

"Food-processing plant" means a commercial operation that manufactures, packages, labels, or stores food for human consumption and does not provide food directly to a consumer.

"Game animal" means an animal, the products of which are food, that is not classified as cattle, sheep, swine, goat, horse, mule, or other equine in 9 CFR Subchapter A - Mandatory Meat Inspection, Part 301, as Poultry in 9 CFR Subchapter C - Mandatory Poultry Products Inspection, Part 381, or as fish as defined under Subparagraph 1-201.10(B)(25).

"Game animal" includes mammals such as reindeer, elk, deer, antelope, water buffalo, bison, rabbit, squirrel, opossum, raccoon, nutria, or muskrat, and nonaquatic reptiles such as land snakes.

"Game animal" does not include ratites such as ostrich, emu, and rhea.

"Gap" means an open juncture between two materials or equipment components and is generally larger than a seam. See seam.

"Grade A standards" means the requirements of the PHS/FDA "Grade A Pasteurized Milk Ordinance" and "Grade A Condensed and Dry Milk Ordinance" with which certain fluid and dry milk and milk products comply.

"General-use pesticide" means a pesticide that is not classified by EPA for restricted use as specified in 40 CFR 152.175.

"HACCP plan" means a written document that delineates the formal procedures for following the Hazard Analysis Critical Control Point principles developed by The National Advisory Committee on Microbiological Criteria for Foods.

"Hand Antiseptic" means antiseptic products applied to human skin.
(replaces the term hand sanitizer)

"Hazard" means a biologic, chemical, or physical property that may cause an unacceptable consumer health risk.

"Hermetically sealed container" means a container that is designed and intended to be secure against the entry of microorganisms and, in the case

of low-acid canned foods, to maintain the commercial sterility of its contents after processing.

"Imminent health hazard" means a significant threat or danger to health that is considered to exist when evidence is sufficient to show that a product, practice, circumstance, or event creates a situation that requires immediate correction or cessation of operation to prevent injury based on the number of potential injuries, and the nature, severity, and duration of the anticipated injury.

"Injected" means manipulating a meat so that infectious or toxigenic microorganisms may be introduced from its surface to its interior through tenderizing with deep penetration or injecting the meat such as with juices which may be referred to as "injecting," "pinning," or "stitch pumping."

"Kitchenware" means food preparation and storage utensils.

"Law" means applicable local, state, federal, or other equivalent international statutes, regulations, and ordinances.

"Linens" means fabric items such as cloth hampers, cloth napkins, table cloths, wiping cloths, and work garments including cloth gloves.

"Meat" means the flesh of animals used as food including the dressed flesh of cattle, swine, sheep, or goats and other edible animals, *except fish, poultry, and wild game animals.*

"Molluscan shellfish" means any edible species of fresh or frozen oysters, clams, mussels, and scallops or edible portions thereof, *except when the scallop product consists only of the shucked adductor muscle*

"Packaged" means bottled, canned, cartoned, securely bagged, or securely wrapped, whether packaged in a food establishment or a food-processing plant.

"Packaged" *does not include a wrapper, carry-out box, or other nondurable container used to containerize food to facilitate food protection during service and receipt of the food by the consumer.*

"Person in charge" means the individual present on a vessel who is responsible for the food operation at the time of inspection such as the Food and Beverage Manager, Food Manager, or Chef.

"Personal-care items" means items or substances that may be poisonous, toxic, or a source of contamination and are used to maintain or enhance a person's health, hygiene, or appearance.

"Personal-care items" include items such as medicines; first aid supplies; and other items such as cosmetics, and toiletries such as toothpaste and

mouthwash.

"pH" means the symbol for the negative logarithm of the hydrogen ion concentration, which is a measure of the degree of acidity or basicity of a solution.

Values between 0 and 7 indicate acidity and values between 7 and 14 indicate alkalinity. The value for pure distilled water is 7, which is considered neutral.

"Physical facilities" means the structure and interior surfaces of a vessel's food storage, preparation and service areas, including accessories such as soap and towel dispensers, and attachments, such as light fixtures and heating or air conditioning system vents.

"Plumbing fixture" means a receptacle or device that:

- (a) Is permanently or temporarily connected to the water- distribution system of the vessel and demands a supply of water from the system; or
- (b) Discharges used water, waste materials, or sewage directly or indirectly to the drainage system of the vessel.

"Plumbing system" means the water supply and distribution pipes, plumbing fixtures and traps; soil, waste, and vent pipes; sanitary sewer drains and vessel drains, including their respective connections, devices, and appurtenances within the vessel; and water-treating equipment.

"Poisonous or toxic materials" means substances that are not intended for ingestion and are included in 4 categories:

- (a) Cleaners and sanitizers, which include cleaning and sanitizing agents and agents such as caustics, acids, drying agents, polishes, and other chemicals;
- (b) Pesticides *except sanitizers*, which include substances such as insecticides and rodenticides;
- (c) Substances necessary for the operation and maintenance of the establishment such as nonfood-grade lubricants and personal care items that may be deleterious to health; and
- (d) Substances that are not necessary for the operation and maintenance of the vessel and are on the vessel, such as petroleum products and paints.

"Potentially hazardous food" means a food that is natural or synthetic and that requires temperature control because it is in a form capable of supporting:

(a) The rapid and progressive growth of infectious or toxigenic microorganisms;

(b) The growth and toxin production of *Clostridium botulinum*; or

(c) In raw shell eggs, the growth of *Salmonella Enteritidis*.

"Potentially hazardous food" includes an animal food (a food of animal origin) that is raw or heat-treated; a food of plant origin that is heat-treated or consists of raw seed sprouts; cut melons; and garlic and oil mixtures that are not acidified or otherwise modified at a food processing plant in a way that results in mixtures that do not support growth as specified under Subparagraph (a) of this definition.

"Potentially hazardous food" does not include:

(a) An air-cooled hard-boiled egg with shell intact, or a shell egg that is not hard-boiled, but has been treated to destroy all viable *Salmonellae*;

(b) A food with an a_w value of 0.85 or less;

(c) A food with a pH level of 4.6 or below when measured at 24°C (75°F);

(d) A food in an unopened hermetically sealed container that is commercially processed to achieve and maintain commercial sterility under conditions of nonrefrigerated storage and distribution; and

(e) A food for which laboratory evidence demonstrates that the rapid and progressive growth of infectious or toxigenic microorganisms or the growth of *S. Enteritidis* in eggs or *C. botulinum* can not occur, such as a food that has an a_w and a pH above the levels specified under Subparagraphs (b) and (c) of this definition and that may contain a preservative, other barrier to the growth of microorganisms, or a combination of barriers that inhibit the growth of microorganisms.

(f) A food that may contain an infectious or toxigenic microorganism or chemical or physical contaminant at a level sufficient to cause illness, but that does not support the growth of microorganisms as specified under Subparagraph (a) of this definition.

"Poultry" means:

(a) Any domesticated bird such as chicken, turkey, duck, goose, or guinea, whether live or dead, as defined in 9 CFR 381 Poultry Products Inspection Regulations; and

(b) Any migratory waterfowl, game bird, or squab such as pheasant, partridge, quail, grouse, or guinea, whether live or dead, as defined in 9 CFR 362 Voluntary Poultry Inspection Program.

"Poultry" does not include ratite.

"Primal cut" means a basic major cut into which carcasses and sides of meat are separated, such as a beef round, pork loin, lamb flank, or veal breast.

"Readily accessible" means exposed or capable of being exposed for cleaning or inspection without the use of tools.

"Readily removable" means capable of being detached from the main unit without the use of tools.

"Ready-to-eat food" means food in a form that is edible without washing, cooking, or additional preparation by the food establishment or the consumer and that is reasonably expected to be consumed in that form.

"Ready-to-eat food" includes:

(a) Potentially hazardous food that is unpackaged and cooked to the temperature and time required for the specific food;

(b) Raw, washed, cut fruits and vegetables;

(c) Whole, raw fruits and vegetables that are presented for consumption without the need for further washing, such as at a buffet; and

(d) Other food presented for consumption for which further washing or cooking is not required and from which rinds, peels, husks, or shells are removed.

"Refuse" means solid waste not carried by water through the sewage system.

"Regulatory authority" means the local, state, or federal or equivalent international enforcement body or authorized representative having jurisdiction over the food processing, transportation, warehousing, or other food establishment.

"Removable" means capable of being detached from the main unit with the use of simple tools such as a screwdriver, pliers, or an open-end wrench.

"Restricted-use pesticide" means a pesticide product that contains the active ingredients specified in 40 CFR 152.175 Pesticides classified for restricted use, and that is limited to use by or under the direct supervision of a certified applicator.

"Safe material" means:

(a) An article manufactured from or composed of materials that may not reasonably be expected to result, directly or indirectly, in their becoming a component or otherwise affecting the characteristics of any food;

(b) An additive that is used as specified in §409 or 706 of the Federal Food, Drug, and Cosmetic Act; or

(c) Other materials that are not additives and that are used in conformity with applicable regulations of the FDA.

"Sanitization" means the application of cumulative heat or chemicals on cleaned food-contact surfaces that, when evaluated for efficacy, is sufficient to yield a reduction of 5 logs, which is equal to a 99.999% reduction, of representative disease microorganisms of public health importance.

"Sealed" means having no openings present that will permit the entry of soil or seepage of liquids.

"Sealed seam" means a seam that has no openings that would permit the entry of soil or liquid seepage.

"Seam" means an open juncture between two materials or equipment components greater than 0.8 mm (1/32 inch) and less than 3 mm (1/8 inch).

"Sewage" means liquid waste containing animal or vegetable matter in suspension or solution and may include liquids containing chemicals in solution.

"Shellfish-control authority" means a state, federal, foreign, tribal, or other government entity legally responsible for administering a program that includes certification of molluscan shellfish harvesters and dealers for interstate commerce.

"Shellstock" means raw, in-shell molluscan shellfish.

"Shucked shellfish" means molluscan shellfish that have one or both

shells removed.

"Single-service articles" means tableware, carry-out utensils, and other items such as bags, containers, placemats, stirrers, straws, toothpicks, and wrappers that are designed and constructed for one time, one person use.

"Single-use articles" means utensils and bulk food containers designed and constructed to be used once and discarded.

"Single-use articles" includes items such as wax paper, butcher paper, plastic wrap, formed aluminum food containers, jars, plastic tubs or buckets, bread wrappers, pickle barrels, ketchup bottles, and number 10 cans which do not meet the materials, durability, strength, and cleanability specifications.

"Slacking" means the process of moderating the temperature of a food such as allowing a food to gradually increase from a temperature of -23°C (-10°F) to -4°C (25°F) in preparation for deep-fat frying or to facilitate even heat penetration during the cooking of previously block-frozen food such as spinach.

"Smooth" means:

(a) A food-contact surface having a surface free of pits and inclusions with a cleanability equal to or exceeding that of (100 grit) number 3 stainless steel;

(b) A nonfood-contact surface of equipment having a surface equal to that of commercial grade hot-rolled steel free of visible scale; and

(c) A floor, wall, or ceiling having an even or level surface with no roughness or projections that renders it difficult to clean.

"Table-mounted equipment" means equipment that is not portable and is designed to be mounted off the floor on a table, counter, or shelf.

"Tableware" means eating, drinking, and serving utensils for table use such as flatware including forks, knives, and spoons; hollowware including bowls, cups, serving dishes, and tumblers; and plates.

"Temperature measuring device or TMD" means a thermometer, thermocouple, thermistor, or other device that indicates the temperature of food, air, or water and is numerically scaled in Celsius and or Fahrenheit.

"USDA" means the U.S. Department of Agriculture.

"Utensil" means a food-contact implement or container used in the

storage, preparation, transportation, dispensing, sale, or service of food, such as kitchenware or tableware that is multiuse, single-service, or single-use; gloves used in contact with food; food temperature measuring devices; and probe-type price or identification tags used in contact with food.

"Warewashing" means the cleaning and sanitizing of utensils and food-contact surfaces of equipment.

"Whole-muscle, intact beef" means whole muscle beef that is not injected, mechanically tenderized, reconstructed, or scored and marinated, from which beef steaks may be cut.

Integrated Pest Management

"Integrated Pest Management (IPM) " means a documented organized system of controlling pests through a combination of methods including inspection, baits, traps, effective sanitation and maintenance and judicious use of chemical compounds.

Child-Activity Centers

"Child-activity center" means facilities for child-related activities where children under 6-years old are placed to be cared for by vessel staff.

Administrative Guidelines

"Critical item" means a provision of these guidelines that, if in noncompliance, is more likely than other deficiencies to contribute to food or water contamination, illness, or environmental health hazard.

"Critical item" is an item that is denoted in these guidelines with a "C" to the right of the section number which is also highlighted in red.

"Variance" means a written document issued by the Vessel Sanitation Program that authorizes a modification or waiver of one or more requirements of these guidelines if, in the opinion of the Vessel Sanitation Program, a health hazard or nuisance will not result from the modification or waiver.

Outbreak-related Definitions

"Acute gastroenteritis (AGE)" – means an irritation and inflammation of the digestive tract characterized by sudden onset of symptoms of diarrhea and/or vomiting, as well as other constitutional symptoms.

"Attack rate" – (1) means the proportion of individuals who are exposed to an infectious agent who becomes clinically ill. (2) The cumulative

incidence of infection in a group observed over a period during an epidemic.

"Chemical disinfectant" – means a chemical agent that is applied to inanimate objects to kill microbes. Chemical disinfectants are classified as "high-level," "intermediate-level," and "low-level" according to their comparative levels of potency and their intended uses. Chemical disinfectants are regulated either by FDA (medical instrument uses) or the Environmental Protection Agency EPA (environmental surface uses). Intended uses and directions for use are found both on the labels of the products and/or in package inserts. Material Safety and Data Sheets (MSDS) for each product are available from the manufacturer.

"Chemical sanitizer" – means a chemical that, when applied to a surface, reduces the number of microbes to a safe level.

"Communicable disease" – means an illness due to a specific infectious agent or its toxic products that arises through transmission of that agent or its products from an infected person, animal or inanimate reservoir to a susceptible host; either directly or indirectly through an intermediate plant or animal host, vector or the inanimate environment.

"Communicable period" – means the time during which an infectious agent may be transferred directly or indirectly from an infected person to another person, from an infected animal to humans, or from an infected person to animals, including arthropods

"Contamination" – means the presence of an infectious agent on a body surface, in clothes, bedding, toys, surgical instruments or dressings, or other inanimate articles or substances including food and water.

"Date/Time of onset" – means the date/time on which the first symptom appeared.

"Diarrheal Disease" – means 3 or more episodes of loose stools in a 24-hour period or of a greater than normal (for the person) amount of loose stools.

"Disinfectant" – (see chemical disinfectant)

"Disinfection" – means the process that reduces the level of microbial contamination. A disinfectant is a chemical or physical agent that is applied to inanimate objects to kill microbes. Disinfectant performance is typically not defined in terms of a specific percentage or log-reduction target, and unlike the sanitizers for food-contact surfaces, products that are termed disinfectants are usually not intended for use in association with food-contact surfaces.

"Epidemic" – means the occurrence in a community or region of cases of

an illness, specific health-behavior, or other health-related events clearly in excess of normal expectancy.

"Epidemic curve" – means a graphic plotting of the distribution of cases by date/time of symptom onset.

"Fomites" (singular, fomes) – means articles that convey infection to others because they have been contaminated by pathogenic organisms. Examples include handkerchief, drinking glass, door handle, clothing, and toys.

"Fomite transmission" – means the transmission of pathogenic organisms via inanimate objects (see fomites)

"Foodborne disease outbreak" (see food safety definition section)

"Gastrointestinal illness case" – (see reportable gastrointestinal illness case)

"Host" – means a person or other living animal, including birds and arthropods, that affords subsistence or lodgment to an infectious agent under natural conditions.

"Incubation period" – means the time interval between invasion by an infectious agent and the appearance of the first sign or symptom of the disease in question.

"Index case" – means the first case in a family or other defined group to come to the attention of the investigator

"Infectious agent" – means an organism (virus, rickettsia, bacteria, fungus, protozoan, or helminth) that is capable of producing infection or infectious disease.

"Quarantine" – means the limitation of movement of apparently well persons who have been exposed to a case of communicable (infectious) disease during its period of communicability to prevent disease transmission during the incubation period if infection should occur

"Reportable gastrointestinal illness case" (VSP definition) – means a case of gastrointestinal illness with one of the following characteristics; (1) diarrhea (three or more episodes of loose stool in a 24-hour period), or (2) vomiting and one additional symptom including one or more episodes of loose stool in a 24-hour period, or abdominal cramps, or headache, or muscle aches, or fever; and (3) reported to the master of the vessel, the medical staff or other designated staff by passenger or a crew member.

"Sanitization" (food-contact surfaces only)– means the application of cumulative heat or chemicals on cleaned food-contact surfaces that, when

evaluated for efficacy, is sufficient to yield a reduction of 5 logs, which is equal to a 99.999% reduction, of representative disease microorganisms of public health importance.

"Sanitization" (non-food-contact surfaces) – means the performance standard used by the Environmental Protection Agency (EPA) for these sanitizers has required a reduction of the target microorganism by 99.9% or 3 logs (1000, 1/1000, or 10^3) after 5 minutes of contact time.

"Sanitizer" – (see chemical sanitizer).

"Secondary attack rate" – means the proportion of cases of an infection that occur among contacts within the incubation period following exposure to the primary case in relation to the total number of exposed contacts; the denominator is restricted to susceptible contacts when these can be determined. The secondary attack rate is a measure of contagiousness and is useful in evaluating control measures.

"Surveillance" (CDC) – means the ongoing, systematic collection, analysis and interpretation of outcome-specific data used in planning, implementation, and evaluation of public health practice

"Transmission" (of infection) - means any mechanism by which an infectious agent is spread from a source or reservoir to another person. These mechanisms are defined as follows:

- (1) Direct transmission (includes person-to-person transmission) – Direct and essentially immediate transfer of infectious agents to a receptive portal of entry through which human or animal infection may take place.
- (2) Indirect transmission – Occurs when an infectious agent is transferred or carried by some intermediate item, organism, means, or process to a susceptible host, resulting in disease. Included are airborne, foodborne, waterborne, vehicleborne (e.g., fomites) and vectorborne modes of transmission.

"Vehicle" – means the mode of transmission of an infectious agent from its reservoir to a susceptible host. This can be by food, water, and vectors, among others.

"Waterborne outbreak" (USEPA)– means an outbreak involving at least two people that experience a similar illness after ingesting or using water intended for drinking or after being exposed to or unintentionally ingesting or inhaling fresh or marine water used for recreational purposes and epidemiological evidence implicates the water as the source of illness. A single case of chemical poisoning or a laboratory-confirmed case of primary amebic meningoencephalitis is considered an outbreak.

4.0 Gastrointestinal Illness Surveillance

4.1 Data Collection

4.2 Notification

4.3 Clinical Specimens

4.4 Requirements for Isolating Symptomatic and Primary Contacts of Crew and Passengers with Gastroenteritis

4.1 Data Collection

4.1.1 Reportable Cases

4.1.1.1 Definition

case definition

4.1.1.1.1

A reportable case of gastrointestinal illness shall be defined as:

02

(1) Diarrhea (three or more episodes of loose stools in a 24 hour period); or

(2) Vomiting and one additional symptom including one or more episodes of loose stools in a 24-hour period, or abdominal cramps, or headache, or muscle aches, or fever (temperature of $\geq 38^{\circ}\text{C}$ (100.4°F)); and

(3) Reported to the master of the vessel, the medical staff, or other designated staff by a passenger or a crew member.

(4) Nausea, although a common symptom of gastrointestinal illness, is specifically excluded from this definition to avoid misclassifying seasickness (nausea and vomiting) as gastroenteritis.

onset time

4.1.1.1.2

The reportable cases shall include those crew members with a symptom onset time of up to 3 days before boarding the vessel. Documentation of the 3 day assessment for each crew member **WITH SYMPTOMS** shall be maintained on the vessel and be available for review during inspections.

02

definition
purpose

4.1.1.1.3

These case definitions are to be used for identifying and classifying cases, both of which are done for reporting purposes. They should not be used as criteria for clinical intervention or public health action. For many conditions of public health importance, action to contain disease

should be initiated as soon as a problem is identified; in many circumstances, appropriate public health action should be undertaken even though insufficient information is available to determine whether cases meet the case definition.

foreign quarantine regulations 4.1.1.1.4

Foreign quarantine regulations require death and certain illnesses of an arriving international passenger or crew members to be reported to the quarantine station having responsibility for the port of entry. More information can be obtained from: Centers for Disease Control and Prevention, National Center for Infectious Diseases, Division of Global Migration and Quarantine, 1600 Clifton Road, MS E-03, Atlanta, GA 30333 USA, telephone (404) 498-1600, fax (404) 498-1633.

4.1.2 Records

4.1.2.1 Log

responsibility 4.1.2.1.1 A standardized gastrointestinal illness surveillance log for each cruise shall be maintained daily by the master of the vessel, the medical staff, or other designated staff. 02

cruise information 4.1.2.1.2 The gastrointestinal illness surveillance log shall list the name of the vessel, the cruise dates and the cruise number. 02

log contents 4.1.2.1.3 The log shall list: 02

- (1) All reportable cases of gastrointestinal illness;
- (2) All passengers and crew members who are dispensed antidiarrheal medication from the master of the vessel, the medical staff, or other designated staff.

log details 4.1.2.1.4 The gastrointestinal illness surveillance log entry for each passenger or crew member shall contain the following information: 02

- (1) The first date of clinic visit or report to staff of illness;
- (2) The person's name, age and gender;
- (3) A designation as passenger or crew member;
- (4) Crew member position or job on the vessel, if applicable;

- (5) Cabin number;
- (6) Meal seating information;
- (7) Date and time of illness onset;
- (8) Illness symptoms, including the presence of the following selected signs and symptoms: numbers of episodes each of diarrhea and vomiting per day, bloody stools, fever, recorded temperature, abdominal cramps, headaches and muscle aches;
- (9) Notation on whether or not a stool specimen was requested and received;
- (10) Use of antidiarrheal medication; and
- (11) The presence of underlying medical conditions which may affect interpretation of acute gastrointestinal illness for example diabetic diarrhea, inflammatory bowel disease, gastrectomy, or others.

<i>medications sold or dispensed</i>	4.1.2.1.5	Antidiarrheal medications shall not be sold or dispensed to passengers or crew except by designated medical staff. <i>A yes/no entry for antidiarrheal medications sold or dispensed at medical will be recorded on the gastrointestinal illness surveillance log form.</i>	02

4.1.2.2 Questionnaires

<i>food/ beverage questionnaire</i>	4.1.2.2.1	Questionnaires detailing activities and meal locations for the 72 hours before illness onset shall be distributed to all passengers and crew members who are gastrointestinal illness cases. The self-administered questionnaires shall contain all of the data elements that appear in the questionnaire found in Annex 13.2. The completed questionnaires shall be maintained alongside the gastrointestinal illness surveillance log.	02

4.1.2.3 Retention

<i>retention</i>	4.1.2.3.1	The medical log, gastrointestinal illness log and the 72 hour self-administered questionnaires shall be maintained on the vessel for 12 months. Electronic records of these documents are acceptable as long as the data are complete and can be retrieved during inspections and outbreak investigations. Retention of a paper record or crew medical log for crew members with symptoms up to 3 days prior to boarding the vessel is	02

acceptable and shall also be maintained on the vessel for 12 months.

<i>review</i>	4.1.2.3.2	The gastrointestinal illness surveillance log and the 72 hour self-administered questionnaires shall be available for review by the VSP during inspections and outbreak investigations. These materials shall be transmitted by facsimile to the VSP for review in outbreak investigations, as requested.	02

	4.1.2.4	Confidentiality	
<i>privacy</i>	4.1.2.4.1	All personal medical information received by CDC personnel shall be protected in accordance with applicable federal law, including 5 U.S.C. Section 552a. Privacy Act - Records maintained on individuals and the Freedom of Information Act. 5 U.S.C. Section 552. Administrative Procedure - Public information; agency rules, opinions, orders, records, and proceedings.	

4.2 Notification

4.2.1 Routine Report

4.2.1.1 Routine Report Timing

<i>24-hour report</i>	4.2.1.1.1	The master, the medical staff, or other designated staff of a vessel destined for a U.S. port from a foreign port shall submit at least one standardized gastrointestinal illness report based on the number of reportable cases in the gastrointestinal illness log to the VSP no less than 24 hours, but not more than 36 hours before the vessel's expected arrival at the U.S. port.	01	C

<i>4-hour update report</i>	4.2.1.1.2	If the number of cases changes after submission of the initial report, an updated report shall be submitted no less than 4 hours before the vessel's arrival at the U.S. port. The 4-hour update report shall be a cumulative total count of the reported crew and passengers during the entire cruise, including the additional cases.	01	C

	4.2.1.1.3	Routine (24 hour) and 4-hour update reports may be made by telephone, facsimile, or preferably electronically. The vessel shall maintain proof onboard that the report was successfully received by the VSP.	02

4.2.1.2 Report Contents

<i>contents</i>	4.2.1.2.1	The gastrointestinal illness report shall contain:	01	C

- (1) The name of the vessel;
- (2) The ports of embarkation and disembarkation;
- (3) The dates of embarkation and disembarkation;
- (4) The total numbers of reportable cases of gastrointestinal illness among passengers and crew members, including those who have been disembarked or removed because of illness, even if the number is 0; and
- (5) The total number of passengers and crew members on the cruise.

cruise length 4.2.1.2.2 *For cruises lasting longer than 15 days prior to entering a U. S. port, the gastrointestinal illness report may include only those reportable cases and total numbers of passengers and crew members for the 15 days prior to the expected arrival at a U. S. port.*

4.2.2 Special Report

4.2.2.1 Special Report Timing

2% illness rate 4.2.2.1.1 The master, or designated corporate representative, of a vessel with an international itinerary destined for a U.S. port shall submit a special report at any time during a cruise, including between two U.S. ports, when:

01 C

- (1) The cumulative percentage of reportable cases entered in the gastrointestinal illness surveillance log, reaches 2% among passengers or 2% among crew and the vessel is within 15 days of expected arrival at a U.S. port.

daily report 4.2.2.1.2 Daily reports of illness status shall be submitted as requested by the VSP following the initial submission of a special report.

01 C

routine reporting continues 4.2.2.1.3 Routine 24-hours before arrival and 4-hours before arrival reports shall continue to be submitted by the master, or designated corporate representative, of a vessel that has submitted a special report.

01 C

4.2.2.2 Special Notification

telephone report 4.2.2.2.1 A telephone notification to the VSP shall accompany a special 2% report.

01 C

	4.2.3	Report Retention	
	4.2.3.1	Retention	
<i>retention</i>	4.2.3.1.1	The 24 hour, 4 hour, and special reports shall be maintained on the vessel for 12 months.	02
<i>review</i>	4.2.3.1.2	The reports shall be available for review by the VSP during inspections and outbreak investigations.	02
	4.3	Clinical Specimens	
	4.3.1	Clinical Specimen Submission	
<i>specimen/ shipping containers</i>	4.3.1.1	The medical staff will be responsible for maintaining a supply of at least 10 clinical specimen collection containers for both viral and bacterial agents (10 for each), as well as the proper shipping containers and labels for same and provided in Annex 13.4 of this manual. <i>Specific information on vendors where supplies may be ordered is provided in the VSP website.</i>	02
	4.3.2	Clinical Specimen Submission Collection Procedures	
<i>when to collect</i>	4.3.2.1	When a vessel reaches 2% reportable gastrointestinal illness in either passengers or crew members, the medical staff will begin collecting whole stool specimens for viral analysis, unless it is clear from clinical and epidemiological data that the causative agent is of bacterial or parasitic etiology. If the etiologic agent is suspected to be bacterial and/or parasitic, the medical staff should consult with epidemiology staff at the VSP for clinical specimen collection requirements.	02
<i>proper packing</i>	4.3.2.2	All clinical specimens shall be packaged and shipped in accordance with the guidelines outlined in Annex 13.4 and the specific details provided in the VSP website. The specimen packaging shall include the proper documentation as required by the receiving laboratory.	02

4.4 Requirements for Isolating Symptomatic and Primary Contacts of Crew and Passengers with Gastroenteritis

4.4.1 Crew, Staff, Officers and other Employees

isolate ill crew

4.4.1.1

a. Symptomatic and meeting the case definition for Acute Gastroenteritis (AGE):

11 C

i. Food Employees

- Isolation in cabin or designated restricted area until symptom-free for a minimum of 48 hours;

- Follow-up with and approval by designated medical personnel is required before returning crew to work;

ii. Non-food Employees:

- Isolation in cabin or designated restricted area until symptom-free for a minimum of 24 hours;

- Follow-up with and approval by designated medical personnel is required before returning crew to work.

*cabin mates/
contacts*

4.4.1.2

b. Asymptomatic cabin mates or immediate contacts of symptomatic crew:

11 C

i. Food and Non-Food Employees:

- Restrict exposure to symptomatic crew member(s);

- Medical or supervisory staff shall conduct a verbal interview with asymptomatic cabin mates and immediate contacts to confirm their condition, advise them of the hygiene and handwashing facts, and to instruct them to report immediately to medical if they develop illness symptoms;

- Medical or supervisory staff shall conduct verbal interviews daily with asymptomatic crew until 48 hours after onset of the ill crew members symptoms began.

4.4.2 Passengers

*isolate ill
passengers*

4.4.2.1

a. Symptomatic and meeting the case definition for AGE:

11 C

- Advised to remain isolated in cabin until well for a minimum of 24 hours after symptom resolution;

- Follow-up by infirmary personnel advised;
- Handwashing tips and personal hygiene information sheet provided by ship.

5.0 Potable Water

- 5.1 Source
- 5.2 Bunker and Production Halogenation
- 5.3 Potable Water System
- 5.4 Potable Water System Halogenation
- 5.5 Potable Water System Halogen Monitoring
- 5.6 Microbiologic Monitoring
- 5.7 Water Distribution System Protection

5.1 Source

5.1.1 Bunkering

5.1.1.1 Standards

safe source

5.1.1.1.1 Drinking water bunkered from shore supplies shall be from a potable source which meets World Health Organization standards for potable water.

03

C

5.1.1.2 Sample Reports

water report

5.1.1.2.1 Where available, the vessel shall have a copy of the most recent microbiologic report from each port before bunkering potable water to verify that the water meets potable standards. *A recent microbiological report shall mean a report where the date of the analysis report is 30 days or less from the date of potable water bunkering, and the report should include an analysis for Escherichia coli at a minimum.*

06

onboard test

5.1.1.2.2 *Water samples collected and analyzed by the vessel for the presence of Escherichia coli may be substituted for port water system supplied reports. These samples shall be analyzed utilizing a method accepted in Standard Methods for the Examination of Water and Wastewater. If a vessel bunkers potable water from the same port more than once per month only one test per month is required.*

review

5.1.1.2.3 These records shall be maintained on the vessel for 12 months and shall be available to the VSP for review during inspections.

06

	5.1.2	Water Production		
	5.1.2.1	Location		
<i>polluted harbors</i>	5.1.2.1.1	A reverse osmosis, distillation plant or other process that supplies water to the vessel's potable water system shall not operate in polluted areas, harbors, or at anchor.	03	C
	5.1.2.1.2	A reverse osmosis unit or evaporator with a completely separate plant/process, piping system, and connections from the potable water system may be used to produce technical water while in polluted areas, in port, or at anchor.	03	
	5.2	Bunker and Production Halogenation		
	5.2.1	Procedures		
	5.2.1.1	Residual Halogen		
<i>halogen level</i>	5.2.1.1.1	Potable water shall be continuously halogenated to at least 2.0 mg/L (ppm) free residual halogen at the time of bunkering or production with an automatic halogenation device. The amount of halogen injected during bunkering or production shall be controlled by a flow meter or a free halogen analyzer.	03	C
	5.2.1.2	Monitoring		
<i>halogen pre-test</i>	5.2.1.2.1	A free halogen residual and pH test shall be conducted on the shore-side water supply before starting the bunkering process to establish the correct halogen dosage. The results of the pre-test shall be recorded and available for review during inspections.	08	
<i>hourly test</i>	5.2.1.2.2	Free residual halogen monitoring shall be performed at least hourly during the bunkering of potable water and performed at least once every 4 hours during the on-board production of potable water.	08	
<i>records</i>	5.2.1.2.3	Accurate records of this monitoring shall be maintained aboard for 12 months and shall be available to the VSP for review during inspections.	08	
<i>analyzer-chart recorders</i>	5.2.1.2.4	Halogen analyzer-chart recorders used in lieu of manual tests and logs shall be calibrated at the beginning of bunkering or production, and the calibration shall be recorded on the chart or in a log book.	06	

<i>construction</i>	5.2.1.2.5	Halogen analyzer-chart recorders used on bunker water systems shall be constructed and installed in accordance with accepted engineering practices.	06	
<i>data logger</i>	5.2.1.2.6	<i>Electronic data loggers with certified data security features may be used in lieu of chart recorders.</i>		
<i>halogen sample</i>	5.2.1.2.7	Water samples for halogen testing shall be obtained from a sample cock located on the bunker or production water line at least 3 m (10 feet) after the halogen injection point and before the storage tank.	08	
<i>tank sample</i>	5.2.1.2.8	<i>Bunker water or production water halogen samples may also be taken from potable water tanks which were previously empty.</i>		

5.3 Potable Water System

5.3.1 Potable Water Tanks

5.3.1.1 Protection

<i>potable water tank walls</i>	5.3.1.1.1	Potable water tanks shall not share a common wall with the hull of the vessel or with tanks or piping containing non-potable water or other liquids.	07	C
<i>non-potable piping</i>	5.3.1.1.2	Piping systems carrying sewage or other non-potable liquids shall not pass through potable water tanks. Minimize the use of non-potable lines above potable water tanks. Non-potable lines above potable water tanks shall not have any mechanical couplings.	08	
<i>coatings</i>	5.3.1.1.3	Interior coatings on potable water tanks shall be approved for potable water contact, and all manufacturer's recommendations for application, drying, or curing shall be followed. Written documentation for the coating used and recommendations followed shall be available for review during inspections.	08	

5.3.1.2 Tank Construction

<i>identification</i>	5.3.1.2.1	Potable water tanks shall be identified with a number and the words "POTABLE WATER" in letters 13 mm (0.5 inch) high.	08	
<i>sample valves</i>	5.3.1.2.2	Potable water tanks shall have sample valves which are turned down.	08	
<i>vent/overflow</i>	5.3.1.2.3	The potable water tank or combined vent and overflow	08	

shall be protected from contamination.

<i>level measurement</i>	5.3.1.2.4	Any device for determining the depth of water in the potable water tanks shall be constructed and maintained so as to prevent contaminated substances or liquids from entering the tanks.	08	
<i>manual sounding</i>	5.3.1.2.5	Manual sounding of potable water tanks shall be performed only in emergencies and shall be performed in a sanitary manner.	08	
	5.3.2	Potable Water Piping		
	5.3.2.1	Protection		
<i>identification</i>	5.3.2.1.1	Paint or stripe potable water piping and fittings in auxiliary blue, or in accordance with ISO 14726, at 5 m (15 feet) intervals and on each side of partitions, decks, and bulkheads, except where décor would be marred by such markings.	08	
<i>protection</i>	5.3.2.1.2	Potable water piping shall not pass under or through sewage or other tanks holding non-potable liquids.	07	C
<i>bunker connection</i>	5.3.2.1.3	The potable water bunker filling line shall begin either horizontally or in a gooseneck position pointing downwards, at a point at least 460 mm (18 inches) above the bunker station deck.	08	
<i>cap/keeper chain</i>	5.3.2.1.4	The potable water filling line shall have a screw cap or plug fastened by a non-corroding chain to an adjacent bulkhead or surface in such a manner that the cap or plug shall not touch the deck when hanging free. The connections for the hose attachments shall be unique and fit only potable water hoses.	08	
<i>identification</i>	5.3.2.1.5	Each bunker station potable water filling line shall be painted auxiliary blue and clearly marked "POTABLE WATER FILLING" in letters at least 13 mm (0.5 inch) high, stamped on a non-corrosive label plate or the equivalent and located at or near the point of hose connection.	08	
<i>non-potable fresh water</i>	5.3.2.1.6	Non-potable freshwater, if used on the vessel, shall be bunkered through separate piping using fittings incompatible for potable water bunkering.	08	
<i>different piping</i>	5.3.2.1.7	Non-potable freshwater shall flow through a completely different piping system and be identified with a different color.	08	

	5.3.3	Potable Water Hoses	
	5.3.3.1	Construction	
<i>fittings</i>	5.3.3.1.1	Potable water hoses shall have unique fittings from all other hose fittings on the vessel	08
<i>identification</i>	5.3.3.1.2	Potable water hoses shall be labeled for use with the words "potable water only" in letters at least 13 mm (0.5 inch) at each connecting end.	08
<i>construction</i>	5.3.3.1.3	All hoses, fittings, water filters, and appurtenances used for connection with the bunkering of potable water shall be constructed of safe, easily cleanable materials.	08
<i>good repair</i>	5.3.3.1.4	All hoses, fittings, water filters, and appurtenances used for connection with the bunkering of potable water shall be maintained in good repair.	08
<i>locker construction</i>	5.3.3.1.5	Potable water hose lockers shall be constructed of smooth, nontoxic, corrosion resistant, easily cleanable material and shall be maintained in good repair.	08
<i>locker identification</i>	5.3.3.1.6	Potable water hose lockers shall be marked "POTABLE WATER HOSE AND FITTING STORAGE" in letters at least 13 mm (0.5 inch) high.	08
<i>locker height</i>	5.3.3.1.7	The potable water hose lockers shall be mounted at least 460 mm (18 inches) above the deck and shall be self-draining.	08
<i>locker closed</i>	5.3.3.1.8	The locker doors shall be closed when not removing hoses and equipment.	08
<i>locker restriction</i>	5.3.3.1.9	The locker shall not be used for any other purpose than storing potable water hoses, fittings, sanitizing buckets, and other associated equipment.	08
	5.3.3.2	Handling	
<i>limit use</i>	5.3.3.2.1	Potable water hoses shall not be used for any other purpose.	08
<i>handling</i>	5.3.3.2.2	All hoses, fittings, water filters, buckets, and appurtenances used for connection with the bunkering of potable water shall be handled and stored in a sanitary manner.	08

<i>contamination prevention</i>	5.3.3.2.3	Potable water hoses shall be handled with care to prevent contamination by dragging ends on the ground, pier, or deck surfaces, or by dropping the hose into the harbor.	08	
<i>flush/drain</i>	5.3.3.2.4	Potable water hoses shall be flushed before being used and shall be drained after each use.	08	
<i>storage</i>	5.3.3.2.5	Potable water hoses shall be stowed rolled tight with the ends capped, on reels, or racks, or with ends coupled together in potable water hose lockers.	08	
	5.3.4	Potable Water System Contamination		
	5.3.4.1	Cleaning and Disinfection		
<i>disinfecting</i>	5.3.4.1.1	Potable water tanks and any parts of the potable water distribution system shall be cleaned, disinfected, and flushed with potable water: (1) Before being placed in service; and (2) Before returning to operation after repair, replacement; or (3) Being subjected to any contamination, including entry into a potable water tank.	07	C
<i>annual inspection</i>	5.3.4.1.2	Potable water tanks shall be inspected, cleaned, and disinfected during dry docks and wet docks, or every 2 years, whichever is less.	08	
<i>record retention</i>	5.3.4.1.3	Documentation of the inspection, maintenance, cleaning, disinfection (to include concentration and contact time of disinfectant), and flushing shall be maintained for 12 months and shall be available to the VSP for review during inspections.	08	
<i>disinfection residual</i>	5.3.4.1.4	Disinfection following potential contamination shall be accomplished by increasing free residual halogen to at least 50 mg/L (ppm) throughout the affected area and maintaining this concentration for 4 hours, or by way of another procedure recognized and accepted by the VSP.	07	C

<i>emergencies</i>	5.3.4.1.5	<i>In an emergency, this contact time may be shortened to 1 hour by increasing free residual halogen to at least 200 mg/L (ppm) throughout the affected area.</i>	
<i>flush</i>	5.3.4.1.6	The disinfected parts of the system shall be flushed with potable water or otherwise de-chlorinated until the free residual halogen is ≤ 5.00 mg/L (ppm).	08
<i>alternative method</i>	5.3.4.1.7	An alternative potable water tank cleaning and disinfection procedure which is ONLY approved for routine cleaning and disinfection and is NOT approved for known or suspected contaminated tanks is as follows: (1) Remove (strip) all water from the tank; (2) Clean all tank surfaces, including filling lines, etc. with an appropriate detergent; (3) Thoroughly rinse the surfaces of the tank with potable water and strip this water; (4) Wet all surfaces of the tank with at least a 200 ppm (mg/L) solution of chlorine (this can be done using new, clean mops, rollers, etc.); (5) Ensure that the tank surfaces remain wet with the chlorine solution for at least 2 hours; (6) Refill the tank and verify that the chlorine level is ≤ 5.0 ppm (mg/L) before placing the tank back into service.	08

5.4 Potable Water System Halogenation

5.4.1 Halogenation Devices

construction

5.4.1.1 Construction and Installation

- 5.4.1.1.1 All distribution water system halogenation devices shall be constructed and installed in accordance with recommended engineering practices. 06

5.4.1.2 Operation

residual

- 5.4.1.2.1 The halogenation device shall provide continuous halogenation of the potable water distribution system and shall maintain a free residual halogen of ≥ 0.2 mg/l (ppm) and ≤ 5.0 mg/L (ppm) throughout the distribution system. 04 C

controlled

- 5.4.1.2.2 The amount of halogen injected into the potable water system shall be controlled by a free halogen analyzer. 08

backup pump

- 5.4.1.2.3 At least one backup halogen pump shall be installed with an active automatic switchover feature to maintain the free residual halogen in the event that the primary pump fails, an increase in demand occurs, or the low chlorine alarm sounds. 06

5.5 Potable Water System Halogen Monitoring

5.5.1 Halogen Analyzer-Chart Recorder

5.5.1.1 Installation

distant point

- 5.5.1.1.1 A halogen analyzer-chart recorder shall be installed at a distant point in the potable water distribution system where a significant water flow exists and represents the entire distribution system. In cases where dual distribution loops exist and no pipes connect the loops there shall be an analyzer and chart recorder for each loop. 06

data logger

- 5.5.1.1.2 *Electronic data loggers with certified data security features may be used in lieu of chart recorders.*

	5.5.1.2	Operation		
<i>maintenance</i>	5.5.1.2.1	The halogen analyzer-chart recorder shall be properly maintained, operated, and calibrated/verified daily in accordance with the manufacturer's instructions. A manual comparison test shall be conducted daily to verify calibration. Calibration shall be made whenever the manual test value is > 0.2 ppm higher or lower than the analyzer reading.	06	
<i>calibration</i>	5.5.1.2.2	The daily, manual comparison test or calibration shall be recorded either on the recorder chart or in a log book.	06	
<i>accuracy</i>	5.5.1.2.3	The free residual halogen measured by the halogen analyzer shall be ± 0.2 mg/L (ppm) of the free residual halogen measured by the manual test.	05	C
<i>test kit</i>	5.5.1.2.4	The test kit used to calibrate the halogen analyzer shall be graduated in increments no greater than 0.2 mg/L (ppm) in the range of free residual halogen normally maintained in the potable water system.	06	
	5.5.2	Halogen Analyzer Charts		
	5.5.2.1	Chart Design		
<i>range</i>	5.5.2.1.1	Halogen analyzer-chart recorder charts shall have a range of 0.2 to 5.0 mg/L (ppm) and have a recording period of 24 hours.	06	
<i>data logger</i>	5.5.2.1.2	Electronic data loggers with certified data security features used in lieu of chart recorders shall produce records that conform to the principles of operation and data display required of the analog charts, including printing the records.	06	
	5.5.2.1.3	Electronic data logging shall be in increments of ≤ 15 minutes.	06	
	5.5.2.2	Operation		
<i>charts</i>	5.5.2.2.1	Halogen analyzer-chart recorder charts shall be changed, initialed, and dated daily. Charts shall contain notations of any unusual water events in the potable water system.	06	
<i>retention</i>	5.5.2.2.2	Halogen analyzer-chart recorder charts shall be retained for at least 12 months and shall be available to the VSP for review during inspections.	06	

<i>chart review</i>	5.5.2.2.3	Records from the halogen analyzer-chart recorder shall verify the free residual halogen of ≥ 0.2 mg/L (ppm) and ≤ 5.0 mg/L (ppm) in the water distribution system for at least 16 hours in each 24-hour period since the last inspection of the vessel.	06
	5.5.3	Manual Halogen Monitoring	
	5.5.3.1	Equipment Failure	
<i>every 4 hours</i>	5.5.3.1.1	Free residual halogen shall be measured by a manual test kit at the halogen analyzer at least every 4 hours in the event of equipment failure.	06
<i>recording</i>	5.5.3.1.2	Manual readings shall be recorded on a chart or log, shall be retained for at least 12 months, and shall be available to the VSP for review during inspections.	06
<i>limit</i>	5.5.3.1.3	Repairs on malfunctioning halogen analyzer-chart recorders shall be completed within 10 days of equipment failure.	06
<i>low level alarm</i>	5.5.3.1.4	Provide an audible alarm in a continuously occupied watch station, ie: the engine control room, to indicate low free halogen readings at the distant point (bridge) analyzer.	06

5.6 Microbiologic Monitoring

5.6.1 Sampling and Analysis

5.6.1.1 Methodology

samples 5.6.1.1.1 A minimum of four potable water samples per month shall be collected and analyzed for the presence of *Escherichia coli*. Samples shall be collected from locations forward, aft, upper, and lower decks of the vessel. Sample sites shall be changed each month in order to obtain a good representation of the potable water distribution system. 06

analysis 5.6.1.1.2 Samples shall be analyzed utilizing a method accepted in Standard Methods for the Examination of Water and Wastewater. 06

5.6.1.2 Records

records 5.6.1.2.1 Sample results shall be maintained onboard the vessel for at least 12 months, and shall be available to the VSP for review during inspections. 06

5.7 Water Distribution System Protection

5.7.1 Cross-Connection Control

5.7.1.1 Program

cross-connections 5.7.1.1.1 The potable water distribution system shall be maintained free of cross-connections with non-potable piping systems and tanks. 07 C

protection 5.7.1.1.2 The potable water system shall be protected against backflow or other contamination by backflow preventers or air-gaps. 07 C

The vessel shall provide a comprehensive cross-connection control program that provides safe connections to the potable water system through air-gaps or appropriate backflow devices at the following locations, if present:

- (1) Potable water supply lines to swimming pools, whirlpool spas, hot tubs, bathtubs, showers, and similar facilities; In the case of a potable water supply to a pool or whirlpool spa make-up tank, an overflow line at least twice the diameter of the potable water supply line and located below the tank supply line, is an acceptable form of backflow prevention provided that there is an indirect connection to the wastewater system;
- (2) Photographic laboratory developing machines and utility sinks;
- (3) Beauty and barber shop spray-rinse hoses;
- (4) Potable water faucets where hoses are connected or can be connected by threaded or quick-connect outlets such as those serving tanks containing chlorine and other chemicals, and deck taps;
- (5) Garbage grinders and pulpers;
- (6) Mechanical warewashing machines;
- (7) Hospital and laundry equipment;
- (8) Air conditioning expansion tanks;
- (9) Boiler feed water tanks;
- (10) Fire systems;
- (11) Toilets;
- (12) Potable water, bilge, and sanitary pumps that require priming;
- (13) Freshwater or saltwater ballast systems;
- (14) Bilge or other waste water locations;
- (15) International shore connections for fire/sprinkler, high saline overboard discharge from evaporators, or

other such cross-connections involving high pressure require reduced pressure assembly backflow prevention devices installed; and

(16) Any other connection between potable and non potable water systems.

<i>log</i>	5.7.1.1.4	A cross-connection control program shall include at a minimum: a complete listing of cross-connections and the backflow prevention method/device for each, so there is a match to the plumbing system component and location, the program shall set a schedule for inspection frequency. Repeat devices such as toilets can be grouped under a single device type, and air-gaps shall be included in the listing. A log documenting the inspection or maintenance in written or electronic form shall be maintained and be available for review during inspections.	08
	5.7.1.2	Device Installation	
<i>backflow preventers</i>	5.7.1.2.1	Backflow preventers shall be installed when air-gaps are impractical or when water under pressure is required.	08
<i>2X diameter</i>	5.7.1.2.2	Air-gaps shall be at least twice the diameter of the delivery fixture opening and a minimum of 25 mm (1 inch).	08
<i>flood-level rim</i>	5.7.1.2.3	An atmospheric vacuum breaker shall be installed at least 150 mm (6 inches) above the flood-level rim of the fixtures.	08
<i>after valve</i>	5.7.1.2.4	An atmospheric vacuum breaker shall be installed only in the supply line on the discharge side of the last control valve.	08
<i>continuous pressure</i>	5.7.1.2.5	A continuous pressure-type backflow preventer shall be installed when a valve is located downstream from the backflow preventer.	08
<i>backflow preventers</i>	5.7.1.2.6	Backflow preventers shall be provided on all fixtures using potable water and which have submerged inlets.	08
<i>vacuum toilets</i>	5.7.1.2.7	A vacuum breaker shall be installed on a potable water supply that is connected to a vacuum toilet system. An atmospheric vacuum breaker shall be located on the discharge side of the last control valve (flushing device).	08

<i>diversion valves</i>	5.7.1.2.8	Lines to divert potable water to other systems by valves or interchangeable pipe fittings shall have an air-gap following the valve.	08
<i>location</i>	5.7.1.2.9	Backflow preventers shall be located so they may be inspected, serviced, and maintained.	08
	5.7.1.3	Air Supply Connections	
<i>air supply</i>	5.7.1.3.1	The air supply to a compressed air system that supplies pressure to both non-potable and potable water pneumatic tanks shall be through a press-on (manual) type of air valve or hose.	08
<i>separate compressor</i>	5.7.1.3.2	<i>A fixed connection of this valve may be used when the air supply is from a separate compressor used exclusively for pressure to potable pneumatic tanks.</i>	
	5.7.2	Backflow-Preventer Inspection and Testing	
	5.7.2.1	Maintenance	
<i>maintained</i>	5.7.2.1.1	Backflow preventers shall be maintained in good repair.	08
	5.7.2.2	Inspection and Service	
<i>schedule</i>	5.7.2.2.1	Backflow prevention devices should be periodically inspected and any failed units shall be replaced.	08
<i>RP annually</i>	5.7.2.2.2	Backflow prevention devices requiring testing, for example reduced pressure backflow preventer and double check valves with test cocks, shall be inspected and tested with a test kit at least annually. Test results showing the pressure differences on both sides of the valves shall be maintained for each device.	08
<i>records</i>	5.7.2.2.3	The inspection and test results for backflow preventers shall be retained for at least 12 months and shall be available to the VSP for review during inspections.	08

6.0 Swimming Pools and Whirlpool Spas

- 6.1 Flow-Through Seawater Swimming Pools
- 6.2 Recirculating Swimming Pools
- 6.3 Whirlpool Spas
- 6.4 Safety

6.1 Flow Through Seawater Swimming Pools

6.1.1 Operation

6.1.1.1 At Sea

12 miles 6.1.1.1.1 Flow-through seawater supply systems for swimming pools shall be used only while the vessel is under way and at sea beyond 20 kilometers (12 miles) from nearest land. 10

6.1.1.2 In Port

drained 6.1.1.2.1 The pool (when in flow-thru seawater mode only) shall be drained before the vessel reaches port, and it shall remain empty while in port. 10

switched to recirculation 6.1.1.2.2 If the pool is not drained before arriving in port, the pool's seawater filling system shall be shut off 20 kilometers (12 miles) before reaching land, and a recirculation system shall be used with appropriate filtering and halogenation. 10

1.0 mg/L (ppm) 6.1.1.2.3 No bathers shall be allowed to use the pool before a free residual halogen of 1.0 mg/L (ppm) is achieved. 09 C

6.2 Recirculating Swimming Pools

6.2.1 Operation

6.2.1.1 Filters

filtered 6.2.1.1.1 Recirculated swimming pool water shall be filtered. 10

backwashed 6.2.1.1.2 Filter pressure differential shall be monitored. A filter shall be backwashed as recommended by the manufacturer. A written or electronic record of the backwashing shall be available for review during inspections. 10

media 6.2.1.1.3 Filter media shall be examined and changed as recommended by the manufacturer. 10

<i>gauges</i>	6.2.1.1.4	Swimming pool filter pressure gauges and valves shall be replaced when they are defective.	10	
<i>manuals</i>	6.2.1.1.5	The operating manuals for all recirculating swimming pool components such as filters, pumps, and halogenation shall be maintained aboard the vessel in a location that is known by and is accessible to crew members who are responsible for the pool's operations and maintenance.	10	
	6.2.1.2	Water Quality		
<i>water chemistry</i>	6.2.1.2.1	The recirculated swimming pool's water flow rates, pH, alkalinity, and clarity shall be monitored and adjusted as recommended by the manufacturer and to maintain optimum public health protection.	10	
<i>fecal accident</i>	6.2.1.2.2	A fecal accident response procedure which meets or exceeds the procedure provided in annex 13.11 shall be documented and available to the VSP for review during inspections.	10	
<i>record of fecal accidents</i>	6.2.1.2.3	A written or electronic record shall be made of all fecal accidents which includes pool name, date and time of incident, response steps taken, free residual halogen level achieved following cleaning, and contact times.	10	
	6.2.2	Halogenation		
	6.2.2.1	Residual Halogen		
<i>residual</i>	6.2.2.1.1	A free residual halogen of ≥ 1.0 and ≤ 5.0 mg/L (ppm) shall be maintained in recirculated swimming pools.	09	C
<i>maintenance</i>	6.2.2.1.2	Halogenation systems shall be operated and maintained in good repair in accordance with the manufacturer's recommendations.	10	
	6.2.2.2	Residual Halogen Monitoring		
<i>test kit</i>	6.2.2.2.1	A halogen test kit shall be provided and used.	10	
<i>testing</i>	6.2.2.2.2	Residual halogen logs shall be maintained with residuals measured and recorded every 4 hours during operation.	10	
<i>analyzer-chart recorder</i>	6.2.2.2.3	Halogen analyzer-chart recorders used in lieu of manual tests and logs shall be calibrated daily, and the calibration shall be recorded on the chart or in a log book.	10	
<i>data logger</i>	6.2.2.2.4	<i>Electronic data loggers with certified data security features may be used in lieu of chart recorders.</i>		

<i>charts</i>	6.2.2.2.5	Halogen analyzer-chart recorder charts shall be initialed, dated, and changed daily.	10
<i>logs</i>	6.2.2.2.6	Logs and charts shall contain notations of any unusual water events with the swimming pool operation and corrective actions taken.	10
<i>retention</i>	6.2.2.2.7	Logs and charts shall be retained for at least 12 months and shall be available to the VSP for review during inspections.	10

6.3 Whirlpool Spas

6.3.1 Public Operations

6.3.1.1 Filters

<i>filtration</i>	6.3.1.1.1	Whirlpool spa water shall be filtered.	10
<i>replacement</i>	6.3.1.1.2	At least one replacement cartridge or cannister-type filter shall be available at all times for whirlpool spa filtration systems that use this type of filter.	10
<i>inspection</i>	6.3.1.1.3	Cartridge or cannister-type filters shall be inspected at least weekly for cracks, breaks, damaged components, and excessive organic material accumulation.	10
<i>backwash</i>	6.3.1.1.4	Granular filters shall be backwashed at least daily. Backwashing shall be repeated until the water viewed through the sight glass or discharge point is clean flowing.	10
<i>examination and core sample</i>	6.3.1.1.5	The granular filters shall be opened at least monthly and examined for cracks, mounds, or holes in the filter media. A core sample of the filter media shall be inspected for excessive organic material accumulation using a recommended sedimentation method. <i>One acceptable method is to draw water down to the media surface and inspect the granular filter for cracks, mounds, or holes. Take a sample from the filter core and inspect it for excessive organic/dirt build-up at least monthly. Shake sampled media and water in a clean, stoppered, clear-plastic container and observe the settling action. If, after 30 minutes of settling, a measurable layer of sediment is within or on top of the filter media or fine, colored particles are suspended in the water, the organic loading may be excessive, and media replacement should be considered.</i>	10
<i>replacement</i>	6.3.1.1.6	The granular filter media shall be replaced at least every 6 months. The filter housing shall be cleaned and sanitized	10

		before the new filter media is placed in it.		
<i>maintenance</i>	6.3.1.1.7	Whirlpool spa filter pressure gauges and valves shall be replaced when they are defective.	10	
	6.3.1.1.8	The operating manuals for all whirlpool spa components such as filters, pumps, and halogenation equipment shall be maintained aboard the vessel in a location that is known by and is accessible to crew members who are responsible for the whirlpool spa's operations and maintenance.	10	
	6.3.1.2	Water Quality		
<i>changed</i>	6.3.1.2.1	The whirlpool spa water shall be changed daily.	10	
<i>pH</i>	6.3.1.2.2	The whirlpool spa water shall be maintained with a pH between 7.2 and 7.8.	10	
<i>fecal accident</i>	6.3.1.2.3	A fecal accident response procedure which meets or exceeds the procedure provided in annex 13.11 shall be documented and available to the VSP for review during inspections.	10	
<i>record of fecal accidents</i>	6.3.1.2.4	A written or electronic record shall be made of all fecal accidents which includes pool name, date and time of incident, response steps taken, free residual halogen level achieved following cleaning, and contact times.	10	
	6.3.2	Halogenation		
	6.3.2.1	Residual Halogen		
<i>residual</i>	6.3.2.1.1	Whirlpool spas shall maintain a free residual chlorine of ≥ 3.0 mg/L (ppm) and ≤ 10 mg/L (ppm), or a free residual bromine of ≥ 4.0 mg/L (ppm) and ≤ 10 mg/L (ppm).	09	C
<i>shock</i>	6.3.2.1.2	The free residual halogen shall be increased to at least 10.0 mg/L (ppm) in whirlpool spas and circulated for at least 1 hour at the end of each day. Except for areas covered in section 6.3.3 and 6.3.4, the free residual halogen shall be increased to at least 10.0 mg/L (ppm) in whirlpool spas and circulated for at least 1 hour at the end of each day. <i>Whirlpool spas filled with seawater are exempt from this requirement.</i>	10	
<i>maintenance</i>	6.3.2.1.3	Halogenation systems shall be operated and maintained in good repair in accordance with the manufacturer's recommendations.	10	

<i>records</i>	6.3.2.1.4	A written or electronic record of whirlpool spa filter inspections, backwashing, coliform sample sedimentation test, and shock halogenation (concentration in ppm and time) shall be available for review during inspections.	10
	6.3.2.2	Residual Halogen Monitoring	
<i>test kit</i>	6.3.2.2.1	A halogen test kit shall be provided and used.	10
<i>testing</i>	6.3.2.2.2	Residual halogen logs shall be maintained with residuals measured and recorded hourly during operation.	10
<i>analyzer- chart recorder</i>	6.3.2.2.3	Halogen analyzer-chart recorders used in lieu of manual tests and logs shall be calibrated daily, and the calibration shall be recorded on the chart or in a log book.	10
<i>data logger</i>	6.3.2.2.4	<i>Electronic data loggers with certified data security features may be used in lieu of chart recorders.</i>	
<i>charts</i>	6.3.2.3.5	Halogen analyzer-chart recorder charts shall be initialed, dated and changed daily.	10
<i>logs</i>	6.3.2.3.6	Logs and charts shall contain notations of any unusual water events with the whirlpool spas and corrective actions taken.	10
<i>retention</i>	6.3.2.3.7	Logs and charts shall be retained for at least 12 months.	10

	6.3.3	Private Cabin Operations	
	6.3.3.1	Maintenance	
<i>cleaning</i>	6.3.3.1.1	Private whirlpool spas located in individual passenger cabins shall be cleaned and disinfected, including associated recirculation systems, between occupancies or weekly, whichever is more frequent.	10
<i>maintenance</i>	6.3.3.1.2	Manufacturer's operation and maintenance instructions shall be available to personnel that service the units.	10
	6.3.4	Individual Hydrotherapy Pools	
	6.3.4.1	Maintenance	
<i>cleaning</i>	6.3.4.1.1	Individual hydrotherapy pools shall be cleaned and disinfected, including associated recirculation systems, between customers.	10
<i>maintenance</i>	6.3.4.1.2	Manufacturer's operation and maintenance instructions shall be available to personnel that service the units.	10

6.4 Safety

6.4.1 Public Swimming Pools and Whirlpool Spas

6.4.1.1 Signs and Markings

signs 6.4.1.1.1 Safety signs shall be provided for public swimming pools and whirlpool spas. 10

depth markers 6.4.1.1.2 The depth of each pool shall be displayed prominently, so that it can be seen from the deck and in the pool. Depth markers should be labeled either in feet or meters, or both. Additionally, depth markers shall be installed for every 1 m (3 feet) change in depth. 10

spas 6.4.1.1.3 A sign shall be installed near the whirlpool spas that list standard safety precautions and risks, warning against use by particularly susceptible people, such as those who are immunocompromised. 10

6.4.1.2 Equipment

life saving 6.4.1.2.1 Easy access shepherd's hook and approved floatation device (with a length of line $\frac{1}{2}$ the pool width or 16 m (50 feet)) shall be provided at a prominent location near each public swimming pool. 10

anti-entrapment drain 6.4.1.2.2 Anti-entrapment drain covers or other drains that prevent entrapment hazards as specified in U.S. Consumer Product Safety Publication 363-009801 (dual drains/channel drains) shall be provided on swimming pools and whirlpool spas. An approved cover shall have either the plumbing/engineering approving organization stamp and flow rate affixed to the cover, or a letter maintained onboard the vessel certifying that the cover meets the safety requirements outlined in ASME/ANSI A112.19.8M or an equivalent standard. 10

temperature 6.4.1.2.3 A temperature control mechanism to prevent the temperature from exceeding 40°C (104°F) shall be provided on whirlpool spas. 10

	6.4.1.3	Restrictions	
<i>diapers</i>	6.4.1.3.1	Children in diapers or who are not toilet trained are not permitted in the public swimming pools and whirlpool spas.	10
	6.4.2	Spa Pool (<i>an independent pool with combined elements of a whirlpool spa</i>)	
	6.4.2.1	Maintenance and Operating Standards	
<i>operation and maintenance</i>	6.4.2.1.1	The spa pool halogen shall be operated and maintained according to whirlpool spa standards provided in sections 6.3.1.1.1 - 6.4.1.3.1, except that daily water change in section 6.3.1.2 is not required. If the spa pool uses only seawater the daily shock in section 6.3.2.1.2 is also not required.	9/10
<i>spa standards</i>	6.4.2.1.2	For any pool with an attached whirlpool spa, where the water, recirculation system equipment, or filters are shared with the spa, all elements of the whirlpool spa standards shall apply to the pool.	9/10

7.0 Food Safety

- 7.1 Reserved
- 7.2 Personnel
- 7.3 Food
- 7.4 Equipment and Utensils
- 7.5 Warewashing and Laundering
- 7.6 Poisonous and Toxic Materials
- 7.7 Facilities

7.1 Reserved

7.2 Personnel

7.2.1 Food-Safety Management

7.2.1.1 Food-Safety Knowledge

<i>knowledge</i>	7.2.1.1.1	Based on the risks of foodborne illness inherent to the food operation, during inspections and upon request the person in charge of the food operations on the vessel shall demonstrate to the VSP knowledge of foodborne disease prevention, application of the Hazard Analysis Critical Control Point principles, and the food-safety guidelines in this manual. The person in charge shall demonstrate this knowledge by compliance with these guidelines, by being a domestically or foreign certified food protection manager who has shown proficiency of required information through passing a test that is part of an accredited program, or by responding correctly to the inspector's questions as they relate to the specific food operation. The areas of knowledge shall include:	13	C
<i>personal hygiene</i>		(1) Describing the relation between prevention of foodborne disease and personal hygiene of a food employee;		
<i>employee to food disease transmission</i>		(2) Explaining the responsibility of the person in charge of preventing the transmission of foodborne disease by a food employee who has a disease or medical condition that may cause foodborne disease;		
<i>symptoms</i>		(3) Describing the symptoms associated with the diseases that are transmissible through food;		
<i>PHF time/temperature</i>		(4) Explaining the significance of the relation between maintaining the time and temperature of potentially hazardous food;		

<i>raw/ undercooked PHF</i>	(5) Explaining the hazards involved in the consumption of raw or undercooked meat, poultry, eggs, and fish;
<i>safe cooking temperatures</i>	(6) Stating the required food temperatures and times for safe cooking of potentially hazardous food, including meat, poultry, eggs, and fish;
<i>safe holding temperatures</i>	(7) Stating the required temperatures and times for the safe refrigerated storage, hot holding, cooling, and reheating of potentially hazardous food;
<i>cross- contamination</i>	(8) Describing the relation between prevention of foodborne illness and management and control of the following: cross-contamination, hand contact with ready-to-eat foods, handwashing, and maintaining the food operations in a clean condition and in good repair;
<i>equipment and food safety</i>	(9) Explaining the relation between food safety and providing equipment that is sufficient in number and capacity, and properly designed, constructed, located, installed, operated, maintained, and cleaned;
<i>cleaning and sanitizing</i>	(10) Explaining correct procedures for cleaning and sanitizing utensils and food-contact surfaces of equipment;
<i>toxic material control</i>	(11) Identifying poisonous or toxic materials on the vessel and the procedures necessary to ensure they are safely stored, dispensed, used, and disposed of according to law; and
<i>critical-control points</i>	(12) Identifying critical-control points in the operation from purchasing through service that when not controlled may contribute to the transmission of foodborne illness and explaining steps taken to ensure the points are controlled in accordance with the guidelines in this manual.

7.2.1.2 Food-Safety Duties

<i>monitoring duties</i>	7.2.1.2.1	The person in charge of the food operations on the vessel shall ensure that:
<i>separate areas</i>		(1) Food operations are not conducted in a room used as living or sleeping quarters;
<i>unnecessary persons</i>		(2) Persons unnecessary to the food operation are not allowed in the food preparation, food storage, or warewashing areas, except that brief visits and tours may be authorized if steps are taken to ensure that exposed food; clean

13 C

equipment, utensils, and linens; and unwrapped single-service and single-use articles are protected from contamination;

access control

(3) Employees and other persons such as delivery and maintenance persons and pesticide applicators entering the food preparation, food storage, and warewashing areas comply with the guidelines in this manual;

handwashing

(4) Food employees are effectively cleaning their hands, by routinely monitoring the employees' handwashing;

receiving

(5) Employees are observing foods as they are received to determine that they are from approved sources, delivered at the required temperatures, protected from contamination, unadulterated, and accurately presented, by routinely monitoring the employees' observations and periodically evaluating foods upon their receipt;

PHF cooking temperature

(6) Employees are properly cooking potentially hazardous food, being particularly careful in cooking foods known to cause severe foodborne illness and death, such as eggs and comminuted meats, through daily oversight of the employees' routine monitoring of the cooking temperatures using appropriate temperature measuring devices properly scaled and calibrated;

PHF cooling

(7) Employees are using proper methods to rapidly cool potentially hazardous foods that are not held hot or are not for consumption within 4 hours, through daily oversight of the employees' routine monitoring of food temperatures during cooling;

consumer advisory

(8) Consumers who order raw or partially cooked ready-to-eat foods of animal origin are informed that the food is not cooked sufficiently to ensure its safety;

sanitizing

(9) Employees are properly sanitizing cleaned multiuse equipment and utensils before they are reused, through routine monitoring of solution temperature and exposure time for hot water sanitizing, and chemical concentration, pH, temperature, and exposure time for chemical sanitizing;

clean tableware

(10) Consumers are notified that clean tableware is to be used when they return to self-service areas such as salad bars and buffets;

no bare hand contact

(11) Employees are preventing cross-contamination of ready-to-eat food with bare hands by properly using suitable utensils such as deli tissue, spatulas, tongs, single-use gloves, or

dispensing equipment; and

employee
training

(12) Employees are properly trained in food safety as it relates to their assigned duties.

7.2.2 Employee Health

7.2.2.1 Communicable Diseases and Symptoms

communicable
diseases

7.2.2.1.1

Food employees suspected of, diagnosed with, or exposed to any communicable disease caused by *Salmonella typhi*, *Shigella* spp., *Escherichia coli* O157:H7, or hepatitis A virus, or other communicable diseases that can be transmitted by food, shall be restricted from working in any food or food related areas or operations, including working with exposed food, warewashing, equipment, utensils, table linens, single-service and single-use articles. The restricted individual shall not be allowed to return to the above duties until they are symptom free for a minimum of 48 hours.

11 C

other symptoms

7.2.2.1.2

Food employees who have conditions or symptoms of boils, open sores, infected wounds, diarrhea, jaundice, fever, vomiting, sore throat with fever, or discharges from the nose or mouth shall report these conditions or symptoms to the vessel's medical staff and shall be restricted from working with exposed food, warewashing, clean equipment, utensils, table linens, and unwrapped single-service and single-use articles.

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sneeze/cough

7.2.2.1.3

Food employees experiencing persistent sneezing, coughing, or a runny nose that causes discharges from the eyes, nose, or mouth may not work with exposed food, warewashing clean equipment, utensils, and table linens; or unwrapped single-service or single-use articles.

11 C

restrictions
removal

7.2.2.1.4

The restriction may be removed when the person in charge of the food operation obtains written approval from the vessel's physician or equivalent medical staff.

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record of
restriction and
release

7.2.2.1.5

A written or electronic record of both the work restriction and release from restriction shall be maintained onboard the vessel for 12 months for inspection review.

02

7.2.3 Employee Cleanliness

7.2.3.1 Hands and Arms

hands and arms
clean

7.2.3.1.1

Food employees shall keep their hands and exposed portions of their arms clean.

12 C

<i>cleaning procedures</i>	7.2.3.1.2	Food employees shall clean their hands and exposed portions of their arms with a cleaning compound in a handwashing sink by vigorously rubbing together the surfaces of their lathered hands and arms for at least 20 seconds and thoroughly rinsing with clean water. Employees shall pay particular attention to the areas underneath the fingernails and between the fingers.	12	C
<i>when to wash hands</i>	7.2.3.1.3	Food employees shall clean their hands and exposed portions of their arms immediately before engaging in food preparation including working with exposed food, clean equipment and utensils, and unwrapped single-service and single-use articles and:	12	C
<i>after touching</i>		(1) After touching bare human body parts other than clean hands and clean, exposed portions of arms;		
<i>after toilet</i>		(2) After using the toilet room;		
<i>after cough/sneeze</i>		(3) After coughing, sneezing, using a handkerchief or disposable tissue, using tobacco, eating, or drinking;		
<i>after soiled equipment</i>		(4) After handling soiled equipment or utensils;		
<i>changing tasks</i>		(5) During food preparation, as often as necessary to remove soil and contamination and to prevent cross- contamination when changing tasks;		
<i>between raw and RTE</i>		(6) When switching between working with raw food and working with ready-to-eat food; and		
<i>after other contamination</i>		(7) After engaging in other activities that contaminate the hands.		
<i>hand sanitizer</i>	7.2.3.1.4	A hand antiseptic or a hand antiseptic used as a hand dip, or a hand antiseptic soap shall: comply with applicable formulation and use laws under FDA or 21 CFR 170.39, 178, 182, 184, or 186.	14	
<i>apply to clean hands</i>	7.2.3.1.5	A hand antiseptic or a hand antiseptic used as a hand dip, or a hand antiseptic soap shall only be applied to hands that are cleaned.	12	C
	7.2.3.2	Fingernails		
<i>fingernails</i>	7.2.3.2.1	Food employees shall keep their fingernails trimmed, filed, and maintained so the edges and surfaces are cleanable and not rough.	14	

<i>fingernail polish/ artificial nails</i>	7.2.3.2.2	<i>Unless wearing intact gloves in good repair, a food employee may not wear fingernail polish or artificial fingernails when preparing exposed food.</i>	14	
	7.2.3.3	Jewelry		
<i>jewelry</i>	7.2.3.3.1	While preparing food, food employees may not wear jewelry on their arms and hands.	14	
<i>plain ring</i>	7.2.3.3.2	<i>A plain ring such as a smooth simple wedding band may be allowed to be worn by food employees.</i>		
	7.2.3.4	Outer Clothing		
<i>outer clothing</i>	7.2.3.4.1	Food employees shall wear clean outer clothing to prevent contamination of food, equipment, utensils, linens, and single-service and single-use articles.	14	
	7.2.4	Hygienic Practices		
	7.2.4.1	Eating, Drinking, or Using Tobacco		
<i>eating, drinking, and using tobacco</i>	7.2.4.1.1	An employee shall eat, drink, or use any form of tobacco only in designated areas where the contamination of exposed food; clean equipment, utensils, and table linens; unwrapped single-service and single-use articles; or other items needing protection can not result.	12	C
	7.2.4.2	Hair Restraints		
<i>hair restraints</i>	7.2.4.2.1	Food employees shall wear hair restraints such as hats, hair coverings or nets, beard restraints, and clothing that covers body hair, that are designed and worn to effectively keep their hair from contacting exposed food; clean equipment, utensils, and linens; and unwrapped single-service and single-use articles.	14	
<i>counter staff/ wait staff</i>	7.2.4.2.2	<i>This section does not apply to food employees such as counter staff who serve only beverages and wrapped or packaged foods, hostesses, and wait staff if they present a minimal risk of contaminating exposed food; clean equipment, utensils, and linens; and unwrapped single-service and single-use articles.</i>		

7.3 Food

7.3.1 Food Condition

7.3.1.1 Safe and Unadulterated

sound condition 7.3.1.1.1 Food shall be safe and unadulterated. 15 C

7.3.2 Food Sources

7.3.2.1 Lawful Sourcing

comply with law 7.3.2.1.1 Food shall be obtained from sources that comply with applicable local, state, federal, or country of origin's statutes, regulations, and ordinances. 15 C

food from private home 7.3.2.1.2 Food prepared in a private home may not be used or offered for human consumption on a vessel. 15 C

fish for undercooked consumption 7.3.2.1.3 Fish, other than molluscan shellfish, that are intended for consumption in their raw form may be served if they are obtained from a supplier that freezes the fish to destroy parasites; or frozen on the vessel and records are retained. 15 C

steaks 7.3.2.1.4 Whole-muscle, intact beef steaks that are intended for consumption in an undercooked form without a consumer advisory shall be: 15 C

from processing plants (1) Obtained from a food-processing plant that packages the steaks and labels them to indicate they meet the definition of whole-muscle, intact beef; or

cut on vessel (2) If individually cut on a vessel, cut from whole-muscle intact beef that is labeled by a food-processing plant to indicate the beef meets the definition of whole-muscle, intact beef, and prepared so they remain intact.

hermetically sealed container 7.3.2.1.5 Food in a hermetically sealed container shall be obtained from a food-processing plant that is regulated by the food regulatory agency that has jurisdiction over the plant. 15 C

milk 7.3.2.1.6 U.S. supplied fluid milk and milk products shall be obtained from sources that comply with Grade A standards as specified in law. Non-U.S. sourced fluid milk and milk products shall be obtained from sources which meet or exceed the standards of the health authorities from the source Country. 15 C

7.3.2.1.7 Fish and Molluscan Shellfish Sources:

15 C

fish/molluscan shellfish

(1) Fish that are received for service shall be commercially and legally caught or harvested or otherwise approved for service by the VSP.

no recreational caught

(2) Molluscan shellfish that are recreationally caught may not be received for service.

certified source

(3) Molluscan shellfish shall be obtained from sources according to law and the requirements specified in the U.S. Department of Health and Human Services, Public Health Service, Food and Drug Administration, National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish or equivalent standards; and received in interstate commerce shall be from sources that are listed in the FDA Interstate Certified Shellfish Shippers List or equivalent foreign certified shellfish listing.

wild mushrooms 7.3.2.1.8

Mushroom species picked in the wild shall be obtained from sources where each mushroom is individually inspected and found to be safe by an approved mushroom identification expert. *This requirement does not apply to:*

15 C

(1) *Cultivated wild mushroom species that are grown, harvested, and processed in an operation that is regulated by the food regulatory agency that has jurisdiction over the operation; or*

(2) *Wild mushroom species if they are in packaged form and are the product of a food-processing plant that is regulated by the food regulatory agency that has jurisdiction over the plant.*

game animals

7.3.2.1.9

If game animals are received for sale or service they shall be:

15 C

commercially raised

(1) Commercially raised for food and raised, slaughtered, and processed under law; or

inspection program

(2) Under a voluntary inspection program administered by the USDA for game animals such as exotic animals (reindeer, elk, deer, antelope, water buffalo, or bison) that are inspected and approved in accordance with 9 CFR 352 Voluntary Exotic Animal Program or rabbits that are "inspected and certified" in accordance with 9 CFR 354 Rabbit Inspection Program.

endangered species

(3) A game animal may not be received for service if it is a species of wildlife that is listed in 50 CFR 17 Endangered and Threatened Wildlife and Plants.

	7.3.2.2	Receiving Condition		
receiving temperatures	7.3.2.2.1	Receiving temperatures shall be as follows:	16	C
		(1) Refrigerated, potentially hazardous food shall be at a temperature of 7°C (45°F) or below when received.		
		(2) <i>If a temperature other than 7°C (45°F) for a potentially hazardous food is specified in law governing its distribution, such as laws governing milk, molluscan shellfish, and shell eggs, the food may be received at the specified temperature.</i>		
		(3) Potentially hazardous food that is cooked and received hot shall be at a temperature of 60°C (140°F) or above.		
		(4) A food that is labeled frozen and shipped frozen by a food-processing plant shall be received frozen.		
		(5) Upon receipt, potentially hazardous food shall be free of evidence of previous temperature abuse.		
food additives	7.3.2.2.2	Food may not contain unapproved food additives or additives that exceed amounts specified in law.	15	C
shell eggs	7.3.2.2.3	Shell eggs shall be received clean and sound and may not exceed the restricted egg tolerances specified in law.	15	C
egg and milk products	7.3.2.2.4	Eggs and milk products shall be received as follows:	15	C
egg products		(1) Liquid, frozen, and dry eggs and egg products shall be obtained pasteurized.		
milk products		(2) Fluid and dry milk and milk products complying with Grade A standards as specified in law shall be obtained pasteurized.		
frozen milk		(3) Frozen milk products, such as ice cream, shall be obtained pasteurized as specified in 21 CFR 135 Frozen Desserts.		
cheese		(4) Cheese shall be obtained pasteurized unless alternative procedures to pasteurization are specified in the CFR, such as 21 CFR 133 Cheeses and Related Cheese Products, for curing certain cheese varieties.		

<i>package integrity</i>	7.3.2.2.5	Food packages shall be in good condition and protect the integrity of the contents so that the food is not exposed to adulteration or potential contaminants. Canned goods with dents on end or side seams may not be used.	15	C
<i>ice</i>	7.3.2.2.6	Ice for use as a food or a cooling medium shall be made from drinking water.	15	C
<i>shucked shellfish</i>	7.3.2.2.7	Raw shucked shellfish shall be obtained in nonreturnable packages which bear a legible label as specified in the National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish.	15	C
<i>shellstock shellfish</i>	7.3.2.2.8	Shellstock shall be obtained in containers bearing legible source identification tags or labels that are affixed by the harvester and each dealer that depurates, ships, or reships the shellstock, as specified in the National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish.	15	C
<i>shellstock condition</i>	7.3.2.2.9	Shellstock shall be reasonably free of mud, dead shellfish, and shellfish with broken shells when received by a vessel. Dead shellfish or shellstock with badly broken shells shall be discarded.	19	
	7.3.2.3	Maintaining Molluscan Shellfish Identification		
<i>shucked identification</i>	7.3.2.3.1	Shucked molluscan shellfish may not be removed from the container in which they are received other than immediately before preparation for service.	15	C
<i>shellstock identification</i>	7.3.2.3.2	Shellstock shellfish tags shall:	15	C
<i>attached</i>		(1) Remain attached to the container in which the shellstock are received until the container is empty.		
<i>retained 90 days</i>		(2) Be maintained by retaining shellstock tags or labels for 90 calendar days from the date the container is emptied by using an approved record keeping system that keeps the tags or labels in chronologic order correlated to the date when the shellstock are served.		

7.3.3 Food Protection

7.3.3.1 Employee Contamination

wash hands	7.3.3.1.1	Food employees shall wash their hands.	12	C
R. — hand contact prohibited	7.3.3.1.2	<i>Except when washing fruits and vegetables or when otherwise approved,</i> food employees may not contact exposed, ready-to-eat food with their bare hands and shall use suitable utensils such as deli tissue, spatulas, tongs, single-use gloves, or dispensing equipment.	12	C
not RTE contact minimized	7.3.3.1.3	Food employees shall minimize bare hand and arm contact with exposed food that is not in a ready-to-eat form.	12	C
tasting	7.3.3.1.4	A food employee shall not use a utensil more than once to taste food that is to be served.	12	C

7.3.3.2 Food and Ingredient Contamination

cross- contamination	7.3.3.2.1	Food shall be protected from cross-contamination by:	18	C
raw animal foods		(1) Physically separating raw animal foods during storage, preparation, holding, and display from raw ready-to-eat food including other raw animal food such as fish for sushi or molluscan shellfish, or other raw ready-to-eat food such as vegetables, and cooked ready-to-eat food; so products do not physically touch, and so as to prevent dripping of one product into another;		
different species		(2) <i>Except when combined as ingredients,</i> separating types of raw animal foods from each other such as beef, fish, lamb, pork, and poultry during storage, preparation, holding, and display by using separate equipment for each type, or arranging each type of food in equipment so that cross-contamination of one type with another is prevented, and preparing each type of food at different times or in separate areas;		
cleaning/ sanitizing		(3) Cleaning and sanitizing equipment and utensils;		
packaging/contain- er		(4) Storing the food in packages, covered containers, or wrappings;		
cleaning containers		(5) Cleaning hermetically sealed containers of food of visible soil before opening;		
protecting containers		(6) Protecting food containers that are received packaged together in a case or overwrap from cuts when the case or overwrap is opened;		
damaged/				

spoiled		(7) Separating damaged, spoiled, or recalled food being held on the vessel; and	
raw/RTE vegetables		(8) Separating fruits and vegetables, before they are washed, from ready-to-eat food.	
	7.3.3.2.2	<i>Storing the food in packages, covered containers, or wrappings does not apply to:</i>	
		(1) <i>Whole, uncut, raw fruits and vegetables and nuts in the shell, that require peeling or hulling before consumption;</i>	
		(2) <i>Primal cuts, quarters, or sides of raw meat or slab bacon that are hung on clean, sanitized hooks or placed on clean, sanitized racks;</i>	
		(3) <i>Whole, uncut, processed meats such as country hams, and smoked or cured sausages that are placed on clean, sanitized racks;</i>	
		(4) <i>Food being cooled; or</i>	
		(5) <i>Shellstock.</i>	
container identified,	7.3.3.2.3	Working containers holding food or food ingredients that are removed from their original packages for use on the vessel, such as cooking oils, flour, herbs, potato flakes, salt, spices, and sugar shall be identified with the common name of the food. <i>Containers holding food that can be readily and unmistakably recognized such as dry pasta need not be identified.</i>	19
pasteurized eggs	7.3.3.2.4	Pasteurized eggs or egg products shall be substituted for raw shell eggs in the preparation of foods such as Caesar salad, hollandaise, or Béarnaise sauce, mayonnaise, eggnog, ice cream, and egg-fortified beverages or dessert items that are not cooked.	18 C
wash fruits/vegetables	7.3.3.2.5	Raw fruits and vegetables shall be thoroughly washed in water to remove soil and other contaminants before being cut, combined with other ingredients, cooked, served, or offered for human consumption in ready-to-eat form.	19
vegetable washes	7.3.3.2.6	<i>Fruits and vegetables may be washed by using chemicals specified under 21 CFR 173.315.</i>	

	7.3.3.3 Ice as Coolant		
<i>ice used as a coolant</i>	7.3.3.3.1	After use as a medium for cooling the exterior surfaces of food such as melons or fish, packaged foods such as canned beverages or cooling coils and tubes of equipment, ice may not be used as food.	19
<i>coolant</i>	7.3.3.3.2	Packaged food may not be stored in direct contact with ice or water if the food is subject to the entry of water because of the nature of its packaging, wrapping, or container, or its positioning in the ice or water.	19
<i>undrained ice</i>	7.3.3.3.3	Except as specified below, unpackaged food may not be stored in direct contact with undrained ice.	19
<i>raw fruit/vegetables</i>	7.3.3.3.4	<i>Whole, raw fruits or vegetables; cut, raw vegetables such as celery or carrot sticks, or cut potatoes; and tofu may be immersed in ice or water.</i>	
<i>raw chicken/ fish</i>	7.3.3.3.5	<i>Raw chicken and raw fish that are received immersed in ice in shipping containers may remain in that condition while in storage awaiting preparation, display, or service.</i>	
<i>ongoing meal service</i>	7.3.3.3.6	<i>Other unpackaged foods in a raw, cooked, or partially cooked state may be immersed in ice as part of an ongoing meal service process, such as liquid egg product, individual eggs, pasta, and reconstituted powdered mixes.</i>	
	7.3.3.4 Equipment, Utensils, and Linens		
<i>cleaned/ sanitized</i>	7.3.3.4.1	Food shall only contact surfaces of equipment and utensils that are cleaned and sanitized.	26 C
<i>storage during use</i>	7.3.3.4.2	During pauses in food preparation or dispensing, food preparation and dispensing utensils shall be stored:	19
<i>handles out</i>		(1) In the food with their handles above the top of the food and the container;	
<i>storage bins</i>		(2) In food that is not potentially hazardous with their handles above the top of the food within containers or equipment that can be closed, such as bins of sugar, flour, or cinnamon;	
<i>clean surfaces</i>		(3) On a clean portion of the food preparation table or cooking equipment only if the in-use utensil and the food-contact surface of the food preparation table or cooking equipment are cleaned and sanitized at least every four hours;	
<i>running water</i>		(4) In running water of sufficient velocity to flush particulates to	

		the drain, if used with moist food such as ice cream or mashed potatoes;	
<i>ice scoops</i>		(5) In a clean, protected location if the utensils, such as ice scoops, are used only with a food that is not potentially hazardous; or	
<i>heated water</i>		(6) In a container of water if the water is maintained at a temperature of at least 60°C (140°F) and the container is frequently cleaned and sanitized.	
<i>linen/ napkins</i>	7.3.3.4.3	Linens and napkins may not be used in contact with food <i>unless they are used to line a container for the service of foods and the linens and napkins are replaced each time the container is refilled for a new consumer.</i>	19
<i>wiping cloths</i>	7.3.3.4.4	Wiping cloths shall be restricted to the following:	25
<i>no other purpose</i>		(1) Cloths that are in use for wiping food spills shall be used for no other purpose.	
<i>dry or stored in sanitizer</i>		(2) Cloths used for wiping food spills shall be dry and used for wiping food spills from tableware and single-service articles or wet and cleaned, stored in a chemical sanitizer, and used for wiping spills from food-contact and nonfood-contact surfaces of equipment.	
<i>separate for raw</i>		(3) Dry or wet cloths that are used with raw animal foods shall be kept separate from cloths used for other purposes, and wet cloths used with raw animal foods shall be kept in a separate sanitizing solution.	
<i>clean solution</i>		(4) Wet wiping cloths used with a freshly made sanitizing solution and dry wiping cloths shall be free of food debris and visible soil.	

7.3.3.4.5 Gloves shall be used as follows:

19

<i>one task/ discard</i>	(1) If used, single-use gloves shall be used for only one task such as working with ready-to-eat food or with raw animal food, used for no other purpose, and discarded when damaged or soiled or when interruptions occur in the operation.
<i>slash-resistant</i>	(2) Slash-resistant gloves that are used to protect the hands during operations requiring cutting shall be used in direct contact only with food that is subsequently cooked such as frozen food or a primal cut of meat.
<i>covered when RTE food prep</i>	(3) <i>Slash-resistant gloves may be used with ready-to-eat food that will not be subsequently cooked if the slash-resistant gloves have a smooth, durable, and nonabsorbent outer surface; or if the slash resistant gloves are covered with a smooth, durable, nonabsorbent glove or a single-use glove.</i>
<i>cloth gloves</i>	(4) Cloth gloves may not be used in direct contact with food unless the food is subsequently cooked such as frozen food or a primal cut of meat.

7.3.3.4.6 Procedures for second portions and refills shall be as follows:

19

<i>second portions and refills</i>	(1) Except for refilling a consumer's drinking cup or container without contact between the pouring utensil and the lip-contact area of the drinking cup or container, food employees may not use tableware, including single-service articles, soiled by the consumer, to provide second portions or refills.
<i>soiled tableware</i>	(2) Except as specified below, self-service consumers may not be allowed to use soiled tableware, including single-service articles, to obtain additional food from the display and serving equipment.
<i>self-service</i>	(3) <i>Drinking cups and containers may be reused by self-service consumers if refilling is a contamination-free process.</i>

	7.3.3.5 Food Storage and Preparation	
<i>storage protection</i>	7.3.3.5.1 Food shall be protected from contamination by storing the food:	19
<i>clean dry</i>	(1) In a clean, dry location;	
<i>not exposed</i>	(2) Where it is not exposed to splash, dust, or other contamination; and	
<i>above deck</i>	(3) At least 15 centimeters (6 inches) above the deck.	
<i>prohibited storage</i>	7.3.3.5.2 Food may not be stored:	19
	(1) In locker rooms;	
	(2) In toilet rooms;	
	(3) In dressing rooms;	
	(4) In garbage rooms;	
	(5) In mechanical rooms;	
	(6) Under sewer lines that are not continuously sleeve welded;	
	(7) Under leaking water lines, including leaking automatic fire sprinkler heads, or under lines on which water has condensed;	
	(8) Under open stairwells; or	
	(9) Under other sources of contamination from nonfood items such as ice blocks, ice carvings and flowers.	
<i>PHF packages in vending machines</i>	7.3.3.5.3 Potentially hazardous food dispensed through a vending machine shall be in the package in which it was placed at the galley or food-processing plant at which it was prepared.	19
<i>preparation</i>	7.3.3.5.4 During preparation, unpackaged food shall be protected from environmental sources of contamination such as rain.	19
	7.3.3.6 Food Display and Service	
<i>display preparation</i>	7.3.3.6.1 Food on display shall be protected from contamination by the use of packaging; counter, service line, or salad bar food guards; display cases; or other effective means.	19

Condiments	7.3.3.6.2	Condiments shall be protected from contamination:	19
		(1) By being kept in dispensers that are designed to provide protection, protected food displays provided with the proper utensils, original containers designed for dispensing, or individual packages or portions; and	
		(2) Condiments at a vending machine location shall be in individual packages or provided in dispensers that are filled at an approved location, such as the galley that provides food to the vending machine location, a food-processing plant, or a properly equipped facility that is located on the site of the vending machine location.	
self-service	7.3.3.6.3	Consumer self-service operations, such as salad bars and buffets, for unpackaged ready-to-eat foods:	19
		(1) Shall be provided with suitable utensils or effective dispensing methods that protect the food from contamination; and	
		(2) Shall be monitored by food employees trained in safe operating procedures.	
food re-service	7.3.3.6.4	After being served and in the possession of a consumer or being placed on a buffet service line, food that is unused or returned by the consumer:	15 C
		(1) May not be offered as food for human consumption.	
		(2) <i>Except a container of food that is not potentially hazardous may be transferred from one consumer to another if the food is dispensed so that it is protected from contamination and the container is closed between uses, such as a narrow-neck bottle containing catsup, steak sauce, or wine; or the food, such as crackers, salt, or pepper, is in an unopened original package and is maintained in sound condition.</i>	
		(3) <i>Except re-service for foods served to passengers from a fully enclosed display case, under strict employee monitoring, strict temperature control of hot/cold potentially hazardous foods, proper cooling and reheating of hot held potentially hazardous foods, and complete protection from any other contamination sources, including pests is permitted.</i>	
	7.3.3.7	Other Contamination	
other contaminants	7.3.3.7.1	Food shall be protected from contamination that may result	19

from a factor or source such as seawater, bilge water, or hydraulic or fuel lines.

7.3.4 Pathogen Destruction

7.3.4.1 Cooking Temperatures / Times

cooking

7.3.4.1.1 Raw animal foods such as eggs, fish, meat, poultry, and foods containing these raw animal foods, shall be cooked to heat all parts of the food to a temperature and for a time that complies with one of the following methods based on the food that is being cooked:

16 C

63 °C/
145 °F

(1) 63°C (145°F) or above for 15 seconds for raw shell eggs that are broken and prepared in response to consumers' orders and for immediate service, and fish, meat, and pork including game animals commercially raised for food and game animals under a voluntary inspection program;

68 °C/
155 °F

(2) 68°C (155°F) for 15 seconds or equivalent temperature-time combination for ratites and injected meats; the following if they are comminuted: fish, meat, game animals commercially raised for food, and game animals under a voluntary inspection program; and raw eggs that are not prepared for immediate service; or

74 °C/
165 °F

(3) 74°C (165°F) or above for 15 seconds for poultry, wild game animals not specified in (2), stuffed fish, stuffed meat, stuffed pasta, stuffed poultry, stuffed ratites, or stuffing containing fish, meat, poultry, or ratites.

roasts

(4) Whole beef roasts, corned beef roasts, pork roasts, and cured pork roasts such as ham, shall be cooked to 63°C (145°F) or above for 15 seconds or to equivalent temperature-time combination in ovens operated in accordance with the specifications in Annex 13.6.

beef steaks

(5) *A raw or undercooked whole-muscle, intact beef steak may be served or offered for sale in a ready-to-eat form if the steak is labeled to indicate that it meets the definition of "whole-muscle, intact beef;" and the steak is cooked on both the top and bottom to a surface temperature of 63°C (145°F) or above and a cooked color change is achieved on all external surfaces.*

raw/lightly
cooked

(6) *A raw animal food such as raw fish, raw-marinated fish, raw molluscan shellfish, or steak tartare; or a partially cooked food such as lightly cooked fish, soft cooked eggs, or rare meat other than whole-muscle, intact beef steaks, may be served or*

offered for sale in a ready-to-eat form if the consumer is informed by the written consumer advisory; or the VSP grants a variance from the cooking recommendations based on a HACCP plan that is submitted by the vessel and approved. The HACCP plan must document scientific data or other information showing that a lesser time and temperature regimen results in a safe food. The HACCP plan must verify that equipment and procedures for food preparation and training of food employees meet the conditions of the variance.

microwave	7.3.4.1.2	Raw animal foods cooked in a microwave oven shall be:	16	C
		(1) Rotated or stirred throughout or midway during cooking to compensate for uneven distribution of heat;		
		(2) Covered to retain surface moisture;		
		(3) Heated to a temperature of at least 74°C (165°F) in all parts of the food; and		
		(4) Allowed to stand covered for 2 minutes after cooking to obtain temperature equilibrium.		
fruits/ vegetables	7.3.4.1.3	Fruits and vegetables that are cooked for hot holding shall be cooked to a temperature of 60°C (140°F).	17	
	7.3.4.2	Parasite Destruction		
parasite destruction	7.3.4.2.1	Before service in ready-to-eat form, raw, raw-marinated, partially cooked, or marinated-partially cooked fish other than molluscan shellfish:	16	C
		(1) Shall be frozen throughout to a temperature of -20°C (-4°F) or below for 168 hours (7 days) in a freezer; or -35°C (-31°F) or below for 15 hours in a blast freezer.		
		(2) If the fish are tuna of the species <i>Thunnus alalunga</i> , <i>T. albacares</i> (yellowfin tuna), <i>T. atlanticus</i> , <i>T. maccoyii</i> (bluefin tuna, southern), <i>T. obesus</i> (bigeye tuna), or <i>T. thynnus</i> (bluefin tuna, northern), the fish may be served in a raw, raw-marinated, or partially cooked ready-to-eat form without freezing.		
		(3) If foods, such as gravlax, sevice, fish carpaccio, or sashimi, are prepared in a food processing plant and certified as parasite free, they may be served raw, raw-marinated, or partially cooked ready-to-eat without freezing the product on-board the vessel.		

records	7.3.4.2.2	If raw, raw-marinated, partially cooked, or marinated-partially cooked fish are served in ready-to-eat form:	17	
		(1) The person in charge shall record the freezing temperature and time to which the fish are subjected and shall retain the records on the vessel for 90 calendar days beyond the time of service or sale of the fish; or		
		(2) If the fish are frozen by a supplier, a written letter from the supplier which specifies the fish species involved and both the temperature to which the fish was frozen and the total time period at that temperature. If the supplier provides any of the same fish species to the vessel in a fresh state, there shall be some designation on the outer packaging for the parasite-free fish.		
	7.3.4.3	Reheating		
immediate service	7.3.4.3.1	<i>Cooked and refrigerated food that is prepared for immediate service in response to an individual consumer order, such as a roast beef sandwich au jus, may be served at any temperature.</i>		
74 °C/ 165 °F	7.3.4.3.2	Potentially hazardous food that is cooked, cooled, and reheated for hot holding shall be reheated so that all parts of the food reach a temperature of at least 74°C (165°F) for 15 seconds.	16	C
microwave heating	7.3.4.3.3	If reheated in a microwave oven for hot holding, potentially hazardous food shall be reheated so that all parts of the food reach a temperature of at least 74°C (165°F) and the food is rotated or stirred, covered, and allowed to stand covered for 2 minutes after reheating.	16	C
commercial products	7.3.4.3.4	Ready-to-eat potentially hazardous food taken from a commercially processed, hermetically sealed container, or from an intact package from a food processing plant that is inspected by the food regulatory authority that has jurisdiction over the plant, shall be heated to a temperature of at least 60°C (140°F) for hot holding.	17	
rapid reheat	7.3.4.3.5	Reheating for hot holding shall be done rapidly and the time the food is between 5°C (41°F) and 74°C (165°F) may not exceed 2 hours.	16	C
reheat once	7.3.4.3.6	Potentially hazardous food may not be reheated more than once.	17	
reheat roast beef	7.3.4.3.7	<i>Remaining unsliced portions of roasts of beef that are cooked</i>		

on the vessel may be reheated for hot holding using the oven parameters and minimum time and temperature conditions used in the original cooking process.

7.3.5 Food Holding Temperatures and Times

7.3.5.1 Frozen, Slacking and Thawing Procedures

7.3.5.1.1 Stored frozen foods shall be maintained frozen. 17

slacking 7.3.5.1.2 Froze potentially hazardous food that is slacked to moderate the temperature shall be held: 17

(1) Under refrigeration that maintains the food temperature at 5°C (41°F) or less; or

(2) At any temperature if the food remains frozen.

thawing under 7.3.5.1.3 Potentially hazardous food shall be thawed: 17

refrigeration (1) Under refrigeration that maintains the food temperature at 5°C (41°F) or less; or

running water (2) Completely submerged under running water at a water temperature of 21°C (70°F) or below, with sufficient water velocity to agitate and float off loose particles in an overflow, and for a period of time that does not allow thawed portions of ready-to-eat food to rise above 5°C (41°F), or for a period of time that does not allow thawed portions of a raw animal food requiring cooking to be above 5°C (41°F) for more than 4 hours including the time the food is exposed to the running water, the time needed for preparation for cooking, or the time it takes under refrigeration to lower the food temperature to 5°C (41°F); or

*cooking/
microwave* (3) As part of a cooking process if the food that is frozen is cooked, or thawed in a microwave oven.

(4) *Using any procedure if a portion of frozen ready-to-eat food is thawed and prepared for immediate service in response to an individual consumer's order.*

	7.3.5.2	Food Cooling		
<i>cooling times/ temperatures</i>	7.3.5.2.1	Cooked potentially hazardous food shall be cooled: (1) Within 2 hours, from 60°C (140°F) to 21°C (70°F); and (2) Within 4 hours, from 21°C (70°F) to 5°C (41°F) or less.	16	C
<i>cooling prepared food</i>	7.3.5.2.2	Potentially hazardous food shall be cooled within 4 hours to 5°C (41°F) or less, if prepared from ingredients at ambient temperature, such as reconstituted foods and canned tuna.	16	C
<i>cooling received food</i>	7.3.5.2.3	A potentially hazardous food received in compliance with laws allowing a temperature above 5°C (41°F) during shipment from the supplier shall be cooled within 4 hours to 5°C (41°F) or less.	16	C
	7.3.5.2.4	<i>Shell eggs need not comply with the cooling time if the eggs are placed immediately upon their receipt in refrigerated equipment that is capable of maintaining food at 5°C (41°F) or less.</i>		
<i>cooling methods</i>	7.3.5.2.5	Cooling shall be accomplished using one or more of the following methods based on the type of food being cooled: (1) Placing the food in shallow pans; separating the food into smaller or thinner portions; using blast chillers, freezers, or other rapid cooling equipment; stirring the food in a container placed in an ice water bath; using containers that facilitate heat transfer; adding ice as an ingredient; or other effective methods. (2) When placed in cooling or cold-holding equipment, food containers in which food is being cooled shall be arranged in the equipment to provide maximum heat transfer through the container walls; and loosely covered, or uncovered if protected from overhead contamination, during the cooling period to facilitate heat transfer from the surface of the food.	17	
<i>arrangement</i>				
<i>cooling logs</i>	7.3.5.2.6	Logs documenting cooked potentially hazardous food cooling temperatures and times from the starting points designated in 7.3.5.2.1 thru the control points at 2 and 6 hours shall be maintained onboard the vessel for a period of 30 days from the date the food was placed in a cooling process. Logs documenting cooling of potentially hazardous foods prepared from ingredients at ambient temperatures, with the start time to the time when 5 °C (41 °F) is reached, shall also be maintained for a 30 day period, beginning with the day of	17	

preparation.

7.3.5.3 Food Holding Temperatures and Times

holding
temperature/
time

7.3.5.3.1

Except during preparation, cooking, or cooling, or when time is used as the public health control, potentially hazardous food shall be maintained:

16 C

60 °C/140 °F

(1) At 60°C (140°F) or above, *except that roasts may be held at a temperature of 54°C (130°F); or*

5 °C/41 °F

(2) At 5°C (41°F) or less.

RTE PHF shelf-
life

7.3.5.3.2

Refrigerated, ready-to-eat, potentially hazardous food:

16 C

prepared on
vessel

(1) Prepared on a vessel and held refrigerated for more than 24 hours shall be clearly marked at the time of preparation to indicate the date or day by which the food shall be consumed, which is 7 calendar days or fewer from the day the food is prepared. The day of preparation is counted as day 1.

from food
processing
plant

(2) A container of refrigerated, ready-to-eat potentially hazardous food prepared and packaged by a food processing plant and held on the vessel after opening for more than 24 hours shall be clearly marked, at the time the original container is opened, to indicate the date by which the food shall be consumed which is, including the day the original container is opened, 7 calendar days or fewer after the original container is opened. The day of opening is counted as day 1.

system used
and exempted
products

(3) *The date marking requirement can be accomplished with a calendar date, day, color-code, or other system, provided it is effective. Hard and semisoft aged cheeses, and pasteurized process cheese manufactured according to 21 CFR 133 are exempt from the date marking requirement. Some shelf stable meats (dry, fermented sausages and salt-cured products such as prosciutto and parma ham that are not labeled "Keep Refrigerated") are exempt from the date marking requirement.*

discarding RTE
PHF

7.3.5.3.3

Refrigerated, ready-to-eat, potentially hazardous food shall be discarded if not consumed within 7 calendar days from the date of preparation or opening.

16 C

<i>retain date</i>	7.3.5.3.4	A refrigerated, potentially hazardous, ready-to-eat food ingredient or a portion of a refrigerated, potentially hazardous, ready-to-eat food that is subsequently combined with additional ingredients or portions of food shall retain the date marking of the earliest or first-prepared ingredient.	16	C
<i>time as a public health control</i>	7.3.5.3.5	If time only, rather than time in conjunction with temperature, is used as the public health control for a working supply of potentially hazardous food before cooking, or for ready-to-eat potentially hazardous food that is displayed or held for service for immediate consumption: (1) The food shall be marked or otherwise identified to indicate the time that is 4 hours past the point in time when the food is removed from temperature control; (2) The food shall be cooked and served, served if ready-to-eat, or discarded, within 4 hours from the time when the food is removed from temperature control; and (3) The food in unmarked containers or packages or marked to exceed a 4 hour limit shall be discarded.	16	C
<i>written procedures</i>	7.3.5.3.6	Written procedures that ensure compliance with these guidelines shall be maintained on the vessel and made available to the VSP, upon request.	16	C
<i>day stores</i>	7.3.5.3.7	Refrigerated, ready-to-eat, potentially hazardous food may be held at 7°C (45°F) up to 24 hours in existing short term holding refrigeration equipment provided:	16	C
<i>designation label</i>		(1) The equipment is designated by a permanent label affixed to it indicating the maximum allowable product temperature is 7°C (45°F) and the maximum allowable storage time is 24 hours;		
<i>container labeling</i>		(2) All containers of potentially hazardous foods placed in the unit must be labeled with a date and time by which food shall be used or discarded;		
<i>pre-cooled PHF</i>		(3) Potentially hazardous foods when placed in the equipment shall be at 5°C (41°F) or less; and		
<i>replacement</i>		(4) When the equipment is upgraded or replaced, it shall be with equipment that can maintain the potentially hazardous food at 5°C (41°F) or less.		

	7.3.6	Consumer Information		
	7.3.6.1	Advisory		
<i>consumer advisory</i>	7.3.6.1.1	If an animal food such as beef, eggs, fish, lamb, milk, pork, poultry, or shellfish that is raw, undercooked, or not otherwise processed to eliminate pathogens is offered in a ready-to-eat form or as a raw ingredient in another ready-to-eat food, the passengers shall be informed by vessel newsletter articles, brochures, embarkation television broadcasts, menu advisories, placards, or other written means of the significantly increased risk to certain especially vulnerable consumers eating such foods in raw or undercooked form. <i>Raw shell egg preparations are prohibited in uncooked products as described in 7.3.3.2.4.</i>	16	C
	7.3.7	Contaminated Food		
	7.3.7.1	Discarding Food		
<i>unsafe/ adulterated</i>	7.3.7.1.1	A food that is unsafe or adulterated shall be discarded.	18	C
<i>unapproved source</i>	7.3.7.1.2	Food that is not from an approved source shall be discarded.	18	C
<i>restricted or excluded employee</i>	7.3.7.1.3	Ready-to-eat food that may have been contaminated by an employee who has been restricted or excluded for food employee health issues shall be discarded.	18	C
<i>contaminated by others</i>	7.3.7.1.4	Food that is contaminated by food employees, consumers, or other persons through contact with their hands; bodily discharges, such as nasal or oral discharges; or other means shall be discarded.	18	C
	7.4	Equipment and Utensils		
	7.4.1	Materials		
	7.4.1.1	Multiuse Characteristics and Use Limitations		
<i>safe food-contact materials</i>	7.4.1.1.1	Materials that are used in the construction of multiuse utensils and food-contact surfaces of equipment may not allow the migration of deleterious substances or impart colors, odors, or tastes to food and under normal use conditions shall be safe.	26	C
<i>food-contact surfaces</i>	7.4.1.1.2	Materials that are used in the construction of multiuse utensils and food-contact surfaces of equipment shall be: (1) Durable, corrosion-resistant, and nonabsorbent; (2) Sufficient in weight and thickness to withstand repeated	20	

warewashing;

(3) Finished to have a smooth, easily cleanable surface; and

(4) Resistant to pitting, chipping, crazing, scratching, scoring, distortion, and decomposition.

<i>cast iron</i>	7.4.1.1.3	Cast iron may not be used for utensils or food-contact surfaces of equipment. <i>Cast iron may be used as a surface for cooking. Cast iron may be used in utensils for serving food if the utensils are used only as part of an uninterrupted process from cooking through service.</i>	20

<i>lead</i>	7.4.1.1.4	Limitation of lead use shall be as follows:	20
		(1) Ceramic, china, crystal utensils, and decorative utensils such as hand painted ceramic or china that are used in contact with food shall be lead-free or contain levels of lead not exceeding the limits for specific utensil categories as allowed by law.	

(2) Pewter alloys containing lead in excess of 0.05% may not be used as a food-contact surface.

(3) Solder and flux containing lead in excess of 0.2% may not be used as a food-contact surface.

<i>copper/ brass</i>	7.4.1.1.5	Copper and copper alloys such as brass:	26	C
		(1) May not be used in contact with a food that has a pH below 6 such as vinegar, fruit juice, or wine or for a fitting or tubing installed between a backflow prevention device and a carbonator.		

(2) *Copper and copper alloys may be used in contact with beer brewing ingredients that have a pH below 6 in the prefermentation and fermentation steps of a beer brewing operation such as a brewpub or microbrewery.*

<i>galvanized</i>	7.4.1.1.6	Galvanized metal may not be used for utensils or food-contact surfaces of equipment that are used in contact with acidic food.	26	C

Wood	7.4.1.1.7	Wood use shall be limited as follows:	20	
		(1) Wood and wood wicker may not be used as a food-contact surface.		
		(2) <i>Hard maple or an equivalently hard, close-grained wood may be used for cutting boards; cutting blocks; bakers' tables; and utensils such as rolling pins, doughnut dowels, salad bowls, and chopsticks; and wooden paddles used in confectionery operations for pressure scraping kettles when manually preparing confections at a temperature of 110°C (230°F) or above.</i>		
		(3) <i>Whole, uncut, raw fruits and vegetables, and nuts in the shell may be kept in the wood shipping containers in which they were received, until the fruits, vegetables, or nuts are used.</i>		
		(4) <i>If the nature of the food requires removal of rinds, peels, husks, or shells before consumption, the whole, uncut, raw food may be kept in untreated wood containers; or treated wood containers if the containers are treated with a preservative that meets the requirements specified in 21 CFR 178.3800 Preservatives for Wood.</i>		
coatings	7.4.1.1.8	Multiuse kitchenware such as frying pans, griddles, sauce pans, cookie sheets, and waffle bakers that have a perfluorocarbon resin coating shall be used with nonscoring or nonscratching utensils and cleaning aids.	20	
nonfood-contact surfaces	7.4.1.1.9	Nonfood-contact surfaces of equipment that are exposed to splash, spillage, or other food soiling or that require frequent cleaning shall be constructed of a corrosion-resistant, nonabsorbent, and smooth material.	21	
	7.4.1.2	Single-Service and Single-Use Characteristics		
single-service materials safe	7.4.1.2.1	Materials that are used to make single-service and single-use articles shall not allow the migration of deleterious substances and shall be safe.	26	C
no colors/odors/taste	7.4.1.2.2	Materials that are used to make single-service and single-use articles shall not impart colors, odors, or tastes to food and shall be clean.	20	

	7.4.2	Design and Construction	
	7.4.2.1	Durability and Strength	
<i>food-contact durability/strength</i>	7.4.2.1.1	Food contact surfaces of equipment and utensils shall be designed and constructed to be durable and to retain their characteristic qualities under normal use conditions.	20
<i>nonfood-contact durability/strength</i>	7.4.2.1.2	Nonfood-contact surfaces of equipment and utensils shall be designed and constructed to be durable and to retain their characteristic qualities under normal use conditions.	21
<i>glass TMD's</i>	7.4.2.1.3	Food temperature measuring devices may not have sensors or stems constructed of glass, <i>except that thermometers with glass sensors or stems that are encased in a shatterproof coating such as candy thermometers may be used.</i>	26 C
	7.4.2.2	Cleanability	
<i>multiuse food-contact surfaces</i>	7.4.2.2.1	Multiuse food-contact surfaces shall be: (1) Smooth; (2) Free of breaks, open seams >0.8 mm (1/32 inch), cracks, chips, inclusions, pits, and similar imperfections; (3) Free of sharp internal angles, corners, and crevices; (4) Finished to have smooth welds and joints; and (5) Accessible for cleaning and inspection by one of the following methods without being disassembled, by disassembling without the use of tools, or by easy disassembling with the use of handheld tools commonly available to maintenance and cleaning personnel such as screwdrivers, pliers, open-end wrenches, and Allen wrenches. <i>This section does not apply to cooking oil storage tanks, distribution lines for cooking oils, or beverage syrup lines or tubes.</i>	20
<i>CIP equipment design/construction</i>	7.4.2.2.2	CIP equipment shall meet the following criteria: (1) It shall be designed and constructed so that cleaning and sanitizing solutions circulate throughout a fixed system and contact all interior food-contact surfaces, and the system is self-draining or capable of being completely drained of cleaning and sanitizing solutions; or (2) CIP equipment that is not designed to be disassembled for cleaning shall be designed with inspection access points to	20

ensure that all interior food-contact surfaces throughout the fixed system are being effectively cleaned.

"V" type threads	7.4.2.2.3	<i>Except for hot oil cooking or filtering equipment, "V" type threads may not be used on food-contact surfaces.</i>	20
oil filtering equipment	7.4.2.2.4	Hot oil filtering equipment shall be readily accessible for filter replacement and cleaning of the filter.	20
can openers	7.4.2.2.5	Cutting or piercing parts of can openers shall be readily removable for cleaning and for replacement.	20
nonfood-contact design	7.4.2.2.6	Nonfood-contact surfaces shall be free of unnecessary ledges, projections, and crevices, and designed and constructed to allow easy cleaning and to facilitate maintenance.	21
kick plates	7.4.2.2.7	Kick plates shall be designed so that the areas behind them are accessible for inspection and cleaning by: (1) Being easily removable or capable of being rotated open; and (2) Being removable or capable of being rotated open without unlocking equipment doors.	21
grease filters	7.4.2.2.8	Filters or other grease extracting equipment shall be designed to be readily removable for cleaning and replacement if not designed to be cleaned in place.	21
	7.4.2.3	Accuracy	
food TMD accuracy	7.4.2.3.1	Food temperature measuring devices: (1) That are scaled only in Celsius or dually scaled in Celsius and Fahrenheit shall be accurate to $\pm 1^{\circ}\text{C}$ in the intended range of use; and (2) That are scaled only in Fahrenheit shall be accurate to $\pm 2^{\circ}\text{F}$ in the intended range of use.	20
ambient air TMD accuracy	7.4.2.3.2	Ambient air temperature measuring devices: (1) That are scaled in Celsius or dually scaled in Celsius and Fahrenheit shall be designed to be easily readable and accurate to $\pm 1.5^{\circ}\text{C}$ in the intended range of use. (2) That are scaled only in Fahrenheit shall be accurate to $\pm 3^{\circ}\text{F}$ in the intended range of use.	21

	7.4.2.4	Functionality	
<i>ventilation hood design</i>	7.4.2.4.1	Exhaust ventilation hood systems in food preparation and warewashing areas including components such as hoods, fans, guards, and ducting shall be designed to prevent grease or condensation from draining or dripping onto food, equipment, utensils, linens, and single-service and single-use articles.	37
<i>equipment openings, closures, and deflectors</i>	7.4.2.4.2	Equipment openings, closures and deflectors shall conform to: (1) A cover or lid for equipment shall overlap the opening and be sloped to drain. (2) An opening located within the top of a unit of equipment that is designed for use with a cover or lid shall be flanged upward at least 5 millimeters (2/10 of an inch). (3) Fixed piping, temperature measuring devices, rotary shafts, and other parts extending into equipment shall be provided with a watertight joint at the point where the item enters the equipment. (4) If a watertight joint is not provided, the piping, temperature measuring devices, rotary shafts, and other parts extending through the openings shall be equipped with an apron designed to deflect condensation, drips, and dust from openings into the food; and the opening shall be flanged at least 5 millimeters (2/10 of an inch).	20
<i>beverage/ice dispensing</i>	7.4.2.4.3	In equipment that dispenses liquid food or ice in unpackaged form: (1) The delivery tube, chute, orifice, and splash surfaces directly above the container receiving the food shall be designed in a manner, such as with barriers, baffles, or drip aprons, so that drips from condensation and splash are diverted from the opening of the container receiving the food; (2) The delivery tube, chute, and orifice shall be protected from manual contact such as by being recessed; (3) The delivery tube or chute and orifice of equipment used to vend liquid food or ice in unpackaged form to self-service consumers shall be designed so that the delivery tube or chute and orifice are protected from dust, insects, rodents, and other contamination by a self-closing door if the equipment is located in an outside area that does not	20

otherwise afford the protection of an enclosure against the rain, windblown debris, insects, rodents, and other contaminants that are present in the environment, or available for self-service during hours when it is not under the full-time supervision of a food employee; and

(4) The dispensing equipment actuating lever or mechanism and filling device of consumer self-service beverage dispensing equipment shall be designed to prevent contact with the lip-contact surface of glasses or cups that are refilled.

bearings/ gears	7.4.2.4.4	Equipment containing bearings and gears that require lubricants shall be designed and constructed so that the lubricant cannot leak, drip, or be forced into food or onto food-contact surfaces.	21
beverage line cooling	7.4.2.4.5	Beverage tubing and cold-plate beverage cooling devices may not be installed in contact with stored ice. <i>This guideline does not apply to cold plates that are constructed integrally without seams in an ice storage bin.</i>	20
equipment drainage	7.4.2.4.6	Equipment compartments that are subject to accumulation of moisture because of conditions such as condensation, food or beverage drip, or water from melting ice shall be sloped to an outlet that allows complete draining.	21
drain lines	7.4.2.4.7	Liquid waste drain lines may not pass through an ice machine or ice storage bin.	20
condenser unit	7.4.2.4.8	If a condenser unit is an integral component of equipment, the condenser unit shall be separated from the food and food storage space by a dustproof barrier.	21
ambient air TMD's	7.4.2.4.9	Temperature measuring devices shall conform to the following guidelines: (1) In a mechanically refrigerated or hot-food storage unit, the sensor of a temperature measuring device shall be located to measure the air temperature in the warmest part of a mechanically refrigerated unit and in the coolest part of a hot-food storage unit. (2) Cold or hot holding equipment used for potentially hazardous food shall be designed to include and shall be equipped with at least one integral or affixed temperature measuring device that is located to allow easy viewing of the device's temperature display. (3) <i>The above section does not apply to equipment for which</i>	21

the placement of a temperature measuring device is not a practical means for measuring the ambient air surrounding the food because of the design, type, and use of the equipment, such as calrod units, heat lamps, cold plates, bains-marie, steam tables, insulated food transport containers, and salad bars.

(4) Temperature measuring devices shall be designed to be easily readable.

(5) Food temperature measuring devices shall have a numerical scale, printed record, or digital readout in increments no greater than 1°C (2°F) in the intended range of use. 20

7.4.2.5 Food Equipment, Standards and Classification

food-contact equipment standards 7.4.2.5.1 Food-contact surfaces of food equipment shall comply with American National Standards Institute (ANSI) or other internationally accredited food equipment sanitation standards for materials, design, and construction. 20

nonfood-contact equipment standards 7.4.2.5.2 Nonfood-contact surfaces of food equipment shall comply with American National Standards Institute (ANSI) or other internationally accredited food-equipment sanitation standards for materials, design, and construction. 21

7.4.3 Numbers and Capacities

7.4.3.1 Cooling, Heating, and Holding Capacities

cold/hot holding capacity 7.4.3.1.1 Equipment for cooling and heating food, and holding cold and hot food, shall be sufficient in number and capacity to maintain specified potentially hazardous food temperatures. 20

7.4.3.2 Ventilation Hood Systems

ventilation hood 7.4.3.2.1 Ventilation hood systems and devices shall be sufficient in number and capacity to prevent grease or condensation from collecting on bulkheads and deckheads. 37

7.4.3.3 Utensils, Consumer Self-Service

dispensing utensil 7.4.3.3.1 A food-dispensing utensil shall be available for each container displayed at a consumer self-service unit such as a buffet or salad bar. 19

utensil protected 7.4.3.3.2 Each self-service food dispensing utensil shall be covered or located beneath shielding during service. 19

	7.4.3.4	Food Temperature Measuring Devices	
<i>food TMD</i>	7.4.3.4.1	Food temperature measuring devices shall be provided and readily accessible for use in ensuring attainment and maintenance of food temperatures.	20
	7.4.4	Equipment Location and Installation	
	7.4.4.1	Fixed Equipment, Spacing or Sealing	
<i>fixed equipment installation</i>	7.4.4.1.1	Equipment that is fixed because it is not easily movable shall be installed so that it is: (1) Spaced to allow access for cleaning along the sides, behind, under and above the equipment; (2) Spaced from adjoining equipment, bulkhead, and deckhead at a distance of not more than 0.8 millimeter or 1/32 inch; or (3) Sealed to adjoining equipment or bulkhead, if the equipment is exposed to spillage or seepage.	21
<i>table- mounted sealed or elevated</i>	7.4.4.1.2	Table-mounted equipment that is not easily movable shall be installed to allow cleaning of the equipment and areas underneath and around the equipment by being: (1) Sealed to the table; or (2) Elevated on legs.	21
	7.4.4.2	Fixed Equipment, Elevation or Sealing	
<i>deck- mounted sealed or elevated</i>	7.4.4.2.1	Deck-mounted equipment that is not easily movable shall be sealed to the deck or elevated on legs that provide at least a 150 millimeter (6-inch) clearance between the deck and the equipment.	21
<i>deck- mounted clearance</i>	7.4.4.2.2	<i>if no part of the deck under the deck-mounted equipment is more than 150 millimeters (6 inches) from the point of cleaning access, the clearance space may be only 100 millimeters (4 inches).</i>	
<i>table-mounted elevated</i>	7.4.4.2.3	Table-mounted equipment that is not easily movable shall be elevated on legs that provide at least a 100 millimeter (4-inch) clearance between the table and the equipment.	21

<i>table-mounted clearance</i>	7.4.4.2.4	<i>The clearance space between the table and table-mounted equipment may be:</i> (1) <i>75 millimeters (3 inches) if the horizontal distance of the table top under the equipment is no more than 500 millimeters (20 inches) from the point of access for cleaning; or</i> (2) <i>50 millimeters (2 inches) if the horizontal distance of the table top under the equipment is no more than 75 millimeters (3 inches) from the point of access for cleaning.</i>	
	7.4.5	Maintenance and Operation	
	7.4.5.1	Equipment	
<i>food-contact equipment in good repair</i>	7.4.5.1.1	Food-contact equipment shall be maintained in good repair and proper adjustment including: (1) Equipment shall be maintained in a state of repair and condition that meets the materials, design, construction, and operation specifications of these guidelines. (2) Cutting or piercing parts of can openers shall be kept sharp to minimize the creation of metal fragments that can contaminate food when the container is opened.	20
<i>nonfood-contact equipment in good repair</i>	7.4.5.1.2	Nonfood-contact equipment shall be maintained in good repair and proper adjustment including: (1) Equipment shall be maintained in a state of repair and condition that meets the materials, design, construction, and operation specifications of these guidelines. (2) Equipment components such as doors, seals, hinges, fasteners, and kick plates shall be kept intact, tight, and adjusted in accordance with manufacturer's specifications.	21
<i>cutting boards</i>	7.4.5.1.3	Surfaces such as cutting blocks and boards that are subject to scratching and scoring shall be resurfaced if they no longer can be effectively cleaned and sanitized, or discarded if they are not capable of being resurfaced.	20
<i>microwave ovens</i>	7.4.5.1.4	Microwave ovens shall meet the safety standards specified in 21 CFR 1030.10 Microwave Ovens, or equivalent.	20

	7.4.5.2	Good Repair and Calibration	
<i>utensils and TMD's in good repair and calibration</i>	7.4.5.2.1	Utensils and temperature measuring devices shall be maintained in good repair and proper adjustment including: (1) Utensils shall be maintained in a state of repair or condition that meets the materials, design and construction specifications of these guidelines or shall be discarded. (2) Food temperature measuring devices shall be calibrated in accordance with manufacturer's specifications as necessary to ensure their accuracy.	20
<i>ambient air TMD's good repair and calibration</i>	7.4.5.2.2	Ambient air temperature measuring devices shall be maintained in good repair and be accurate within the intended range of use.	21
	7.4.5.3	Single-Service and Single-Use Articles	
	7.4.5.3.1	Single-service and single-use articles may not be reused.	28
<i>bulk milk tubes</i>	7.4.5.3.2	The bulk milk container dispensing tube shall be cut on the diagonal leaving no more than 25 millimeters (1 inch) protruding from the chilled dispensing head.	20
<i>shell reuse</i>	7.4.5.3.3	Mollusk and crustacean shells may not be used more than once as serving containers.	28

7.5 Warewashing

	7.5.1	[Reserved]	
	7.5.2	Warewashing Design and Construction	
	7.5.2.1	Warewashing Measuring Device Accuracy	
<i>water TMD accuracy</i>	7.5.2.1.1	Water temperature measuring devices: (1) That are scaled in Celsius or dually scaled in Celsius and Fahrenheit shall be designed to be accurate to $\pm 1.5^{\circ}\text{C}$ in the intended range of use. (2) That are scaled only in Fahrenheit shall be designed to be accurate to $\pm 3^{\circ}\text{F}$ in the intended range of use.	22

<i>pressure gauge accuracy</i>	7.5.2.1.2	Pressure measuring devices that display the pressures in the water supply line for the fresh hot water sanitizing rinse shall have increments of 7 kilopascals (1 pounds per square inch) or smaller and shall be accurate to ± 14 kilopascals (± 2 pounds per square inch) in the 100-170 kilopascals (15-25 pounds per square inch) range.	22
	7.5.2.2	Warewashing Functionality	
<i>water TMD readable</i>	7.5.2.2.1	Water temperature measuring devices shall be designed to be easily readable.	22
<i>water TMD scale</i>	7.5.2.2.2	Water temperature measuring devices on warewashing machines shall have a numerical scale, printed record, or digital readout in increments no greater than 1°C (2°F) in the intended range of use.	22
<i>warewasher data plate</i>	7.5.2.2.3	A warewashing machine shall be provided with an easily accessible and readable data plate affixed to the machine by the manufacturer that indicates the machine's design and operating specifications including the: (1) Temperatures required for washing, rinsing, and sanitizing; (2) Pressure required for the fresh water sanitizing rinse <i>unless the machine is designed to use only a pumped sanitizing rinse</i>; and (3) Conveyor speed for conveyor machines or cycle time for stationary rack machines.	22
<i>baffles/ curtains</i>	7.5.2.2.4	Warewashing machine wash and rinse tanks shall be equipped with baffles, curtains, or other means to minimize internal cross-contamination of the solutions in wash and rinse tanks.	22
<i>warewash TMD's</i>	7.5.2.2.5	A warewashing machine shall be equipped with a temperature measuring device that indicates the temperature of the water: (1) In each wash and rinse tank; and (2) As the water enters the hot water sanitizing final rinse manifold or in the chemical sanitizing solution tank.	22
<i>sanitizer level alert</i>	7.5.2.2.6	A warewashing machine that uses a chemical for sanitization and that is installed after adoption of these guidelines shall be equipped with a device that indicates audibly or visually when more chemical sanitizer needs to be added.	22

pressure gauge	7.5.2.2.7	Warewashing machines that provide a fresh hot water sanitizing rinse:	22
		(1) Shall be equipped with a pressure gauge or similar device such as a transducer that measures and displays the water pressure in the supply line immediately before entering the warewashing machine; and	
		(2) If the flow pressure measuring device is upstream of the fresh hot water sanitizing rinse control valve, the device shall be mounted in a 6.4 mm (1/4 inch) Iron Pipe Size (IPS) valve.	
		(3) <i>These guidelines do not apply to a machine that uses only a pumped or recirculated sanitizing rinse.</i>	
manual sanitizing booster heater	7.5.2.2.8	If hot water is used for sanitization in manual warewashing operations, the sanitizing compartment of the sink shall be:	22
		(1) Designed with an integral heating device that is capable of maintaining water at a temperature not less than 77°C (171°F); and	
self-draining	7.5.2.2.9	Sinks and drainboards of warewashing sinks and machines shall be self-draining.	22
	7.5.3	Warewashing Numbers and Capacities	
	7.5.3.1	Three-Compartment Sinks	
3-compartment sink	7.5.3.1.1	A sink with at least 3 compartments shall be provided for manually washing, rinsing, and sanitizing equipment and utensils.	22
size	7.5.3.2	Sink compartments shall be large enough to accommodate immersion of the largest equipment and utensils. If equipment or utensils are too large for the warewashing sink, a warewashing machine or alternative equipment, such as a 3-bucket system, shall be used.	22

manual warewashing alternatives	7.5.3.1.3	Alternative manual warewashing equipment may be used when there are special cleaning needs or constraints and its use is approved. Alternative manual warewashing equipment may include:	
		(1) High-pressure detergent sprayers;	
		(2) Low- or line-pressure spray detergent foamers;	
		(3) Other task-specific cleaning equipment;	
		(4) Brushes or other implements;	
		(5) Receptacles such as a 3-bucket system that substitute for the compartments of a 3-compartment sink.	
	7.5.3.2	Drainboards	
soiled/clean storage	7.5.3.2.1	Drainboards, utensil racks, or tables large enough to accommodate all soiled and cleaned items that may accumulate during hours of operation shall be provided for necessary utensil holding before cleaning and after sanitizing.	22
	7.5.3.3	Sanitizing Solutions, Testing Devices	
test kit	7.5.3.3.1	A test kit or other device that accurately measures the concentration in mg/L (ppm) of sanitizing solutions shall be provided.	22
	7.5.4	Warewashing Equipment Maintenance and Operation	
	7.5.4.1	Good Repair and Proper Adjustment	
warewash equipment repair	7.5.4.1.1	Warewashing equipment shall be maintained in good repair and proper adjustment including:	22
		(1) Warewashing equipment shall be maintained in a state of repair and condition that meets the standards of the materials, design, and construction of these guidelines.	
		(2) Water pressure, and water temperature measuring devices shall be maintained in good repair and be accurate within the intended range of use.	

<i>warewash equipment cleaning</i>	7.5.4.1.2	A warewashing machine; the compartments of sinks, basins, or other receptacles used for washing and rinsing equipment, utensils, or raw foods, or laundering wiping cloths; and drainboards shall be cleaned: (1) Before use; (2) Throughout the day at a frequency necessary to prevent recontamination of equipment and utensils and to ensure that the equipment performs its intended function; and (3) If used, at least every 24 hours.	22
<i>warewash equipment operation</i>	7.5.4.1.3	A warewashing machine and its auxiliary components: (1) Shall be operated in accordance with the machine's data plate and other manufacturer's instructions. (2) A warewashing machine's conveyor speed or automatic cycle times shall be maintained accurately timed in accordance with manufacturer's specifications.	22
<i>cleaners</i>	7.5.4.1.4	When used for warewashing, the wash compartment of a sink, mechanical warewasher, or wash receptacle of alternative manual warewashing equipment shall contain a wash solution of soap, detergent, acid cleaner, alkaline cleaner, degreaser, abrasive cleaner, or other cleaning agent according to the cleaning agent manufacturer's label instructions.	22
<i>solution clean</i>	7.5.4.1.5	The wash, rinse, and sanitize solutions shall be maintained clean.	22
	7.5.4.2	Wash Temperatures	
<i>manual wash temperature</i>	7.5.4.2.1	The temperature of the wash solution in manual warewashing equipment shall be maintained at not less than the temperature specified on the cleaning agent manufacturer's label instructions.	23

<i>warewash wash temperatures</i>	7.5.4.2.2	The temperature of the wash solution in spray type warewashers that use hot water to sanitize may not be less than: (1) For a stationary-rack, single-temperature machine, 74°C (165°F); (2) For a stationary-rack, dual-temperature machine, 66°C (150°F); (3) For a single-tank, conveyor, dual-temperature machine, 71°C (160°F); or (4) For a multitank, conveyor, multitemperature machine, 66°C (150°F).	23	
<i>wash temperatures for chemical machines</i>	7.5.4.2.3	The temperature of the wash solution in spray-type warewashers that use chemicals to sanitize may not be less than 49°C (120°F).	23	
	7.5.5	Cleaning Equipment and Utensils		
	7.5.5.1	Cleaning Frequency		
<i>food-contact surfaces clean</i>	7.5.5.1.1	Food-contact surfaces of equipment and utensils shall be clean to sight and touch.	26	C
<i>encrusted</i>	7.5.5.1.2	The food-contact surfaces of cooking equipment and pans shall be kept free of encrusted grease deposits and other soil accumulations.	26	C
<i>nonfood- contact surfaces</i>	7.5.5.1.3	Nonfood-contact surfaces of equipment shall be kept free of an accumulation of dust, dirt, food residue, and other debris.	27	
<i>food-contact cleaning frequency</i>	7.5.5.1.4	Equipment food-contact surfaces and utensils shall be cleaned: (1) Before each use with a different type of raw animal food such as beef, fish, lamb, pork, or poultry; (2) Each time there is a change from working with raw foods to working with ready-to-eat foods; (3) Between uses with raw fruits and vegetables and with potentially hazardous food; (4) Before using or storing a food temperature measuring device; and	26	C

		(5) At any time during the operation when contamination might have occurred.	
<i>in-use food-contact equipment</i>	7.5.5.1.5	If used with potentially hazardous food, equipment food-contact surfaces and utensils used on a continuing basis shall be cleaned throughout the day at least every 4 hours.	28
<i>dispensing equipment cleaning</i>	7.5.5.1.6	Cleaning of equipment such as ice bins and beverage dispensing nozzles and enclosed components of equipment such as ice makers, cooking oil storage tanks, and distribution lines, beverage, and syrup dispensing lines or tubes, and coffee bean grinders shall be conducted: (1) At a frequency specified by the manufacturer, or (2) Absent manufacturer specifications, at a frequency necessary to preclude accumulation of soil or mold.	28
<i>cooking/ baking equipment cleaning</i>	7.5.5.1.7	Cooking and baking equipment shall be cleaned as follows: (1) The food-contact surfaces of cooking and baking equipment shall be cleaned at least every 24 hours. (2) The cavities and door seals of microwave ovens shall be cleaned at least every 24 hours by using the manufacturer's recommended cleaning procedure.	28
	7.5.5.2	Dry Cleaning Methods	
<i>dry cleaning</i>	7.5.5.2.1	Dry cleaning shall be accomplished as follows: (1) If used, dry cleaning methods such as brushing, scraping, and vacuuming shall contact only surfaces that are soiled with dry food residues that are not potentially hazardous. (2) Cleaning equipment used in dry cleaning food-contact surfaces may not be used for any other purpose.	28
	7.5.5.3	Precleaning and Racking	
<i>precleaning/ scrapping</i>	7.5.5.3.1	Food debris on equipment and utensils shall be scrapped over a waste disposal unit, pulper, or garbage receptacle or shall be removed in a warewashing machine with a prewash cycle.	23
<i>presoak/ scrubbed</i>	7.5.5.3.2	If necessary for effective cleaning, utensils, and equipment shall be preflushed, presoaked, or scrubbed with abrasives.	23

<i>Racking</i>	7.5.5.3.3	Soiled items to be cleaned in a warewashing machine shall be loaded into racks, trays, or baskets or onto conveyors in a position that: (1) Exposes the items to the unobstructed spray from all cycles; and (2) Allows the items to drain.	22
	7.5.5.4	Wet Cleaning	
washing	7.5.5.4.1	Equipment food-contact surfaces and utensils shall be effectively washed to remove or completely loosen soils by using the manual or mechanical means necessary such as the application of detergents containing wetting agents and emulsifiers; acid, alkaline, or abrasive cleaners; hot water; brushes; scouring pads; high-pressure sprays; or ultrasonic devices.	23
soil-specific	7.5.5.4.2	The washing procedures selected shall be based on the type and purpose of the equipment or utensil, and on the type of soil to be removed.	22
	7.5.5.5	Alternative Manual Warewashing Procedures	
<i>alternative warewashing procedures</i>	7.5.5.5.1	If washing in sink compartments or a warewashing machine is impractical such as when the equipment is fixed or the utensils are too large, washing shall be done by using alternative manual warewashing equipment in accordance with the following procedures: (1) Equipment shall be disassembled as necessary to allow access of the detergent solution to all parts; (2) Equipment components and utensils shall be scrapped or rough-cleaned to remove food particle accumulation; and (3) Equipment and utensils shall be washed.	23
<i>sponges limited</i>	7.5.5.5.2	Sponges may not be used in contact with cleaned and sanitized or in-use food-contact surfaces.	22

	7.5.5.6	Rinsing Procedures		
<i>rinsing</i>	7.5.5.6.1	Washed utensils and equipment shall be rinsed so that abrasives are removed and cleaning chemicals are removed or diluted through the use of water by using one of the following procedures:		23
		(1) Use of a distinct, separate water rinse after washing and before sanitizing if using a 3-compartment sink, alternative manual warewashing equipment equivalent to a 3-compartment sink, or a 3-step washing, rinsing, and sanitizing procedure in a warewashing system for CIP equipment;		
		(2) If using a warewashing machine that does not recycle the sanitizing solution, or alternative manual warewashing equipment such as sprayers, use of a nondistinct water rinse that is integrated in the application of the sanitizing solution, and wasted immediately after each application; or		
		(3) If using a warewashing machine that recycles the sanitizing solution for use in the next wash cycle, use of a nondistinct water rinse that is integrated in the application of the sanitizing solution.		
	7.5.6	Sanitizing		
	7.5.6.1	Sanitizing Temperatures		
<i>manual hot-water sanitizing</i>	7.5.6.1.1	In a manual operation, if immersion in hot water is used for sanitizing:		24 C
		(1) The temperature of the water shall be maintained at 77°C (171°F) or above; and		
		(2) The food-contact surface shall be immersed for at least 30 seconds.		
<i>warewasher hot-water sanitizing</i>	7.5.6.1.2	In a mechanical operation, the temperature of the fresh hot water sanitizing rinse as it enters the manifold may not be more than 90°C (194°F), or less than:		24 C
		(1) For a stationary rack, single temperature machine, 74°C (165°F); or		
		(2) For all other machines, 82°C (180°F).		
		(3) A utensil surface temperature of 71°C (160°F) as measured by an irreversible registering temperature indicator shall be achieved.		

(4) The maximum temperature of 90°C (194°F), does not apply to the high pressure and temperature systems with wand-type, hand-held, spraying devices used for the in-place cleaning and sanitizing of equipment such as meat saws.

<i>warewasher hot-water sanitizing pressure</i>	7.5.6.1.3	The flow pressure of the fresh hot water sanitizing rinse in a warewashing machine may not be less than 100 kilopascals (15 pounds per square inch) or more than 170 kilopascals (25 pounds per square inch) as measured in the water line immediately downstream or upstream from the fresh hot water sanitizing rinse control valve.	22	
	7.5.6.2	Sanitizing Concentrations		
<i>chemical sanitizing solutions</i>	7.5.6.2.1	A chemical sanitizer used in a sanitizing solution for a manual or mechanical operation shall be listed in 21 CFR 178.1010 Sanitizing Solutions.	24	C
<i>chemical sanitizing exposure</i>	7.5.6.2.2	A chemical sanitizer shall be used in accordance with the EPA-approved manufacturer's label use instructions at a minimum temperature of 24°C (75°F) with an exposure time of 7 seconds for a chlorine solution and 30 seconds for other chemical sanitizers.	24	C
<i>chemical sanitizing concentration</i>	7.5.6.2.3	The sanitizing solutions shall be used with the following concentrations. (1) A chlorine solution shall have a concentration between 50 mg/L (ppm) and 200 mg/L (ppm); (2) An iodine solution shall have a pH of 5.0 or less or a pH no higher than the level for which the manufacturer specifies the solution is effective, and a concentration between 12.5 mg/L (ppm) and 25 mg/L (ppm); or (3) A quaternary ammonium compound solution shall have a concentration as specified in 21 CFR 178.1010 Sanitizing Solutions and as indicated by the manufacturer's use directions included in the labeling. (4) If another solution concentration or temperature of a chlorine, iodine, or quaternary ammonium compound is used, the vessel shall demonstrate to VSP that the solution achieves sanitization and the use of the solution shall be approved; or (5) If a chemical sanitizer other than a chlorine, iodine, or quaternary ammonium compound is used, it shall be applied in accordance with the manufacturer's use directions included	24	C

		in the labeling.	
<i>sanitizer concentration testing</i>	7.5.6.2.4	Concentration of the sanitizing solution shall be accurately determined by using a test kit or other device.	22
	7.5.7	Protection of Clean Items	
	7.5.7.1	Drying	
<i>air-dried/ drained</i>	7.5.7.1.1	After cleaning and sanitizing, equipment and utensils shall be air-dried or adequately drained before contact with food. <i>Cleaned, sanitized, and air-dried dishware, glassware, and utensils may be polished with a clean, dry, lint-free cloth that is maintained clean and dry.</i>	28
	7.5.7.2	Lubricating and Reassembling	
<i>lubricating</i>	7.5.7.2.1	Lubricants shall be applied to food-contact surfaces that require lubrication in a manner that does not contaminate food-contact surfaces.	28
<i>assembling</i>	7.5.7.2.2	Equipment shall be reassembled so that food-contact surfaces are not contaminated.	28
	7.5.7.3	Storing Equipment, Utensils, Linens, and Single-Service and Single-Use Articles	
<i>storing protected</i>	7.5.7.3.1	Cleaned equipment and utensils, laundered linens, and single-service and single-use articles shall be stored: (1) In a clean, dry location; (2) Where they are not exposed to splash, dust, or other contamination; and (3) At least 150 millimeters (6 inches) above the deck.	28
<i>storing inverted</i>	7.5.7.3.2	Clean equipment and utensils shall be stored: (1) In a self-draining position that allows air drying; and (2) Covered or inverted.	28
<i>original package</i>	7.5.7.3.3	Single-service and single-use articles shall be kept in the original protective package or stored by using other means that afford protection from contamination until used.	28
<i>utensil dispensing</i>	7.5.7.3.4	Eating utensils dispensed at a consumer self-service unit such as a buffet or salad bar shall be protected from contamination.	28

	7.5.8	Laundrying	
	7.5.8.1	Laundry Facilities	
<i>laundry equipment</i>	7.5.8.1.1	If linens used in the food areas are laundered on the vessel, a mechanical clothes washer and dryer shall be provided and used.	28
	7.5.8.1.2	<i>If laundry is limited to wiping cloths intended to be used moist, or to wiping cloths that are air-dried, a mechanical clothes washer and dryer need not be provided.</i>	
<i>laundry operations location</i>	7.5.8.1.3	Laundry operations shall be located so that the operations are protected from contamination and only where there is no exposed food; clean equipment, utensils, and linens; and unwrapped single-service and single-use articles.	28
	7.5.8.2	Laundry Procedures	
<i>laundry frequency</i>	7.5.8.2.1	Linens that do not come in direct contact with food shall be laundered between operations if they become wet, sticky, or visibly soiled.	28
<i>cloth gloves</i>	7.5.8.2.2	Cloth gloves shall be laundered before being used with a different type of raw animal food such as beef, lamb, pork, and fish.	28
<i>linens/ napkins</i>	7.5.8.2.3	Linens and napkins that are used to line food service containers and cloth napkins shall be laundered between each use.	28
<i>wiping cloths</i>	7.5.8.2.4	Wet wiping cloths shall be laundered daily.	28
	7.5.8.2.5	Dry wiping cloths shall be laundered as necessary to prevent contamination of food and clean serving utensils.	28
<i>laundry procedures</i>	7.5.8.2.6	Soiled linens shall be kept in clean, nonabsorbent, receptacles or clean, washable laundry bags and stored and transported to prevent contamination of food, clean equipment, clean utensils, and single-service and single-use articles.	28
<i>washing</i>	7.5.8.2.7	Linens shall be mechanically washed.	28

7.6 Poisonous and Toxic Materials

7.6.1 Identification

7.6.1.1 Labeling

<i>manufacturer label</i>	7.6.1.1.1	Original containers of poisonous or toxic materials and personal-care items shall bear a legible manufacturer's label.	31	C

<i>working containers</i>	7.6.1.1.2	Working containers used for storing poisonous or toxic materials such as cleaners and sanitizers taken from bulk supplies shall be clearly and individually identified with the common name of the material.	31	C

7.6.2 Operational Supplies and Applications

7.6.2.1 Storage

<i>pesticide/rodenticide locker</i>	7.6.2.1.1	Pesticides, insecticides, and rodenticides shall be stored in a locked area of the vessel that is not in a food area	31	C

<i>cleaning materials locker</i>	7.6.2.1.2	Poisonous or toxic materials used in food area cleaning and maintenance shall be stored so they cannot contaminate food, equipment, utensils, linens, and single-service and single-use articles by separating the poisonous or toxic materials by storing in a cleaning materials locker.	31	C

	7.6.2.1.3	<i>This guideline does not apply to equipment and utensil cleaners and sanitizers that are stored in warewashing areas for availability and convenience if the materials are stored to prevent contamination of food, equipment, utensils, linens, and single-service and single-use articles.</i>		

7.6.2.2 Use

<i>necessary materials</i>	7.6.2.2.1	Only poisonous or toxic materials that are required for the operation and maintenance of a food areas of the vessel, such as for the cleaning and sanitizing of equipment and utensils and the control of insects and rodents, shall be allowed in the food areas of the vessel.	31	C

<i>use conditions</i>	7.6.2.2.2	Poisonous or toxic materials shall be used according to:	31	C
		(1) Law and these guidelines;		
		(2) Manufacturer's use directions included in labeling, and, for a pesticide, manufacturer's label instructions that state that use is allowed in a food area; and		

		(3) The conditions of certification, if certification is required,		

for use of the pest-control materials.

<i>application</i>	7.6.2.2.3	Poisonous or toxic materials shall be applied so that: (1) A hazard to employees or other persons is not constituted, and (2) Contamination including toxic residues resulting from drip, drain, fog, splash or spray on food, equipment, utensils, linens, and single-service and single-use articles is prevented.	31	C
<i>restricted-use applications</i>	7.6.2.2.4	For a restricted-use pesticide, food, equipment, utensils, linens, and single-service and single-use articles shall be removed; covered with impermeable covers; and other precautions.	31	C
<i>restricted-use applicator</i>	7.6.2.2.5	A restricted-use pesticide shall be applied only by an applicator certified as defined in 7 USC 136(e) Certified Applicator, of the Federal Insecticide, Fungicide and Rodenticide Act or a person under the direct supervision of a certified applicator.	31	C
<i>equipment cleaning and sanitizing</i>	7.6.2.2.6	Food equipment and utensils in the area treated shall be cleaned and sanitized following the application.	31	C
<i>containers</i>	7.6.2.2.7	A container previously used to store poisonous or toxic materials may not be used to store, transport, or dispense food.	31	C
	7.6.2.3	Sanitizers and Other Food Area Chemicals		
<i>sanitizers</i>	7.6.2.3.1	Chemical sanitizers and other chemical antimicrobials applied to food-contact surfaces shall meet the requirements specified in 21 CFR 178.1010 Sanitizing Solutions.	31	C
<i>fruit/vegetable wash</i>	7.6.2.3.2	Chemicals used to wash or peel raw, whole fruits and vegetables shall meet the requirements specified in 21 CFR 173.315 Chemicals Used in Washing or to Assist in the Lye Peeling of Fruits and Vegetables.	31	C
<i>boiler water additives</i>	7.6.2.3.3	Chemicals used as boiler water additives for culinary steam or other food area purposes shall meet the requirements specified in 21 CFR 173.310 - Boiler Water Additives.	31	C

<i>drying agents</i>	7.6.2.3.4	Drying agents used in conjunction with sanitization shall contain only components that are listed as one of the following: (1) Generally recognized as safe for use in food as specified in 21 CFR 182 - Substances Generally Recognized as Safe or 21 CFR 184 - Direct Food Substances Affirmed as Generally Recognized as Safe; (2) Generally recognized as safe for the intended use as specified in 21 CFR 186 - Indirect Food Substances Affirmed as Generally Recognized as Safe; (3) Approved for use as a drying agent under a prior sanction specified in 21 CFR 181 - Prior-Sanctioned Food Ingredients; (4) Specifically regulated as an indirect food additive for use as a drying agent as specified in 21 CFR Parts 175-178; or (5) Approved for use as a drying agent under the threshold of regulation process established by 21 CFR 170.39 Threshold of Regulation for Substances Used in Food-Contact Articles.	31	C
<i>approved for use with chemical sanitizers</i>	7.6.2.3.5	Drying agents, when used with chemical sanitization, shall be specifically approved for use with chemical sanitizing solutions.	31	C
<i>lubricants</i>	7.6.2.3.6	Lubricants shall meet the requirements specified in 21 CFR 178.3570 Lubricants with Incidental Food-Contact, if they are used on food-contact surfaces, on bearings and gears located on or within food-contact surfaces, or on bearings and gears that are located so that lubricants may leak, drip, or be forced into food or onto food-contact surfaces.	31	C
	7.6.2.4	Pesticides and Rodenticides		
<i>restricted-use pesticides</i>	7.6.2.4.1	Restricted-use pesticides used in food areas shall meet the requirements specified in 40 CFR 152 Subpart I Classification of Pesticides.	31	C
<i>rodent bait</i>	7.6.2.4.2	Rodent bait used in food areas shall be contained in a covered, tamper-resistant bait station.		C
<i>tracking powders</i>	7.6.2.4.3	A tracking powder pesticide may not be used in a food area.	31	C
	7.6.2.4.4	A nontoxic tracking powder such as talcum or flour, if used, may not contaminate food.	19	

	7.6.2.4.5	A nontoxic tracking powder such as talcum or flour, if used, may not contaminate equipment, utensils, linens, and single-service and single-use articles.	28	
	7.6.3	Medicines		
	7.6.3.1	Restriction and Storage		
<i>necessary medicines</i>	7.6.3.1.1	Only medicines necessary for the health of the food employees shall be allowed in a food area.	31	C
<i>medicines labeling/separation</i>	7.6.3.1.2	Medicines that are in a food area for the food employees' use shall be labeled and be located in an area such as the chef's office to prevent the contamination of food, equipment, utensils, linens, and single-service and single-use articles.	31	C
<i>first aid supplies</i>	7.6.3.1.3	First aid supplies that are in a food area for the food employees' use shall be labeled and stored in a kit or a container that is located to prevent the contamination of food, equipment, utensils, linens, and single-service and single-use articles	31	C
	7.7	Facilities		
	7.7.1	Handwashing and Toilet Facilities		
	7.7.1.1	Handwashing Facility Installation		
<i>convenient</i>	7.7.1.1.1	Each food preparation area, bar, warewashing area, and garbage-processing area shall have at least one handwashing facility located in it.	29	C
<i>8 m/25 feet</i>	7.7.1.1.2	The handwashing facility shall be located within 8 m (25 feet) of all parts of the area and should not be located in an adjacent area that requires passage through a closed door, where the user makes hand-contact with the door.	29	C
<i>tempered water</i>	7.7.1.1.3	A handwashing sink shall be equipped to provide water at a temperature of at least 43 °C (110 °F) through a mixing valve or combination faucet. For handwash sinks with electronic sensors, where the user cannot make temperature adjustments, the temperature provided to the user after the mixing valve shall not exceed 52 °C (125 °F).	29	C
<i>metered faucet</i>	7.7.1.1.4	A self-closing, slow-closing, or metering faucet shall provide a flow of water for at least 15 seconds without the need to reactivate the faucet.	30	

<i>automatic systems</i>	7.7.1.1.5	An automatic handwashing facility shall be installed in accordance with manufacturer's instructions.	30	
<i>dispenser/receptacle</i>	7.7.1.1.6	A handwashing facility shall include a sink, soap dispenser, single-use towels dispenser, and waste receptacle.	30	
<i>sign</i>	7.7.1.1.7	A sign stating "WASH HANDS OFTEN" in a language that the food employees understand shall be posted over handwashing sinks.	30	
	7.7.1.2	Toilet Facility Installation		
<i>convenient</i>	7.7.1.2.1	Toilet rooms shall be provided and conveniently located.	29	C
<i>handwashing facilities</i>	7.7.1.2.2	Handwashing facilities shall be provided in or immediately adjacent to toilet rooms or vestibules.	29	C
<i>sign</i>	7.7.1.2.3	Signs shall be conspicuously posted on the bulkhead adjacent to the door of the toilet, reading "WASH HANDS AFTER USING TOILET" in a language that the food employees understand.	30	
<i>enclosed/doors</i>	7.7.1.2.4	Toilet rooms shall be completely enclosed and shall have tight-fitting, self-closing doors which shall be kept closed except during cleaning or maintenance.	30	
<i>waste receptacle</i>	7.7.1.2.5	Easily cleanable receptacles shall be provided for waste materials.	30	
	7.7.1.3	Handwashing and Toilet Facility Maintenance		
<i>accessible</i>	7.7.1.3.1	Handwashing facilities shall be used for no other purpose and shall be accessible at all times.	29	C
<i>facilities clean/good repair</i>	7.7.1.3.2	Handwashing facilities shall be kept clean and in good repair.	30	
<i>soap/towels</i>	7.7.1.3.3	Each handwashing facility shall have a supply of hand-cleansing soap or detergent and a supply of single-service paper towels available.	30	
<i>toilets clean/good repair</i>	7.7.1.3.4	Toilet fixtures shall be kept clean and in good repair.	30	
<i>toilet tissue</i>	7.7.1.3.5	A supply of toilet tissue shall be provided at each toilet at all times.	30	

7.7.2 Solid Waste

7.7.2.1 Receptacles and Containers

containers 7.7.2.1.1 Receptacles and waste-handling containers for refuse and recyclables and for use with materials containing food residue shall be durable, nonabsorbent, easily cleanable and leakproof. 32

insect/rodent resistant 7.7.2.1.2 Receptacles and waste-handling containers for refuse, recyclables and for use with materials containing food residue shall be insect and rodent resistant and shall have tight-fitting lids. 32

covered/provided 7.7.2.1.3 Receptacles and waste-handling containers shall be kept covered when not in continuous use and after they are filled. 32

location 7.7.2.1.4 A receptacle or waste-handling container shall be provided in each area of the vessel or premise where refuse is generated or commonly discarded or where recyclables are placed. 32

wash facilities 7.7.2.1.5 Facilities suitable for washing receptacles and waste-handling containers shall be provided separate from food equipment and utensil storage areas or food preparation areas. 32

design/supplies 7.7.2.1.6 The designated container wash area shall be easily cleanable and shall have tempered water, access to detergent, and suitable drainage. 32

cleaned 7.7.2.1.7 Receptacles and waste-handling containers shall be cleaned when emptied. 32

7.7.2.2 Garbage and Refuse Storage Room

easily cleanable/durable 7.7.2.2.1 The dry and refrigerated garbage and refuse storage room shall be constructed of easily cleanable, corrosion-resistant, nonabsorbent, and durable materials. 32

size 7.7.2.2.2 The garbage and refuse storage room shall be large enough to store and process the garbage and refuse. 32

prevent contamination 7.7.2.2.3 The garbage and refuse storage room shall be located so as to prevent contamination in food preparation, storage, and utensil washing areas. 32

good repair/clean 7.7.2.2.4 The garbage and refuse storage room shall be maintained in good repair and kept clean. 32

	7.7.3	Liquid Waste Disposal and Plumbing	
	7.7.3.1	Drain Lines	
<i>drain lines</i>	7.7.3.1.1	Drain lines from all fixtures, sinks, appliances, compartments, refrigeration units, or devices that are used, designed for, or intended to be used in the preparation, processing, storage, or handling of food, ice or drinks shall be indirectly connected to appropriate waste systems by means of an air-gap or air-break.	19
<i>hand/mop sink drain lines</i>	7.7.3.1.2	<i>Drain lines from handwashing and mop sinks may be directly connected to the appropriate waste system.</i>	
<i>overhead</i>	7.7.3.1.3	Drain lines carrying sewage or other liquid waste shall not pass directly overhead or horizontally through spaces used for the preparation, serving, or storage of food or the washing or storage of utensils and equipment. Drain lines that are unavoidable in these food areas shall be sleeve-welded and shall not have mechanical couplings.	19
<i>warewash sink/machine drains</i>	7.7.3.1.4	All drain lines from warewashing sinks or machines shall drain through an air-gap or air-break to a drain or scupper.	28
	7.7.3.2	Liquid Waste Disposal	
<i>discharge</i>	7.7.3.2.1	Black and gray water shall be discharged to the vessel's wastewater disposal system and shall not pool on the deck.	35
<i>leakage</i>	7.7.3.2.2	The leakage of sewage tanks or discharge of sewage into the bilge or other areas on the vessel shall be prohibited.	35
	7.7.3.3	Plumbing	
<i>good repair</i>	7.7.3.3.1	A plumbing system in a food area shall be maintained in good repair.	34
	7.7.4	Decks, Bulkheads, and Deckheads	
	7.7.4.1	Design and Construction	
<i>cleanable</i>	7.7.4.1.1	Decks, bulkheads, and deckheads in food preparation, warewashing, pantries, and storage areas shall be constructed and maintained for easy cleaning.	33
<i>non-skid</i>	7.7.4.1.2	<i>Decks may be of non-skid construction provided they are easily cleanable.</i>	

<i>Coving</i>	7.7.4.1.3	Bulkhead and deck junctures shall be coved (including galleys, pantries, deck/counter junctures at buffets, bars, waiter stations, and dining room work counters).	33
<i>finishes</i>	7.7.4.1.4	Bulkheads and deckheads shall have smooth, hard finishes, and light colored surfaces.	33
<i>corrosion-resistant</i>	7.7.4.1.5	Decks, bulkheads, and deckheads in food preparation, warewashing, pantries, and storage areas shall be corrosion-resistant.	33
<i>attached equipment</i>	7.7.4.1.6	Light fixtures, vent covers, and similar equipment attached to the bulkheads or deckheads shall be easily cleanable.	33
<i>exposed lines</i>	7.7.4.1.7	Exposed utility service lines and pipes, including lines for fire detection and protection systems, shall be installed so they do not obstruct or prevent cleaning.	33
<i>cleanable surfaces</i>	7.7.4.1.8	Surfaces subject to routine splashes, spillage or other soiling during normal use shall have easily cleanable features.	33
<i>deck mats</i>	7.7.4.1.9	Mats shall be designed to be removable and easily cleanable.	33
	7.7.4.2	Maintenance	
<i>clean</i>	7.7.4.2.1	Decks, bulkheads, deckheads, and attached equipment in food preparation, warewashing, pantries, and storage areas, shall be cleaned as often as necessary.	33
<i>timing</i>	7.7.4.2.2	Cleaning shall be done during periods when the least amount of food is exposed.	33
<i>good repair</i>	7.7.4.2.3	Decks, bulkheads, and deckheads in food preparation, warewashing, pantries, and storage areas, shall be maintained in good repair.	33
	7.7.5	Lighting	
	7.7.5.1	Intensity	
220 Lux/ 20 foot candles	7.7.5.1.1	The light intensity shall be at least 220 Lux (20 foot candles) on food preparation surfaces, and at a distance of 75 centimeters (30 inches) above the deck in food preparation areas, handwashing facilities, warewashing areas, equipment, and utensil storage, pantries, toilet rooms, and consumer self-service areas.	36

<i>110 Lux/ 10 foot candles</i>	7.7.5.1.2	The light intensity shall be at least 110 Lux (10 foot candles) at a distance of 75 centimeters (30 inches) above the deck when in use, in walk-in refrigerator units and dry storage areas, and in other areas and rooms during periods of cleaning.	36
<i>during cleaning</i>	7.7.5.1.3	In bars and dining room waiter stations provide 220 lux (20 foot candles) light-intensity during cleaning operations.	36
	7.7.5.2	Protected	
<i>shielded/ shatter-resistant</i>	7.7.5.2.1	Light bulbs shall be shielded, coated, or otherwise shatter-resistant in areas where there is exposed food; clean equipment, utensils, and linens; or unwrapped single-service, and single-use articles.	36
<i>heat lamps</i>	7.7.5.2.2	An infrared or other heat lamp shall be protected against breakage by a shield surrounding and extending beyond the bulb so that only the face of the bulb is exposed.	36
	7.7.6	Ventilation	
	7.7.6.1	Design and Operation	
<i>sufficient</i>	7.7.6.1.1	All food preparation, warewashing, and toilet rooms shall have sufficient ventilation to keep them free of excessive heat, steam, condensation, vapors, obnoxious odors, smoke, and fumes.	37
<i>effective</i>	7.7.6.1.2	Ventilation hood systems and devices shall operate effectively to prevent grease and condensate from collecting on the bulkheads and deckheads and remove contaminants generated by equipment located under them.	37
<i>no contamination</i>	7.7.6.1.3	Heating, ventilating, and air conditioning systems shall be designed and installed so that make-up air intake and exhaust vents do not cause contamination of food, food-contact surfaces, equipment, or utensils.	37
	7.7.6.2	Maintenance	
<i>filters</i>	7.7.6.2.1	Filters and other grease extracting equipment shall be designed to be readily removable for cleaning and replacement if not designed to be cleaned in place. Intake and exhaust air ducts shall be cleaned and filters changed so they are not a source of contamination by dust, dirt, and other materials.	37

7.7.7 Cleaning Equipment and Unnecessary Articles

7.7.7.1 Storage

<i>necessary articles</i>	7.7.7.1.1	Only articles necessary for the food service operation shall be stored in food preparation, food storage, and warewashing areas.	38
<i>cleaning locker</i>	7.7.7.1.2	Maintenance tools such as mops, brooms, and similar items shall be stored in a designated locker so they do not contaminate food; food-contact surfaces of utensils; and equipment; linens, and single-service and single-use articles.	38
<i>orderly manner</i>	7.7.7.1.3	Maintenance tools such as mops, brooms, and similar items shall be stored in an orderly manner that facilitates cleaning of the area used for storing the maintenance tools.	38
<i>mop drying</i>	7.7.7.1.4	After use, mops shall be placed in a position that allows them to air-dry without soiling walls, equipment, or supplies.	38
	7.7.7.1.5	<i>Wash, rinse, and sanitize buckets or other containers may be stored with maintenance tools provided they are stored inverted and nested.</i>	

8.0 Integrated Pest Management

8.1 Integrated Pest Management

8.2 Pest Control

8.1 Integrated Pest Management

8.1.1 Plan Development and Implementation

8.1.1.1 IPM Plans

IPM plan 8.1.1.1.1 Each vessel shall develop an Integrated Pest Management Plan to address effective monitoring and control strategies for pests aboard the vessel. 40

monitoring 8.1.1.1.2 The Integrated Pest Management Plan shall set a schedule for periodic monitoring inspections including some at night. 40

logs 8.1.1.1.3 The Integrated Pest Management Plan shall include provisions for active monitoring including pest sighting logs for the operational areas of the vessel and training for crew members in charge of log completion. 40

passive surveillance 8.1.1.1.4 The Integrated Pest Management Plan shall include passive surveillance procedures such as glue traps and other monitoring tools, as well as location of each. A monitoring log on passive surveillance procedures shall be maintained. 40

8.1.1.2 Plan Evaluation

2 years 8.1.1.2.1 The vessel's Integrated Pest Management Plan shall be evaluated for effectiveness every 2 years or whenever there is a significant change in the vessel's structure such as a renovation or operation. 40

reviews 8.1.1.2.2 Reviews shall be documented and changes noted in the vessel's Integrated Pest Management Plan. 40

inspections 8.1.1.2.3 The vessel's Integrated Pest Management Plan documentation shall be made available during the VSP inspections. 40

	8.1.2	IPM and Pesticide Use	
	8.1.2.1	Pesticide Application	
<i>records</i>	8.1.2.1.1	The Integrated Pest Management Plan shall include a record of pesticides used. The record shall include only pesticides currently onboard the vessel and those used in the previous 12 months.	40
<i>restricted-use</i>	8.1.2.1.2	A restricted-use pesticide shall be applied only by a certified applicator or a person with training and testing equivalent to that of a certified applicator.	39 C
<i>applicator training</i>	8.1.2.1.3	The training of the pest-control personnel shall be documented in the Integrated Pest Management Plan.	40
<i>safety</i>	8.1.2.1.4	The Integrated Pest Management Plan shall establish health and safety procedures to protect the passengers and crew.	40

8.2 Pest Control

8.2.1 Exclusion

8.2.1.1 Food Areas

<i>effective control</i>	8.2.1.1.1	The presence of insects, rodents, and other pests shall be effectively controlled to minimize their presence in the food storage, preparation, and service areas and warewashing and utensil storage areas aboard a vessel.	39	C
<i>exclusion</i>	8.2.1.1.2	Entry points where pests may enter the food areas shall be protected.	40	
<i>incoming food supplies</i>	8.2.1.1.3	Incoming shipments of food and supplies shall be routinely inspected for evidence of insects, rodents, and other pests. A record of these inspections shall be maintained onboard the vessel and shall be available for review during inspections.	40	
<i>IPM inspections</i>	8.2.1.1.4	The vessel's food areas shall be inspected under the Integrated Pest Management Plan at a frequency that can quickly detect the evidence of pests or the creation of harborage conditions.	40	

	8.2.2	Control Measures		
	8.2.2.1	Chemical		
<i>chemical controls</i>	8.2.2.2.1	Chemical control measures shall conform to products and application procedures specifically allowed in the food safety section of these guidelines and the vessel's Integrated Pest Management Plan.	39	C
	8.2.2.2	Physical		
<i>insect-control devices</i>	8.2.2.2.1	Insect-control devices that are used to electrocute or stun flying insects shall be designed to retain the insect within the device.	40	
<i>food protection</i>	8.2.2.2.2	The insect devices shall not be located over food storage, preparation, and service areas. Dead insects and insect fragments shall be prevented from being impelled onto or falling on exposed food.	19	
<i>utensil protection</i>	8.2.2.2.3	The insect devices shall not be located over warewashing, utensil storage areas, equipment, utensils, linens, unwrapped single-service, and single-use articles. Dead insects and insect fragments shall be prevented from being impelled onto or falling on clean items.	28	
<i>cleaning</i>	8.2.2.2.4	Dead or trapped insects, rodents, and other pests shall be removed from control devices and the vessel at a frequency that prevents their accumulation or decomposition, or the attraction of pests.	40	

9.0 Housekeeping

- 9.1 Infection-Control Procedures
- 9.2 Air Systems
- 9.3 Fountains, Humidifiers, and Showers

9.1 Infection Control Procedures

9.1.1 Disinfection

9.1.1.1 Public Areas

public areas 9.1.1.1.1 When the cumulative proportion of cases of gastrointestinal illness among passengers or crew members is $\geq 2\%$, the infection control response shall include cleaning and disinfecting all public areas, including handrails and restrooms, on a continuous basis until the proportion decreases to $< 2\%$. 41

written OPRP 9.1.1.2 Each vessel shall have a written Outbreak Prevention and Response Plan (OPRP) which details the standard procedures and policies to specifically address gastrointestinal illness onboard. The written OPRP shall include at a minimum, the following: 41

- (a) Duties and responsibilities of each department and their staff
- (b) Steps in outbreak management and control and the trigger for each step
- (c) A detailed example OPRP is provided in the VSP website at <http://www.cdc.gov/nceh/vsp>.

public toilet facilities 9.1.1.3 Public toilet facilities shall be equipped so that persons exiting the toilet room are not required to handle the door with bare hands. *This may be accomplished by methods such as locating paper towel dispensers at sinks and waste containers near the room door, installing mechanically operated doors, door removal, or other effective means.* 41

9.1.2.1 Cabins

cabin cleaning 9.1.2.1.1 Cabins that house passengers or crew with gastrointestinal illness shall be thoroughly cleaned and disinfected daily while the occupants are ill. 41

<i>precautionary measures</i>	9.1.2.1.2	Extra precautionary measures by housekeeping personnel shall be taken in consultation with the vessel's medical staff to prevent the spread of gastrointestinal illness from cabin to cabin.	41
<i>example</i>	9.1.2.1.3	<i>Precautionary measures by the housekeeping personnel may include using disposable personal protection equipment, including gloves, which are changed after each cabin.</i>	

9.2 Air Systems

9.2.1 Design and Maintenance

9.2.1.1 Construction

condensate pans 9.2.1.1.1 Air handling unit condensate drain pans and collection systems shall be accessible for inspection, maintenance, and cleaning. Installation of sight windows or other effective methods for full inspection and cleaning of condensate collection pans shall be utilized when original equipment access makes evaluation during operational inspections impractical. 41

self-draining 9.2.1.1.2 Air condition condensation collection pans shall be self-draining. 41

9.2.1.2 Maintenance

air handling units 9.2.1.2.1 Air handling units shall be kept clean. 41

condensers 9.2.1.2.2 Evaporative condensers shall be inspected at least annually and cleaned as necessary to remove scale and sediment. Cooling coils and condensate pans shall be cleaned as necessary to remove dirt and organic material. 41

inspection and maintenance plan 9.2.1.2.3 Vessels shall have a plan to inspect and maintain heating, ventilation, and air-conditioning systems in accordance with manufacturers recommendations and industry standards. The written inspection, cleaning, and maintenance plan for the heating, ventilation, and air-conditioning system shall be maintained on the vessel and available for review during inspections. 41

9.2.1.3 Dust Control

cleaning 9.2.1.3.1 Carpets, curtains, drapes, furniture, decks, lighting fixtures, and decorative items on the vessel shall be cleaned to minimize accumulation of dust and soil. 41

methods 9.2.1.3.2 Dustless cleaning methods shall be used. 41

9.3 Fountains, Humidifiers, and Showers

9.3.1 Fountains and Humidifiers

9.3.1.1 Water Source

sprays 9.3.1.1.1 Water used in conjunction with decorative fountains and water sprays in HVAC air- distribution systems shall originate in the vessel's potable water system and shall be further treated to 41

avoid microbial build-up in the operation of the sprays and fountains.

	9.3.1.2	Fountain and Water Spray Maintenance	
<i>clean</i>	9.3.1.2.1	Decorative fountains and water sprays in HVAC air- distribution systems shall be maintained free of algae and mold.	41
	9.3.2	Hot-Water System and Showers	
	9.3.2.1	Maintenance	
<i>hot-water system</i>	9.3.2.1.1	The potable hot-water system including shower heads shall be maintained to preclude growth of <i>Mycobacterium</i> or <i>legionella</i> .	41
<i>showers</i>	9.3.2.1.2	Shower heads shall be cleaned and disinfected every 6 months to preclude growth of <i>Mycobacterium</i> or <i>legionella</i> .	41

10.0 Child-Activity Centers

- 10.1 Diaper Changing
- 10.2 Toilet and Handwashing
- 10.3 Cleaning and Disinfection
- 10.4 Exclusions

10.1 Diaper Changing

10.1.1 Diaper-Changing Facilities

10.1.1.1 Design

<i>diaper changing</i>	10.1.1.1.1	If children who wear diapers are accepted in the child-activity center, diaper-changing stations and disposal facilities shall be provided.	41
<i>facilities</i>	10.1.1.1.2	Each station shall include: (1) A changing table that is impervious, nonabsorbent, nontoxic, smooth, durable, and cleanable, and designed for diaper changing; (2) A supply of disposable diapers, gloves, wipes, table cleanser, and disinfectant; (3) An airtight, soiled-diaper receptacle; and (4) An adjacent handwashing station.	41
<i>signs</i>	10.1.1.1.3	Signs shall be posted in the diaper-changing area advising handwashing after each diaper change.	41

10.2 Toilets and Handwashing

10.2.1 Facilities

10.2.1.1 Design

<i>child-size toilet</i>	10.2.1.1.1	Child-size toilet and handwashing facilities shall be provided, if toilet rooms are located in a child-activity center.	41
<i>toilet supplies</i>	10.2.1.1.2	Each toilet facility shall be provided with a supply of toilet tissue, disposable gloves, and sanitary wipes.	41
<i>waste receptacle</i>	10.2.1.1.3	An airtight, washable, waste receptacle shall be conveniently located to dispose of excrement, soiled sanitary wipes that cannot be disposed of in the toilet and gloves. Waste materials shall be removed from the child-activity center each day.	41
<i>handwashing supplies</i>	10.2.1.1.4	Soap, paper towels or air dryers, and waste towel receptacle shall be located at handwashing stations.	41
<i>signs</i>	10.2.1.1.5	Signs shall be posted in children's toilet room advising the providers to wash their hands and the children's hands after assisting children use the toilet.	41
<i>assistance</i>	10.2.1.1.6	Children under 6-years old shall be assisted in washing their hands in the child-activity center after using the toilet room, before eating, or after otherwise contaminating their hands.	41
<i>separate</i>	10.2.1.1.7	Separate toilet facilities shall be provided for child activity center staff.	41

10.3 Cleaning and Disinfection

10.3.1 Furnishings and Toys

10.3.1.1 Construction

cleanable 10.3.1.1.1 Surfaces of tables, chairs, and other furnishings that children touch with their hands shall be cleanable. 41

construction 10.3.1.1.2 Toys used in the child-activity center shall be maintained in a clean condition. 41

10.3.1.2 Procedures

hard surfaces 10.3.1.2.1 Surfaces that children touch with their hands shall be cleaned and disinfected at least daily with products labeled by the manufacturer for that purpose. 41

*toy cleaning/
ball pits* 10.3.1.2.2 Toys used in the child-activity center shall be cleaned and disinfected daily. Balls used in ball pits/pens shall be cleaned at least once per week, unless otherwise contaminated. 41

*tables/ high
chairs* 10.3.1.2.3 Tables or high chair trays shall be cleaned and disinfected before and after they are used for eating. 41

decks 10.3.1.2.4 Carpeting shall be vacuumed at least daily and shall be periodically cleaned when it becomes visibly soiled. Decks shall be mopped and disinfected when soiled or at least daily. 41

*facility
cleaning/
disinfecting* 10.3.1.2.5 Diaper changing and handwashing facilities and toilet rooms shall be cleaned and disinfected when soiled during use and at least daily. 41

10.3.1.3 Linens

*linens
laundered* 10.3.1.3.1 Linens such as blankets, sheets, and pillow cases shall be laundered between each use. 41

10.4 Exclusions

10.4.1 Children with Infectious Illness

10.4.1.1 Procedures

<i>written guidance</i>	10.4.1.1.1	Written guidance on symptoms of common childhood infectious illnesses shall be maintained in the child-activity center.	41
<i>illness policy</i>	10.4.1.1.2	The child-activity center shall have a written policy on procedures to be followed when a child develops symptoms of an infectious illness while at the center.	41
<i>infectious illness</i>	10.4.1.1.3	Children with infectious illness shall not be allowed in the child-activity center without permission of the vessel's medical staff.	41

11.0 Administrative Guidelines

- 11.1 Inspections
- 11.2 Inspection Report
- 11.3 Risk-Based Scoring and Correction Priority
- 11.4 Closing Conference
- 11.5 Inspection Review
- 11.6 Corrective Action Statement
- 11.7 Correction Affidavit
- 11.8 Inspection Publication
- 11.9 Recommendation that the Vessel Not Sail
- 11.10 Re-inspections and Follow-Up Inspections
- 11.11 Construction/Renovation Inspections
- 11.12 Other Environmental Investigations
- 11.13 Variances

11.1 Inspections

11.1.1 Inspection Procedures

<i>routine inspections</i>	11.1.1.1	An unannounced, complete sanitation inspection by VSP Environmental Health Officers (EHOs) shall be done twice each federal fiscal year, if the vessel is available.
<i>inspectors</i>	11.1.1.2	VSP EHO's shall be trained in the interpretation and application of the USPHS / CDC / VSP Operations Manual.
<i>boarding</i>	11.1.1.3	The VSP EHO shall board the vessel and immediately inform the master of the vessel or a designated agent that a vessel sanitation inspection is to be conducted.
<i>sequence</i>	11.1.1.4	The VSP EHO shall then conduct the inspection in a logical sequence until the EHO has completed the inspection of all areas identified in this manual.
<i>imminent health hazard detection</i>	11.1.1.5	The VSP EHO shall contact the master of the vessel or a designated agent and the Chief, VSP, immediately during an inspection about a possible recommendation that the vessel not sail, if an imminent health hazard as specified in section 11.9.2 is found to exist on the vessel and if these deficiencies possibly cannot be corrected before the inspection is completed.

<i>incomplete inspections</i>	11.1.1.6	The inspection shall be completed in the same visit once it has begun. In the event that the inspection cannot be completed, the results of an incomplete inspection shall be discussed with the vessel's staff. A complete inspection shall be conducted at a later date.

11.2 Inspection Report

11.2.1 Draft Report

<i>provided</i>	11.2.1.1	The VSP EHO shall provide a draft inspection report to the master of the vessel, or a designated agent, at the conclusion of the inspection.

<i>information</i>	11.2.1.2	The draft inspection report shall provide administrative information, gastrointestinal illness log review details, and inspection score.

<i>deficiency descriptions</i>	11.2.1.3	The draft inspection report shall provide a written description of the items found deficient and where the deficiency was observed.

11.2.2 Final Report

<i>report form</i>	11.2.2.1	The VSP EHO shall use the Vessel Sanitation Inspection Report (Annex 13.8) to summarize the inspection score. The inspection report shall contain the following elements:

<i>administrative</i>	11.2.2.2	Administrative information that identifies the vessel and its master or designee and the numerical rating when the credit point values for all observed deficiencies are subtracted from 100.

<i>deviations</i>	11.2.2.3	The item number and the credit point value for that item number shall be indicated if the vessel does not meet the Operations Manual standard for that item.

<i>medical review</i>	11.2.2.4	The medical documentation (e.g.; GI logs, medical logs, special reports, etc.) shall be available for review by VSP for accuracy and timeliness of reporting.

<i>report detail</i>	11.2.2.5	A written description of the items found deficient shall be included. The deficiencies shall be itemized with references to the section of the Operations Manual. The description shall include the deficiency location and Operations Manual section citation.

11.3 Risk-Based Scoring and Correction Priority

	11.3.1	Scoring System
<i>weighted items</i>	11.3.1.1	The inspection report scoring system is based on inspection items with a total value of 100 points.
<i>risk-based</i>	11.3.1.2	Inspection items are weighted according to their probability of increasing the risk for a gastrointestinal disease outbreak.
<i>critical items</i>	11.3.1.3	Critical items are those with a weight of 3 to 5 credit point values on the inspection report.
<i>critical designation</i>	11.3.1.4	Critical items are designated in this Operations Manual with a red C to the right of the inspection report item number which is also shown in red. The section numbers of the critical items in this Operations Manual are also provided in red.
<i>noncritical items</i>	11.3.1.5	Noncritical items are those with a weight of 1 to 2 credit point values on the inspection report.
<i>scoring</i>	11.3.1.6	Each weighted deficiency found on an inspection shall be deducted from 100 possible credit points.
	11.3.2	Risk-Based Correction Priority
<i>critical correction time frame</i>	11.3.2.1	A vessel shall at the time of inspection correct a critical deficiency of this Operations Manual and implement a corrective- action plan for monitoring the critical item for continued compliance.
<i>extension</i>	11.3.2.2	<i>Considering the nature of the potential hazard involved and the complexity of the corrective action needed, the VSP may agree to, or specify, a longer time frame, not to exceed 10 calendar days after the inspection, for the vessel to correct critical deficiencies.</i>

11.4 Closing Conference

	11.4.1	Procedures
<i>closing conference</i>	11.4.1.1	The results of the inspection shall be explained to the master or a designee before the VSP EHO leaves the vessel.
<i>report copy</i>	11.4.1.2	A copy of the draft inspection report shall be left with the master or designee. The report shall be reviewed in detail and opportunity provided for discussions of the findings. The draft report is provided so that the vessel personnel can begin correcting deficiencies immediately.
<i>invoice</i>	11.4.1.3	The master or a designee shall be provided with a payment invoice for a signature. The VSP EHO shall provide one copy of the signed invoice to the master or designee and shall

forward one copy to the vessel's company office along with the final inspection report.

- fee schedule* 11.4.1.4 The fee for inspections shall be based on the existing fee schedule for routine inspections of passenger cruise vessels, published annually in the Federal Register.

11.5 Inspection Review

11.5.1 Inspection Report Review Requests

- contested results* 11.5.1.1 If the master disagrees with the findings, the master shall notify the VSP EHO during the closing conference of the intent to request a review of the specific items being contested, and the substantive reasons for disagreement.

If a designated corporate official disagrees with the findings, the corporate official may submit a request to review the inspection. This request must be submitted to VSP within 48 hours of the closing conference.

- interim report* 11.5.1.2 An interim report shall be completed at the request of the owner or operator if an inspection is under review, indicating the item(s) under review. The VSP shall modify the final inspection report, as necessary, after the review by the Chief, VSP.

- report remarks* 11.5.1.3 After receiving a request for review, the VSP EHO shall mark the vessel's inspection report as under review at the request of the vessel owner or operator.

- written request* 11.5.1.4 The vessel owner or operator shall make a written request for review within 2 weeks of the inspection with specific reference and facts concerning the contested deficiencies that the VSP EHO documented during the inspection.

- address* 11.5.1.5 The written request shall be sent to:

Chief, Vessel Sanitation Program Branch
National Center for Environmental Health
Centers for Disease Control and Prevention
4770 Buford Hwy NE, Mailstop F 23
Atlanta, GA 30341-3724
USA

11.5.2 Inspection Report Review Procedures

- review* 11.5.2.1 The Chief, VSP, shall review the matter and respond within 2 weeks of receiving the request for a review. In the response, the Chief, VSP, shall state whether the inspection report is to

be changed.

<i>no score</i>	11.5.2.2	No numerical score shall be published before the Chief, VSP, makes a final determination on the review. Publication of inspection results shall indicate the vessel's status as under review at the request of the vessel owner or operator.
<i>report copies</i>	11.5.2.3	Copies of the contested inspection results that are released before the Chief, VSP, makes a final determination on the review shall have each contested deficiency clearly marked as under review at the request of the vessel owner or operator.
<i>final report</i>	11.5.2.4	The interim report shall be issued as a final report if the written request for review is not received within 2 weeks of the inspection.
<i>appeal</i>	11.5.2.5	If the ship owner does not agree with the review and decision of the Chief VSP, they may appeal the decision to the Director, Division of Emergency and Environmental Health Services, National Center for Environmental Health.
	11.5.3	Other Recommendations Review
<i>review</i>	11.5.3.1	A vessel owner or operator shall have the right to request a review of recommendations made during a technical consultation, or an inspection, if the owner or operator believes that VSP officials have imposed requirements inconsistent with or beyond the scope of this manual.
<i>written request</i>	11.5.3.2	The owner or operator shall send a written statement explaining the problem in detail to the Chief, VSP, within 30 days of the date the recommendation was made.
<i>review</i>	11.5.3.3	The Chief, VSP, shall review the issue and respond within 2 weeks of receiving the statement, advising whether the recommendation shall be revised.
<i>appeal</i>	11.5.3.4	If the ship owner does not agree with the review and decision of the Chief VSP, they may appeal the decision to the Director, Division of Emergency and Environmental Health Services, National Center for Environmental Health.

11.6 Corrective Action Statement

11.6.1 Procedures

<i>corrective actions</i>	11.6.1.1	A signed corrective-action statement (Annex 13.9) shall be submitted to the Chief, VSP, by the master, owner or operator which details each deficiency identified during the inspection, and the corrective action taken.
<i>critical-corrective actions</i>	11.6.1.2	Critical-item deficiencies shall also include standard operating procedures and monitoring procedures implemented to prevent the recurrence of the critical deficiency.
<i>clarification requests</i>	11.6.1.3	The corrective-action statement may contain requests for clarification of items noted on the inspection report. The request for clarification shall be included in the cover letter from the vessel's master, owner, or operator. Clarification of these items will be provided back to the requestor, in writing, by the Chief, VSP, or the EHO who conducted the inspection in question.
<i>public distribution</i>	11.6.1.4	The corrective-action statement shall be appended to the final inspection report for future reference and, if requested, made available for public distribution.
<i>same score</i>	11.6.1.5	A corrective-action statement shall not affect the inspection score.

11.7 Correction Affidavit

11.7.1 Procedures

<i>procedures</i>	11.7.1.1	An affidavit of correction from the owner or operator, certifying that corrective action has been completed, may be submitted to the Chief, VSP. The procedure may be used only one time for an item. The item shall be structure- or equipment-related, and it shall be corrected within a reasonable period.
<i>conditions</i>	11.7.1.2	At least one of the following conditions shall apply for an item to qualify for an affidavit of correction: (1) It shall be a longstanding deficiency that has not been identified during previous inspections; or (2) It shall be a deficiency in which the function of the equipment is being accomplished by an alternative method.
<i>requested at inspection</i>	11.7.1.3	After the inspection, but before the VSP EHO leaves the vessel, the vessel's master or a representative shall provide

notification of the intent to submit an affidavit of correction. This notice shall specify the deficiency(s) to be corrected and the corrective action to be taken. The draft inspection report will include a notation of the items to be corrected.

<i>final inspection score</i>	11.7.1.4	Upon acceptance of the affidavit, the final inspection score will be recalculated to include credit for the items corrected.

11.8 Inspection Publication

11.8.1 Methods

<i>report availability on website</i>	11.8.1.1	CDC shall publish an announcement of inspections performed in the <i>Summary of Sanitation Inspections of International Cruise Ships</i> on the VSP Web site http://www.cdc.gov/nceh/vsp .

<i>data</i>	11.8.1.2	The announcement shall include, at a minimum, the names of the vessels in the inspection program, the dates of their most recent inspections, and the numerical score achieved by each vessel.

<i>public record</i>	11.8.1.3	Reports, including the corrective-action statement, shall be available to the public upon request.

11.9 Recommendation that the Vessel Not Sail

11.9.1 Imminent Health Hazards

<i>imminent health hazard</i>	11.9.1.1	An imminent health hazard shall be determined to be, but not limited to, one of the following situations:

<i>potable water halogen</i>	(1) Free halogen residual in the potable water distribution system is less than 0.2 mg/L (ppm) and this deficiency is not corrected before the inspection ends;

<i>PHF temperature facilities</i>	(2) Inadequate facilities for maintaining safe temperatures for potentially hazardous food;

<i>cleaning and sanitizing</i>	(3) Inadequate facilities for cleaning and sanitizing equipment;

<i>liquid/solid waste</i>	(4) Continuous problems with liquid and solid waste disposal, such as inoperative or overflowing toilets or shower stalls in passenger and crew member cabins; or

<i>disease outbreak</i>	(5) Infectious disease outbreak among passengers or crew, and where it is suspected that continuing normal operations may subject newly arriving passengers to disease.

11.9.2 Procedures

- notify Chief, VSP* 11.9.2.1 The VSP EHO shall immediately notify the Chief, VSP, when any of these imminent health hazards or similar imminent threats to public health are found aboard a vessel.
- no sail* 11.9.2.2 CDC shall recommend or direct the master of a vessel not to sail when an imminent health hazard is identified and cannot be immediately corrected. Such a recommendation shall be signed by the Chief, VSP, with concurrence of the Director, National Center for Environmental Health, or the Director's designee.

11.10 Re-inspection and Follow-Up Inspections

11.10.1 Re-inspection Procedures

- failing vessels re-inspections* 11.10.1.1 A re-inspection is a complete sanitation inspection performed on vessels that, on the previous inspection, did not score at least 86.
- reasonable time* 11.10.1.2 Vessels that fail on a routine inspection shall be reinspected within a reasonable time, depending on:
- (1) Vessel schedules; and
 - (2) Receipt of the corrective-action statement from the vessel's management.
- unannounced* 11.10.1.3 Re-inspections shall be unannounced.
- no sail re-inspections* 11.10.1.4 If such a no sail recommendation is made, a follow-up inspection shall be conducted as soon as requested.
- scheduling priority* 11.10.1.5 In scheduling inspections, VSP shall give priority to the re-inspection of those vessels that failed the routine inspection.
- one re-inspection* 11.10.1.6 Vessels that fail a routine inspection shall undergo only one re-inspection.
- written requests* 11.10.1.7 *Exceptions may be made, when the owner or operator submits a written request for an additional re-inspection to the Chief, VSP stating the reasons why the additional re-inspection is warranted.*
- unannounced /inspection fee* 11.10.1.8 These additional re-inspections shall be unannounced and the vessel shall be charged the standard inspection fee.

11.10.2 Follow-Up Inspection Procedures

- follow-up* 11.10.2.1 A follow-up inspection is a partial inspection to review the status of deficiencies identified during the previous periodic

inspection or re-inspection.

<i>not periodic or re-inspection</i>	11.10.2.2	A follow-up inspection cannot be a substitute for a periodic or re-inspection.
<i>follow-up reasons</i>	11.10.2.3	Follow-up inspections may be conducted to resolve a contested inspection; or inspect imminent health hazards that resulted in a recommendation to prohibit the vessel from sailing.
<i>next arrival</i>	11.10.2.4	These inspections shall be conducted as soon as possible after the routine inspection or re-inspection, preferably the next time the vessel arrives at a U.S. port.
<i>limited</i>	11.10.2.5	They shall be limited to inspection of deficiencies in question. For example, if an item under the refrigerator section of the inspection was found to be a deficiency and was the only item contested, only refrigeration would be checked during the follow-up inspection.
<i>other items</i>	11.10.2.6	Any other problems noted during the follow-up inspection shall be brought to the attention of the vessel's master or designee so that the deficiencies can be corrected.
<i>no score</i>	11.10.2.7	There shall be no inspection score provided nor fee charged for these follow-up inspections.

11.11 Construction /Renovation Inspections

11.11.1 Procedures

<i>construction</i>	11.11.1.1	Whenever possible, the VSP staff shall conduct inspections of vessels being constructed or undergoing major retrofits upon the request of the vessel owner or operator.
<i>requesting inspection</i>	11.11.1.2	An official written request shall be submitted to the Chief, VSP, requesting a voluntary construction renovation inspection. CDC's ability to honor these requests shall be based on the availability of VSP staff.

<i>time frame</i>	11.11.1.3	Construction / renovation inspections shall normally be conducted at the shipyard 4 to 6 weeks before completion. An additional inspection may also be conducted upon completion of the work and before the vessel enters operational status.
<i>construction compliance</i>	11.11.1.4	Construction / renovation inspections shall document the vessel's compliance with CDC's <i>Vessel Sanitation Program Construction Guidelines</i> , which provides a framework for consistency in the sanitary design, construction, and construction inspections of cruise vessels.
<i>new vessels</i>	11.11.1.5	The <i>CDC Vessel Sanitation Program Construction Guidelines</i> shall apply to all new vessels in which the keel is laid after June 1, 2005.
<i>major retrofits</i>	11.11.1.6	The construction guidelines shall also apply to major retrofits planned after June 1, 2005.
<i>minor retrofits</i>	11.11.1.7	These guidelines shall not apply to minor retrofits.
<i>fee schedule</i>	11.11.1.8	The fee for these construction / renovation inspections shall be based on the existing fee schedule for routine inspections.
	11.11.2	Construction / Renovation Inspection Reports
<i>report</i>	11.11.2.1	A written report shall be issued by the VSP after a construction / renovation inspection. These reports shall summarize any changes recommended to ensure conformity with CDC guidelines.
<i>guides</i>	11.11.2.2	The reports prepared by VSP personnel in the shipyards during construction shall be used as guides if VSP conducts a final construction / renovation inspection on the vessel before the vessel enters operational service.
<i>no score</i>	11.11.2.3	No score shall be given for construction / renovation inspections.

11.12 Other Environmental Investigations

11.12.1 Procedures

*environ-
mental
investigations*

11.12.1.1 The VSP may conduct or coordinate other activities such as: investigating disease outbreaks; checking a specific condition such as halogen residual in the potable water distribution system; or investigating complaints of unsanitary conditions on a vessel.

*problems
noted*

11.12.1.2 Public health problems noted during other environmental investigations shall be brought to the attention of the vessel's master or designee when these investigations are performed.

no score

11.12.1.3 There shall be no inspection score provided nor fee charged for other environmental investigations.

11.13 Variances

11.13.1 Procedures

*variance
procedures*

11.13.1.1 The VSP may grant a variance by modifying or waiving the requirements of this Operations Manual if in the opinion of the VSP a health hazard or nuisance will not result from the variance.

VSP records

11.13.1.2 If a variance is granted, the VSP shall retain the information in its records for the vessel or, if applicable, multiple vessels.

*vessel
records*

11.13.1.3 If a variance is granted, the vessel using the variance shall retain the information in its records for ready reference.

	11.13.2	Documentation
<i>detailed justification</i>	11.13.2.1	Before a variance from a requirement of this Operations Manual is approved, the information that shall be provided to the VSP by the person requesting the variance and retained in the VSP's file on the vessel or vessels shall include:
<i>section specific</i>		(1) A statement of the proposed variance of the Operations Manual requirement citing relevant section numbers;
<i>hazard analysis</i>		(2) An analysis of the rationale for how the potential public health hazards and nuisances addressed by the relevant Operations Manual requirement will be alternatively addressed by the proposal;
<i>HACCP/ procedures/ training/ monitoring</i>		(3) If required, a HACCP plan, standard operating procedures, training plan and monitoring plan that includes all the information as it is relevant to the variance requested; and
<i>scientific/ supporting data</i>		(4) Additional scientific data or other information as required to support the determination that public health will not be compromised by the proposal.
	11.13.3	Conformance
	11.13.3.1	If the VSP grants a variance, the vessel shall:
<i>conformance</i>		(1) Comply with the HACCP plans, standard operating procedures, training plan, and monitoring plan that are submitted and approved as a basis for the modification or waiver; and
<i>records</i>		(2) Maintain and provide to the VSP, upon request, records that demonstrate that procedures monitoring critical-control points are effective, monitoring of the critical-control points are routinely employed, necessary corrective actions are taken if there is failure at a critical-control points and periodic verification of the effectiveness of the operation or process protects public health.
<i>rescinding variance</i>	11.13.3.2	The variance approval may be rescinded at any time for noncompliance with these conditions or if it is determined that public health has the potential of being compromised.

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13.1 Authority

13.1.1 Public Health Service Act

CHAPTER 6A--PUBLIC HEALTH SERVICE

SUBCHAPTER II--GENERAL POWERS AND DUTIES

Part G--Quarantine and Inspection

Sec. 264. Regulations to control communicable diseases

(a) Promulgation and enforcement by Surgeon General

The Surgeon General, with the approval of the Secretary, is authorized to make and enforce such regulations as in his judgment are necessary to prevent the introduction, transmission, or spread of communicable diseases from foreign countries into the States or possessions, or from one State or possession into any other State or possession. For purposes of carrying out and enforcing such regulations, the Surgeon General may provide for such inspection, fumigation, disinfection, sanitation, pest extermination, destruction of animals or articles found to be so infected or contaminated as to be sources of dangerous infection to human beings, and other measures, as in his judgment may be necessary.

(b) Apprehension, detention, or conditional release of individuals

Regulations prescribed under this section shall not provide for the apprehension, detention, or conditional release of individuals except for the purpose of preventing the introduction, transmission, or spread of such communicable diseases as may be specified from time to time in Executive orders of the President upon the recommendation of the National Advisory Health Council and the Surgeon General.

(c) Application of regulations to persons entering from foreign countries

Except as provided in subsection (d) of this section, regulations prescribed under this section, insofar as they provide

for the apprehension, detention, examination, or conditional release of individuals, shall be applicable only to individuals coming into a State or possession from a foreign country or a possession.

(d) Apprehension and examination of persons reasonably believed to be infected

On recommendation of the National Advisory Health Council, regulations prescribed under this section may provide for the apprehension and examination of any individual reasonably believed to be infected with a communicable disease in a communicable stage and (1) to be moving or about to move from a State to another State; or (2) to be a probable source of infection to individuals who, while infected with such disease in a communicable stage, will be moving from a State to another State. Such regulations may provide that if upon examination any such individual is found to be infected, he may be detained for such time and in such manner as may be reasonably necessary. For purposes of this subsection, the term "State" includes, in addition to the several States, only the District of Columbia.

(July 1, 1944, ch. 373, title III, Sec. 361, 58 Stat. 703; 1953 Reorg. Plan No. 1, Secs. 5, 8, eff. Apr. 11, 1953, 18 F.R. 2053, 67 Stat. 631; July 12, 1960, Pub. L. 86-624, Sec. 29(c), 74 Stat. 419; June 23, 1976, Pub. L. 94-317, title III, Sec. 301(b)(1), 90 Stat. 707.)

Sec. 269. Bills of Health

(a) Detail of medical officer; conditions precedent to issuance; consular officer to receive fees

Except as otherwise prescribed in regulations, any vessel at any foreign port or place clearing or departing for any port or place in a State or possession shall be required to obtain from the consular officer of the United States or from the Public Health Service officer, or other medical officer of the United States designated by the Surgeon General, at the port or place of departure, a bill of health in duplicate, in the form prescribed by the Surgeon General. The President, from time to time, shall specify the ports at which a medical officer shall be stationed for this purpose. Such bill of health shall set forth the sanitary history and condition of said vessel, and shall state that it has in all respects complied with the regulations prescribed pursuant to subsection (c) of this section. Before granting such duplicate bill of health, such consular or medical officer shall be satisfied that the matters and things therein stated are true. The consular officer shall be entitled to demand and receive the fees for bills of health and such fees shall be established by regulation.

(b) Collectors of customs to receive originals; duplicate copies as part of ship's papers

Original bills of health shall be delivered to the collectors of customs at the port of entry. Duplicate copies of such bills of health shall be delivered at the time of inspection to quarantine officers at such port. The bills of health herein prescribed shall be considered as part of the ship's papers, and when duly certified to by the proper consular or other officer of the United States, over his official signature and seal, shall be accepted as evidence of the statements therein contained in any court of the United States.

(c) Regulations to secure sanitary conditions of vessels

The Surgeon General shall from time to time prescribe regulations, applicable to vessels referred to in subsection (a) of this section for the purpose of preventing the introduction into the States or possessions of the United States of any communicable disease by securing the best sanitary condition of such vessels, their cargoes, passengers, and crews. Such regulations shall be observed by such vessels prior to departure,

during the course of the voyage, and also during inspection, disinfection, or other quarantine procedure upon arrival at any United States quarantine station.

(d) Vessels from ports near frontier

The provisions of subsections (a) and (b) of this section shall not apply to vessels plying between such foreign ports on or near the frontiers of the United States and ports of the United States as are designated by treaty.

(e) Compliance with regulations

It shall be unlawful for any vessel to enter any port in any State or possession of the United States to discharge its cargo, or land its passengers, except upon a certificate of the quarantine officer that regulations prescribed under subsection (c) of this section have in all respects been complied with by such officer, the vessel, and its master. The master of every such vessel shall deliver such certificate to the collector of customs at the port of entry, together with the original bill of health and other papers of the vessel. The certificate required by this subsection shall be procurable from the quarantine officer, upon arrival of the vessel at the quarantine station and satisfactory inspection thereof, at any time within which quarantine services are performed at such station.

(July 1, 1944, ch. 373, title III, Sec. 366, 58 Stat. 705.)

Sec. 271. Penalties for violation of quarantine laws

(a) Penalties for persons violating quarantine laws

Any person who violates any regulation prescribed under sections 264 to 266 of this title, or any provision of section 269 of this title or any regulation prescribed thereunder, or who enters or departs from the limits of any quarantine station, ground, or anchorage in disregard of quarantine rules and regulations or without permission of the quarantine officer in charge, shall be punished by a fine of not more than \$1,000 or by imprisonment for not more than one year, or both.

(b) Penalties for vessels violating quarantine laws

Any vessel which violates section 269 of this title, or any regulations thereunder or under section 267 of this title, or which enters within or departs from the limits of any quarantine station, ground, or anchorage in disregard of the quarantine rules and regulations or without permission of the officer in charge, shall forfeit to the United States not more than \$5,000, the amount to be determined by the court, which shall be a lien on such vessel, to be recovered by proceedings in the proper district court of the United States. In all such proceedings the United States attorney shall appear on behalf of the United States; and all such proceedings shall be conducted in accordance with the rules and laws governing cases of seizure of vessels for violation of the revenue laws of the United States.

(c) Remittance or mitigation of forfeitures

With the approval of the Secretary, the Surgeon General may, upon application therefore, remit or mitigate any forfeiture provided for under subsection (b) of this section, and he shall have authority to ascertain the facts upon all such applications.

(July 1, 1944, ch. 373, title III, Sec. 368, 58 Stat. 706; June 25, 1948, ch. 646, Sec. 1, 62 Stat. 909; 1953 Reorg. Plan No. 1, Secs. 5, 8, eff. Apr. 11, 1953, 18 F.R. 2053, 67 Stat. 631.)

13.1.2 Title 42 Code of Federal Regulations

**TITLE 42--PUBLIC HEALTH
CHAPTER I--PUBLIC HEALTH SERVICE,
DEPARTMENT OF HEALTH AND HUMAN SERVICES
PART 71--FOREIGN QUARANTINE**

**Subpart C--Notice of Communicable Disease Prior to
Arrival**

71.21 Radio report of death or illness.

(a) The master of a ship destined for a U.S. port shall report immediately to the quarantine station at or nearest the port at which the ship will arrive, the occurrence, on board, of any death or any ill person among passengers or crew (including those who have disembarked or have been removed) during the 15-day period preceding the date of expected arrival or during the period since departure from a U.S. port (whichever period of time is shorter).

(b) The commander of an aircraft destined for a U.S. airport shall report immediately to the quarantine station at or nearest the airport at which the aircraft will arrive, the occurrence, on board, of any death or ill person among passengers or crew.

(c) In addition to paragraph (a) of this section, the master of a ship carrying 13 or more passengers must report by radio 24 hours before arrival the number of cases (including zero) of diarrhea in passengers and crew recorded in the ship's medical log during the current cruise. All cases of diarrhea that occur after the 24 hour report must also be reported not less than 4 hours before arrival.

(Approved by the Office of Management and Budget under control number 0920-0134)

**Subpart D--Health Measures at U.S. Ports:
Communicable Diseases
Sec. 71.31 General provisions.**

(a) Upon arrival at a U.S. port, a carrier will not undergo inspection unless the Director determines that a failure to inspect will present a threat of introduction of communicable diseases into the United States, as may exist when the carrier has on board individual(s) reportable in accordance with Sec. 71.21 or meets the circumstances described in Sec. 71.42. Carriers not subject to inspection under this section will be subject to sanitary inspection under Sec. 71.41 of this part.

(b) The Director may require detention of a carrier until the completion of the measures outlined in this part that are necessary to prevent the introduction or spread of a communicable disease. The Director may issue a controlled free pratique to the carrier stipulating what measures are to be met, but such issuance does not prevent the periodic boarding of a carrier and the inspection of persons and records to verify that the conditions have been met for granting the pratique.

Sec. 71.32 Persons, carriers, and things.

(a) Whenever the Director has reason to believe that any arriving person is infected with or has been exposed to any of the communicable diseases listed in paragraph (b) of this section, he/she may detain, isolate, or place the person under surveillance and may order disinfection or disinfestation as he/she considers necessary to prevent the introduction, transmission, or spread of the listed communicable diseases.

(b) The communicable diseases authorizing the application of sanitary, detention, and/or isolation measures under paragraph (a) of this section are: cholera or suspected cholera, diphtheria, infectious tuberculosis, plague, suspected smallpox, yellow fever, or suspected viral hemorrhagic fevers (Lassa, Marburg, Ebola, Congo-Crimean, and others not yet isolated or named).

(c) Whenever the Director has reason to believe that any arriving carrier or article or thing on board the carrier is or

may be infected or contaminated with a communicable disease, he/she may require detention, disinsection, disinfection, disinfestation, fumigation, or other related measures respecting the carrier or article or thing as he/she considers necessary to prevent the introduction, transmission, or spread of communicable diseases.

Sec. 71.33 Persons: Isolation and surveillance.

(a) Persons held in isolation under this subpart may be held in facilities suitable for isolation and treatment.

(b) The Director may require isolation where surveillance is authorized in this subpart whenever the Director considers the risk of transmission of infection to be exceptionally serious.

(c) Every person who is placed under surveillance by authority of this subpart shall, during the period of surveillance:

(1) Give information relative to his/her health and his/her intended destination and report, in person or by telephone, to the local health officer having jurisdiction over the areas to be visited, and report for medical examinations as may be required;

(2) Upon arrival at any address other than that stated as the intended destination when placed under surveillance, or prior to departure from the United States, inform, in person or by telephone, the health officer serving the health jurisdiction from which he/she is departing.

(d) From time to time the Director may, in accordance with section 322 of the Public Health Service Act, enter into agreements with public or private medical or hospital facilities for providing care and treatment for persons detained under this part.

(Approved by the Office of Management and Budget under control number 0920-0134)

[50 FR 1519, Jan. 11, 1985; 50 FR 3910, Jan. 29, 1985]

Sec. 71.34 Carriers of U.S. military services.

(a) Carriers belonging to or operated by the military

services of the United States may be exempted from inspection if the Director is satisfied that they have complied with regulations of the military services which also meet the requirements of the regulations in this part. (For applicable regulations of the military services, see Army Regulation No. 40-12, Air Force Regulation No. 161-4, Secretary of the Navy Instruction 6210.2, and Coast Guard Commandant Instruction 6210.2).

(b) Notwithstanding exemption from inspection of carriers under this section, animals or articles on board shall be required to comply with the applicable requirements of subpart F of this part.

Sec. 71.35 Report of death or illness on carrier during stay in port.

The master of any carrier at a U.S. port shall report immediately to the quarantine station at or nearest the port the occurrence, on board, of any death or any ill person among passengers or crew.

(Approved by the Office of Management and Budget under control number 0920-0134)

**Subpart E--Requirements Upon Arrival at U.S. Ports:
Sanitary Inspection
Sec. 71.41 General provisions.**

Carriers arriving at a U.S. port from a foreign area shall be subject to a sanitary inspection to determine whether there exists rodent, insect, or other vermin infestation, contaminated food or water, or other insanitary conditions requiring measures for the prevention of the introduction, transmission, or spread of communicable disease.

Sec. 71.45 Food, potable water, and waste: U.S. seaports and airports.

(a) Every seaport and airport shall be provided with a supply of potable water from a watering point approved by the Commissioner of Food and Drugs, Food and Drug Administration, in accordance with standards established in title 21, Code of Federal Regulations, parts 1240 and 1250.

(b) All food and potable water taken on board a ship or aircraft at any seaport or airport intended for human consumption thereon shall be obtained from sources approved in accordance with regulations cited in paragraph (a) of this section.

(c) Aircraft inbound or outbound on an international voyage shall not discharge over the United States any excrement, or waste water or other polluting materials. Arriving aircraft shall discharge such matter only at servicing areas approved under regulations cited in paragraph (a) of this section.

Sec. 71.48 Carriers in intercoastal and interstate traffic.

Carriers, on an international voyage, which are in traffic between U.S. ports, shall be subject to inspection as described in Secs. 71.31 and 71.41 when there occurs on board, among passengers or crew, any death, or any ill person, or when illness is suspected to be caused by insanitary conditions.

13.2 Gastrointestinal Illness Surveillance System

13.2.1 Introduction

purpose

The following forms are provided as guides to standardize the collection of information required to assess the patterns of gastrointestinal illnesses and monitor for outbreaks aboard vessels. These forms are downloadable at the Vessel Sanitation Program Web site: <http://www.cdc.gov/nceh/vsp>.

13.2.2 Forms



Gastronintestinal Illness Surveillance System Questionnaire



(To be completed if you experienced gastrointestinal illness)

Vessel Name:		Voyage No. :		Date:	
Last Name:		First Name:			
Date of Birth:	(mm/dd/yyyy)	Age:	(in years)	Sex M / F	
Cabin Number:		Total Number of People in Cabin:			
Dining Seating:		Dining Table Number:			
Symptoms Started Date:	(mm/dd/yyyy)	Time:	(hh:mm)	AM / PM	
Do you know other people ill with the same symptoms?				Yes / No	
If yes, please list their names:					
Did you stay overnight or longer in a boarding city before you joined the vessel?				Yes / No	
If yes, where?		City:	State:	Country:	
Was the overnight stay in a hotel/motel/commercial residence?				Yes / No	
If yes, what was the name and address of the hotel, motel/commercial residence					
Name:					
Address:					
City:		State:		Country:	
How did you travel to the city where you boarded the ship for this cruise? Select all that apply.					
☐ Airplane		Airlines:		Flight No.:	
☐ Automobile					
☐ Bus/Motorcoach					
☐ Train					
☐ Other		Please specify:			
Are you a member of a tour group?				Yes / No	
Prior to boarding the ship, did you participate in a pre-embarkation tour/package?				Yes / No	
If yes, which tour(s)/package(s) did you participate in? (list all)					
Prior to your illness, did you go ashore at any of the ports of call?				Yes / No	
If yes, please list the ports of call where you went ashore					
Did you participate in any shore excursions at any port of call?				Yes / No	
If yes, which shore excursions did you participate in? (list all)					
Did you eat anything while you were ashore at any port of call?				Yes / No	
Did you drink anything (including drinks with ice) while ashore at any port of call?				Yes / No	
What did you think is the cause of your illness?:					

PLEASE TURN THIS FORM OVER TO PROVIDE FOOD AND SHIPBOARD ACTIVITIES HISTORY



Last Name _____ First Name _____

Meals and Activities Aboard Vessel Prior to Illness

Please list the *specific* vessel locations of the meals you consumed and the vessel activities you participated in before you became ill

Day of illness onset Give Date: _____		Day before illness onset		Two days before illness onset		Three days before illness onset	
Breakfast		Breakfast		Breakfast		Breakfast	
Place: _____		Place: _____		Place: _____		Place: _____	
Time: _____		Time: _____		Time: _____		Time: _____	
Items eaten/drunk		Items eaten/drunk		Items eaten/drunk		Items eaten/drunk	
Lunch		Lunch		Lunch		Lunch	
Place: _____		Place: _____		Place: _____		Place: _____	
Time: _____		Time: _____		Time: _____		Time: _____	
Items eaten/drunk		Items eaten/drunk		Items eaten/drunk		Items eaten/drunk	
Dinner		Dinner		Dinner		Dinner	
Place: _____		Place: _____		Place: _____		Place: _____	
Time: _____		Time: _____		Time: _____		Time: _____	
Items eaten/drunk		Items eaten/drunk		Items eaten/drunk		Items eaten/drunk	
Snack		Snack		Snack		Snack	
Place: _____		Place: _____		Place: _____		Time: _____	
Time: _____		Time: _____		Time: _____		Items eaten/drunk	
Items eaten/drunk		Items eaten/drunk		Items eaten/drunk		Items eaten/drunk	
Activities		Activities		Activities		Activities	
AM	PM	AM	PM	AM	PM	AM	PM

13.3 Gastrointestinal Illness Surveillance System Reporting

13.3.1 Introduction

13.3.2 Procedures

13.3.1 Introduction

*Operations
Manual*

The details of the Gastrointestinal Illness Surveillance data collection and notification system are contained in the *VSP Operations Manual* in Chapter 4.

Following are some sample itineraries of vessels that may call upon a U.S. port. The ports where the routine gastrointestinal illness surveillance report is required at least 24 hours before arrival, but not more than 36 hours, are marked with an ⇐.

*sample
itineraries*

Itinerary A

Port Everglades, FL
at Sea
at Sea
St. Thomas, U.S. VI
Philipsburg, St. Maarten
at Sea
Nassau, Bahamas
Port Everglades, FL ⇐

Itinerary B

Vancouver, BC
at Sea
Juneau, AK ⇐
Ketchikan, AK
Sitka, AK
at Sea
Seward, AK
Vancouver, BC

Itinerary C

Barcelona, Spain
at Sea
at Sea
at Sea
St. Thomas, U.S. VI ⇐
at Sea
Port Everglades, FL
[Note: The report in this itinerary
includes passengers and crew
members during the 15 days prior
to arrival in St. Thomas, U.S. VI.]

Itinerary D

Miami, FL
at Sea
St. Barthélemy, French W.I.
San Juan, PR ⇐
St. Thomas, U.S. VI
at Sea
Freeport, Bahamas
Miami, FL ⇐

13.3.2 Submission Procedures

telephone

The reports may be submitted as follows:

fax

Telephone: 800-323-2132 or 954-356-6650

e-mail

Fax: 954-356-6671

website

Electronic Mail: vsp-report@cuc.gov

Website (User ID and Password required):

<http://wwwn.cdc.gov/vsp>

*telephone
call
required*

A telephone notification to the Vessel Sanitation Program at the telephone numbers listed above shall accompany a special 2% report required when the vessel is within 15 days of expected arrival at a U.S. port, even when the special 2% report is submitted via fax, electronic mail or website.

13.4 Gastrointestinal Illness Outbreak Investigation

- 13.4.1 Introduction
- 13.4.2 Objectives
- 13.4.3 Outbreak Investigation Procedures
- 13.4.4 Report
- 13.4.5 Gastrointestinal Illness Specimens
- 13.4.6 Food and Water Samples

13.4.1 Introduction

<i>introduction</i>	Outbreaks of gastrointestinal illness aboard cruise ships are relatively infrequent occurrences. Since implementation of the cooperative program between the cruise industry and the VSP, the outbreak rate on vessels each year has steadily declined.
<i>vigilance</i>	Ongoing vigilance and rapid outbreak detection and response is still warranted. Since so many people share the same environment, meals and water, disease can often spread quickly to passengers and crew members on the vessel and overwhelm the vessel's medical system. The infection can also continue unabated between cruises, if the proper interventions are not instituted.
<i>consultation</i>	An outbreak of gastrointestinal illness occurs aboard a vessel when the number of cases are in excess of expected levels for a given time period. When the cumulative proportion of reportable cases of gastrointestinal illness reaches 2% among passengers or 2% among crew, and the vessel is within 15 days of arrival at a U.S. Port, the vessel shall submit a special report to VSP. This will provide an early opportunity for consultation to potentially avert more illness among passengers and crew members.
<i>monitoring</i>	In most instances, a 2% proportion of illness will not lead to an investigation aboard the vessel, but will provide the opportunity to discuss and monitor illness patterns, and collaboratively develop intervention strategies. Members of the VSP staff are available at anytime to discuss disease transmission and intervention questions.
<i>investigation</i>	Outbreaks of gastrointestinal illness aboard cruise ships are relatively infrequent occurrences. Since implementation of the cooperative program between the cruise industry and the VSP, the outbreak rate on vessels each year has steadily declined.
<i>special circumstances</i>	Under special circumstances, when an unusual gastrointestinal illness pattern or disease characteristic is found, an investigation may be conducted when the proportion of cases is less than 3%. These special circumstances may include a high incidence of illness in successive

cruises, unusual severity of illnesses or complications, or a large number of persons reporting the illness over a brief period of time.

rapid response

Conducting an outbreak investigation aboard a vessel demands a rapid, organized, and comprehensive response. Because of the turnover of passengers, and sometimes the crew members, the investigation must be rapid to be able to collect data needed to identify the cause.

collaboration

The investigation is a collaborative effort between the cruise line, the passengers and crew members aboard the vessel, and CDC. An organized plan drafted between the organizations and individuals involved, therefore, is crucial in conducting a successful investigation, a comprehensive effort that includes epidemiologic, environmental, and laboratory studies. Recommendations based on the success of the investigation can then be implemented to prevent a recurrence on the following cruise.

13.4.2 Objectives

objectives

The objectives of an investigation are to:

- (1) Determine the extent of the gastrointestinal illness among passengers and crew;
- (2) Identify the agent causing the illness;
- (3) Identify risk factors associated with the illness; and
- (4) Formulate control measures to prevent the spread of the illness.

13.4.3 Outbreak Investigation Procedures

contingency plan

The early stages of an investigation are usually coordinated aboard the vessel by the vessel's medical staff in cooperation with engineering staff and hotel staff. It is important to have a coordinated contingency plan in place on board the vessel before the need for plan implementation. All staff with a potential for involvement investigation should be familiar with the contingency plan.

periodic review

This preliminary preparation will assist the vessel with the necessary rapid implementation of investigation and response measures before the arrival of the VSP team. The outbreak contingency plan should be periodically reviewed to ensure it will still meet the vessel's needs in dealing with an outbreak.

specimens and samples

Timely collection of medical specimens and food and water samples are important in the disease investigative process. The proper materials and techniques for collection and preservation are a part of the planning.

It is important to periodically review these to make sure they are on hand and ready to use in the event they are needed.

ready to use

A list of recommended medical specimen and food sample collection supplies for investigating gastrointestinal outbreaks may be found in sections 13.4.5 and 13.4.6 of this annex. Vessels, with no medical staff aboard may choose to stock items 1-9 only unless there is a qualified staff member aboard, capable of performing venipuncture for collection of serum specimens.

useful information

In order to assist in the rapid evaluation of the extent of illness among passengers and crew, to identify the causative pathogen and associated risk factors, the VSP may request the following items:

- (1) the gastrointestinal illness surveillance log for the duration of the current cruise;
- (2) self-administered 72 hour food and activity questionnaires completed by cases;
- (3) daily newsletters distributed to passengers;
- (4) a complete list of food items and menus served to both crew and passengers for the 72 hour period before the peak onset of illness date of most cases; and
- (5) a complete list of ship and shore activities of passengers for the cruise.

survey

Additionally, VSP may request distribution of a survey to all passengers and crew members. VSP will provide this survey to the vessel. Completed surveys should be held in the infirmary until collection by VSP staff for epidemiologic analysis.

interviews

Interviews with cases may also be useful for identifying the etiology and associated risk factors of an outbreak. When distributing the surveys, the medical staff should advise the cases that interviews may be requested when VSP arrives at the vessel.

13.4.4 Report

preliminary report

Following an outbreak investigation, a preliminary report of findings based on available clinical and epidemiologic information, environmental inspection reports of the investigation, and interim recommendations, will be presented to the master of the vessel. Based on preliminary findings, additional materials, including additional passenger and crew information, may be requested from the cruise line or the vessel and

follow-up studies may be undertaken, to address specific suspicions or concerns.

final report

The report presented to the master of the vessel will remain preliminary until more extensive epidemiologic and laboratory studies have been completed, and a final report containing summary recommendations has been distributed.

13.4.5 Gastrointestinal Illness Specimens

Gastrointestinal Illness Specimen Supplies

*specimen
supplies*

- (1) 20-50 wide-mouth plastic jars or specimen cups with screw caps for stool specimens;
- (2) 20 plastic bags for storing specimen cups,
- (3) Disposable medical gloves;
- (4) Plastic disposable spoons for collecting stool
- (5) 20 sterile bottles or tubes containing bacterial preservative and transport medium (e.g., Cary-Blair);
- (6) Sterile swabs;
- (7) Rectal swabs;
- (8) Stool preservative medium for parasites;
- (9) A large commercial roll of plastic wrap;
- (10) Sterile phlebotomy supplies for obtaining serum specimens (needles, syringes, swabs);
- (11) Sterile pipettes;
- (12) 20 serum separator tubes (containing no anticoagulant [red tops]);
- (13) 20 nunc tubes for serum separation;
- (14) Shipping containers (for diagnostic specimens) and;
- (15) Shipping container labels and markings (as required by current shipping regulations for diagnostic specimens).

Specimen Collection

specimen collection

It may be advisable to collect clinical specimens of stool, vomitus or serum from passengers and crew members with reportable cases of gastrointestinal illness. Timely notification of the vessel as to what samples and information will be required is essential. Collection of specimens for analysis for viruses, bacteria or parasites may be recommended depending upon the likely etiology of disease.

request procedures

It is recommended that specimens be requested from patients during clinical evaluation in the infirmary, or subsequent to infirmary visits by direct contact with or letter from medical staff. Individuals asked to provide specimens should each be provided with disposable gloves, 2 specimen cups, a disposable spoon, and plastic wrap. The following is suggested language for a letter to passengers for request of stool specimens as well as instructions to passengers and crew for collection of stool:

Request to Passengers for Stool Specimens

specimen request

The [U.S. Public Health Service /Name of Cruise Line/ Medical Department] is requesting stool specimens from some people who became ill with gastrointestinal illness on the cruise. Please give one cup to a friend who has recently become ill and use the other cup for yourself. Put your next bowel movement into the cup and return the cup to the hospital as soon possible so it can be refrigerated.

Patient Instructions

patient instructions

- (1) Urinate into the toilet (if you feel the need).
- (2) Wash and dry hands.
- (3) Lift the toilet seat. Place sheets of plastic wrap over the toilet bowl, leaving a slight dip in the center. Place the toilet seat down. Pass some stool onto the plastic wrap. Do not let urine (if possible) or water touch the stool specimen.
- (4) Using the spoon given to you, place bloody, slimy or whitish areas of the stool into the container first. Fill the cup at least 2/3 full, if possible.
- (5) Tighten the cap.
- (6) Wash hands.

(7) Label the specimen jar with your name, the date, and your cabin number.

Medical Staff Instructions

*specimen
labeling*

Please ensure that each specimen is properly labeled with:

(1) Date of collection;

(2) Passenger or crew member name and date of birth (or a unique identifying number with a separate log linked to name and date of birth); and

(3) Notation on use of antidiarrheal or antibiotic medication.

*collection,
storage, and
transport*

Complete guidelines for collection and storage of specimens for viral, bacterial and parasite analysis are listed below, although it may not be necessary to implement all procedures during each investigation. Transport of specimens will be arranged in collaboration with VSP.

Guidelines for Collecting Fecal Specimens for Viral Diagnosis

(Modified from *MMWR*, 1990; 39, [RR-5]; 19.)

Stool for Viral Diagnosis

first 48 hours

(1) Collect stool specimens in the first 48 hours. Specimen collection should not await the results of epidemiologic and other investigations because delay will almost certainly preclude a viral diagnosis. If information gathered subsequently indicates that a viral etiology is unlikely, the specimens can be discarded.

bulk specimens

(2) Collect 10 diarrhea bulk specimens, if possible. Bulk specimens, enough to fill a large stool cup, are preferred. Serial specimens from persons with acute, frequent, high-volume diarrhea are particularly useful. The smaller the specimen and the more formed the stool, the lower the diagnostic yield. Rectal swabs are of little or no value in viral detection. Specimens from at least 10 ill persons should be collected to maximize the chance that a diagnosis can be made. The diagnostic yield is low when specimens from <10 persons are submitted.

*storage
temperature*

(3) Store specimens at 4°C (40°F). Freezing may destroy the characteristic viral morphology that permits a diagnosis by electron microscopy.

*prevent cross-
contamination*

(4) Special care must be taken to prevent cross-contamination of specimens during collection and transport because new amplification techniques are exquisitely sensitive.

Paired Serum Specimens for Viral Diagnosis

- timing* (1) Acute-period serum specimens should be collected during the first 5 days of symptoms. The convalescent-period serum specimen should be collected during the third to sixth week after illness.
- number* (2) Collect 10 pairs from ill persons (the same persons submitting stool specimens) and 10 pairs from well persons.
- quantity* (3) Serum specimens from adults should be 10 mL and serum specimens from children should be 3 mL.
- red top tubes* (4) Storage tubes containing no anticoagulant (tubes with red tops) should be used for collection.
- processing* (5) If a centrifuge is available, centrifuge the specimen for 10 minutes and remove the serum using a pipette. If no centrifuge is available, the blood specimens can sit in a refrigerator until a clot has formed; remove the serum using pipettes, as above.
- storage* (6) Place the serum into an empty nunc tube, label, then refrigerate. Do not freeze.

Other Specimens for Viral Diagnosis

- water, food, and environmental samples* Viruses causing gastroenteritis cannot routinely be detected in water, food, or environmental samples. Viruses have been successfully detected in vomitus specimens. These should be collected and sent using same methodology as for stool specimens.

Guidelines for Collecting Fecal Specimens for Bacteriologic Diagnosis

- media temperature* (1) Before use, the transport media should be stored in a refrigerator or at room temperature. If the transport media is stored at room temperature, it should normally be chilled for 1 to 2 hours by refrigeration before use.
- rectal swabs* (2) At least 2 rectal swabs or swabs of fresh stools should normally be collected for bacterial analysis and placed in refrigerated Cary-Blair transport media.
- methodology* (3) It is recommended that the swabs be inserted initially into the transport media to moisten, then inserted about 1 to 1-1/2 inches into the rectum, gently rotated, and removed for insertion individually into the same tube of transport media.

visible fecal material

(4) If possible, there should be visible fecal material on the swabs.

place both in same tube

(5) Both swabs should be inserted into the same tube of media and the swabs pushed completely to the bottom of the tube.

break off stick

(6) The top portion of the stick touching the fingers should be broken off and discarded.

refrigerate specimens

(7) Refrigeration during transport may be accomplished by shipping in an insulated box with frozen refrigerant packs. The specimens shall never be frozen during storage or transport.

Guidelines for Collecting Fecal Specimens for Parasite Diagnosis

parasite specimens

In the event a disease of parasitic etiology is suspected, arrangements for shipment of appropriate specimen containers containing 10% formalin and PVA (polyvinyl-alcohol) will be made.

A summary table with instructions for collecting clinical specimens during outbreaks to test for bacteria, viruses and parasites is available at http://www.cdc.gov/foodborneoutbreaks/guide_sc.htm.

13.4.6 Food and Water Samples

Food and Water Sample Collection Kit

food sample kit

A recommended food and water sampling kit would include:

sample containers

(1) Sterile sampling containers (15 or more sealable plastic bags and wide-mouth screw top jars; 15 water sample bottles with sodium thiosulfate solution to provide concentration of 100 mg per mL of sample volume; foil or heavy wrapping paper);

collection tools

(2) Sterile specimen collection devices (spoons, tongs, scoop, knife, scissors, swabs and pipettes);

disinfection agents

(3) Disinfection agents (sanitizing solution, 95% ethyl alcohol and propane torch); and

support equipment

(4) Support equipment (plastic gloves, plastic container liners for iced samples, water-proof marking pen for sample identification; roll of adhesive or masking tape; labels; waterproof cardboard tags with ties; insulated ice chests; frozen refrigerant packs).

Food and Water Sampling Procedures

<i>sample plan</i>	Environmental sampling should be directed towards suspect food and sources identified by the preliminary epidemiologic investigation.
<i>aseptic techniques</i>	Food and water samples should be collected using aseptic techniques. Washed and gloved hands and sterile sampling utensils and containers protect the integrity of the sample during collection. Water taps used for collection of water should be sterilized with heat or chemicals and then sample should be collected after a minute of flow time.
<i>sample amount</i>	Approximately 200 grams or 200 mL of sample will usually suffice for the laboratory analytical requirements. Carefully squeeze most of the air out of bag before sealing food samples.
<i>sample identification</i>	Sample numbers should be assigned on each collection container and recorded on a sample log that will accompany samples to the laboratory. Information that identifies the date, time, and location of collection, product information, codes, storage conditions and temperatures for each sample should be recorded on the sample log. Include contact information for the person in charge of collecting the samples on the vessel.
<i>sample temperatures</i>	Food and water samples should be held below 5°C (41°F), but not frozen. Sufficient frozen refrigerant packs should be used to maintain cold sample temperatures during transport to the laboratory.

13.5 Disinfection Calculations for Water and Equipment

13.5.1 Introduction

13.5.2 Water Chlorination

13.5.3 Equipment Disinfection

13.5.4 Tables

13.5.1 Introduction

Potable water systems and equipment, swimming pools, and whirlpool spas on a vessel may need to be disinfected when there is a possibility of contamination and as a routine part of maintenance. This annex provides tables for calculating the amount of chlorine to be used in emergency chlorination of potable water and for the routine disinfection of potable water systems and equipment, swimming pools, and whirlpool spas.

13.5.2 Water Chlorination

Tables 1 and 2 are for calculating the amount of chlorine to be used in the disinfection of potable water systems, swimming pools, and equipment.

Amounts of chlorine compound shown in:

Table 1 are in GRAMS

Table 2 are in KILOGRAMS.

The "Chlorine Compound" column in Tables 1 and 2 refers to the amount of available chlorine in the compound as stated on the product label. Requirements varying from those shown in the table, for example metric tons of water, available chlorine compounds, or final chlorine concentrations, may be extrapolated.

For example, potable water tanks or fresh water tanks shall be superchlorinated to at least 50 mg/L (ppm) available chlorine when samples taken from these tanks indicate potential contamination with fecal coliform bacteria.

The total amount of 70% chlorine compound required to obtain 50 mg/L (ppm) in 166 metric tons of water is calculated in Example 1. The following example illustrates how to use the tables:

The capacity of a potable tank from which a coliform-positive sample was obtained is 166 metric tons. The vessel has a compound on board containing 70% available chlorine. Using the 70% column in Table 1, detailed in Example 1 below, the amount of chlorine required for 50 ppm is determined as follows:

Follow the "Metric Tons" column stopping at 100 and then proceed across this row until you reach the "50 ppm" column. The amount of chlorine required for 100 tons of water at 50 ppm is 7,150 grams. Do the same for 50, 10, 5, and 1 metric tons. Now total each column.

Example 1. Amount of 70% chlorine compound required for 166 tons of water at 50 parts per million

Metric Tons of Water	Grams Required 70% Available Chlorine Solution
	50 ppm column from Table 1
100	7,150.0
50	3,575.0
10	715.0
5	357.5
1	71.5
166 Total Weight Water	11,869.0 grams or 11.87 kilograms

13.5.3 Equipment Disinfection

Figure 1 lists the various chlorine compounds and the amount of the compound required in grams per liter of water to produce a solution containing 100 ppm of chlorine. The 100 ppm chlorine solution should be applied as outlined in this manual.

Figure 1. Available chlorine in compounds

Grams per Liter of Available Chlorine	Grams per Liter for 100 ppm
70%	0.143
65%	0.154
25%	0.4
15%	0.7
10%	1.0
5%	2.0

13.5.4 Tables

Table 1. Amount of Chlorine Required in GRAMS to Produce Desired PPM (mg/L)

Chlorine Compound	Metric Tons of Water	PPM Desired					
		1	2	5	10	50	100
70%	1	1.43	2.86	7.15	14.30	71.50	143.00
	5	7.15	14.30	35.75	71.50	357.50	715.00
	10	14.30	28.60	71.50	143.00	715.00	1,430.00
	50	71.50	143.00	357.50	715.00	3,575.00	7,150.00
	100	143.00	286.00	715.00	1,430.00	7,150.00	14,300.00
65%	1	1.54	3.08	7.70	15.40	77.00	154.00
	5	7.70	15.40	38.50	77.00	385.00	770.00
	10	15.40	30.80	77.00	154.00	770.00	1,540.00
	50	77.00	154.00	385.00	770.00	3,850.00	7,700.00
	100	154.00	308.00	770.00	1,540.00	7,700.00	15,400.00
25%	1	4.00	8.00	20.00	40.00	200.00	400.00
	5	20.00	40.00	100.00	200.00	1,000.00	2,000.00
	10	40.00	80.00	200.00	400.00	2,000.00	4,000.00
	50	200.00	400.00	1,000.00	2,000.00	10,000.00	20,000.00
	100	400.00	800.00	2,000.00	4,000.00	20,000.00	40,000.00

Table 2. Amount of Chlorine Required in KILOGRAMS to Produce Desired PPM (mg/L)

Chlorine Compound	Metric Tons of Water	PPM Desired					
		1	2	5	10	50	100
15%	1	0.007	0.01	0.03	0.07	0.34	0.70
	5	0.035	0.07	0.17	0.35	1.70	3.50
	10	0.070	0.13	0.34	0.70	3.40	7.00
	50	0.350	0.65	1.70	3.50	17.00	35.00
	100	0.70	1.30	3.40	7.00	34.00	70.00
10%	1	0.01	0.02	0.05	0.10	0.50	1.00
	5	0.05	0.10	0.25	0.50	2.50	5.00
	10	0.10	0.20	0.50	1.00	5.00	10.00
	50	0.50	1.00	2.50	5.00	25.00	50.00
	100	1.00	2.00	5.00	10.00	50.00	100.00
5%	1	0.02	0.04	0.10	0.20	1.00	2.00
	5	0.10	0.20	0.50	1.00	5.00	10.00
	10	0.20	0.40	1.00	2.00	10.00	20.00
	50	1.00	2.00	5.00	10.00	50.00	100.00
	100	2.00	4.00	10.00	20.00	100.00	200.00

13.6 Food Cooking Temperature Alternatives

13.6.1 Introduction

13.6.2 Temperature-Time Alternatives

13.6.1 Introduction

Cooking, to be effective in eliminating pathogens, must be adjusted to a number of factors. These include the anticipated level of pathogenic bacteria in the raw product, the initial temperature of the food, and the food's bulk, which affects the time to achieve the needed internal product temperature. Other factors to be considered include post cooking heat rise and the time the food must be held at a specified internal temperature.

To kill microorganisms, food must be held at a sufficient temperature for the specified time. Cooking is a scheduled process in which each of a series of continuous time/temperature combinations can be equally effective. For example, in cooking a beef roast, the microbial lethality achieved at 121 minutes after it has reached 54°C (130°F) is the same lethality attained as if it were cooked for 3 minutes after it has reached 63°C (145°F).

Cooking requirements are based in part on the biology of pathogens. The thermal destruction of a microorganism is determined by its ability to survive heat. Different species of microorganisms have different susceptibilities to heat. Also, the growing stage of a species (such as the vegetative cell of bacteria, the trophozoite of protozoa, or the larval form of worms) is less resistant than the same organism's survival form (the bacterial spore, protozoan cyst, or worm egg).

Food characteristics also affect the lethality of cooking temperatures. Heat penetrates into different foods at different rates. High fat content in food reduces the effective lethality of heat. High humidity within the cooking vessel and the moisture content of food aids thermal destruction.

Heating a large roast too quickly with a high oven temperature may char or dry the outside, creating a layer of insulation that shields the inside from efficient heat penetration. To kill all pathogens in food, cooking must bring *all* parts of the food up to the required temperatures for the correct length of time.

The temperature and time combination criteria specified in Part 3-4 of this Code is based on the destruction of *Salmonellae*. This Part includes temperature and time parameters that provide "D" values (decimal log reduction values) that may surpass 7D. For example, at 63°C (145°F), a time span of 15 seconds will provide a 3D reduction of *Salmonella enteritidis* in eggs. This organism, if present in raw shell eggs, is generally found in relatively low numbers.

Other foods, fish, and meats that have not been ground or minced, including commercially raised game animal meat, specified as acceptable for cooking at this temperature and time parameter, are expected to have a low level of internal contamination. The parameters are expected to provide destruction of the surface contaminants on these foods.

13.6.2 Temperature-Time Alternatives

Chart 1 - Alternative Temperature Times for 68°C (155°F)

Minimum	
Temperature °C (°F)	Time
63 (145)	3 minutes
66 (150)	1 minute
70 (158)	< 1 second (instantaneous)

Chart 2 - Oven Type / Roasting Temperature

Oven Type	Oven Temperature Based on Roast Weight	
Still Dry	177°C (350°F) or more	121°C (250°F) or more
Convection	163°C (325°F) or more	121°C (250°F) or more
High Humidity ¹	121°C (250°F)	121°C (250°F)

1. Relative humidity greater than 90% for at least 1 hour as measured in the cooking chamber or exit of the oven; or in a moisture-impermeable bag that provides 100% humidity.

Chart 3 - Internal Roast Temperature and Holding Time

Temperature		Time In Minutes	Temperature		Time In Minutes ¹
°C	°F		°C	°F	
54	130	121	60	140	12
56	132	77	61	142	8
57	134	47	62	144	5
58	136	32	63	145	3
59	138	19			

¹ Holding time may include postoven heat rise

Chart 4 - Cooking Exemptions

Food	Provisions
Beef Steak -- Whole-Muscle, Intact	Steak is cooked on top and bottom to a surface temperature of 63°C (145°F) or above and color change is achieved on all surfaces.
Eggs, Fish, Molluscan Shellfish and Other Meats	Consumer information is provided as specified in 7.3.6.1.1; or a variance is granted as specified in 11.13 of the VSP Operations Manual.

Extracted from *Food Code*, Recommendations of the United States Public Health Service, 1999.

13.7 Warewashing Evaluation

- 13.7.1 Introduction
- 13.7.2 Machine Data Plates
- 13.7.3 Evaluation Procedures
- 13.7.4 Routine Monitoring

13.7.1 Introduction

13.7.1.1 Methodology Source

resources

The following warewashing machine evaluation procedure was compiled from the NSF International (NSF) brochure Food Service: *Recommended Field Evaluation Procedures for Spray-Type Dishwashing Machines*, 1991, and *Food Code*, 1999. ANSI/NSF 3-1996, *Commercial Spray-Type Dishwashing and Glasswashing Machines* and the CDC / VSP Operations Manual should be consulted for recommended construction and operational parameters.

13.7.1.2 Recommended Evaluation Equipment

TMD

The following equipment to conduct warewashing evaluations is recommended:

maximum
registering

(1) Thermocouple or thermistor temperature-measuring device for warewasher operational temperatures;

wax crayons

(2) Maximum registering temperature-measuring device or temperature-sensitive tapes for verifying hot water warewasher final rinse temperature, 73° C (160° F);

(3) Optional: Calibrated melting temperature wax crayons with melt points set at 82° C (180° F) and another at 91° C (195° F);

pressure gauge

(4) Pressure gauge, as applicable, for determining in-line pressure of hot water at injection point of warewasher in the 100-170 kilopascals (15-25 pounds per square inch) range;

chemical test
kit

(5) Chemical test kits for different chemical sanitizer types used on the vessel;

flashlight

(6) Flashlight;

tape measure

(7) Tape measure; and

Annexes

timing device

(8) Watch or stop watch.

calibrated

The temperature-measuring devices and pressure gauges shall be calibrated against standards to ensure reliable warewasher evaluations. The chemical test kits and temperature sensitive tapes shall be maintained as specified by their manufacturer to ensure accuracy.

mercury spills

Mercury-filled maximum registering temperature-measuring devices are subject to breakage and shall be carefully used during the evaluations. If they break, a thorough clean-up shall be performed before warewashing operations resume.

13.7.2 Machines Data Plates

*data plate
required*

The required manufacturer's data plate shall be studied for correct operating parameters. If data plate indicates a flow pressure, the machine shall have a gauge or a gauge valve to measure it. If manufacturer's data plate does not state a flow pressure, the machine is not required to have a gauge or a gauge valve.

*temperature
requirements*

The temperatures stated on the warewash machine data plate shall be considered minimums. Except for chemical sanitizing machines, the machine should not heat to more than 9°C (15°F) above its minimum temperatures to reduce steam buildup and baking food particles on the articles being washed. Differences will be noted on the tank temperatures when the pumps are activated and when they are not.

*conform to
ANSI / NSF 3 -
1996*

The warewash machine temperatures shall conform to those specified in these guidelines for the specific type of machine. For those manufactured to different temperature standards, evidence shall be furnished that they at least conform to the minimum equivalent standards of ANSI/NSF 3-1996, *Commercial Spray-Type Dishwashing and Glasswashing Machines*.

13.7.3 Evaluation Procedures

13.7.3.1 Operating Procedures

<i>prescraped / racked</i>	(1) Dishes shall be properly prescraped and racked.
<i>scrap trays</i>	(2) The machine prewash "scrap trays" shall be clear of excessive soil and debris.
<i>curtains / baffles</i>	(3) The curtains and baffles on conveyor type machines shall be intact and in their proper position.
<i>conveyor speed</i>	(4) The conveyor speed and cycle times shall be set according to manufacturer's specifications.
<i>overflow</i>	(5) The overflow standpipe shall be installed, not blocked or leaking.
<i>nozzles aligned</i>	(6) The wash and rinse nozzles shall be properly aligned and provide a uniform spray pattern.
<i>nozzles clear</i>	(7) The wash and rinse nozzles shall be clear of obstructions.
<i>manifolds repair</i>	(8) The wash and rinse manifolds shall be in good repair, properly installed in the machine, and end caps installed.
<i>heating elements</i>	(9) The heating elements used in tanks shall not have mineral or other deposits on them.
<i>strainer clear</i>	(10) The rinse supply line strainer shall be clear of debris.
<i>TMDs accurate</i>	(11) The wash and rinse tanks, and final rinse manifold temperature-measuring devices shall be accurate to ± 1.5 °C (± 3 °F).
<i>pressure regulator</i>	(12) The pressure regulator shall be functioning properly.
<i>flow pressure</i>	(13) The flow pressure shall be 100-170 kilopascals (15-25 pounds per square inch).

13.7.3.2 Temperature Evaluation

<i>manufacturer's instructions</i>	(1) The machine shall be installed and operated in accordance to the manufacturer's instructions.

warm-up	(2) The machine shall be run through at least two complete cycles before testing unless it has been operating just before the evaluation. On conveyor machines, this is accomplished by running at least two racks through the machine.
additional warm-up	(3) When minimum temperatures are not indicated on the machine-mounted temperature-measuring devices, additional pre-evaluation cycles may be run to determine, if higher temperatures are possible.
tank thermometer calibration	(4) Temperatures of the wash water and pumped rinse shall be taken directly from the tanks of the machines and compared against the machine mounted temperature-measuring devices. The evaluation temperature-measuring device probe shall be placed in the tank near the machine mounted temperature-measuring device probe, if possible.
sanitizing rinse TMDs	(5) A maximum registering temperature-measuring device, remote sensing thermocouple or nonreversible thermo-labels such as paper temperature-measuring devices that turn from silver to black or similar device shall be used to confirm the effectiveness of heat sanitization.
rinse exposure	(6) The maximum registering temperature-measuring device shall be attached in a vertical position in a rack that is exposed to the final sanitizing rinse spray at the approximate level of a plate. The nonreversible thermo-labels shall be attached to the center of a dry ceramic plate.
high wash / rinse temperature factor	(7) The effect of the temperatures of the wash water and pumped rinse shall be factored into the evaluation, if the tank thermometers indicate they are above 74°C (165°F). <i>The maximum-registering TMD may also be checked at the end of each part of the cycle to verify that the wash and rinse temperatures have not been in excess of 71°C (160°F).</i>
effective sanitization	(8) Effective sanitization shall be evaluated by noting one of the following: In a mechanical operation, the temperature of the fresh hot water sanitizing rinse as it enters the manifold may not be more than 90 °C (194 °F), or less than: (A) For a stationary rack, single temperature machine, 74 °C (165 °F); or (B) For all other machines, 82 °C (180 °F).

(C) A utensil surface temperature of 71 °C (160 °F) as measured by an irreversible registering temperature indicator shall be achieved.

*indirect
methods*

(9) The final rinse spray temperature may be indirectly evaluated by using a non-reversible thermo-labels attached to manifold or by using a calibrated melting temperature wax crayons. A mark is made on a dry portion of the final sanitizing rinse manifold or supply line with a crayon that melts at 82 °C (180 °F) and another that melts at 91 °C (195 °F).

13.7.3.3 Chemical Sanitizing Evaluation

*chemical
sanitizing*

Obtain sample at end of the final chemical sanitizing rinse cycle, and use a sanitizer test kit to confirm sanitizer level is at minimum specified on machine data plate and in these guidelines.

13.7.4 Routine Monitoring

*periodic
detailed
evaluations*

Proper warewashing is critical to protecting the health of a vessel's passengers. The procedures provided in this annex may assist the vessel crew in periodically verifying the proper operation of its warewashing machines. Following the manufacturer's recommendations for maintenance and operation will ensure the warewashing machines continue to meet the criteria of these guidelines and standards of ANSI/NSF 3-1996, *Commercial Spray-Type Dishwashing and Glasswashing Machines*.

*start-up
evaluations*

During each warewashing machine's startup, the proper setup and operation of the equipment should be verified with basic checks. These would include checks of the tank, manifold, and curtain assemblies to ensure they are properly installed. Proper operating temperatures should be verified to meet the minimum required temperatures during the start-up.

*routine
operation
evaluations*

Periodic operation and temperature checks by the warewashing crew during the warewashing time should detect problems soon after they occur. The person removing the clean and sanitized ware must examine each piece to determine if it is clean. Periodic management checks of the warewashing process during operation verify that the machines are operating properly and the utensils processed are indeed clean and sanitized.

simple records

Simple records can assist in the warewash machine monitoring process. A review of these records can ensure proper monitoring is being conducted and assist in determining a gradual or severe malfunction of the machine.

13.8 Inspection Report

13.8.1 Report Form

The copy of the VSP Inspection Report form follows on the next pages

During the implementation of the VSP Operation Manual, an electronic version of this form will also be used. Copies of the electronic version will be returned to the cruise line by electronic mail.

**VESSEL SANITATION INSPECTION REPORT**

Vessel Name	Inspection Date	Port	Results Presented to	Score:
Cruise Line	No. Pax	No. Crew	Inspection Type	
Inspected by				

Item No. / Point Value / Description **Bold = Critical Item****DISEASE REPORTING**

01	4	Disease reporting
02	1	Medical logs maintenance

POTABLE WATER

03	5	Bunker / production source; Halogen residual
04	5	Distribution system halogen residual
05	5	Distribution system halogen analyzer calibrated
06	2	Halogen analyzer chart recorder maintenance, operation, records; Micro sampling, records
07	3	System protection cross-connections, backflow; Disinfection
08	1	Filling hoses, caps, connections, procedures; Sample records, valves; System construction, maintenance

SWIMMING POOLS, SPAS

09	3	Swimming pools / spas halogen residuals
10	1	Swimming pools / spas maintenance, safety equipment

FOOD SAFETY**PERSONNEL**

11	5	Food handlers infections, communicable diseases
12	4	Hands washed; Hygienic practices
13	3	Management, knowledge, monitoring
14	1	Outer clothing clean; Jewelry, hair, hand sanitizers

FOOD

15	5	Food source, sound condition; Food re-service
16	5	Potentially hazardous food temperatures
17	2	Temperature practices; Thawing
18	3	Cross-contamination
19	2	Food protection; Original containers; labeling; In-use food dispensing, preparation utensils

MEDICAL LOG REVIEW

Cruise - Start / End / Port / PAX / ILL / CREW / ILL

- 1.
- 2.
- 3.
- 4.
- 5.

Item No. / Point Value / Description **Bold = Critical Item****EQUIPMENT**

20	2	PHF temperature maintenance facilities; Food-contact surfaces; Food TMD's
21	1	Nonfood-contact surfaces; Ambient TMD's
22	2	Warewashing facilities; TMD's; Test kits
23	2	Pre-wash; Wash and rinse solutions
24	3	Sanitizing rinse
25	1	Wiping cloths / chef's towels
26	3	Food-contact surfaces equipment / utensils clean; Safe materials
27	1	Non-food contact surfaces equipment / utensils clean
28	2	Equipment / utensil / linen / single / service storage handling dispensing; Cleaning frequency

TOILET AND HANDWASHING FACILITIES

29	3	Facilities convenient, accessible, design, installation
30	1	Hand cleanser, sanitary towels, waste receptacles. Handwashing signs; Maintenance

TOXIC SUBSTANCES

31	5	Toxic Items

FACILITIES

32	1	Solid waste containers
33	1	Decks / bulkheads / deckheads
34	1	Plumbing fixtures / supply lines / drain lines / drains
35	2	Liquid waste disposal
36	1	Lighting
37	1	Rooms / equipment venting
38	1	Unnecessary articles, cleaning equipment; Unauthorized personnel

ENVIRONMENTAL HEALTH

39	3	IPM program effective; Approved pesticide application
40	1	IPM procedures; Outer openings protection
41	2	Housekeeping; Child-Activity Centers

Comments:

13.9 Corrective Action Statement

13.9.1 Introduction

13.9.2 Format

13.9.1 Introduction

<i>purpose</i>	VSP has established a procedure for post-inspection reporting of corrective action to encourage the correction of deficiencies noted during an inspection. A signed corrective action statement shall not affect the inspection score.
<i>critical item monitoring</i>	The corrective action statement, particularly for critical items, should include a management monitoring plan to ensure that the procedure or process found out of control will be monitored and controlled in the future. The public health goal of the inspection is to prevent the recurrence of the critical deficiency in the specific instance where it was found and generally in future similar operations aboard the vessel.
<i>publicly available</i>	The corrective action statement shall be appended to the final inspection report for future reference and public distribution, if requested.
<i>e-mail submission</i>	The corrective action statement may be submitted to VSP by electronic mail. Please send it to vsp@cdc.gov and include your vessel name, corrective action statement and inspection date on the message subject line. It is preferable that the corrective action statement be submitted as an attached word processing format file.
<i>mail submission</i>	The corrective-action statement may also be mailed to:

CDC / Vessel Sanitation Program
1850 Eller Drive - Suite 101
Ft. Lauderdale, FL 33316
USA

13.9.2 Format

*example
statement*

Date

CDC / Vessel Sanitation Program
1850 Eller Drive - Suite 101
Ft. Lauderdale, FL 33316
USA

Dear Sir:

The following actions have been taken to correct each of the deficiencies noted during the inspection of (Name of Vessel) on (Date), at (Port).

Item Number	Deficiency / Corrective Action

1.

2.

3.

(Continue list until all violations have been listed.)

Sincerely,

(Signature)

Name

Title

Company

13.10 Summary of Sanitation Inspections of International Cruise Ships

- 13.10.1 Introduction
- 13.10.2 Format
- 13.10.3 Contact Information

13.10.1 Introduction

introduction

Every vessel that has a foreign itinerary and that carries 13 or more passengers is subject to twice-yearly inspections and, when necessary, to re-inspection by the Centers for Disease Control and Prevention (CDC). To ensure a clean and healthful environment, cruise ships must meet the criteria established by CDC.

The score and the complete inspection report for each inspection are published on the CDC website.

The ship's level of sanitation is acceptable to CDC if its score on the inspection is 86 or higher.

The website address for these scores and inspection reports is:
<http://www.cdc.gov/nceh/vsp>.

13.10.2 Format

online information

The VSP website has a searchable database of inspection report summaries and lists. The complete inspection report information is also retrievable.

lists

Lists

Some of the lists available on the VSP website include:

- Summary of Most Recent Ships Inspected;
- Ships Inspected within Past 2 Months;
- Ships with Not Satisfactory Scores (under 86); and
- Summary of Inspection Scores (Green Sheet) .

These lists show the data by:

- Ship Name;
- Inspection Date; and
- Score.

*complete
report
available*

Further information can be obtained on a particular ship, including all scores for that ship and a inspection report preview.

The Summary of Inspections with Violations is provided on the VSP website. This report provides a categorical review of the deficiencies noted along with the number of points deducted for that category and the numerical score for the inspection.

The details of the inspection with the specific deficiencies and recommendations are also accessible from this page.

Search

*search
possibilities*

The inspection report data is also searchable from this database within the following search categories:

- Ship Name;
- Inspection Date;
- Most Recent Date;
- All Dates;
- Range of Dates; and
- Score.

Score Categories include:

- All;
- 86 or higher -- Satisfactory Scores; and
- 85 or lower -- Not Satisfactory Scores.

*search result
sorts*

The search results may be sorted by:

- Inspection Date (most recent first);
- Ship Name (alphabetical);
- Score (high-low); and
- Score (low -high).

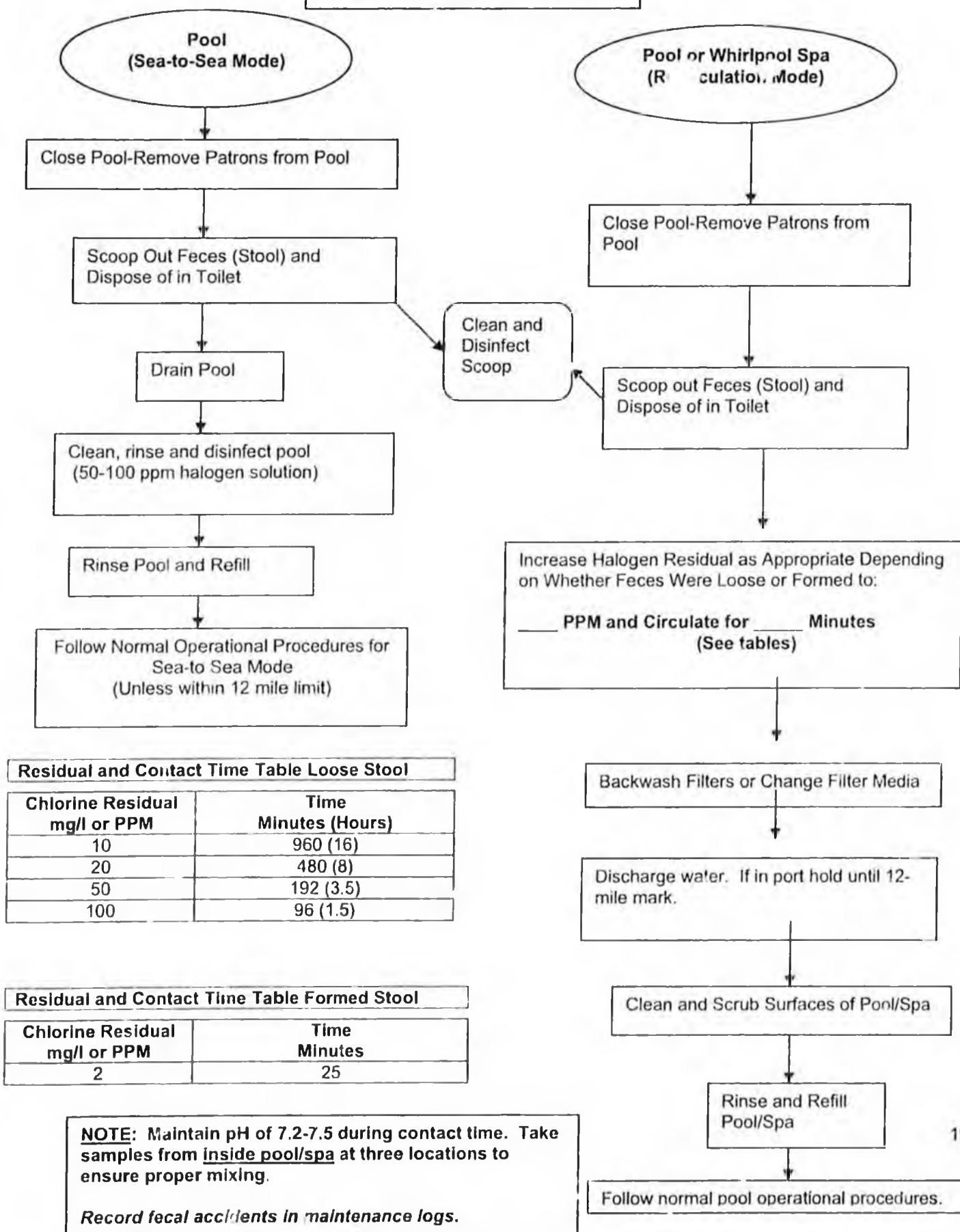
13.10.3 Contact Information

*further
information*

Further information on the Vessel Sanitation Program and the inspection results and the vessel's corrective action statements maybe obtained through electronic mail at: vsp@cdc.gov, by telephone at 800-323-2132, via fax at 770-488-4127 or on the VSP Web site at www.cdc.gov/nceh/vsp.

13.11 Fecal Accident Plan

Sample Fecal Accident Procedure



14.0 Bibliography

- 14.1 Introduction
- 14.2 Authority
- 14.3 Definitions
- 14.4 Gastrointestinal Illness Surveillance
- 14.5 Potable Water
- 14.6 Swimming Pools, Whirlpool Spas and Hot Tubs
- 14.7 Food Safety
- 14.8 Integrated Pest Management
- 14.9 Housekeeping
- 14.10 Child-Activity Centers
- 14.11 Administrative Guidelines

14.1 Introduction

Centers for Disease Control and Prevention, NCEH, 1999. Vessel Sanitation Program: Charting a Healthier Course.

Centers for Disease Control and Prevention, NCEH, 1999.
<http://www.cdc.gov/nceh/vsp>.

Centers for Disease Control and Prevention, NCEH, 1989. Vessel Sanitation Program Operations Manual.

14.2 Authority

The Public Health Service Act, 42 U.S.C. Section 264. Quarantine and Inspection - Regulations to control communicable diseases.

The Public Health Service Act, 42 U.S.C. Section 269. Quarantine and Inspection - Bills of health.

Code of Federal Regulations 42 CFR 71.31. Health Measures at U.S. Ports: Communicable Diseases. General provisions.

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(A) Viewing and Copying the USC or CFR

(1) Government Depository Library

The USC and CFR are widely available for reference and viewing in some 1400 "depository libraries" located throughout the United States. A *Directory of U.S. Government Depository Libraries* is published by the Joint Committee on Printing of the United States Congress and is available through the Superintendent of Documents, U.S. Government Printing Office. This publication lists all depository libraries by state, city, and congressional district.

Persons may also obtain information about the location of the depository library nearest to them by contacting:

Library Programs Service, SL
U.S. Government Printing Office
North Capitol & H Streets, NW
Washington, DC 20401
(202) 512-1114, FAX (202) 512-1432

(2) Internet World Wide Web Information System. The CFR are

available on-line in downloadable form through the Internet World Wide Web information system. Two sources are:

(a) The National Archives and Records Administration
Copies of Federal Regulations - Retrieve CFR by Citation
Provided through the Government Printing Office Web Site - GPO Inet Services

<<http://www.access.gpo.gov/nara/cfr/cfr-retrieve.html#page1>>

(b) The U.S. House of Representatives
Internet Law Library Code of Federal Regulations (Searchable)

<<http://law.house.gov/cfr.htm>>

(B) Purchasing Portions of the USC or CFR

Persons wishing to purchase relevant portions of the USC or CFR may do so by writing or by calling:

Superintendent of Documents (New Orders)
U.S. Government Printing Office
P.O. Box 371954
Pittsburgh, PA 15250-7954
(202) 512-1800

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Chapter 1 Purpose and Definitions

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2-304.11 Clean Condition. (Outer Clothing)

2-401.11 Eating, Drinking, or Using Tobacco.*

2-402.11 Effectiveness. (Hair Restraints)

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Chapter 3 Food

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For
Sampling and Analysis of Treated Sewage and
Graywater
From
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Part 159 and Alaska Statute 46.03.460 -- 46.03.490 and 18 AAC 69

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APPROVAL PAGE

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Individual Companies
UAS, Project Quality Assurance Officer
NorthWest Cruise Ship Association

Acronyms/Abbreviations Used

ADEC	Alaska Department of Environmental Conservation
BNA	Base/Neutrals, Acids
BOD	Biochemical Oxygen Demand – 5-day test
CFR	Code of Federal Regulations
COC	Chain of Custody
COD	Chemical Oxygen Demand
COTP	US Coast Guard Captain of the Port
DQO	Data Quality Objective
EPA	Environmental Protection Agency
HDPE	High Density Polyethylene
HCl	Hydrochloric Acid
H ₂ SO ₄	Sulfuric Acid
HNO ₃	Nitric Acid
MDL	Method Detection Limit
MSD	Marine Sanitation Device
NaOH	Sodium Hydroxide
%R	Percent Recovery
PQL	Practical Quantitation Limit (Minimum Reporting Level)
QA	Quality Assurance
QA/QCP	Quality Assurance/Quality Control Plan
QMP	Quality Management Plan
QC	Quality Control
RPD	Relative Percent Difference
RQ	Reportable Quantity per 40 CFR part 302
SM	Standard Methods
SW-846	Solid Waste Methods
SOP	Standard Operating Procedures
TSS	Total Suspended Solids
UAS	University of Alaska, Southeast
USCG	U.S. Coast Guard
VOCs	Volatile Organic Chemicals
VSSP	Vessel Specific Sampling Plan

Management and Contractors

North West CruiseShip Association

The North West CruiseShip Association (NWCA) represents the large cruise line companies undergoing wastewater testing during the 2007 Alaska cruise ship season. Individual NWCA members are funding the sampling and analysis program for their own respective vessels. The costs incurred by the Project QA Officer will be distributed evenly among all participants in the program. All NWCA member line cruise ships that operate in Alaska waters in 2007 will follow the provisions of this QA/QCP.

Individual Vessel Representatives

The responsibility for adherence to the provisions of this QAQC plan rests with the owner or operator. Failure of vessel owners and operators to follow the provisions of this QAQC plan will result in enforcement action by the State of Alaska under AS 46.03.

Small Cruise Ships and Alaska Marine Highway System

Many other small cruise ship companies and the Alaska Marine Highway System (AMHS) may choose to follow this QA/QCP or they may submit their own QA/QCP to the ADEC in order to satisfy obligations under Alaska Statute 46.03 and 18 AAC 69.025.

Lab Project Manager

The Lab Project Manager is responsible for ensuring that individual project components are executed in a timely and appropriate fashion. However it is the vessel owner or operator that is responsible for compliance. Responsibilities include:

- Submitting results within the time frame specified by law and this document.
- Communicating project information to the Coast Guard, ADEC, and cruise lines.
- Assuring that project participants have necessary training.
- Fielding questions and requests for information that arise during and after the project.
- Managing the financial aspect of the project, including the determination of billing and payment mechanisms.

Sampling team Leader

The contract sampling team leader will coordinate and conduct all unannounced and continued compliance sampling. The VSSP must be submitted by the vessel owner or operator to the ADEC and US Coast Guard prior to sampling.¹ The ADEC will forward the approved VSSP to the sampling manager. The sampling team will design and keep confidential a sampling schedule. Vessel operators will not be aware of the timing of sample collection for the two **unannounced** sampling events.

Samplers are responsible for sample collection, sample integrity and custody, field measurements, and accurate notes. **THE SAMPLER MUST VERIFY THAT THE VESSEL IS DISCHARGING DURING THE UNANNOUNCED SAMPLES.** If discrepancies exist on the VSSP, the sampler

¹ ADEC: 21 days before sampling, 18 AAC 69.030
Coast Guard: w/in 30 days of initial entry, 33 CFR 159.317(a)(3)

is to report them immediately to ADEC and the USCG. The sampler will provide a compilation of field notes, deviations from VSSP or QA/QCP plans (if applicable), and Chain of Custody to the laboratory personnel, Project Manager, and the Project Quality Assurance Officer upon completion of all sampling.

The sampler will notify the ADEC project manager 36 hours prior to the sampling event. This gives ADEC time to audit the sampling event.

Wastewater analysis laboratory

A laboratory, certified for drinking water analysis by ADEC, will be retained to analyze both conventional and priority pollutant samples according to their individual laboratory Quality Assurance Plan, and using EPA-approved analytical methods. If a sub-contract laboratory is used to meet holding times, that sub-contract laboratory must also be certified for drinking water analysis by ADEC or their equivalent state or province and adhere to the quality control procedures outlined in this document. The laboratory Quality Assurance Manager will certify the quality assurance programs of all subcontract laboratories. A list of ADEC certified microbiological labs is available at <http://www.dec.state.ak.us/ch/lab/labs.htm>. Labs that provide chemical analysis can be found at <http://www.dec.state.ak.us/ch/lab/certchemlabs.aspx>.

Project Quality Assurance Officer

The Project Quality Assurance (QA) Officer is an independent individual that ensures that that ALL laboratories and sampling teams follow the laboratory's quality assurance program guidelines, this QA/QCP, and the VSSP. The Project QA Officer works independently to ensure quality of the data.

US Coast Guard COTP

The USCG COTP will use data gathered in accordance with this plan to determine compliance with federal law.

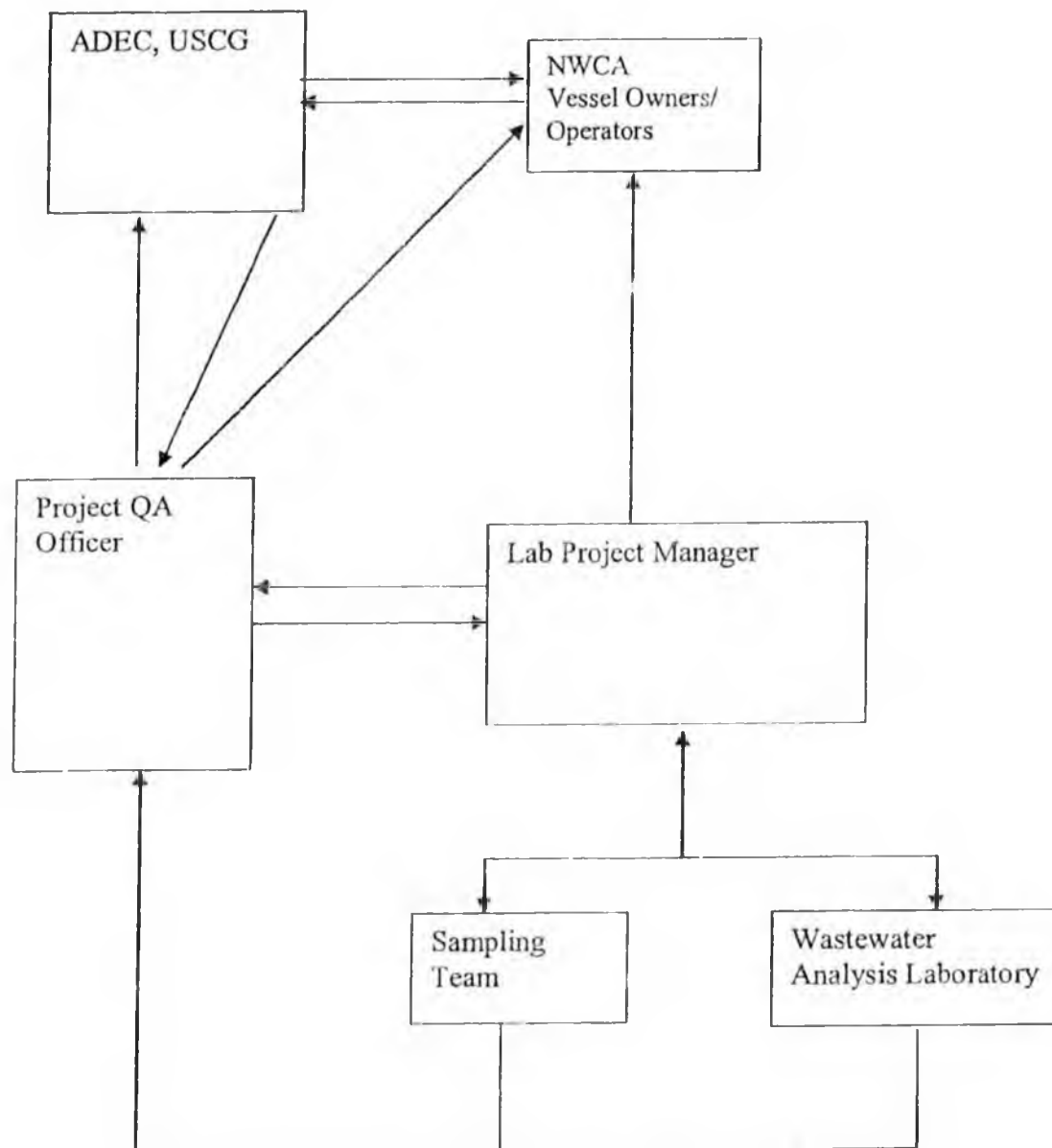
ADEC Project Manager

The ADEC project manager manages the program to meet the requirements in the Alaska statute, regulation, and the approved QA/QC plan.

ADEC Water Quality Assurance Officer

The ADEC Water Quality Assurance Officer will review the QA/QCP to determine if it meets the State of Alaska's objectives for the data collection effort. The ADEC WQA Officer may review data results and participate in sampling and laboratory audits.

2007 Program Organizational Chart



Purpose

This document is prepared and submitted to fulfill certain requirements of United States Title 33 Code of Federal Regulations Part 159.317, Alaska Statute 46.03.460- 46.03.490, and 18 AAC 69.025. Federal law requires at least two **sampling events** per vessel in a season, and that these two sampling events are unannounced to the vessel beforehand. A "sampling event" is the collection of representative samples² of each wastewater type being discharged within Alaska waters. The number of samples in a sampling event is based upon the ship configuration, vessel wastewater management practices, and the wastewater quantities discharged while the sample team is on-board.

The two unannounced samples must be taken at a point in the system directly before being discharged overboard. Sample ports must be within 50 feet of the point of overboard discharge.³

One sample will be tested for conventional pollutants only. The second sample must be tested for conventional and priority pollutants.

Samples submitted to the USCG in order to obtain certification for continuous discharge must also follow this QA/QCP.

Lab reports should clearly state whether the sampling was conducted

- to obtain certification for continuous discharge
- to maintain continued compliance for continuous discharge
- to satisfy 33 CFR 159.317 and AS 46.03.465

The lab will submit the sample results directly to the DEC and USCG, but the owner/operator is responsible for meeting submittal deadlines.

Applicability

This QA/QCP specifies the minimum requirements for sampling and analysis of treated sewage and/or graywater and other wastewaters as defined in AS 46.03.490, for the 2007 Alaska operating season for vessels that are members of the North West CruiseShip Association. This QA/QCP is also applicable for any commercial passenger vessel that discharges treated sewage, graywater and/or other wastewater in the applicable waters of Alaska as defined in 33 CFR 159.305 and the waters of the Alexander Archipelago as defined in AS 46.03.490. All unannounced and/or random sampling events required by 33 CFR 159 and AS 46.03 shall be conducted in accordance with this QA/QCP.

² The VSSP for each vessel will list the proper location and timing of wastewater sampling. The samples will be taken in a manner that seeks to capture a typical wastewater discharge while still meeting the fecal coliform 6-hour holding time.

³ Samples taken at the treatment system are sometimes of different quality than the samples taken at the discharge port. This will make it possible to fairly compare the data from all ships.

Owner or operators must comply with the guidelines in 33 CFR 159, 40 CFR 136.3, AS 46.03.460-46.03.490, and 18 AAC 69, 18 AAC 70 and this plan.

Applicable standards for wastewater discharges⁴

FOR VESSELS DISCHARGING at least 1 nautical mile from shore and traveling a minimum of 6 knots

Pollutant limits	Blackwater	Graywater
Total Suspended Solids (TSS)	150 mg/L	150 mg/L
Fecal Coliform	200 FC/100ml	200 FC/100ml

Each participating ship will be sampled within 30 days of initial entry into Alaska waters and subject to unannounced treated sewage and graywater sampling and analysis for conventional and priority pollutants as determined by the Coast Guard COTP. The second samples must be at least 21 days after the first sampling event. The twice per month continuous compliance sampling must be at least 24 hours apart. The ADEC may board vessels to perform sampling inspections as necessary to implement AS 46.03.

This QA/QCP covers sampling and analysis for the parameters listed below. Analysis for conventional and priority pollutant parameters as required by the USCG under 33 CFR 159.317 are listed below. A sample that fails to provide valid results for all required pollutants will not be counted as an acceptable sample for purposes of meeting the minimum requirement of two samplings for conventional pollutants and one sample for priority pollutants.

Conventional pollutants (two sampling events):

- Total Suspended Solids (TSS)
- Settleable Solids (SS)
- Biochemical Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD)
- Oil and Grease
- Total Organic Carbon
- Ammonia – Total
- Fecal Coliform
- pH
- Total and Free Residual Chlorine
- Specific Conductance (to measure seawater influx)
- Alkalinity
- Total Nitrogen (Ammonia, Nitrate, Nitrite, and Total Kjeldahl Nitrogen (TKN))
- Total Phosphorus

Priority Pollutants (one sampling event)

- Base/Neutrals, Acids
- Total Aromatic and Total Aqueous Hydrocarbons using BNA and VOC data

⁴ According to Title XIV, 33 CFR 159, 40 CFR 140, and AS 46.03.463

- Volatile Organic Chemicals (VOCs)
- Trace Metals (Total Recoverable and Dissolved)

BLIND DUPLICATE SAMPLES

Blind sample duplicates will be collected on a minimum of 10% of the total number of samples or four samples total, whichever number is greater. All blind samples will be analyzed for conventional pollutants, but only half will be analyzed for priority pollutants.

The purpose of the blind sample duplicates is to assess sampling and laboratory error and to assess overall method variability. Precision between the sample and its duplicate will be determined by calculating the relative percent difference between the two samples, in the same way that precision is measured between two laboratory-fortified blanks or a matrix spike/matrix spike duplicate. The use of duplicate samples extends the test of precision to the sampling method itself. The use of blind samples provides a test of the laboratory and is used to assess bias or analytical errors not detected by the laboratory (e.g., a false positive). Every effort will be made to ensure that the labeling of the samples does not disclose the duplicate nature of the samples to the laboratory staff. The samples will be analyzed by the same lab and for the same parameters.

The sampler will need to take a cubitainer (10 liters) of wastewater and thoroughly mix it. The sampler should then pour the contents into individual sample bottles.

Quality Objectives and Criteria for Measurement Data

Data Quality Objectives (DQOs) are quantitative and qualitative objectives that define usable data for meeting the requirements of this project. DQOs define the quality of services provided by the laboratory and are used in the quality assurance review of the field and laboratory data. Review of the quality control (QC) data against the DQOs determines if the data are fully usable, considered estimates, or rejected as unusable.

Quantitative DQOs

The quantitative DQOs for this project include reporting limits, precision, accuracy, and completeness.

Reporting Limits.

Reporting limits are determined by laboratory-provided or method-specified minimum levels, or by interim minimum levels where reporting limits at or near water quality criteria are not obtainable. Individual analyte reporting limits are listed in Table 2.

Precision.

Precision is the ability to replicate the measurement. It is expressed as Relative Percent Difference (RPD). Acceptance criteria for RPD are analysis-specific and are defined by the laboratories.

RPD is normally determined by matrix spike duplicates or by laboratory-fortified blank duplicates. The calculation for RPD is:

$$((X_1 - X_2) / ((X_1 + X_2)/2)) * 100,$$

and is expressed as a percent. X_1 = first sample measurement and X_2 = second sample measurement. Precision limits for specific analytes are listed in Table 2.

Accuracy.

Accuracy is the closeness of the measurement to the true level of the variable. Accuracy is expressed as percent recovery (%R). Acceptance criteria for %R vary depending on the method. %R is normally determined by the use of known traceable laboratory control standards. Acceptance limits for accuracy for each analyte are listed in Table 2.

Completeness.

Completeness is a measure of how many planned measurements for each constituent actually resulted in usable data. It is expressed as a percentage of the total number of samples collected. The completeness criterion for this project is 80 percent. Because of the variety of vessels and discharges sampled, and the possibility for weather or other shipping-related delays resulting in missed holding times, a completeness criterion of less than 100% is to be expected.

Qualitative DQOs

The qualitative DQOs are representativeness and comparability.

Representativeness.

Representativeness is a measure of how well the sample reflects the typical wastewater effluent. Sample representativeness will be established by collecting cruise ship graywater, blackwater, and other wastewater discharge samples following vessel specific sampling plans (VSSP). The owner and operator is responsible for developing and submitting VSSPs to both agencies for each vessel participating in the program.

The treatment system effluent will be considered representative for the two unannounced samples only if the vessel normally discharges continuously. If the vessel normally stores the wastewater in holding tanks before discharging, the effluent from the holding tank will be sampled. The VSSP is designed to ensure that consistent sampling methods are followed and that samples are collected from appropriate and representative locations at appropriate times.

Vessel operation that differs from the VSSP may result in State of Alaska rejection of samples.

Comparability.

Comparability is a measure of confidence with which one data set can be compared to another. It is addressed in the plan by 1) following EPA standardized sampling and analytical methods; 2) by using similar sampling and analytical methods as followed in last year's monitoring project; 3) ensuring that appropriate reporting limits are used; and 4) obtaining data of known and acceptable quality through the use of specified QC measures and QA data assessment.

Because of the different source types found on different vessels (e.g., a holding tank on some ships may contain both blackwater and graywater, while on others it may only contain graywater), careful definition of discharge types will be made in the VSSP. It is essential that these definitions be carried through to the end data user, as these differences could erroneously bias data interpretation.

The sampling team must make full use of ship records and logs, especially the Graywater and Sewage Discharge Record Book which includes the latitude and longitude at the beginning and end of discharge, identifying tanks, estimating volumes and calculating discharge rates (if any) at the time the sample is drawn. If the vessel is discharging continuously (not just certified but actually is in practice) then the sampler does not need to record latitude and longitude at the beginning and end of discharge, identifying tanks, estimating volumes of those tanks. The sampler needs to identify which treatment unit is discharging and the discharge rate. The vessel speed and longitude/latitude must be obtained by the sampler if the sample is taken while the vessel is discharging underway. Information added to the VSSP or changes to the VSSP during the sampling event must be recorded on the VSSP, COC, or in the field notes and must accompany the samples to the lab and be provided to the project data recipients as part of the complete unannounced sampling report.

Special Training Requirements/Certification

Samplers will be trained in sampling methods, sample handling, chain of custody, and field measurements as outlined in 40 CFR 136. Additionally, samplers will receive appropriate training through their employer or their employer's designee, in any necessary shipboard safety procedures.

Laboratories used will have a current Alaska Department of Environmental Conservation Drinking Water certification for microbiologicals or inorganics or home state or provincial equivalent. Laboratory analysts will be trained in accordance with each laboratory's QA Plan and Standard Operating Procedures (SOPs). Records of current certification, analyst training, and the laboratory QA documents listed above will be made available to the Project Manager and the Project QA Officer, and ADEC upon request. Laboratories will employ approved methods, or testing as outlined in 40 CFR 136, or as directed by the methods listed in table 2.

Documentation and Records

Sample schedule and Vessel/Sample Identification

The sampling team will work with the USCG and ADEC to develop a schedule of unannounced sampling events as required in 33 CFR 159.317 (a). The sampler must also notify the ADEC of its intent to sample at least 36 hours prior to sample collection. The two sampling events must be a minimum 21 days apart unless being conducted as allowed under 18 AAC 69.070.

Samples will be identified clearly on the chain of custody and sample bottles. For example, a sample from the overboard discharge from the *M/V Hypothetica* will be identified as "OB Discharge," as the description with associated dates and times. The Sample ID should clearly state

where the sample was taken. All samplers should use the same sample ID system. From continuous discharges with one discharge point "OB Discharge" is appropriate. The sampler should fill out the checklist in Appendix A.

Field Records (Required for both unannounced and continued compliance samples)

Field notes will be collected in bound field notebooks with numbered pages. On-board staff will witness the sampling and will initial the field notes. Included in the field notes for each sample are:

- Vessel name (e.g., *Hypothetica*),
- Sampling personnel,
- Shipboard assistants,
- Signature or initials by the vessel crew in the field notes indicating that the sample port is correct,
- Sample date and times,
- Field measurements: pH, chlorine residual, and temperature,
- Records on discharge flow rates (always) and holding tank volumes (only for underway sampling),
- Samples collected,
- Nature of sample: Composite or Grab,
- Waste type: blackwater, graywater, or mixed,
- Deviations from VSSP and/or QA/QCP,
- Unusual conditions and explanation of data anomalies,
- Latitude/longitude and speed at time of discharge being sampled (only for underway sampling),
- Copy of the Discharge record for the sampled discharge.

Cruise ship operators maintain a sewage and graywater discharge record book that records the date, times, volumes, and vessel location (latitude and longitude) for each wastewater discharge. These records will be provided to the sampler. The sampler will transcribe relevant information from the record book to the sample data sheets as an aid to subsequent determination of conventional and priority pollutant mass input. Submit the discharge logs and field notes to the USCG, ADEC and company representative within three days of the sampling. This information will also be included in final laboratory reports.

Laboratory Records

Upon completion of laboratory analysis, laboratory data review, and data validation, the laboratory will issue a full report in an electronic format describing the results of analysis for each sample submitted. Prior to issuance of the analytical report to the vessel's representatives, ADEC, and the COTP, the laboratory's QA manager will review and approve the report.

The final laboratory reports will identify whether a sample was taken to satisfy 33 CFR 159.317 and AS 46.03.465 or done in order to seek USCG approval for discharge without distance or speed limitations or is a continuous discharge compliance sample.

Components of the analytical report include:

- A short summary sheet discussing the sampling event and results.
- Sample information: ship name, sample names, waste type, date and time collected.

- Parameter name and method reference.
- Analytical result.
- Method Detection Limit.
- Practical Quantitation Limit (reporting limit).
- Date and time of sample preparation and date and time of analysis.
- Quality control information: blank results, spiked blank or laboratory control standard recovery, matrix spike/spike duplicate recoveries, relative percent differences between duplicate spike analyses.
- Chain of custody.
- Holding times met or not.
- Case Narrative of deviations from methods, procedural problems with sample analysis, holding time exceedances, and any additional information that is necessary for describing the sample. This narrative should explain when results are outside the precision and accuracy required and the corrective actions taken to rectify these QC problems.
- Discharge logs and field notes.
- Cooler receipt forms, including information on each lab receiving samples.
- Photograph of sampling port taken during sampling event (unannounced samples only)
- Latitude and longitude information pertaining to each sample including which overboard port the waste was discharged through and the speed the vessel was traveling.
- Explanation of data abnormalities.
- A completed checklist containing all components of sampling (Appendix A).
- A completed checklist containing all components analysis and reporting (Appendix B).
- Electronic data file containing all laboratory results in Excel .xml format.
- *(FOR ADEC ONLY) If applicable, a notification that this sample is a resample under 18 AAC 69.070*

Chain of Custody

The original chain of custody form will accompany the sample to the laboratory. When portions of the sample are sent to another laboratory (e.g., for many of the priority pollutants), a copy of the chain of custody will be made and this will accompany the samples. At each transfer of the sample, the transfer will be indicated on the chain of custody form. The person listed on the Chain of Custody should have full sight or control of the sample at all times until it the COC is relinquished by that person and received by the next party signed on the COC.

A copy of the original chain of custody will be included with the final report including the COC transferring samples to other labs. Electronic scanned copies in PDF form are sufficient.

Sampling Process Design

A vessel specific sampling plan (VSSP) will be developed for each ship by the ship engineers and submitted to the sampling team 30 days prior to entry into Alaska waters. The plan will include, as a minimum, the following:

- Vessel name.
- Passenger and crew capacity of ship.
- Daily water use per individual.
- Locations and capacities for treated sewage, graywater, and other wastewater tanks.
- Type of wastewater treatment systems.

- Each discharge pump type and rate
- Vessel schematic of discharge ports and corresponding sampling ports. **The sample port must be no more than 50 feet from the OVERBOARD port.**
- Description of discharges, including anticipated flow rates and tank volumes.
- Table containing type of discharge, type of sample (grab or composite), parameters (conventional or priority pollutants), location on the vessel where each sample is to be collected, and special circumstances.
- A narrative description of the time at which each sample is to be taken based upon circumstances that will yield a sample most likely to be representative of the average discharge that passes through the location where the sample is taken
- A description of the standards the owner or operator will use to determine a deviation from the plan
- Equipment required.

Each VSSP will be dated and a copy will be provided to the Project Manager, the cruise ship companies, Alaska Department of Conservation and the U.S. Coast Guard. The VSSP will be submitted to the COTP and the ADEC Project Manager within 30 days of each vessel's initial entry into the applicable waters of Alaska. The ADEC must approve the VSSP prior to sampling. After the first sampling event on a vessel, the VSSP may be updated. If it is updated, copies of the updated sampling plan will also be provided to the Project Manager, the vessel's owner or operator, ADEC and the U.S. Coast Guard before the second round of sampling occurs.

The purpose of providing the VSSP to the Project Manager and the cruise ship companies prior to sampling is to provide certainty that consistent sampling methods are followed and that samples are collected from appropriate and representative locations. Deviations from the sampling plan may well occur; these will be noted in the field notes.

Sampling Method Requirements

Sample Collection Procedures

Specific sampling techniques for each vessel will be detailed in the VSSP. The following general guidelines are listed to provide consistency among the vessels utilizing this QA/QCP.

Samples will reflect a representative discharge of treated blackwater, graywater and other wastewaters into applicable waters of Alaska from an operable marine sanitation device, other treatment system, a holding tank or some combination as specified in the VSSP. In port sampling, in compliance with ADEC sampling events, will be conducted only if the vessel is certified to discharge in port. If samples must be taken while the ship is underway, care will be taken to assure sample representativeness and homogeneity. See VSSP for further details on sampling.

A volume of water equal to at least ten times the volume of the sample discharge line will first be discharged into a bucket or similar container to clear the line of standing water and possible contamination.

Samplers will work in teams of two for sampling events that must be performed while the vessel is underway to ensure that proper sampling techniques are followed and adequate notes are taken during the sampling event. One sampler will be sufficient for all in-port sampling events.

Samplers will wear disposable gloves, protective clothing and safety eyewear and will observe precautions while collecting samples, remaining aware of the potential biohazard present.

Samplers will contain all solid and liquid wastes generated during sampling (used gloves, paper towels, chlorine test waste) and remove it from the ship at the conclusion of the sampling event.

Samplers will take care not to touch the insides of bottles or lids/caps during sampling.

Samples will be listed as "grab" on the Chain of Custody form.

Bottles will be pre-cleaned and will not require rinsing with sample. When sample bottles are pre-preserved, bottles must never be rinsed but will be filled only once with sample.

The required field tests will be performed prior to sampling in order to determine if residual chlorine is present. This will dictate the preservation procedures for the VOC and BNA analyses.

Sample fractions for microbiology will be cooled immediately in an ice-water bath and then placed into a cooler containing frozen blue ice or ice and water mixture to maintain a sample temperature of 0 - 6° C. Temperature will be measured and recorded at the time of sample collection and a note shall be made of the temperature of the cooler contents upon arrival at the laboratory.

Sample bottles will be filled sequentially. Bottles will normally be filled to the shoulder of the bottle, leaving a small space for expansion and mixing. VOC bottles will be filled leaving a convex meniscus at the top of the bottle, with no air bubbles present; when the VOC lid is screwed on a small volume of water will be displaced and no air will be present in the bottle. Filtering of dissolved metals will be performed immediately upon receipt at the laboratory followed by preservation through acidification.

TABLE 1 Sample Containers, Preservations, Holding Times, and Sample Types

LAB PARAMETER	CONTAINER	PRESERVATION	HOLDING TIME	Grab or Composite	Sample Timing/ Collection
Conventional Pollutants					
Total Suspended Solids	From BOD bottle	4° C	7 days	Grab Only	Dependent upon vessel (see individual vessel sampling plan)
Settleable Solids	1 liter HDPE, white label	4° C	48 hours	Grab Only	
Biochemical Oxygen Demand	1 liter HDPE, white label	4° C	48 hours	Grab Only	

LAB PARAMETER	CONTAINER	PRESERVATION	HOLDING TIME	Grab or Composite	Sample Timing/ Collection
Ammonia – Total	250 ml HDPE, yellow label	H ₂ SO ₄ , pH <2, 4° C Lab pre-preserved	28 days	Grab Only	
Chemical Oxygen Demand	From ammonia bottle	H ₂ SO ₄ , pH <2, 4° C Lab pre-preserved	28 days	Grab Only	
Specific Conductance	From BOD bottle	4° C	28 days	Grab Only	
Fecal Coliforms	100 ml sterile plastic	Sodium Thiosulfate, 4° C	6 hours	Grab Only	
Alkalinity	From BOD bottle	4° C	14 days	Grab Only	
pH	100 ml HDPE and from BOD bottle	4° C	ASAP In field and lab	Grab Only	
Oil and Grease	1 liter glass	H ₂ SO ₄ , pH <2, 4° C Lab pre-preserved	28 days	Grab Only	
Total Organic Carbon	125 ml glass	HCl, pH < 4° C Lab pre-preserved	28 days	Grab Only	
Total Nitrogen	500 ml HDPE, yellow label	H ₂ SO ₄ , pH <2, 4° C Lab pre-preserved	28 days	Grab Only	
Total Phosphorus	From ammonia bottle	H ₂ SO ₄ , pH <2, 4° C Lab pre-preserved	28 days	Grab Only	
Temperature	From pH Bottle	N/A	ASAP in field	Grab Only	
Chlorine Residual	From pH bottle	N/A	ASAP In field	Grab Only	
Priority Pollutants					
BNA	1 liter glass***	4° C; Ascorbic acid if residual chlorine is detected above 0.1 mg/L	7 days until extraction	Grab Only	Dependent upon vessel (see individual vessel sampling plan)
VOCs	(4) 40-ml VOC vials	(2) vials w/HCl, 4° C; Ascorbic acid if residual chlorine is present (2) vials unpreserved	Preserved: 14 days until analysis Unpreserved: 7 days until analysis	Grab Only	

LAB PARAMETER	CONTAINER	PRESERVATION	HOLDING TIME	Grab or Composite	Sample Timing/ Collection
Total Aromatic and Total Aqueous Hydrocarbons**	See BNAs and VOCs				
Total Recoverable Metals	1 liter HDPE *	HNO ₃ , pH <2, 4° C	28 days Hg/ 6 mos. Others	Grab Only	
Dissolved Metals		Filtration w/0.45 micron filter in lab, HNO ₃ , pH <2	6 months	Grab Only	

Sample containers will normally be pre-preserved by the laboratory. The sampler must measure the chlorine level before taking the VOC, BNA or PCB samples. If chlorine residual is detected above 0.1 mg/L during field measurement of chlorine, ascorbic acid provided by the lab will be added in the field to the BNA and PCB sample bottles until no chlorine is detected. The lab will provide decanting bottles with ascorbic acid. When chlorine is detected, the sample will be added first to the decanting bottle, and then will be decanted into the VOC vials. *The metals sample will be taken in the field as a single 1-liter fraction. The laboratory will filter 500 ml of this sample using acid-washed filters (dissolved fraction), and then the remaining unfiltered fraction (total recoverable) and dissolved fraction will be preserved with nitric acid in the lab. **Total Aromatic and Total Aqueous Hydrocarbons will be calculated from the BNA and VOC results. ***Additional volume of sample is required for matrix spike determination during the BNA analysis. The sampling team will take an additional 2L of sample from all duplicate sampling events for this purpose to provide matrix spike data at a frequency of 10% for project related samples.

Sample Handling and Custody Requirements

Sample Custody

Samples and sample containers will be maintained in a secure environment, from the time the bottles leave the laboratory until the time the samples are received at the laboratory. The laboratories will maintain custody of bottles and samples using their normal custody procedures.

Blind field duplicates will be identified with discrete sampling labels and recorded as blind field duplicates in the sampler's field notebook.

To maintain the secure environment for samples on board ship and during transport, samples must be: 1) in the sampler's possession (line of sight); or 2) in a cooler sealed with signed and dated friable evidence tape on opposing sides of the cooler; or 3) in a locked cooler for which only the sampler has the key. When the cooler is sealed, the method of securing the samples must be such that tampering with samples or bottles is not possible: The cooler must be secured so that the lid cannot be removed without breaking the evidence tape or cutting the lock, so that tampering would be evident.

Transfer of samples will be accomplished using the laboratory's chain of custody form. When samples are transferred between personnel, such transfer will be indicated on the chain of custody form with

signature, date and time of transfer. The chain of custody will remain with the samples until received by the laboratory.

At any time during sample transfer, if custody is broken, a note must be made on the chain of custody form accompanying the sample. Upon receipt at the laboratory, the laboratory sample custodian will make note if a breach of custody has occurred (for example, if a custody seal has broken during transport).

Sample Temperature and Condition

Samples will be held at 0 - 6° C. A 1 liter temperature blank will be placed into the cooler at the same time as the first sample and will accompany all samples, and will be measured at the laboratory upon receipt of the samples to verify the temperature. The temperature of this blank will be recorded on the chain of custody upon receipt of the sample at the lab.

To maintain the temperature, extra blue ice will be kept frozen on board ship or ship ice will be used. Blue ice or ship ice will be exchanged just before shipment of samples to the lab, and may be exchanged more frequently during the sampling trip, as required.

Some samples may be at a temperature near body temperature (37° C) at time of sample collection. This temperature encourages growth of fecal coliform bacteria and thus these samples must be cooled as quickly as possible, without freezing them. The sample bottles for microbial testing shall be placed in a water bath containing ice cubes provided on board ship. The bottles should be immersed in the water to the shoulder, rotated frequently, and ice should be added/water drained off as the ice melts for at least one hour or until the sample reaches a temperature of 4° C. To ensure custody of these samples that may not be able to be sealed in the cooler until the temperature is lowered, these bottles can be sealed with custody tape individually, as necessary.

In no event will samples be placed in refrigerators meant for human food or beverages.

Sample Holding Times

Sample holding times are as described in Table 1 above. Planned sample shipping schedules will allow for the meeting of these holding times.

The most critical holding time will be that of fecal coliforms, which is defined by EPA as 6 hours. To meet this holding time, a stringent scheduling effort will be required by the laboratory and sampling team. If the normal discharge pattern is altered in order to adhere to this holding time, a note will be made of the change in the field notes and in the final quality control review.

Sample Disposal

Samples collected for analysis shall be held by the laboratory for not less than three months from the sample collection date, or for an extended time period on an individual basis as directed by the Coast Guard and AL prior to the three month date.

Analytical Methods and Quality Control Requirements

The USCG requires the analytical report within 15 calendar days after the sampling date for conventional pollutant analyses. The USCG requires the analytical report within 30 calendar days from the sampling

date for priority pollutant analysis and associated conventional pollutant analyses from the same sampling event. The ADEC requires conventional and priority pollutants reports within 21 days of completion of laboratory analysis.

The MDL referred to in Table 2 is a statistically derived method detection limit, typically arrived at by repeat analyses performed by the laboratory, with a statistical EPA-defined calculation then performed (40 CFR 136 Appendix B). It is sometimes method-defined (as in BOD). The PQL (Practical Quantitation Limit) is the level at which the laboratory QA department feels comfortable reporting data. Because the MDL is statistically derived, data can be detected at and near the MDL that are not accurate and that are frequently false positives. For this reason, many labs do not report at the MDL but report at some level, often approximately 3 times greater than the MDL (again, for statistical purposes). The MDL's and Reporting Limits are usually laboratory-specific standards and are not tied to compliance limits, and are not regulatory action levels. The MDL and PQL values in this document reflect typical laboratory performance at the present time and will serve as general targeted levels for this project. Actual data reporting levels may change due to ongoing detection limit studies and sample dilution due to matrix interferences. Current targeted guidelines for MDL's, RL's (minimum levels, PQL), and precision and accuracy requirements for the project are listed in the following table.

Table 2. ANALYTICAL METHODS AND QUALITY CONTROL REQUIREMENTS

PARAMETER	METHOD*	MDL (mg/l)	Reporting Level (Minimum Level) (mg/l)	PRECISION (RPD)	ACCURACY (% Recovery)
Conventional Pollutants					
Alkalinity	SM 2320 B	0.5	2	<20%	85 - 115 %
Ammonia - Total	350.2/350.3	0.15	0.5	<20%	80 - 120 %
Biochemical Oxygen Demand	405.1	2	2	<20%	70 - 130 %
Chemical Oxygen Demand	410.4	5	15	<20%	85 - 115 %
Chlorine Residual (total/free)	SM 4500 Cl- G	0.1	0.1	N/A	N/A
Fecal Coliforms	SM 9221E/SM 9222D	2 FC/100 ml	2 FC/100 ml	N/A	N/A
Oil and Grease	1664	1.5	5	<20%	60-150%
pH	150.1	0.10 standard units	0.10 standard units	<20%	N/A
Settleable Solids	160.5	0.10 (ml/L)	0.10 (ml/L)	<20%	N/A
Specific Conductance	120.1	1 µmhos/ cm	2 µmhos/cm	<20%	85 - 115 %
Total Nitrogen	EPA various	1	1	N/A	N/A
Total Organic Carbon	SM 5310 B	0.3	1	<20%	85 - 115 %
Total Phosphorus	EPA 365.2	0.03	0.1	<20%	85 - 115 %
Total Suspended Solids	160.2	1.3	4	<20%	85 - 115 %
		□	□		
Priority Pollutants					
• Total Aromatic and Total Aqueous Hydrocarbons using BNA and VOC data					

PARAMETER	METHOD*	MDL (µg/l)	Reporting Level (Minimum Level) (µg/l)	PRECISION (RPD)	ACCURACY (% Recovery)
Total Recoverable Metals		µg/l	µg/l		
Antimony	200.8	0.8	2.5	<20%	85 - 115 %
Arsenic	200.8	0.8	2.5	<20%	85 - 115 %
Beryllium	200.8	0.5	1.5	<20%	85 - 115 %
Cadmium	200.8	0.65	2	<20%	85 - 115 %
Chromium	200.8	0.8	2.5	<20%	85 - 115 %
Copper	200.8	0.4	1	<20%	85 - 115 %
Lead	200.8	0.3	1	<20%	85 - 115 %
Mercury (Total)	245.1	0.65	2	<20%	80 - 120 %
Nickel	200.8	0.5	1.5	<20%	85 - 115 %
Selenium	200.8	1.5	5	<20%	85 - 115 %
Silver	200.8	0.3	1	<20%	85 - 115 %
Thallium	200.8	0.3	1	<20%	85 - 115 %
Zinc	200.8	0.9	2.5	<20%	85 - 115 %
Dissolved Metals		µg/l	µg/l		
Antimony	200.8	0.8	2.5	<20%	85 - 115 %
Arsenic	200.8	0.8	2.5	<20%	85 - 115 %
Beryllium	200.8	0.5	1.5	<20%	85 - 115 %
Cadmium	200.8	0.65	2	<20%	85 - 115 %
Chromium	200.8	0.8	2.5	<20%	85 - 115 %
Copper	200.8	0.4	1	<20%	85 - 115 %
Lead	200.8	0.3	1	<20%	85 - 115 %
Nickel	200.8	0.5	1.5	<20%	85 - 115 %
Selenium	200.8	1.5	5	<20%	85 - 115 %
Silver	200.8	0.3	1	<20%	85 - 115 %
Thallium	200.8	0.3	1	<20%	85 - 115 %
Zinc	200.8	0.9	2.5	<20%	85 - 115 %
VOCs					
1,1,1,2-Tetrachloroethane	624	0.5	2	<20%	75-125%

PARAMETER	METHOD*	MDL (µg/l)	Reporting Level (Minimum Level) (µg/l)	PRECISION (RPD)	ACCURACY (% Recovery)
1,1,1-Trichloroethane	624	0.5	2	<20%	75-125%
1,1,2,2-Tetrachloroethane	624	0.5	2	<20%	75-130%
1,1,2-Trichloroethane	624	0.5	2	<20%	80-120%
1,1-Dichloroethane	624	0.5	2	<20%	75-130%
1,1-Dichloroethene	624	0.5	2	<20%	70-140%
1,1-Dichloropropene	624	1	3	<20%	75-125%
1,2,3-Trichlorobenzene	624	1	3	<20%	75-125%
1,2,3-Trichloropropane	624	1	3	<20%	80-120%
1,2,4-Trichlorobenzene	624	1	3	<20%	75-125%
1,2,4-Trimethylbenzene	624	1	3	<20%	75-125%
1,2-Dibromo-3- Chloropropane	624	2	10	<20%	70-130%
1,2-Dichlorobenzene	624	0.75	2	<20%	75-125%
1,2-Dichloroethane	624	0.5	2	<20%	80-130%
1,2-Dichloropropane	624	0.5	2	<20%	70-140%
1,3,5-Trimethylbenzene	624	0.5	2	<20%	70-130%
1,3-Dichlorobenzene	624	0.75	2	<20%	75-125%
1,3-Dichloropropane	624	0.5	2	<20%	75-130%
1,4-Dichlorobenzene	624	0.75	2	<20%	75-120%
2,2-Dichloropropane	624	0.5	2	<20%	60-130%
2-Butanone	624	1.5	50	<20%	60-140%
2-Chloroethyl Vinyl Ether	624	2	10	<20%	60-140%
2-Chlorotoluene	624	1	3	<20%	75-135%
2-Hexanone	624	4	20	<20%	60-140%
4-Chlorotoluene	624	1	2	<20%	75-130%
4-Isopropyltoluene	624	1	3	<20%	75-125%
4-Methyl-2-Pentanone	624	4	20	<20%	60-140%
Acetone	624	5	50	<20%	40-160%
Acrolein	624	5	100	<20%	40-160%
Acrylonitrile	624	2	10	<20%	65-130%
Benzene	624	0.5	2	<20%	80-120%
Bromobenzene	624	0.5	2	<20%	75-130%
Bromochloromethane	624	1	3	<20%	75-140%

PARAMETER	METHOD*	MDL (µg/l)	Reporting Level (Minimum Level) (µg/l)	PRECISION (RPD)	ACCURACY (% Recovery)
Bromodichloromethane	624	0.5	2	<20%	80-130%
Bromoform	624	0.5	2	<20%	70-135%
Bromomethane	624	1	5	<20%	60-140%
Carbon Disulfide	624	0.5	2	<20%	60-130%
Carbon Tetrachloride	624	0.5	2	<20%	75-125%
Chlorobenzene	624	0.5	2	<20%	80-120%
Chloroethane	624	0.75	5	<20%	65-135%
Chloroform	624	0.5	2	<20%	80-130%
Chloromethane	624	1	5	<20%	60-130%
Cis-1,2-Dichloroethene	624	0.5	2	<20%	80-130%
Cis-1,3-Dichloropropene	624	1	3	<20%	80-130%
Dibromochloromethane	624	0.5	2	<20%	75-130%
Dibromomethane	624	1	3	<20%	80-130%
Dichlorodifluoromethane	624	1.5	5	<20%	60-140%
Ethylbenzene	624	0.5	2	<20%	75-130%
Hexachlorobutadiene	624	0.5	2	<20%	50-130%
Iodomethane	624	1.5	5	<20%	50-150%
Isopropylbenzene	624	0.49	3	<20%	70-130%
m&p Xylenes	624	0.5	2	<20%	75-120%
Methylene Chloride	624	1	5	<20%	60-140%
n-Butylbenzene	624	1	3	<20%	70-130%
n-Propylbenzene	624	1	3	<20%	70-130%
O-Xylene	624	1	3	<20%	80-125%
sec-Butylbenzene	624	1	3	<20%	70-130%
Styrene	624	1	3	<20%	85-125%
tert-Butyl Methyl Ether	624	0.5	2	<20%	70-130%
tert-Butylbenzene	624	1	3	<20%	70-125%
Tetrachloroethene	624	0.5	2.5	<20%	75-125%
Toluene	624	0.5	2	<20%	80-120%
Trans 1,2-Dichloroethene	624	0.5	2	<20%	75-125%
trans-1,3-Dichloropropene	624	1	3	<20%	80-130%
trans-1,4-Dichloro-2 Buten	624	2	10	<20%	70-130%
Trichloroethene	624	0.5	2	<20%	70-130%

PARAMETER	METHOD*	MDL (µg/l)	Reporting Level (Minimum Level) (µg/l)	PRECISION (RPD)	ACCURACY (% Recovery)
Trichlorofluoromethane	624	1	3	<20%	50-120%
Trichlorotrifluoroethane	624	1	3	<20%	60-140%
Vinyl Acetate	624	1.5	5	<20%	60-140%
Vinyl Chloride	624	0.5	2	<20%	60-130%
BNA					
1,2-Diphenylhydrazine	625	1	5	<40%	60-140%
2,4,5-Trichlorophenol	625	1	5	<40%	60-140%
2,4,6-Trichlorophenol	625	1	5	<40%	55-130%
2,4-Dichlorophenol	625	1	5	<40%	55-130%
2,4-Dimethylphenol	625	5	25	<40%	15-130%
2,4-Dinitrophenol	625	30	100	<40%	50-110%
2,4-Dinitrotoluene	625	1	5	<40%	50-140%
2,6-Dinitrotoluene	625	1	5	<40%	30-150%
2-Chloronaphthalene	625	2	10	<40%	30-170%
2-Chlorophenol	625	1	5	<40%	35-125%
2-Methylnaphthalene	625	1	5	<40%	40-140%
2-Methylphenol	625	1	5	<40%	50-115%
2-Nitroaniline	625	5	100	<40%	50-115%
2-Nitrophenol	625	1	5	<40%	50-115%
3&4-Methylphenol	625	1	5	<40%	30-125%
3,3'-Dichlorobenzidine	625	5	20	<40%	30-170%
3-Nitroaniline	625	2	50	<40%	30-170%
4,6-Dinitro-2-methylphenol	625	5	25	<40%	40-130%
4-Bromophenyl Phenyl ether	625	1	5	<40%	50-140%
4-chloro-3-methylphenol	625	1	5	<40%	45-120%
4-Chloroaniline	625	1	5	<40%	30-170%
4-Chlorophenyl methylsulfone	625	2	20	<40%	30-170%
4-Chlorophenyl Phenyl ether	625	1	5	<40%	50-150%
4-Nitroaniline	625	2	50	<40%	40-110%
4-Nitrophenol	625	25	100	<40%	10-125%
Acenaphthene	625	1	5	<40%	40-130%

PARAMETER	METHOD*	MDL (µg/l)	Reporting Level (Minimum Level) (µg/l)	PRECISION (RPD)	ACCURACY (% Recovery)
Acenaphthylene	625	1	5	<40%	45-135%
Anthracene	625	1	5	<40%	55-135%
Benzidine	625	50	200	<40%	30-170%
Benzo (A) Anthracene	625	1	5	<40%	55-120%
Benzo (A) Pyrene	625	1	5	<40%	40-140%
Benzo (B) Fluoranthene	625	1	5	<40%	40-135%
Benzo (g,h,i) Perylene	625	1	5	<40%	50-125%
Benzo (K) Fluoranthene	625	1	5	<40%	60-160%
Benzoic Acid	625	25	130	<40%	5-110%
Benzyl Alcohol	625	2	10	<40%	60-140%
Bis (2-Chloroethoxy) methane	625	1	5	<40%	40-130%
Bis (2-chloroethyl) ether	625	1	5	<40%	35-125%
Bis (2-Chloroisopropyl) ether	625	1	5	<40%	60-140%
Bis (2-Ethylhexyl) Phthalate	625	1	2.5	<40%	55-125%
Butyl Benzyl Phthalate	625	1	5	<40%	55-125%
Chrysene	625	1	5	<40%	55-140%
Dibenzo (a,h) Anthracene	625	1	5	<40%	50-130%
Dibenzofuran	625	1	5	<40%	50-130%
Diethyl Phthalate	625	1	5	<40%	55-135%
Dimethyl Phthalate	625	1	5	<40%	60-125%
Di-N-Butyl Phthalate	625	1	5	<40%	60-160%
Di-N-Octyl Phthalate	625	1	5	<40%	60-140%
Fluoranthene	625	1	5	<40%	50-140%
Fluorene	625	1	5	<40%	55-130%
Hexachlorobenzene	625	1	5	<40%	50-150%
Hexachlorocyclopentadiene	625	2	10	<40%	30-170%
Hexachloroethane	625	1	5	<40%	60-140%
Indeno (1,2,3-CD) Pyrene	625	1	5	<40%	45-125%
Isophorone	625	1	5	<40%	40-120%
Napthalene	625	2	10	<40%	40-140%
Nitrobenzene	625	1	5	<40%	40-120%
N-Nitrosodimethylamine	625	1	5	<40%	30-170%

PARAMETER	METHOD*	MDL (µg/l)	Reporting Level (Minimum Level) (µg/l)	PRECISION (RPD)	ACCURACY (% Recovery)
N-Nitrosodi-N-Propylamine	625	1	5	<40%	35-130%
N-Nitrosodiphenylamine	625	2	10	<40%	60-140%
Pentachlorophenol	625	1	5	<40%	35-115%
Phenanthrene	625	1	5	<40%	50-140%
Phenol	625	1	5	<40%	60-140%
Pyrene	625	1	5	<40%	45-135%
*EPA methods in "Methods for Chemical Analysis of Water and Wastes," Environmental Protection Agency, Environmental Monitoring Systems Laboratory - Cincinnati (EMSL-CI), EPA-600/4-79-020, Revised March 1983 and 1979 where applicable. http://www.epa.gov/cgi-bin/claritgw?op=Display&document=clserv:ORD:0167;&rank=4&template=epa					
*SM methods in "Standard Methods for the Analysis of Water and Wastewater," 19 th or 20 th Edition, APHA/AWWA/WEF.					
*Four digit numeric methods are from <i>EPA Test Methods for Evaluating Solid Wastes. Physical/Chemical Methods (SW-846)</i> . 3 rd Edition Update 2B, January 1995.					

Instrument/Equipment Testing, Inspection, and Maintenance Requirements; Calibration and Frequency

Field instruments include a hand-held pH meter, chlorine residual colorimeter instrument, and a probe thermometer. These must be certified against a laboratory method for pH and chlorine and NIST certified thermometer. All field kits must have certified instruments. The temperature, pH, and chlorine certification and calibration must be submitted to ADEC Project Manager by May 31st and again by July 31st of each year that the QA/QC plan is valid.

Maintenance of the chlorine residual test kit includes keeping the sample vial rinsed after sample measurement, keeping the vial clean and free of fingerprints and oils, and keeping the colorimeter itself clean. An extra sample vial will be kept with the test kit in case of breakage or scratches to the sample vial. The field kit should be checked against the lab kit twice per season.

The analysis of pH in the field will be used for reference purposes only and will be verified through laboratory analysis. A pH meter shall be used that ensures the most accurate reading possible in the expected range of pH values. The laboratory will supply reference buffers to the sampling team for field verification.

Temperature at or shortly after sample collection will be measured using either a temperature probe or with an independent thermometer. The validity of the temperature probe will be checked early and late in the season against a NIST certified thermometer at a certified laboratory; differences between the

temperature probe and the certified thermometer will be documented in the final quality assurance review of the data.

Laboratory instrument and calibration procedures are detailed in the QA Plans and SOPs from the certified laboratories. Copies of these plans are available upon request from the lab managers or from the Project QA Officer.

Inspection/Acceptance Requirements for Supplies and Consumables

Sample bottles will be visually inspected prior to sampling. If problems with bottles are noted, such as a cap that has fallen off an empty bottle, note of the problem will be made on the chain of custody form.

Inspection/Acceptance Requirements (Non-Direct Measurements)

Historical data for this project includes only 7 years of monitoring, so data acceptance criteria will not be required for historical data acceptance.

On-board ship data to be recorded includes tank volume and pumping rate data from ship tracking systems and any documented occurrence of seawater influx. The data will be recorded as reported by shipboard staff in the Graywater and Blackwater Discharge Record Book and through direct observation by the sampling team.

Data Management

Data Management includes accurate field notebook entries, completed Chain-of-Custody forms and laboratory data management documents. Laboratory data management procedures and processes are described in the Laboratory's Quality Management Plan. (This document is kept on file by the ADEC WQA Officer.)

The Lab Project Manager will report data directly to the Coast Guard, the ADEC Project Manager and the individual cruise lines after thorough review by the laboratory QA Manager within the regulatory time limits.

The Lab Project Manager will not be placed in the position of determining whether an analytical result represents a violation of federal or state laws or regulations.

ASSESSMENT/OVERSIGHT

Assessments and Response Actions

Field Assessments

The **Project QA Officer** will perform a field sampling audit on a minimum of two **randomly selected sampling events** during the project in order to evaluate the performance of the sampling team. The Project QA Officer must notify ADEC 36 hours prior to the audit in order to observe if desired. Follow-up field audits may be necessary pending audit findings. The initial field sampling audit will be conducted within 30 days of project initiation, with the second audit occurring midway through the project. Each audit will concentrate on sampling technique, sample handling, field records, field testing

methods, and adherence to vessel specific sampling plans and the QA/QCP. These reports are due within 14 days of the audit. This report will be provided to the Lab Project Manager, ADEC Project Manager and the USCG for evaluation and corrective action, if necessary. The USCG and ADEC may also participate in random onboard field assessments of the sampling effort. The Project QA Officer and Lab Project Manager will be advised in a timely manner of the results of each USCG or ADEC onboard field assessment.

Laboratory Assessments

Laboratories are subject to periodic and extensive audits by regulatory agency personnel as part of their certification. Reports of these audits will be made available to the DEC Project Manager, ADEC Water Quality Assurance Officer, and the Project QA Officer. The Project QA Officer will review any recent and pertinent technical systems audit reports of the analytical laboratories involved in this project.

The Project QA officer will use technical system audit report findings and recommendations to design an on-site technical systems audit of the project laboratories (in consultation with and support from technical experts at ADEC). The unannounced technical systems audit must be performed within the first 30 days of project initiation so any recommended enhancements to laboratory operations can be implemented early on in the project. The Project QA Officer must notify the ADEC Project manager within 36 hours of the audit date to give the ADEC the opportunity to observe if desired. The ADEC may perform additional lab audit of the commercial passenger vessel samples.

Based upon review of past lab audits, the Project QA Officer may recommend that a technical systems audit is not warranted. If the ADEC Project Manager disagrees, the technical audit must be performed.

The ADEC Project Manager and ADEC Water Quality Assurance Officer will be notified in advance and invited to participate in any audit, and a report of these findings will be presented to the ADEC Project Manager and the Lab Project Manager. Any deficiencies noted by the auditor will be corrected immediately, and the Lab Manager will note these changes in a corrective action report to the Project QA Officer and ADEC Project Manager. The Project QA Officer will also perform a technical systems audit on two sampling events in order to evaluate laboratory log-in, sample handling, preservation, and storage procedures.

Duplicates

Blind sample duplicates will be collected on a minimum of 10% of the total number of samples or four samples total, whichever number is greater. All will be analyzed for conventional pollutants, but only half will be analyzed for priority pollutants. The purpose of the blind sample duplicates is to assess sampling and laboratory error and to assess overall method variability. Precision between the sample and its duplicate will be determined by calculating the relative percent difference between the two samples, in the same way that precision is measured between two laboratory-fortified blanks or a matrix spike/matrix spike duplicate. The use of duplicate samples extends the test of precision to the sampling method itself. The use of blind samples provides a test of the laboratory and is used to assess bias or analytical errors not detected by the laboratory (e.g., a false positive). Every effort will be made to ensure that the labeling of the samples does not disclose the duplicate nature of the samples to the laboratory. The samples will be analyzed by the same lab and for the same parameters. Results of the duplicate analysis will be monitored by the Project QA Officer and submitted to the ADEC Project Manager.

In addition, the ADEC QA Officer may conduct a laboratory performance audit. The ADEC may submit a sample that contains a known concentration of analytes prepared and certified by a different laboratory. The ADEC will compare the results from the lab from the certified sample results to determine the laboratory performance. ADEC funds pay for this performance audit.

The ADEC may also submit two trip blank samples over the course of the sampling season. The trip blanks check to see if any outside contamination occurs during the sampling and analyzing process.

Corrective Action

The laboratory or sampling manager will notify the Project QA Officer and ADEC project manager, if errors are noted by the laboratory or sampling personnel. The Project QA Officer will then notify the Lab Project Manager and the party responsible for the error of the deficiency, and will recommend methods of correcting the deficiency. The responsible party will then immediately correct the problem and will send those corrections via email to the Project QA Officer, the Lab Project Manager, and ADEC Project Manager. The Project QA Officer will conduct a follow-up assessment to ensure recommended corrective actions are routinely being followed.

Reports to Management

The Project QA Officer will issue audit reports in accordance with the following guidelines:

- Field sampling audits--Verbal on-site debriefing of audit findings to sampling personnel. Draft field audit report issued to sampling personnel and Lab Project Manager within one week of audit. Final audit report to Lab Project Manager and ADEC Project Manager within 2 weeks of end of audit. The Lab Project Manager will forward all corrective action reports to the ADEC Project Manager when completed.
- Technical laboratory audit—Verbal on-site debriefing of audit findings to laboratory personnel, and Lab Project Manager. Draft technical systems audit report to Lab Project Manager and ADEC Project Manager within 1-2 weeks of end audit (depending upon depth and extent of audit). Final technical systems audit report to Lab Project Manager and ADEC Project Manager within 2 – 4 weeks of end of audit (depending upon depth and extent of audit). Lab Project Manager will forward all corrective action reports to the ADEC Project Manager when completed.
- Blind duplicate samples—Draft report findings within one week of receiving/verifying results to Laboratory QA officer, Project Manager, and ADEC Project Manager.

At project conclusion, the Project QA Officer will issue an overall Quality Assurance Project Report to the USCG, ADEC Project Manager and ADEC Water Quality Assurance Officer, and vessel representatives detailing findings, problems and resolutions, data reliability and recommended enhancements for future monitoring projects, etc.

The ADEC Project Manager will submit the results of the any QA/QC audit reports to the Lab Project Manager and Laboratory Manager.

DATA VALIDATION AND USABILITY

Data Review, Verification, and Validation

During the project, the Project QA Officer will review at least 20% of field notes and laboratory data packages to detect correctable problems for the remainder of the study. The first data review must be submitted by June 15 of each year in order to correct any system problems early in the season. The other data reviews must be equally spaced throughout the season. Upon receipt of these completed data packages from the Project Manager, the Project Quality Assurance Officer will review data and field notes to verify that this QA/QCP was followed. Items reviewed will include:

- Comparison of dated vessel specific sampling plans with the QA/QCP to assure that the correct samples were taken.
- Comparison of dated sampling plans with field notes and custody forms to assure that planned samples were collected.
- Review of field notes and data to assure that information specified in the QA/QCP has been recorded.
- Review of laboratory data packets, particularly the QA/QC laboratory sheets.

Any problems noted will be immediately brought to the attention of the Lab Project Manager who will take appropriate corrective action as necessary. The ADEC Project Manager will also be notified. This data review must be completed and submitted to the ADEC within 40 days of the sampling event. Any review made outside the date will not be accepted.

Reconciliation with Data Quality Objectives

The Project QA Officer will reconcile the data from this project with the requirements defined in this document following the validation and verification methods stated above. If an overall assessment of these elements cannot ensure that the data are of sufficient quality to meet objectives, then additional evaluation of raw data will be performed.

BIBLIOGRAPHY

Documents referenced during the preparation of this document include:

1. April 13 *Alaska Cruise Ship Initiative Wastewater Work Group Protocol for Voluntary Wastewater Monitoring Program in 2001.*
2. July 27, 2000 *Cruise Ship Wastewater Monitoring Southeast Alaska 2000 Quality Assurance Project Plan*
3. *EPA Requirements for QA Project Plans (QA/R-5)*, EPA/240/B-01/003 March 2001.
4. US Code of Federal Regulations; including 33 CFR 159.
5. *Water Quality Standards Handbook, Second Edition*, EPA-823-B-94-005a, August 1994.
6. *Compilation of the U.S. Environmental Protection Agency's Water Quality Criteria for the Priority Toxic Pollutants*, ADEC, September 1997.

Appendix A

2007 Alaska Cruise Ship Sampling Checklist

Vessel Name _____
Sampler Name _____
Date _____

I. Notification

- ☐ ADEC project manager notified 36 hours prior to the sampling event

II. Type of Sampling

- ☐ Conventional pollutants only (unannounced)
- ☐ Conventional and priority pollutants. (unannounced)
 - ☐ If second unannounced sample, must be at least 21 days after the first sampling event.
- ☐ USCG Continuous Compliance Parameters
 - ☐ If second continuous compliance sample for month, must be at least 24 hours after first sample.
 - ☐ USCG Continuous Compliance Parameters
- ☐ Other (Example Re-sampling after exceedance of discharge limitations under 18 AAC 69.070)

III. Sampling Notes (to include:)

- ☐ Vessel name
- ☐ Names of sampling personnel
- ☐ Names of shipboard assistants
- ☐ Signature or initials by the vessel crew in the field notes indicating that the sample port is correct
- ☐ Sample ID clearly stating where the sample was taken
- ☐ Sample date and times recorded on COC
- ☐ Field measurements: pH, chlorine residual, and temp recorded on COC
- ☐ Records collected on discharge flow rates (always) and holding tank volumes (only for underway sampling)
- ☐ Sample ports within 50 feet of the point of overboard discharge
- ☐ Nature of sample recorded (composite or grab)
- ☐ Waste type recorded (blackwater, graywater, or mixed)
- ☐ If deviations from VSSP and/or QA/QCP noted, reported to ADEC/ CG
- ☐ If unannounced sampling, sampler verified that vessel is discharging
- ☐ Latitude/longitude and speed at time of discharge being sampled is recorded (only for underway sampling),
- ☐ Copy of the Discharge record for the sampled discharge included (unannounced only)
- ☐ Chain of custody properly completed
- ☐ Samples delivered to laboratory within holding times for analyses

Appendix B

2007 Alaska Cruise Ship Data Review Checklist

Vessel Name _____

Date _____

Location _____

Sampling Team _____

Laboratory _____

Sample Type:

- ☐ Continued Compliance
- ☐ Random Unannounced

Final Report Package Includes:

- ☐ Sampling event summary sheet
- ☐ Analytical Report
 - ☐ Ship name
 - ☐ Sample ID's
 - ☐ Sample date and time collected
 - ☐ Parameter names and method references
 - ☐ Analytical results
 - ☐ Method Detection Limits (MDL's)
 - ☐ Practical Quantitation Limits (PQL's/reporting limits)
 - ☐ Date and time of sample preparation
 - ☐ Date and time of analysis
 - ☐ Verification that holding times were met
 - ☐ Quality control information: blank results, spiked blank of laboratory control standard recovery, matrix spike/spike duplicate recoveries, relative percent differences between duplicate spike analyses
 - ☐ Case narrative describing deviations from methods, procedural problems with sample analysis, explanation of data abnormalities, and any additional information that is necessary for describing the sample. This narrative should explain when results are outside the precision and accuracy limits and the corrective actions taken to rectify QC problems.
- ☐ Chain of custody form
- ☐ Cooler receipt forms with temperature indicated
- ☐ Discharge logs covering time of sampling. (For recirculated samples, provide discharge logs back to the time of last discharge)
- ☐ Field notes
- ☐ Latitude and longitude information pertaining to each sample including which overboard port the waste was discharged through and the speed the vessel was traveling (unannounced samples only)
- ☐ Completed sampling checklist
- ☐ Completed data review checklist