



**Guidance Manual for the
Aircraft Drinking Water Rule
(ADWR) – Interim Final**

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Purpose of this Document

This document provides guidance and contains EPA's current policy recommendations for complying with the Aircraft Drinking Water Rule.

This is a living document and may be revised periodically without public notice. EPA welcomes public input on this document at any time. Guidance provided in this document reflects provisions of the final rule published on October 19, 2009, at 74 *Federal Register* 53590.

The statutory provisions and the final regulations described in this document contain legally binding requirements. This document is not a regulation itself, nor does it change or substitute for those provisions and regulations. Thus, it does not impose legally binding requirements on EPA or public water systems. This guidance does not confer legal rights or impose legal obligations upon any member of the public.

While EPA has made every effort to ensure the accuracy of the discussion in this guidance, the obligations of the regulated community are determined by statutes, regulations, or other legally binding requirements. In the event of a conflict between the discussion in this document and any statute or regulation, this document would not be controlling.

The general description provided here may not apply to a particular situation based upon the circumstances. Interested parties are free to raise questions and objections about the substance of this guidance and the appropriateness of the application of this guidance to a particular situation. EPA retains the discretion to adopt approaches on a case-by-case basis that differ from those described in this guidance, where appropriate.

Mention of trade names or commercial products does not constitute endorsement or recommendation for their use.

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Acronyms and Abbreviations

ADWR	Aircraft Drinking Water Rule
ANSI	American National Standards Institute
AOC	Administrative Order on Consent
ARCS	ADWR Reporting and Compliance System
ATA	Air Transport Association
BMP	Best Management Practice
CDC	Centers for Disease Control and Prevention
CFR	Code of Federal Regulations
CRMP	Comprehensive Representative Monitoring Plan
CWS	Community Water System
DBP	Disinfection Byproducts
<i>E. coli</i>	<i>Escherichia coli</i>
EPA	United States Environmental Protection Agency
EO	Executive Order
FAA	United States Federal Aviation Administration
FDA	United States Food and Drug Administration
FR	<i>Federal Register</i>
GWS	Ground Water System
GWUDI	Ground Water Under the Direct Influence of Surface Water
HACCP	Hazard Analysis and Critical Control Point
HHS	Department of Health and Human Services
HPC	Heterotrophic Plate Count
ICC	Interstate Carrier Conveyance
IESWTR	Interim Enhanced Surface Water Treatment Rule
LIMS	Laboratory Information Management System
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg/L	Milligrams per Liter
mL	Milliliters
MRDL	Maximum Residual Disinfectant Level
NAICS	National American Industry Classification System
NATA	National Air Transportation Association
NASA	National Aeronautics and Space Administration

NCWS	Non-Community Water System
NELAP	National Environmental Laboratory Accreditation Program
NOV	Notice of Violation
NPDWR	National Primary Drinking Water Regulation
NSF	National Sanitation Foundation International
NTNCWS	Non-Transient Non-Community Water System
OEI	Official Establishment Inventory
O&M	Operations and Maintenance
P-A	Presence-Absence
PN	Public Notification
ppm	Parts per Million
PWS	Public Water System
SDWA	Safe Drinking Water Act
SDWIS	Safe Drinking Water Information System
SWTR	Surface Water Treatment Rule
TC	Total Coliform
TCR	Total Coliform Rule
TCRDSAC	Total Coliform Rule/Distribution System Advisory Committee
TNCWS	Transient Non-Community Water System
TT	Treatment Technique
US	United States
UV	Ultraviolet
WHO	World Health Organization
WSG	Water Supply Guidance
WSP	Water Safety Plan

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1. Introduction

1.1 Purpose of the Aircraft Drinking Water Rule

The primary purpose of the Aircraft Drinking Water Rule (ADWR) is to ensure that a safe and reliable supply of drinking water is provided to aircraft passengers and crew. The rule applies to aircraft that are public water systems (PWSs) and requires that the water provided through lavatory and galley faucets and drinking fountains on the aircraft meet standards for human consumption. The ADWR does not require that water be provided on an aircraft.

Human consumption refers to more than just drinking water or water-based beverages. It includes water uses such as drinking or food preparation, as well as water for brushing teeth, dishwashing, and hand washing [40 CFR 141.801]. Therefore, even if passengers and crew are provided bottled water for drinking, water from all taps on the aircraft (including taps in the lavatories and galleys) must meet drinking water standards. Examples of common uses of drinking water by passengers and crew on an aircraft include:

- Medical use, including ingestion of medications.
- Hygienic purposes such as brushing teeth, washing hands and/or face, and where provided, onboard showering.
- Food and beverage preparation such as making coffee and tea, mixing powered drinks, or re-hydrating dehydrated foods.
- Hand washing by crew prior to providing ice or pre-packaged food to passengers.
- Sanitation activities such as washing utensils or work areas, or wetting towels for use in dish washing or for wiping hands.
- Direct ingestion from taps or fountains (even if drinking cups are not provided by the air carrier).

Applicability of the ADWR

All interstate carrier conveyances that provide piped water for human consumption and that regularly serve at least 25 individuals daily at least 60 days per year are public water systems regardless of whether they treat or sell the water and regardless of whether they are publicly or privately owned. Applicability is discussed in more detail in Section 1.2.

Aircraft classified as public water systems are subject to the requirements of the Safe Drinking Water Act (SDWA). Under SDWA, the United States Environmental Protection Agency (EPA) sets national health-based standards for drinking water quality and oversees the implementation and enforcement of those standards. The health-based standards are National Primary Drinking Water Regulations (NPDWRs). NPDWRs include maximum allowable levels of contaminants, treatment requirements, monitoring, public notification, reporting, and recordkeeping requirements.

Until the ADWR was developed, safe drinking water regulations have been written with traditional stationary public water systems in mind. Examples of stationary public water systems

include large municipal utilities, as well as schools and restaurants that are served by their own wells. The regulations for stationary systems have proven difficult to implement for aircraft due to the unique characteristics of aircraft water systems. For example, aircraft operate under rigorous flight schedules, fly to multiple destinations over the course of one day, and may board drinking water at many of these locations. The ADWR tailors drinking water regulations to provide a more feasible way for air carriers to comply with NPDWRs. The ADWR adapts to aircraft water systems the applicable requirements of the Total Coliform Rule, the suite of Surface Water Treatment Rules, and the Public Notification Rule. The ADWR also builds upon existing aircraft operations and maintenance programs, better coordinates federal programs that regulate aircraft water systems, and enables aircraft to select compliance options that minimize disruptions of aircraft flight schedules.

Because aircraft board water from airport watering points via temporary connections, aircraft drinking water quality depends on a number of factors. These factors include the quality of the water boarded from each source, the care used to board the water, the water transfer equipment (such as water cabinets, trucks, carts, and hoses), and the operation and maintenance (O&M) of the onboard water system. The ADWR, along with complementary US Food and Drug Administration (FDA) regulations, addresses each of these factors in order to safeguard against possible contamination and to ensure that the water is suitable for human consumption.

1.2 Applicability of the Aircraft Drinking Water Rule

The ADWR applies to each *aircraft* that meets the definition of a public water system, boards only finished water, operates within US jurisdiction, and is not excluded from regulation under 40 CFR 141.3. The ADWR applies to the onboard water system only. EPA defers to the FDA with respect to regulating watering points such as water cabinets, carts, trucks, and hoses from which aircraft board water. FDA requirements for watering points do not entail the individual certification of every potential source, method, facility, or system; however, interstate carrier conveyance selected watering points must be in accordance with FDA requirements [21 CFR part 1240, subpart E]. Furthermore, the applicability of the ADWR is not based on the ownership of the aircraft. That is, an aircraft that is subject to the ADWR may be publicly or privately owned, or government or foreign-owned.

The applicability criteria for the ADWR are described in more detail below and are presented in Exhibit 1.1.

- Aircraft that meet the definition of a public water system have an onboard water system of piped water for human consumption and regularly serve an average of at least 25 or more individuals daily at least 60 days out of the year.

Piped water for human consumption means the onboard water system provides water through taps (e.g., in a galley, a lavatory, or drinking fountain). The onboard water can be supplied to the aircraft via a fill port and piping, or by a removable tank.

A galley is the area of the aircraft where food is cooked and prepared. If the galley has a water tap, even if there is only a hot water tap, the aircraft will be subject to the ADWR. EPA also considers “human consumption” to occur in a lavatory if there is a tap. Facilities with toilet seats without a lavatory tap (as seen in some small, short-range aircraft) are not considered to be providing water for human consumption under SDWA because tap water cannot be accessed by passengers or crew. A lavatory sink with a tap provides water for human consumption even if the tap and basin are only intended for hand washing and drinking cups are not provided. An aircraft need only have a galley tap *or* a lavatory tap *or* a drinking fountain to be considered providing water for human consumption.

By definition, a public water system regularly serves an average of at least 25 or more individuals daily at least 60 days out of the year [40 CFR 141.2]. The 25-person average minimum includes the total number of passengers and crew for all of the flights in a day; the 60 days per year do not need to be consecutive days. If the aircraft does not operate at least 60 days each year, or if it does not regularly serve an average of at least 25 people daily at least 60 days in a year, the aircraft would not be a public water system. For example, the ADWR and other NPDWRs do not apply to aircraft that are used solely for cargo purposes if they do not regularly serve an average of at least 25 people daily, even if they have an onboard water system.

- The ADWR is limited to aircraft that board only finished water.

The ADWR assumes that only finished water is boarded for human consumption on aircraft because of the FDA requirement that only potable water may be provided for drinking and culinary purposes on interstate carrier conveyances [21 CFR 1240.80].

Finished water is defined as water that is introduced into the distribution system of a public water system and is intended for distribution and consumption without further treatment, except as treatment necessary to maintain water quality in the distribution system [40 CFR 141.801]. Disinfection, such as an ultraviolet light disinfection system, is an example of treatment that may be used to maintain water quality after the water has been boarded. Carbon filters and particle removal filters are installed on some aircraft water systems for aesthetic purposes.

An aircraft public water system that boards water that is not of finished quality is not eligible to comply with the ADWR but is subject to all of the other applicable National Primary Drinking Water Regulations.

- Aircraft that fly international routes with two or more destinations within US jurisdiction.

Aircraft that fly international routes that make only one stop in the US solely for the purpose of unloading passengers transported from outside the US and/or loading passengers for transportation to a destination outside the US are excluded from ADWR regulations. Thus, under the ADWR, if an aircraft serves two or more US destinations before returning to an international location, the aircraft is subject to the ADWR while within the US.

- Aircraft not excluded from regulation under 40 CFR 141.3.

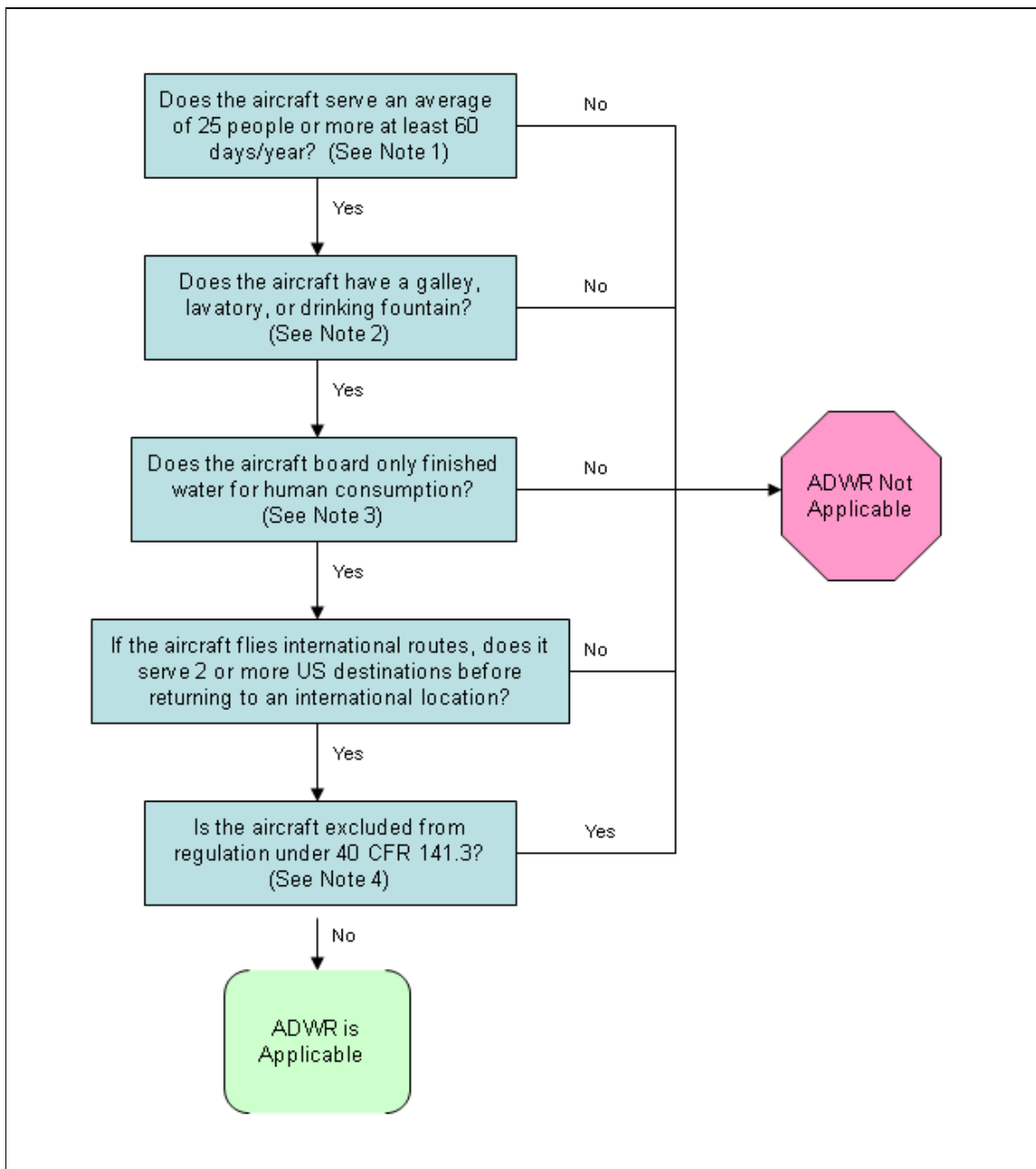
The SDWA [Section 1411(4)] and NPDWRs [40 CFR 141.3] specifically exclude from regulation public water systems that meet all of the following criteria: 1) consist only of distribution and storage facilities and do not have any collection and treatment facilities; 2) obtain all water from, but are not owned or operated by, a public water system; 3) do not sell water to any person; and 4) are not a carrier that conveys passengers in interstate commerce.

Aircraft are carriers; therefore, if aircraft that are public water systems convey passengers in interstate commerce they are specifically identified as being subject to the drinking water regulations and cannot be excluded.

A government-owned aircraft used solely for government purposes that is not conveying passengers in interstate commerce may be excluded from SDWA and ADWR regulations if it meets the other three criteria. However, if a government-owned aircraft **does not** obtain all water from a public water system (e.g., the aircraft boards water from a location that is outside of US jurisdiction), the aircraft **would not** be excluded from regulation.

It is important to note that the term “interstate commerce” does not exclusively apply to aircraft conveying passengers between two different states. Interstate commerce includes activities that substantially affect interstate commerce even if they are not themselves interstate. As a result, EPA interprets the statute to reach intrastate carriers that meet the definition of a public water system; such aircraft are subject to the ADWR if all other necessary criteria are met.

Exhibit 1.1 ADWR Applicability to Aircraft



Note 1: If the aircraft does not operate at least 60 days each year, or if it does not regularly serve an average of at least 25 people daily at least 60 days in a year, the aircraft would not be a PWS. The 25-person average minimum includes the total number of passengers and crew for all of the flights in a day.

Note 2: A lavatory has a flushing toilet and a tap. A galley is a food preparation and handling area where food is cooked, prepared, or stored.

Note 3: EPA considers water for human consumption to include water for drinking, food preparation, brushing teeth, and hand washing. An aircraft PWS that boards water that is not of finished quality is not eligible to comply with the ADWR but is subject to all of the other applicable National Primary Drinking Water Regulations.

Note 4: Aircraft that meet *all* criteria in 40 CFR 141.3 are excluded from regulation under ADWR.

1.3 General Requirements of the Aircraft Drinking Water Rule

In general terms, the ADWR seeks to protect the quality of drinking water onboard aircraft public water systems by establishing the following requirements. Details of each requirement are provided in later chapters in this guidance document. The rule language as published in the *Federal Register* is provided in Appendix A and a Quick Reference Guide summarizing the rule requirements is provided in Appendix B.

- Routine disinfection and flushing of the aircraft water system at a frequency consistent with the water system manufacturers' recommendations. Where manufacturers do not specify a frequency for routine disinfection and flushing of the system, the rule gives air carriers four options from which to choose their preferred frequency (see Chapters 4 and 5).
- Routine monitoring for total coliform (TC) bacteria at aircraft water system taps, at frequencies ranging from monthly to annually, depending on the routine disinfection and flushing frequency (see Chapter 4).
- Aircraft water system operations and maintenance (O&M) plans, which must be incorporated into the air carriers' FAA-accepted O&M program for aircraft. The O&M plans must include a coliform sampling plan and procedures for performing routine disinfection and flushing, as well as other requirements (see Chapter 5).
- Coliform sampling plans, which must be included in the aircraft water system O&M plan. The coliform sampling plan must include the frequency and number of routine coliform samples, location of sample taps, sampling collection procedures, as well as other requirements (see Chapter 4).
- Analysis of total coliform-positive samples for the presence of *Escherichia coli* (*E. coli*) (see Chapter 4).
- Corrective actions in response to a total coliform-positive or *E. coli*-positive sample (see Chapter 4).
- Corrective disinfection and flushing of the aircraft water system when specific circumstances occur (see Chapter 5).
- Follow-up sampling and analysis for total coliform to confirm the effectiveness of corrective disinfection and flushing (see Chapters 4 and 5).
- Comprehensive self-inspection of each aircraft's water system components no less than every 5 years (see Chapter 5).
- Compliance audits at an interval determined by EPA (see Chapter 5).
- Public notification when specific circumstances occur (see Chapter 6).
- Reporting and recordkeeping associated with the activities described above (see Chapter 7).

1.4 Intended Use of this Document

This guidance is intended to help facilitate compliance with and implementation of the requirements of the ADWR. It explains the applicability of the rule to aircraft water systems and describes the rule requirements. It also recommends sampling procedures that ensure accurate sampling results and discusses other considerations to help preserve good water quality aboard the aircraft. This manual also provides templates for the various public notices required by the rule.

While EPA has made every effort to ensure the accuracy of the discussion in this document, the obligations of the regulated community are determined by statutes, regulations, or other legally binding requirements. In the event of a conflict between the discussion in this document and any statute or regulation, this document would not be controlling. Furthermore, the recommendations offered by EPA in this technical manual are provided solely to assist air carriers in rule implementation. Air carriers may develop their own policies and procedures as they deem appropriate based on the nature of their individual operations and are responsible for ensuring those policies and procedures are consistent with, and support compliance with, the rule.

1.5 Outline of this Document

This guidance manual addresses the requirements of the ADWR and provides suggestions to air carriers for ensuring that safe drinking water is provided by aircraft public water systems. Although aircraft operators have the responsibility to protect their water systems from deliberate acts that may threaten public health, this issue is not within the purview of this guidance or the ADWR.

The guidance manual is organized as follows:

Chapter 1. Introduction – Explains the applicability of the ADWR and purpose of this manual.

Chapter 2. Overview of the Aircraft Drinking Water Rule – Describes, in general terms, the ADWR requirements and compliance dates, aircraft public water systems, as well as key background information.

Chapter 3. Aircraft Inventory– Explains the criteria for identifying if an aircraft is a public water system, defines the status of aircraft, and describes other aircraft inventory requirements.

Chapter 4. Coliform Monitoring – Describes coliform monitoring requirements including monitoring plan content, sampling locations, sampling frequency, sampling protocol, analytical methods, and the reporting of sample results. Also discusses activities and options for responding to the detection of coliform organisms in routine or repeat samples.

Chapter 5. Operations and Maintenance Plans – Discusses the required elements of an operations and maintenance (O&M) plan and recommendations for conducting disinfection and flushing procedures, performing water system inspections, and training personnel on the public health implications of their activities on the quality of water onboard the aircraft water system.

Chapter 6. Public Notification – Describes public notice requirements including methods, timing, format, and required language.

Chapter 7. Recordkeeping and Reporting – Describes the requirements for reporting information to the EPA, including inventory information and compliance data, and internal recordkeeping requirements for the air carriers.

Chapter 8. Violations of the Rule – Summarizes rule violations and corrective actions for returning to compliance.

Chapter 9. Other Water System Considerations – Describes considerations that are above and beyond the ADWR regulatory requirements, which may contribute to obtaining and maintaining drinking water quality. Topics include water age and biofilm management, considerations for supplemental treatment, strategies for communications with water systems from which finished water is obtained, and recordkeeping practices for boarded water.

References. – Provides a bibliographic list of references cited in this manual.

Appendix A. Rule Language – The rule as published in the *Federal Register*.

Appendix B. Quick Reference Guide – A stand-alone two-page summary of the rule requirements and key background information.

Appendix C. Example Coliform Sampling Plan – Provides an example coliform sampling plan illustrating all of the required elements of a coliform sampling plan.

Appendix D. Public Notification Templates – Provides examples for various public notices required by the ADWR.

Appendix E. Example Water Safety Plan for an Air Carrier – Provides an outline of a water safety plan based on World Health Organization (WHO) guidelines. EPA encourages the development of comprehensive water safety plans by air carriers. Water safety plans are not required by the ADWR.

2. Overview of the Aircraft Drinking Water Rule

Aircraft public water systems are required to develop aircraft water system operation and maintenance plans including coliform sampling plans, conduct operations and maintenance activities, periodically sample the onboard drinking water, and report compliance with ADWR requirements to an electronic database developed by EPA (ADWR Reporting and Compliance System). Compliance oversight of ADWR requirements is provided by the EPA Regional Office in which the air carrier's US headquarters is located. EPA Headquarters will administer the ADWR Reporting and Compliance System and play a continuing role in ensuring consistent implementation and enforcement of the ADWR.

This chapter provides an overview of the requirements of the ADWR including compliance dates, a description of an aircraft water system, and background information related to the quality of the onboard water.

2.1 Compliance Dates and Requirements

Several rule components must be implemented 18 months after rule promulgation, which is April 19, 2011 [40 CFR 141.806(a)(1)]; the remainder must be implemented within two years after promulgation, which is October 19, 2011 [40 CFR 141.800].

The ADWR relies on a combination of routine aircraft water system operations and maintenance (O&M) practices that build on existing air carrier O&M programs, with periodic monitoring. The ADWR rule components and their compliance dates are summarized in Exhibit 2.1. Chapters 3 through 7 of this document provide details of the requirements of the ADWR.

Air carriers that are operating under an Administrative Order on Consent and Request for Information (AOC) to address pre-ADWR non-compliance with the Safe Drinking Water Act and National Primary Drinking Water Regulations must continue to meet the requirements of their AOCs until the ADWR compliance date of October 19, 2011 [40 CFR 141.800(b)].

If an air carrier is not subject to an AOC, then that air carrier must comply with the applicable requirements of the existing NPDWRs under 40 CFR 141 for each of its aircraft that is a public water system [40 CFR 141.800(b)]. The applicable requirements include those for a transient non-community water system (TNCWS) that uses finished surface water and serves 1,000 or fewer people per day.

Aircraft PWS Requirements Prior to the ADWR

Until the compliance date of October 19, 2011, air carriers remain subject to the requirements of their AOCs, if an AOC is in effect.

If an AOC is not in effect for an air carrier, then that air carrier must comply with the applicable requirements of the existing NPDWRs under 40 CFR 141 for each of its aircraft that is a public water system.

Exhibit 2.1 ADWR Components and Compliance Dates

Component	Compliance Date
Submit aircraft water system inventory.	April 19, 2011
Develop coliform sampling plan and report coliform sampling frequency.	April 19, 2011
Develop aircraft water system O&M plan, and report disinfection and flushing frequency and that the O&M plan is completed.	April 19, 2011
Aircraft water system O&M plan must be incorporated into an FAA-accepted aircraft operations and maintenance program [40 CFR 141.804(a)].	October 19, 2011
Update aircraft inventory and coliform sampling plans as needed for new aircraft. (New aircraft placed into operation after April 19, 2011, must complete these requirements within the first calendar quarter of initial operation [40 CFR 141.806(a)(2)].)	Beginning October 19, 2011
Conduct routine coliform sampling	Beginning October 19, 2011
Conduct routine disinfection and flushing.	Beginning October 19, 2011
Conduct all other reporting and recordkeeping requirements.	Beginning October 19, 2011
Conduct corrective disinfection and flushing as needed.	Beginning October 19, 2011
Conduct public notification as needed.	Beginning October 19, 2011
Complete initial self-inspection of each aircraft that is included in the inventory as of October 19, 2011, and address deficiencies or notify EPA of schedule to address deficiencies.	No Later Than October 19, 2016
Conduct subsequent self-inspections every 5 years thereafter.	5 years after previous self- inspection
Complete self-inspections of each aircraft that was added to the inventory after October 19, 2011.	Within 5 years after aircraft was added to inventory

Aircraft Inventory

Air carriers are required to report their fleet inventory for all existing aircraft that are public water systems to EPA by April 19, 2011. The inventory must specify the aircraft that are currently active and those that are inactive [40 CFR 141.806(b)(1)]. Once the initial inventory has been submitted to EPA, any change in inventory must be submitted to EPA within 10 days after the end of the month in which the change occurred [40 CFR 141.806(b)(2)]. Since each aircraft is a public water system, the inventory must include a unique identifier number for each aircraft [40 CFR 141.806(b)(1)]. Inventory information must be submitted to EPA electronically, in the ADWR Reporting and Compliance System to facilitate subsequent reporting and recordkeeping. If an air carrier is unable to report electronically, the air carrier may use an alternative approach that the Administrator approves [40 CFR 141.806(d)]. Chapter 3 includes more information on inventory information, what is meant by active and inactive status of an aircraft, and the reporting format and procedures.

Coliform Sampling Plans

Air carriers must develop coliform sampling plans for existing aircraft by April 19, 2011 [40 CFR 141.802(b)]. The sampling plans must include sampling procedures, aircraft sampling frequencies, and routine disinfection and flushing frequencies [40 CFR 141.802(a)]. Air carriers are not required to submit the coliform sampling plans to EPA but must inform EPA that the plans are complete and submit their planned sampling frequencies by April 19, 2011 [40 CFR 141.806(a)(1)]. EPA may choose to review the plans during a compliance audit, and can request that the plans be submitted at any time. Although the ADWR requires a sampling plan for each aircraft, individual plan documents are not required for each aircraft. EPA anticipates a plan may be developed that covers several aircraft and specifies the aircraft identifier numbers within the document. For new aircraft, air carriers must place the aircraft under an existing sampling plan or develop a new plan. Air carriers must report the coliform sampling frequency within the first three months of operation of the new aircraft [40 CFR 141.806(a)(2)]. See Chapter 4 for more information on coliform monitoring requirements including coliform sampling plans, sample collection procedures, and follow-up actions and options when routine coliform samples indicate coliforms are present.

Operation and Maintenance Plans

By April 19, 2011, air carriers must report to EPA that they have developed their aircraft water system O&M plans. Air carriers need not submit the O&M plans to EPA but must inform EPA that the plans are complete [40 CFR 141.806(a)(1)]. The O&M plans must be included in the Federal Aviation Administration (FAA)-accepted O&M program by October 19, 2011 [40 CFR 141.804(a)]. EPA can request a copy of the plan at any time and may also view the plan during compliance audits. Although the rule requires an O&M plan for each aircraft, individual plan documents are not required for each aircraft – EPA anticipates a plan may be developed that covers several aircraft and specifies the aircraft identifier numbers within the document. Beginning October 19, 2011, air carriers must revise an existing plan to add the new aircraft or develop a new aircraft water system O&M plan within the first calendar quarter of operation of a

new aircraft water system and inform EPA that the plan is complete [40 CFR 141.806(a)(2)]. See Chapter 5 for more information on the required elements of the O&M plans.

Self-Inspections

Under the ADWR, air carriers or their representatives must perform a self-inspection of all water system components for each aircraft water system no less frequently than once every 5 years [40 CFR 141.800(b) and 141.808(b)]. This frequency is consistent with sanitary surveys of stationary transient non-community water systems and intended to be compatible with other significant aircraft maintenance events. This schedule requires that each aircraft that is included in the inventory as of October 19, 2011, be inspected any time before October 19, 2016. Any new aircraft added to the inventory after October 19, 2011, must have a self-inspection completed within 5 years after it is added to the inventory [40 CFR 141.808(b)]. The air carrier must address any deficiency identified during compliance audits or routine self-inspections within 90 days of identification of the deficiency. Where a deficiency is identified during a period of time when the aircraft water system is inactive (see Chapter 3 for a definition of an inactive aircraft water system), such as during extended or heavy maintenance of the aircraft, the deficiency must be corrected before the aircraft water system is returned to active status [40 CFR 141.808(c)]. If a deficiency is addressed within 90 days of identification, the air carrier will not incur a violation. In addition, if more than 90 days have elapsed but the aircraft water system is *not* active, the air carrier will not incur a violation as long as the deficiency is addressed before the aircraft water system is returned to active status. Procedures for conducting self-inspections must be included in the aircraft water system O&M plan [40 CFR 141.804(b)]. See Chapter 5 for more information on self-inspections.

Notification to Passengers and Crew

Beginning October 19, 2011, air carriers are required to notify passengers and crew that are on board the aircraft of specific situations related to the quality of the water. If access to the water system by passengers is physically prevented through disconnecting or shutting off the water, or the flow of water to the taps is prevented (such as if water is supplied only to lavatory toilets and not to any lavatory taps), then only the notice to the crew is required. This exception only applies when there is no possibility of the passengers accessing the water system for consumptive use. See Section 4.3 for more details on restricting public access.

Notification requirements and timeframes depend on the severity of the health risk created by the situation. When public notice must be provided, the ADWR requires only onboard notification of passengers and crew. Passengers on previous flights may be notified as part of an illness or event investigation, but this is not a requirement of the ADWR. Notification of passengers and crew aboard the aircraft must continue to be provided until situation-specific criteria are met [40 CFR 141.805]. See Chapter 6 for more information on public notification requirements.

Reporting and Recordkeeping

In addition to the reporting described previously for aircraft inventory, coliform sampling plans, and O&M plans, the rule requires air carriers to report [40 CFR 141.806]:

- Sample results;
- Routine disinfection and flushing;
- That self-inspections were completed and any unresolved deficiencies that were noted;
- Failure to comply with monitoring or disinfection and flushing requirements; and
- The occurrence of events requiring corrective disinfection and flushing of the water system and notification of passengers and crew.

This reporting begins October 19, 2011; actual reporting deadlines vary. See Chapter 7 for more information on recordkeeping and reporting.

Air carriers must maintain their coliform sampling plans and O&M plans. The records do *not* need to be retained on the aircraft, and may be kept in electronic format. Records of coliform monitoring and disinfection and flushing must be kept for at least five years, and records of self-inspections must be kept for at least 10 years. The rule also specifies public notice records must be kept for a minimum of three years [40 CFR 141.807]. Records that are required to be maintained by the ADWR must be made available to EPA upon request and during compliance audits.

Implementation Oversight and Enforcement

The rule authorizes EPA to conduct onsite compliance audits of aircraft and aircraft records. EPA may review records, collect coliform samples, and observe procedures at any time. The ADWR does not affect or modify the responsibilities or requirements of the FDA or FAA.

2.2 What is an Aircraft Public Water System?

2.2.1 Types of Public Water Systems

The National Primary Drinking Water Regulations (NPDWRs) define a public water system (PWS) as a system for providing water for human consumption to the public through pipes or other constructed conveyances if such system either has at least 15 service connections or regularly serves an average of at least 25 individuals daily, at least 60 days per year [40 CFR 141.2]. As described in Section 1.1, human consumption includes uses such as water for drinking or food preparation, as well as water for brushing teeth and hand washing.

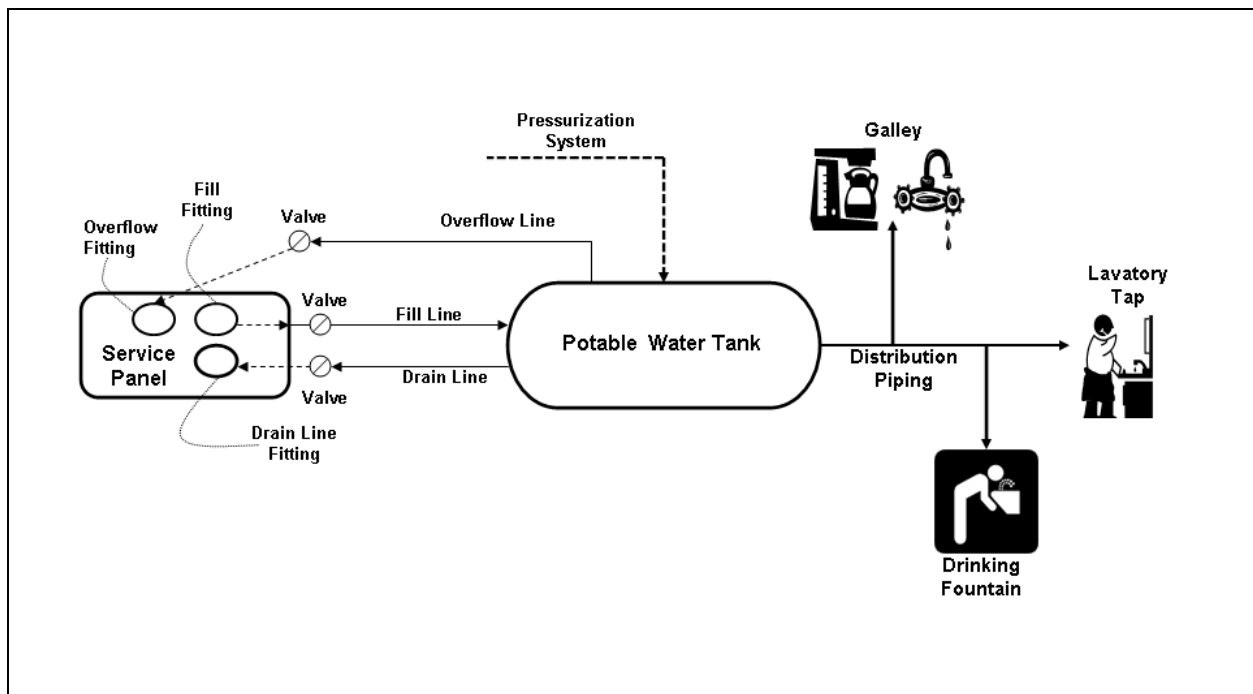
Public water systems are subject to different requirements of the NPDWRs based on the type of population they serve. The type of population served is defined whether consumers are exposed to the water for short time periods or extended time periods. The two main categories of public water systems are community water systems (CWSs) and non-community water systems (NCWSs). CWSs primarily serve residential populations; non-community systems primarily serve nonresidential users. NCWSs are further divided based on whether they regularly serve at least 25 of the same people for more than 6 months per year, such as schools or workers at a business or industry. If the same people are served, the system is classified as a non-transient non-community water system. If different people are served, as occurs at campgrounds, restaurants, or highway rest stops, the system is classified as a transient non-community water system.

Aircraft public water systems are regulated as transient non-community water systems because they are NCWSs that do not regularly serve at least 25 of the same people over six months per year. They are also regulated as surface water systems because they are likely to board finished water from public water systems that use surface water (since many stationary systems serving airports rely, at least in part, on surface water as a source). Since aircraft public water systems serve a transient population, they are subject only to regulations that address acute health effects resulting from short-term exposure to drinking water contaminants. Acute health effects are impacts on health that occur over a short period of time after exposure to the contaminant. The ADWR is designed to address such health risks.

2.2.2 Components of Aircraft Public Water Systems

The ADWR applies to the onboard water system only. The components of an aircraft water system include the water service panel, the filler neck of the aircraft finished water storage tank, the onboard water storage tank(s), piping, treatment equipment, galley and lavatory faucets, and any other plumbing fixtures that supply water to passengers or crew. An example of one type of an aircraft water system is shown in Exhibit 2.2.

Exhibit 2.2 Example Components of One Type of an Aircraft Water System



Generally, water is supplied to the aircraft through a fill port or ports. Water is drained from the water system through a drain port on the underbelly of the aircraft. The water system may be pressurized using bleed air from the operation of the aircraft engines or an on-demand electric pump.

Aircraft with More Than One Water Storage Tank and Piping System

Each aircraft is regulated as one public water system regardless of whether the aircraft has more than one discrete storage and piping system.

Aircraft water systems vary depending on the type of aircraft. Onboard storage tank capacity varies from a single removable/portable tank in a regional jet to multiple tanks exceeding one hundred gallons in long-range aircraft. Various piping configurations in the galley may include separate lines for the sink and a hot water tap located on the coffee maker. Some aircraft have activated carbon filters and/or particle removal filters on the supply line to the coffee makers; others may have more elaborate onboard supplemental treatment systems.

The aircraft water system may also include some protective devices to meet sanitation requirements. Examples include air filters in bleed-air lines and at compressor inlets for protection from contaminants, self-venting valves in galley and lavatory supply lines to help drain the system, and air gaps between the water supply and the drain system.

Many large aircraft have more than one water service panel and associated storage and piping system. For example, one may be in the forward section of the aircraft to serve a galley and a lavatory, and one in the rear of the aircraft to serve a galley and/or lavatory. Interconnections between such systems commonly exist so water service can be provided if one system is not operational. Even if interconnections do not exist and the storage and piping systems are distinct, each *aircraft* is regulated as a single aircraft public water system. That is, all compliance tracking and activities are based on the aircraft, not the number of discrete storage and piping systems that comprise the aircraft water system.

2.3 Quality of Onboard Water

2.3.1 Public Health Threats Addressed by the Rule

Because aircraft are transient non-community public water systems, only contaminants that cause acute health effects are of concern. An acute health effect is a brief and severe onset of illness after short-term exposure. Acute health effects are often caused by microbiological organisms and by some chemicals. Chemicals that can cause acute health effects include nitrate, nitrite, and high levels of chlorine dioxide.

The ADWR seeks to protect against disease-causing microbiological contaminants (pathogens) in the drinking water of the onboard water system. Microbiological contamination is a concern because it can occur after the finished water leaves the public water system from which the water is obtained. The contamination can occur during the water boarding process if there are problems with the watering point connections, water transfer equipment, or the sanitary practices

employed. Contamination can also occur if the aircraft water system is not properly operated and maintained.

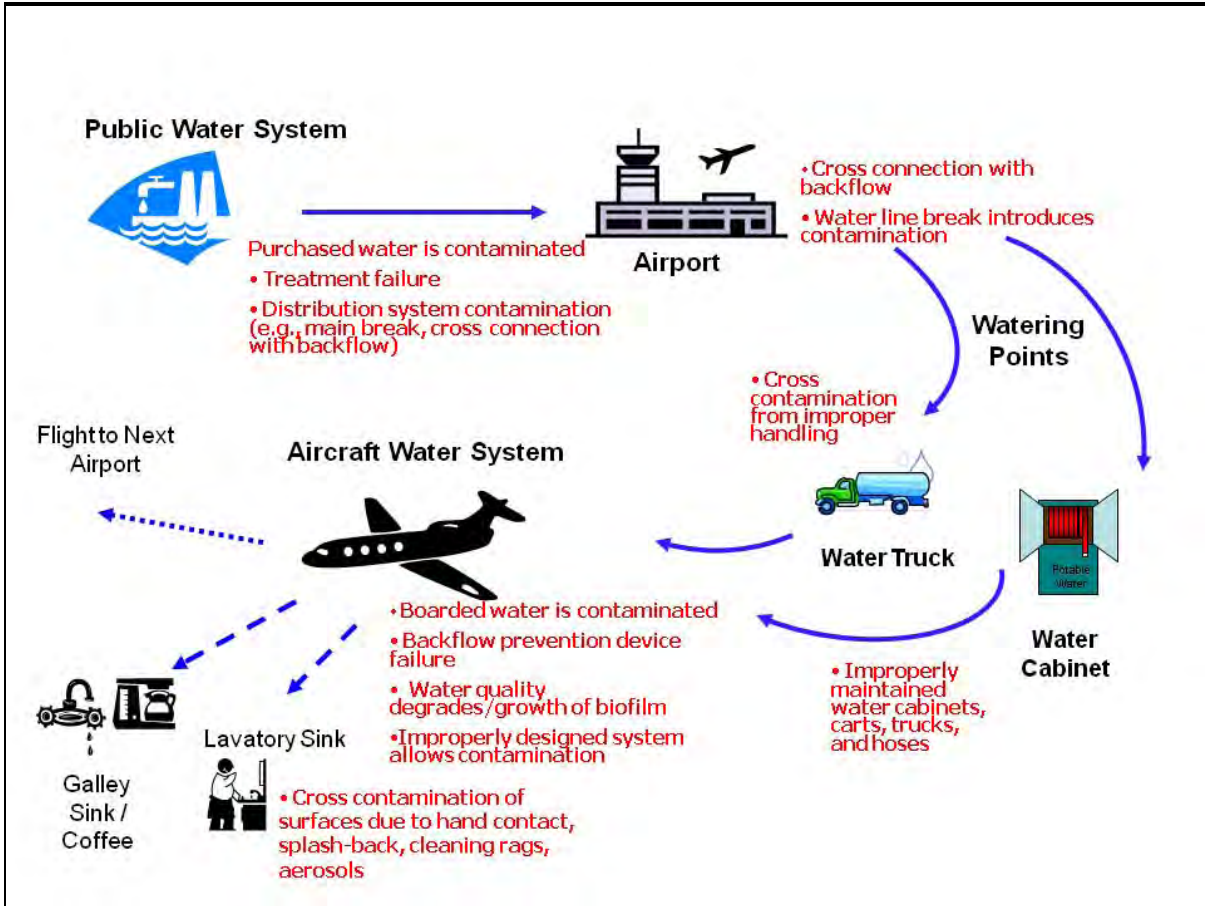
Because the NPDWRs require that nitrate, nitrite, and chlorine dioxide levels be controlled to regulatory limits and monitored by the public water system (parent system) serving the airport watering point, the ADWR does not require onboard monitoring for these chemicals. This assumes that only finished water is boarded for human consumption on aircraft. Finished water means water that is introduced into the distribution system of a public water system and is intended for distribution and consumption without further treatment, except as necessary to maintain water quality in the distribution system (e.g., supplemental disinfection, addition of corrosion control chemicals) [40 CFR 141.2]. The assumption that only finished water is boarded on aircraft is based on an FDA requirement that only potable water may be provided for drinking and culinary purposes on interstate carrier conveyances (ICCs) [21 CFR 1240.80]. However, aircraft water systems that are boarding water that is not finished water will continue to be subject to existing NPDWRs, which include requirements for chemical monitoring for nitrate and nitrite in addition to microbial monitoring. Chlorine dioxide monitoring also would be required if chlorine dioxide was used as a disinfectant or oxidant in the treatment process.

2.3.2 Maintaining Water Quality Throughout the Supply and Transfer Chain

The aircraft water system supply and transfer chain refers to the steps necessary to provide drinking water onboard an aircraft. The supply and transfer chain includes the public water system used as the source of finished water; the airport (that may be a public water system with its own source or convey water from another public water system to the watering points and servicing areas); the watering points and service areas and associated transfer equipment; and the aircraft water system.

Exhibit 2.3 illustrates potential mechanisms and pathways through which water may be contaminated prior to being boarded, or may become contaminated or deteriorate in quality while onboard the aircraft. The discussion that follows provides protection measures to reduce or eliminate potential mechanisms and pathways. The ADWR is intended to complement existing regulations to minimize contamination events and prescribe appropriate response actions if they occur.

Exhibit 2.3 Potential Contamination Pathways within the Aircraft Water System Supply and Transfer Chain



Public Water System

The public water system is required by the NPDWRs to provide a reliable quality and quantity of finished water to all consumers. They must perform monitoring and must comply with reporting and recordkeeping requirements to document the quality of the water provided.

The ADWR requirements for finished water to be boarded are intended to ensure water will be available for boarding that is fully in compliance with drinking water quality standards.

However, treatment failures or events within the distribution system of the public water system could result in contamination of the water supplied to the airport or watering point.

In the event the public water system that provides the water to be boarded is not in compliance with standards, it is required by the NPDWRs to notify all of its customers, which would include airport authorities and/or air carriers. Violations of drinking water standards for acute contaminants (which are the contaminants addressed by the ADWR) require notification to consumers within 24 hours of learning of the violation. The ADWR assumes these events would

be infrequent and temporary. However, if air carriers are notified of such an event, then air carriers should ensure personnel responsible for taking appropriate actions regarding the boarding of water and any follow-up actions if the water is boarded are notified immediately. Development of a communications strategy to address this situation is described in more detail in Chapter 9.

Airport Watering Points

Finished water from a regulated public water system is delivered to the airport and is accessible to aircraft and water service providers at watering points that are in accordance with FDA regulations [21 CFR 1240.83]. Water is transferred to the aircraft storage tank either by a direct hose connection from a water cabinet mounted on the terminal building, a mobile truck, or a cart, depending on the aircraft's relative location to the watering point. Small aircraft such as regional jets may not have a service port for filling the onboard storage tank. Instead, these aircraft water systems may be equipped with a removable container (usually 5 gallons) that is refilled at the airport's servicing area or catering facility.

FDA regulations for interstate carrier conveyance watering points require that the water supply meets the NPDWRs [21 CFR 1240.83]. FDA requirements also ensure that the methods and sanitary conditions for delivery of the water to the aircraft prevent the introduction, transmission, or spread of communicable diseases [21 CFR 1250.63]. FDA administers and enforces these requirements through inspections. FDA inspects watering points to ensure they are clean and sanitary.

Because watering points and servicing areas for aircraft are regulated by FDA, the ADWR does not duplicate the FDA program. The ADWR aligns with the FDA program by requiring that the aircraft water system operations and maintenance (O&M) plan include procedures for boarding water that ensure the water will not become contaminated during transfer. These watering point and boarding water procedure requirements are discussed further in Chapter 5, which covers the requirements for the aircraft O&M plan.

Aircraft Water System

The FDA approves the design of aircraft water systems [21 CFR 1250.41], treatment systems [21 CFR 1240.90], and requires that interstate carrier conveyances only provide potable water for drinking and culinary purposes [21 CFR 1240.80]. In general, the FDA's review of the design of aircraft water systems includes all of the following:

- Ensuring potable water systems are independent systems not connected to non-potable systems, or are protected by backflow prevention devices if non-potable water connections are present (e.g., humidifiers and flush rings on vacuum toilets).
- The equipment making up the water system is made of material suitable for use in a potable water system.
- The water system is constructed to prevent contamination (e.g., fill connection fittings are quick-coupling, no more than ¾" in diameter, clearly labeled "Potable Water

Filling,” and provided with protective dust cover; vents are oriented downward; backflow prevention devices are installed at possible cross connections; insulation is protected to prevent water adsorption and contamination; etc.).

Therefore, additional treatment of the water should not be needed prior to boarding the water.

Although protection measures exist for the boarding of water, the opportunity exists for microbiological organisms to be introduced during the process of boarding water. Contamination of the aircraft water system by microbiological or chemical contaminants can occur inadvertently if water is boarded onto an aircraft that is not known at the time to be in violation of drinking water standards, or if water that does not meet standards is knowingly boarded to operate essential systems such as toilets. Water quality can also deteriorate if water is held in the airport’s distribution system or in the aircraft’s water system for too long. As the water ages, coliform bacteria and other bacteria, although generally harmless, can accumulate on pipe and storage tank interior surfaces forming biofilm, a layer of microorganisms that can provide shelter for pathogens if they were to enter the system.

Routine disinfection and flushing procedures and other O&M requirements are intended to control biofilm growth and ensure water quality is maintained.

As illustrated in Exhibit 2.3 there are numerous pathways for potential contamination within the aircraft water supply and transfer chain. Timely and effective communication is essential between the responsibilities parties (i.e., public water system, airport, air carrier) as well as with the appropriate regulatory authorities if a drinking water contamination event occurs. Communication strategy is discussed in more detail in Chapter 9.

2.3.3 ADWR Public Health Protection Measures

It is impractical for aircraft to monitor the water for microbiological contaminants every time water is boarded because several samples may be necessary in one day for some aircraft and coliform bacteria analytical results would not be available for at least 24 hours after sample analysis has begun. Therefore, results would not be known until long after the water was consumed.

To provide meaningful public health protection, the ADWR requires air carriers to develop a comprehensive O&M plan for each aircraft water system to minimize opportunities for contamination [40 CFR 141.804]. The plan must include procedures for routine disinfection and flushing which must be performed at frequencies recommended by the aircraft water system manufacturer. The plan requires periodic testing for total coliform bacteria to confirm the effectiveness of O&M procedures. It also identifies minimum training content and requires training of key personnel. In the event that an air carrier becomes aware of contamination on an aircraft, the ADWR requires corrective action and onboard public notification of passengers and/or crew, when appropriate.

In addition to the O&M plan, the ADWR requires self-inspections by air carriers of each aircraft water system and provides for EPA compliance audits. Lastly, the rule requires reporting and recordkeeping to facilitate compliance tracking and rule implementation.

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3. Aircraft Inventory

Under the ADWR, air carriers are required to submit to EPA an inventory identifying all aircraft public water systems in their fleet and to update the inventory as fleet changes occur [40 CFR 141.806(b)]. The reporting requirements for inventory are effective April 19, 2011. Compliance with the requirements of the ADWR will be tracked for each aircraft individually. To facilitate collection and analysis of aircraft water system data, EPA will use an internet-based electronic data collection and management system, referred to as the ADWR Reporting and Compliance System (see Section 7.2.1). This Chapter describes how to identify aircraft that are public water systems and the information to be reported. It also provides a reference for more information on how to submit the inventory data.

3.1 Identifying Aircraft Public Water Systems

Air carriers must identify all aircraft in their fleet that are subject to the requirements of the ADWR and include these aircraft in their inventory that is reported to EPA [40 CFR 141.806(b)(1)]. Although the applicability of the ADWR to aircraft and the definition of an aircraft public water system have been covered previously in this guidance manual, it is repeated here because it is pertinent to identifying aircraft that must be included in the air carrier inventory and will be covered by the coliform monitoring and aircraft O&M plans.

The applicability criteria for an aircraft with an onboard water system to be regulated under the ADWR are as follows:

- Aircraft that meet the definition of a public water system have an onboard water system of piped water for human consumption and regularly serve an average of at least 25 or more individuals daily at least 60 days out of the year.

Piped water for human consumption means the onboard water system provides water through taps (e.g., in a galley, a lavatory, or drinking fountain). The onboard water can be supplied to the aircraft via a fill port and piping, or by a removable tank.

A galley is the area of the aircraft where food is cooked and prepared. If the galley has a water tap, even if there is only a hot water tap, the aircraft will be subject to the ADWR. EPA considers “human consumption” to occur in a lavatory if there is a tap. Facilities with toilets without a lavatory tap (as seen in some small, short-range aircraft) are not considered to be providing water for human consumption under SDWA because tap water cannot be accessed by passengers or crew. A lavatory sink with a tap provides water for human consumption even if the tap and basin are only intended for hand washing and drinking cups are not provided. An aircraft need only have a galley tap *or* a lavatory tap *or* a drinking fountain to meet this criterion.

By definition, a public water system regularly serves an average of at least 25 or more individuals daily at least 60 days out of the year [40 CFR 141.2]. The 25-person average minimum includes the total number of passengers and crew for all of the flights in a day; the 60 days per year do not need to be consecutive days. If the aircraft does not operate at least 60 days each year, or if it does not regularly serve an average of at least 25 people daily at least 60 days in a year, the aircraft would not be a public water system. For example, the ADWR and other NPDWRs do not apply to aircraft that are used solely for cargo purposes if they do not regularly serve an average of at least 25 people daily, even if they have an onboard water system.

- The ADWR is limited to aircraft that board only finished water.

The ADWR assumes that only finished water is boarded for human consumption on aircraft because of the FDA requirement that only potable water may be provided for drinking and culinary purposes on interstate carrier conveyances [21 CFR 1240.80].

Finished water is defined as water that is introduced into the distribution system of a public water system and is intended for distribution and consumption without further treatment, except as treatment necessary to maintain water quality in the distribution system [40 CFR 141.801]. Disinfection, such as an ultraviolet light disinfection system, is an example of treatment that may be used to maintain water quality after the water has been boarded. Carbon filters and particle removal filters are installed on some aircraft water systems for aesthetic purposes.

An aircraft public water system that boards water that is not of finished quality is not eligible to comply with the ADWR but is subject to all of the other applicable National Primary Drinking Water Regulations.

- Aircraft that fly international routes with two or more destinations within US jurisdiction.

Aircraft that fly international routes that make only one stop in the US solely for the purpose of unloading passengers transported from outside the US and/or loading passengers for transportation to a destination outside the US are excluded from ADWR regulations. Thus, under the ADWR, if an aircraft serves two or more US destinations before returning to an international location they are subject to the ADWR while in the US.

- Aircraft not excluded from regulation under 40 CFR 141.3.

The SDWA [Section 1411(4)] and NPDWRs [40 CFR 141.3] specifically exclude from regulation public water systems that meet all of the following criteria: 1) consist only of distribution and storage facilities and do not have any collection and treatment facilities; 2) obtain all water from, but are not owned or operated by, a public water system; 3) do not sell water to any person; and 4) are not a carrier that conveys passengers in interstate commerce.

Aircraft are carriers; therefore, if aircraft that are public water systems convey passengers in interstate commerce they are specifically identified as being subject to the drinking water regulations and cannot be excluded.

A government-owned aircraft used solely for government purposes that is not conveying passengers in interstate commerce may be excluded from SDWA and ADWR regulations if it meets the other three criteria. However, if a government-owned aircraft **does not** obtain all water from a public water system (i.e., aircraft that board water from a location that is outside of US jurisdiction), the aircraft **would not** be excluded from regulation.

As discussed in Chapter 1, it is important to note that the term “interstate commerce” does not exclusively apply to aircraft conveying passengers between two different states.

3.2 Aircraft Status as “Active” or “Inactive”

One of the aircraft water system inventory details that must be reported is whether each aircraft water system is under ‘active’ or ‘inactive’ status [40 CFR 141.806(b)(1)(ii)]. EPA requires accurate information on an aircraft water system’s status for ensuring accountability and compliance. Aircraft water systems under active status must comply with the ADWR; aircraft water systems that are inactive would not be required to comply with the ADWR during the period of inactivity.

Aircraft water systems are defined in 40 CFR 141.801 as follows:

“Aircraft Water System means an aircraft that qualifies as a public water system under the Safe Drinking Water Act and the national primary drinking water regulations. The components of an aircraft water system include the water service panel, the filler neck of the aircraft finished water storage tank, and all finished water storage tanks, piping, treatment equipment, and plumbing fixtures within the aircraft that supply water for human consumption to passengers or crew.”

Active status refers to time periods during which an aircraft water system is in normal operation flying routes in the US. EPA anticipates that this will be the default for most of the operating life of an aircraft water system. However, there may be some periods within the operating life of the aircraft where the aircraft water system may be considered inactive.

In order for an aircraft water system to be considered “inactive” for purposes of compliance determination under the ADWR, the following conditions must be met to avoid the automatic issuance of a violation by the ADWR Reporting and Compliance System:

- The aircraft water system must be identified in the ADWR Reporting and Compliance system as inactive by the end of the compliance period in which the monitoring or disinfection and flushing requirement is due to be performed;
- Passenger access to the water system must be prevented by (1) disconnecting or shutting off the water, (2) preventing the flow of water through the tap(s), (3) allowing water to be supplied only to lavatory toilets and not to any lavatory or galley tap, or (4) removing the aircraft from passenger service; and
- The missed requirement(s) must be performed prior to the aircraft water system serving water to the public.

For example, if an aircraft is having unavoidable logistic problems (such as occurred in early 2010 when aircraft in some areas were grounded due to a volcanic eruption) that causes the aircraft to miss a required routine disinfection and flushing event because the aircraft is out of service, the air carrier may identify the aircraft water system in the ADWR Reporting and Compliance System as inactive before the end of the compliance period in which the routine disinfection and flushing event should have occurred. Once the aircraft returns to service, passenger access to the water system must be prevented by disconnecting or shutting off the water, preventing the flow of water through the taps, or allowing water to be supplied only to lavatory toilets and not to any lavatory or galley tap. The aircraft water system must not provide water to the public until the missed requirement(s) has been performed.

3.3 Reporting Inventory Information

The air carrier must report its complete inventory of existing aircraft that are public water systems to EPA no later than April 19, 2011. Aircraft inventory includes but is not limited to the following:

- The unique aircraft identifier number;
- The status of aircraft water systems as active or inactive;
- The type and location of any supplemental treatment equipment installed on the water system; and
- Whether the aircraft water system can be physically disconnected or shut off, or the flow of water prevented through the tap(s).

Any changes in aircraft inventory must be reported no later than 10 days following the calendar month in which the change occurred [40 CFR 141.806(b)(1)]. This includes permanent removal of an aircraft from the inventory, or changes to the active/inactive status, treatment equipment, or ability to shut off the water or prevent the flow of water to taps. This also includes adding new aircraft with public water systems to the fleet.

Prompt notification to EPA of all inventory changes is

**Reporting Inventory
Updates and Updated
Coliform Sampling Plans or
O&M plans**

The reporting requirement for inventory updates is no later than 10 calendar days following the calendar month in which the change occurred.

This **differs** from the requirement that **new aircraft** coliform sampling plans and operations and maintenance plans must be completed and reported within the first calendar quarter of aircraft operation.

necessary to ensure violations are not incurred by aircraft that are out of service or otherwise inactive, and that new and active aircraft are in compliance with the rule.

The ADWR Reporting and Compliance System and its User Guide will include information on the inventory update reporting format and how to make inventory changes.

Details regarding the reporting of aircraft inventory information are provided in Chapter 7.

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4. Coliform Monitoring

Total coliforms are a group of closely related bacteria that, with a few exceptions, are not harmful to humans. Coliforms are abundant in the feces of warm-blooded animals, but can also be found in aquatic environments, in soil, and on vegetation. Total coliforms have long been considered an indicator that a potential pathway exists through which fecal contamination could enter a water system. The absence of total coliforms in the distribution system indicates a reduced likelihood that fecal contamination and/or waterborne pathogens are present.

The ADWR uses coliform monitoring as a means of periodically evaluating the bacterial quality of the water on board the aircraft. All aircraft public water systems are required to monitor for the presence of total coliforms and to further analyze any total coliform-positive samples for the presence of *Escherichia coli* (*E. coli*). *E. coli* bacteria are members of the total coliform group that almost always originate from the gut of warm-blooded animals. Therefore, the presence of *E. coli* indicates that the water may be contaminated by human or animal wastes. Many of the analytical methods for total coliforms simultaneously detect the presence or absence of *E. coli*. See Section 4.5.2 for more information on analytical methods.

This chapter discusses the types of coliform samples required by the ADWR; coliform sampling plan requirements; responses to coliform sample results; coliform sampling protocols; laboratory and analytical method requirements; and reporting of sample results.

4.1 Types of Coliform Samples

There are three types of coliform samples required by the ADWR: routine samples, repeat samples, and follow-up samples. Special purpose samples are also an option for air carriers, and replacement samples may be required if routine, repeat, or follow-up samples or sample results are invalidated by the laboratory or EPA.

Routine Samples

Routine samples are collected on a specified schedule, which is determined by the frequency of routine disinfection and flushing of the aircraft water system and must be described in the coliform sampling plan prepared for the aircraft. See Section 4.2.3 for more information on routine sampling frequencies. EPA intends for air carriers to schedule routine monitoring at regular intervals throughout the calendar year. Routine monitoring should be scheduled so that the amount of time between each monitoring event is approximately equal. Air carriers should not schedule routine monitoring events to take place back-to-back such that samples are taken at the end of one monitoring period and again at the beginning of the following period. Routine samples cannot be collected within 72 hours after completing routine disinfection and flushing procedures [40 CFR 141.803(b)(6)].

For routine sampling, two samples of 100 milliliters (mL) each must be collected, one from a galley and one from a lavatory tap during each monitoring period [40 CFR 141.803(b)].

If the aircraft has only one tap, two 100 mL samples must be collected from that tap. An exception to the requirement for two routine samples each monitoring period is allowed by the ADWR for aircraft water systems consisting of only one tap and a removable or portable container that is drained every day of passenger service. These systems must collect only one 100 mL routine sample from the available tap [40 CFR 141.803(b)(2)].

Aircraft with a single water system but more than two possible sampling locations may also adjust the sample locations each monitoring period if necessary to collect representative samples throughout the system. See Section 4.2.2 for more discussion on rotating sample locations.

Repeat Samples

When one or more routine samples are total coliform-positive and *E. coli*-negative, air carriers have the option to collect repeat samples instead of performing corrective disinfection and flushing of the system. Repeat samples provide information on the extent of the contamination event that resulted in the presence of coliform organisms in the routine samples. If the option to collect repeat samples is selected, three repeat samples of 100 mL each must be collected no later than 24 hours after the laboratory notifies the air carrier of the routine total coliform-positive sample results [40 CFR 141.803(c)(3)(iii)].

The three repeat samples must be collected and analyzed from three taps within the aircraft as follows: the tap that resulted in the total coliform-positive routine sample, one other lavatory tap, and one other galley tap. If less than three taps exist, then a total of three 100-mL samples must be collected and analyzed from the available taps within the aircraft water system. For example, if an aircraft has only two taps, two 100-mL samples would be collected from one of the taps, and one 100-mL sample would be collected from the other tap.

If the carrier cannot collect the repeat samples within 24 hours, no extensions to this timeframe are allowed. The air carrier must proceed with another option.

Follow-up Samples

Follow-up samples are used to indicate the effectiveness of corrective disinfection and flushing procedures. Follow-up samples consist of two samples of 100-mL each that must be collected at the same locations as the routine samples – that is, a galley tap sample and a lavatory tap sample must be collected if both are available [40 CFR 141.803(e)]. The ADWR does not specify a timeframe by which follow-up samples must be collected; however, follow-up samples must be collected prior to providing water to the public for human consumption from the aircraft water system.

Repeat Sample Twenty-four Hour Timeframe

Repeat samples must be *collected* no later than 24 hours after notification of routine sample total coliform-positive and *E. coli*-negative results.

No extensions to the twenty-four hour time frame are allowed. If repeat samples cannot be collected within 24 hours, the air carrier must proceed with another option.

Follow-up samples must be collected when:

- Corrective disinfection and flushing is performed in response to a total coliform-positive or *E. coli*-positive sample.
- Corrective disinfection and flushing is triggered by failure to: perform routine disinfection and flushing or routine coliform monitoring; failure to collect repeat samples or follow-up samples; or failure to board water from a safe watering point.

Follow-up samples may be collected after routine disinfection and flushing. See Section 4.2.6 for more information.

Special Purpose Samples

Special purpose samples are not required by the ADWR. They are samples collected by the air carrier on a voluntary basis, as needed, to indicate the quality of the onboard water. Special purpose samples may be useful indicators of water quality following repair or replacement of water system components or fixtures.

Replacement Samples

In the event a routine, repeat, or follow-up sample is invalidated by the laboratory or EPA, a replacement sample would be required to fulfill the monitoring requirements of the ADWR. The sample must be collected within the monitoring period applicable to the original sample. For this reason, EPA recommends routine monitoring be performed early enough in the monitoring period to allow notification of the need for replacement samples and their collection before the monitoring period is over.

Further details regarding invalidated samples are provided later in this chapter.

4.2 Coliform Sampling Plans

By April 19, 2011, air carriers must develop a coliform sampling plan for each aircraft in their inventory [40 CFR 141.802(b)]. The sampling plan ensures representative and meaningful samples are collected from each aircraft. A separate plan does *not* need to be developed for each aircraft, but each aircraft must be covered by a plan. Therefore, a single plan could be developed to cover each aircraft that has identical requirements and schedules. Coliform sampling plans should include the unique aircraft identifier numbers to which the plan applies.

Once completed, the air carrier must notify EPA that the coliform sampling plan has been prepared [40 CFR 141.806(a)] and the plan must be included in the aircraft water system O&M plan. Air carriers need not submit the coliform sampling plans to EPA but EPA can request a copy of the plan at any time and may also view the plan during compliance audits. When additional aircraft are added to the fleet, EPA must be notified that a sampling plan has been completed for the new aircraft by the end of the calendar quarter in which the aircraft begins operation [40 CFR 141.806(a)(2)]. New aircraft may be added to the list of aircraft covered by an existing plan, or a new plan may be developed. Air carriers must notify EPA electronically using the ADWR Reporting and Compliance System. If they are unable to report the information

electronically, they may use an alternative approach as approved by EPA [40 CFR 141.806(d)]. See Chapter 7 for more discussion regarding reporting requirements.

At a minimum, all coliform sampling plans must include the following [40 CFR 141.802(a)]:

- Coliform sample collection procedures.
- Sample tap location(s) representative of the aircraft water system.
- Frequency and number of routine samples to be collected.
- Frequency of routine disinfection and flushing as specified in the operation and maintenance plan.
- Procedures for communicating sample results to ensure that all required actions are conducted in a timely manner.

Each of these elements of a coliform sampling plan is discussed in more detail below. An example coliform sampling plan is provided in Appendix C.

4.2.1 Coliform Sample Collection Procedures

Standardized procedures ensure representative samples are collected and meaningful sample results are obtained. Proper sample collection procedures will ensure that contaminants on the surface of faucets and fixtures are not transferred to the sample container. Suggested sampling procedures are included in Section 4.4.

4.2.2 Sample Tap Location(s) Representative of the Aircraft Water System

Coliform sample locations should be those most representative of water used for human consumption by passengers and crew. As described in Chapter 1, human consumption is not limited to water used only for drinking or beverage preparation.

Because passengers may access water in the lavatory for hand washing, teeth brushing, drinking, or preparing dehydrated foods, lavatories must be sampled to represent water provided to the public. To ensure representative sample collection locations are used, the ADWR requires that routine coliform samples be collected from a lavatory tap and a galley tap during each monitoring period if the aircraft has taps in these locations. If an aircraft has a single tap, the sample(s) must be collected from that tap [40 CFR 141.803(b)]. Follow-up samples are collected consistent with routine sample collection locations.

Since there is a potential for the water temperature in hot water taps to be high enough to kill existing microorganisms in the sample, thus masking any microbiological contamination in the aircraft water system, samples should be collected from cold water taps when they are available. However, if there is only one tap available in the lavatory, then that tap must be used for the lavatory sample regardless of the temperature. Similarly, when only a hot water tap is available in the galley such as those used for making hot tea, the galley sample must be collected from the hot water tap. If a sample is collected from a hot water tap, it is suggested that the temperature of the water be recorded, if available. The temperature of the water may be useful in diagnosing

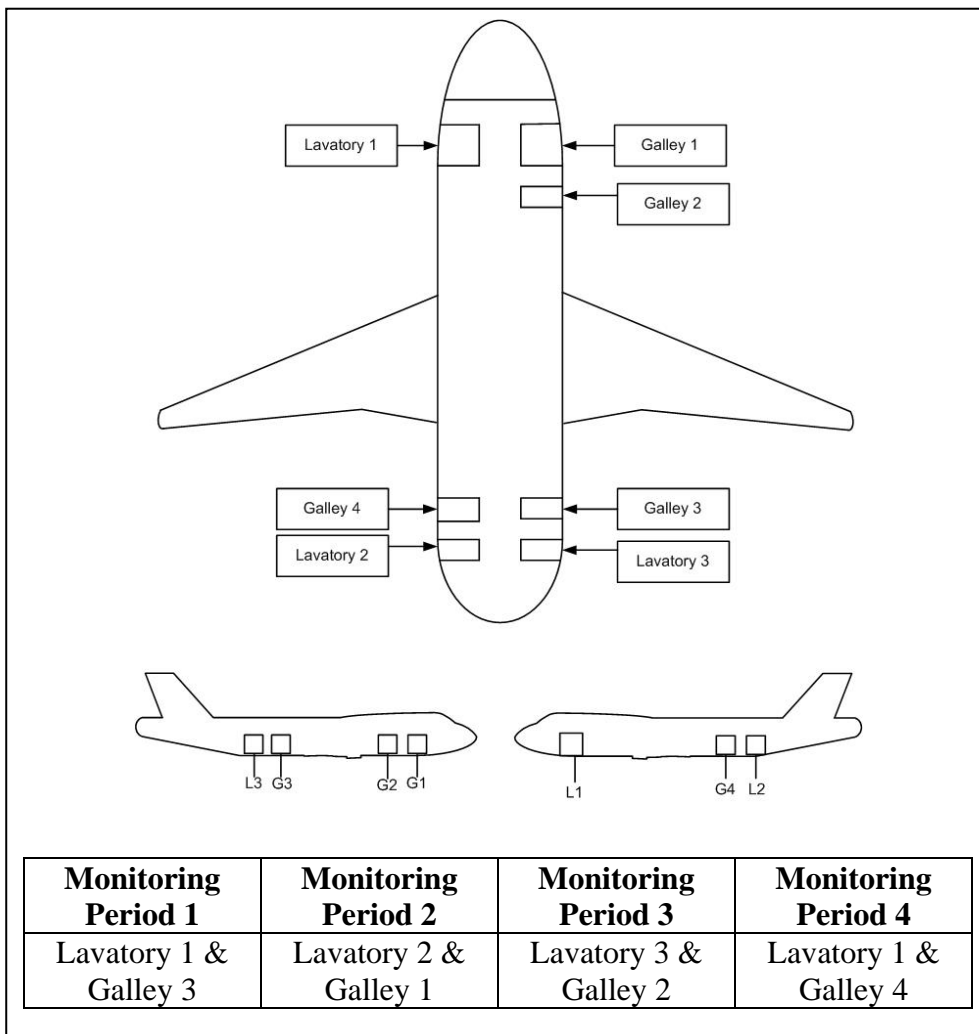
problems in the water system, but measuring the temperature of the water is not required by the ADWR.

The ADWR requires that sample collection locations be identified in the coliform sampling plan [40 CFR 141.802(a)(2)]. Identifying sample taps as to whether they are fore or aft, lavatory or galley, and other details helps identify the specific location from which a sample was collected. When this location information is entered on the coliform sample form submitted to the laboratory, the sample results will also be reported with the location. This information is useful for follow-up investigations if an issue arises. For example, air carriers have noted to EPA that being able to identify the specific sample location from which coliform-positive samples were collected helped detect problematic faucets as well as cleaning issues. This information may have helped to identify and resolve persistent coliform-positive sample problems.

Air carriers have flexibility to consider a variety of approaches in developing sampling procedures to collect representative samples, including:

- If more than one galley and lavatory tap are available, rotate the sample collection locations each monitoring period on a scheduled basis so that the entire aircraft water system is sampled periodically. For example, Exhibit 4.1 illustrates an aircraft with 3 lavatories and 4 galleys. If the aircraft is on quarterly coliform monitoring, a sample from a lavatory and a galley on opposite ends of the aircraft may be appropriate during each monitoring period. The table in Exhibit 4.1 provides an example of how the galleys and lavatories on this aircraft might be paired for each of the four quarters of sampling. Note that a different lavatory and galley is sampled each monitoring period so they are all routinely sampled.
- If more than one galley and lavatory tap are available, select sample collection locations randomly to obtain representative samples over time.
- If an aircraft has more than one water tank and plumbing system and the systems are not interconnected, alternate the sample locations between the discrete systems.

Exhibit 4.1 Example Sample Locations



4.2.3 Frequency and Number of Routine Coliform Samples to Be Collected

Including the required frequency and number of samples to be collected in the coliform sampling plan helps ensure personnel responsible for this task will collect the correct number of samples during the required monitoring period. The number of routine coliform samples that must be collected is discussed in Section 4.1. The frequency of sample collection can be either monthly, quarterly, semi-annually, or annually. It is determined by the routine disinfection and flushing frequency recommended by the manufacturer of the aircraft water system. If the manufacturer does not recommend a frequency, the air carrier must choose a frequency and a corresponding routine coliform sampling frequency as specified in the ADWR [40 CFR 141.804(b)(2)(iii)] and displayed in Exhibit 4.2. Exhibit 4.2 shows monitoring frequencies that correspond to a given disinfection and flushing frequency [40 CFR 141.803(b)(3)]. Additional voluntary coliform sampling is encouraged by EPA.

Any changes to the frequency of required coliform sampling must be reported to EPA and must be incorporated into the sampling plan and the aircraft water system O&M plan [40 CFR 141.806(b)(6)] as discussed in Chapter 7.

Exhibit 4.2 Coliform Sampling Frequencies Based on Disinfection and Flushing Frequencies

Minimum Routine Disinfection and Flushing Frequency	Minimum Routine Coliform Sampling Frequency
At least 4 times per year = At least once within every three-month period (quarterly).	At least 1 time per year = At least once within every twelve-month period (annually)
At least 3 times per year = At least once within every four-month period.	At least 2 times per year = At least once within every six-month period (semi-annually)
At least 2 times per year = At least once within every six-month period (semi-annually)	At least 4 times per year = At least once within every three-month period (quarterly)
At least 1 time per year or less = At least once within every twelve month period (annually) or less.	At least 12 times per year = At least once every month (monthly)

4.2.4 Frequency of Routine Disinfection and Flushing As Specified In the Operation and Maintenance Plan

The frequency of routine disinfection and flushing of the aircraft water system determines the minimum frequency for routine coliform sample collection. Including the disinfection and flushing frequency in the coliform sampling plan helps ensure the proper frequencies are followed and that both activities are performed. Air carriers may conduct disinfection and flushing more frequently, but not less frequently, than the manufacturer recommends. However, it is the responsibility of the air carrier to ensure that the frequency would not result in damage to the aircraft water system’s components.

4.2.5 Procedures for Communicating Sample Results to Ensure All Required Actions Are Conducted in a Timely Manner

The first step in the communications process is the notice the laboratory performing the coliform analyses provides to the air carrier regarding the sample results. Notification of both positive and negative sample results in a timely manner is critical to ensure any required action is promptly implemented. Required actions may entail repeat or replacement sampling, restricting public access including notification of passengers and/or crew, corrective disinfection and flushing, follow-up sampling, or returning to unrestricted access of the water. EPA suggests that

communications procedures include specific contact personnel names, phone numbers, and back-up contact information.

4.2.6 Scheduling Coliform Sampling to Minimize Service Disruption

Each aircraft water system must be routinely monitored for total coliform at the frequency specified in the coliform sampling plan for that aircraft. During each monitoring period – which may be once every monthly period, once every three-month period (quarterly), once every six-month period (semi-annually), or once every twelve-month period (annually) – a set of two routine samples must be collected unless the aircraft qualifies for one routine sample because it has only a single removable/portable tank-based system with a single tap [40 CFR 141.803(b)]. In order to provide meaningful results, routine coliform sampling is intended to be representative of the general conditions of the aircraft water system. That is, they should represent water provided to passengers and crew on a typical flight.

To ensure that routine sample results are not inadvertently influenced by sampling too soon after a routine disinfection and flushing event, routine coliform samples must not be collected within 72 hours *after* completing routine disinfection and flushing procedures [40 CFR 141.803(b)(6)]. They can, however, be collected immediately prior to a routine disinfection and flushing event. This option is provided in the ADWR to minimize unscheduled flight interruptions for sample collection.

If *any* routine, repeat, or follow-up sample is total coliform-positive or *E. coli*-positive, the entire aircraft water system is subject to the applicable corrective actions.

This is true even if samples were collected from distinct piping and storage systems on a single aircraft.

Flight disruptions may be minimized further in the following situation.

If either of the routine samples that were collected immediately prior to the routine disinfection and flushing procedure test positive for total coliform or total coliform and *E. coli*, as long as the air carrier collected a set of follow-up samples after the routine disinfection and flushing procedure, then the routine disinfection and flushing event would also serve as a corrective action disinfection and flushing event. However, if the routine sample was *E. coli*-positive, a complete set of follow-up sample results must be total coliform-negative before the air carrier provides water for human consumption from the aircraft water system and returns to the routine monitoring frequency for coliform as specified in 40 CFR 141.802. If the routine sample was total coliform-positive but *E. coli*-negative, the follow-up samples need only be collected before the aircraft water system provides water to the public.

Tip: Minimizing Flight Disruptions from Coliform Sampling and Disinfection and Flushing Events

Routine coliform samples must not be collected within 72 hours after completing routine disinfection and flushing procedures [40 CFR 141.803(b)(6)]. However, there is no restriction on how much time must elapse after routine samples are collected and before disinfection and flushing occurs. The ADWR allows for the performance of both of these tasks while an aircraft is out of service if the specified routine coliform monitoring frequency and routine disinfection and flushing frequency will be met. Many of the routine disinfection and flushing frequency options will accommodate this arrangement.

For example, when an aircraft is taken out of service to perform its routine disinfection and flushing procedure and the aircraft is also due for collection of its routine coliform samples, the air carrier may collect the routine coliform samples prior to initiating the routine disinfection and flushing procedure. Combining these two activities and performing them while the aircraft is already out of service for other regularly scheduled maintenance may help to reduce associated disruption to flight service. Another possible benefit is that the sample collector does not have to wait for the aircraft to arrive if it is already in the hangar for service. The disinfection and flushing procedure can begin before the results of the routine coliform samples are known. In this case, because the disinfection and flushing procedure has not yet occurred when the coliform samples are collected, the quality of the water in the routine samples will be representative of the water that had been served to passengers and crew. If this practice is implemented, the samples should be collected as soon as possible after taking the aircraft out of service to avoid water quality deterioration that may be caused by stagnant water.

Furthermore, if the air carrier, as a precaution, also collects a set of follow-up samples after the routine disinfection and flushing but before the aircraft serves water to the public and the routine samples test positive, then the routine disinfection and flushing may serve as a corrective action disinfection and flushing. However, if the routine sample was *E. coli*-positive, a complete set of follow-up sample results must be total coliform-negative before the air carrier provides water for human consumption from the aircraft water system and returns to the routine monitoring frequency for coliform as specified in 40 CFR 141.802. If the routine sample was total coliform-positive but *E. coli*-negative, the follow-up samples need only be collected before the aircraft water system provides water to the public.

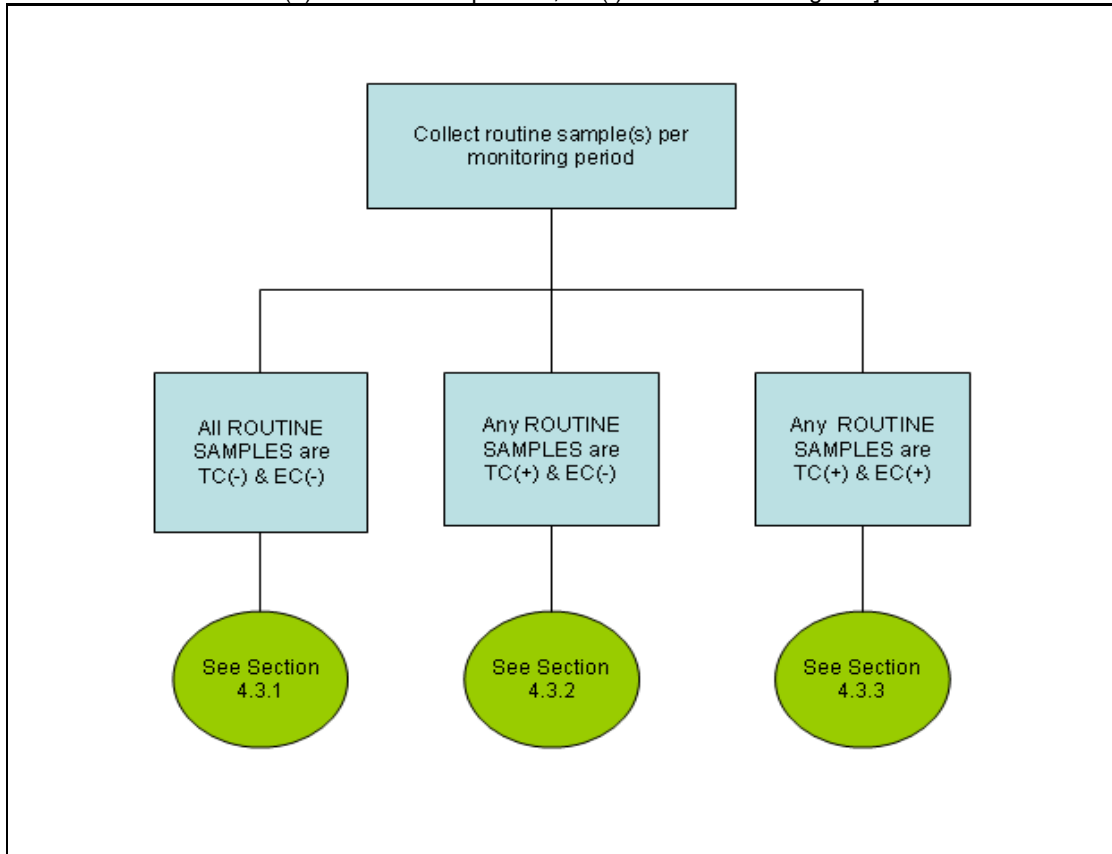
4.3 Responding to Coliform Test Results

If coliform bacteria are detected in any sample collected from an aircraft, the air carrier must take follow-up action but has some discretion regarding the activities to be performed [40 CFR 141.803(c)(3)]. However, due to the possible imminent public health threat if *E. coli* is present in any sample, options for follow-up activities and their timeframes are very limited [40 CFR 141.803(c)(2)].

Exhibit 4.3 provides a general overview of possible coliform sample result scenarios and refers to additional exhibits presented in this section, which provide required situation-specific actions based on those sample results. The details of the required follow-up activities presented in this section are found in 40 CFR 141.803.

Exhibit 4.3 Overview of Possible Coliform Sample Result Scenarios

[TC(+) means total coliform-positive; TC(-) means total coliform-negative;
EC(+) means *E. coli*-positive; EC(-) means *E. coli*-negative]

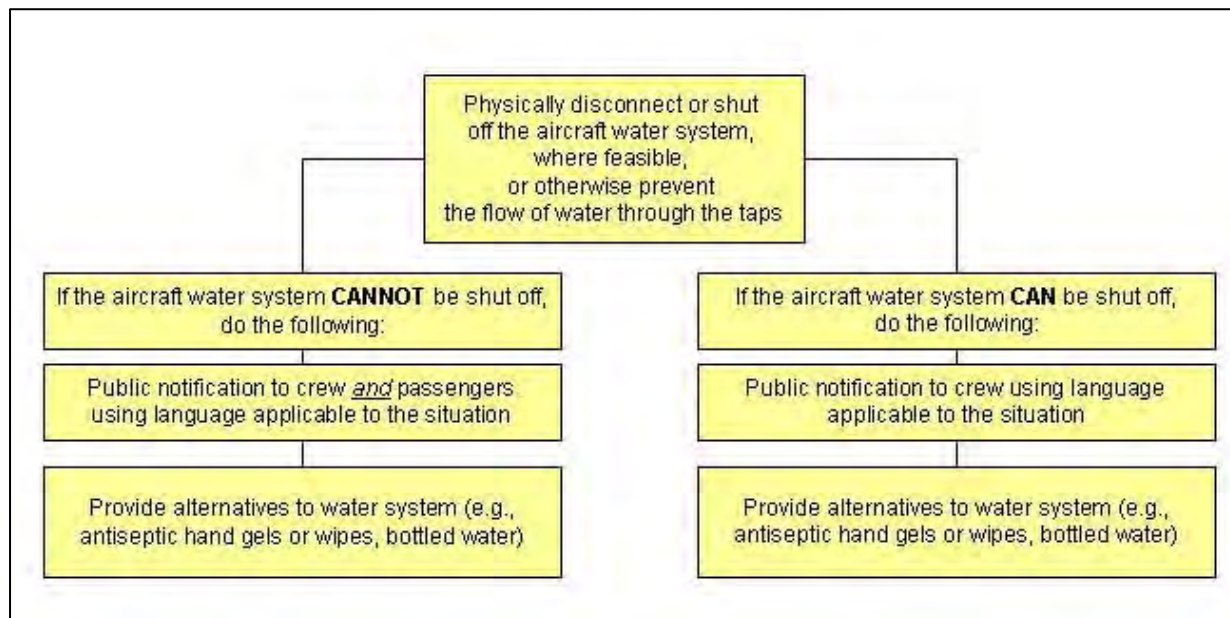


Restricting Public Access

Some of the response action requirements in the ADWR include the restriction of public access to the water system to prevent passengers and crew from accessing the water [40 CFR 141.803(d)]. Restricting public access includes three key items: physically disconnecting or shutting off the aircraft water system, or otherwise preventing flow of water through the taps where feasible; providing public notification as applicable; and providing alternatives to water such as bottled water and antiseptic hand gels to enable passengers and crew to maintain sanitary conditions. The components of restricting public access are presented in Exhibit 4.4.

There may be operational constraints to physically disconnecting the water system. For example, if water to the taps cannot be shut off without also shutting off water to the toilets, then the air carrier may determine that physically disconnecting the water system is not feasible. Furthermore, EPA interprets the ADWR requirement “otherwise preventing the flow of water through the taps” to be accomplished through means similar to physical disconnection. As a result, if the “prevention” is easily removed, it would not meet the terms of the ADWR because it is not similar in effect to physical disconnection and is not an effective means of “preventing the flow of water through the taps.”

Exhibit 4.4 Restricting Public Access



Air carriers must give public notice for each aircraft as part of restricting access to the water system.

- If passenger access to the water system is physically prevented through disconnecting or shutting off the water or the flow of water prevented through the tap(s), or if water is supplied only to lavatory toilets and not to any lavatory or galley taps, then the ADWR requires notice that is directed at the crew. Notice to the crew may be conveyed as part of a mandatory crew briefing or prominently displayed in the galley.
- If the aircraft water system cannot be physically disconnected or the flow of water to the taps otherwise prevented, prominent notice must be displayed in the galley for the crew and prominently displayed in the lavatory for the passengers.

Public notification requirements are discussed in detail in Chapter 6 [40 CFR 141.805(c)].

Whether the water system can be physically disconnected or not, alternatives to water from the aircraft water system, such as bottled water for drinking and coffee or tea preparation, are required if such services are provided. In addition, antiseptic hand gels or wipes and other feasible measures are necessary to help maintain sanitary conditions for passengers and crew. EPA also recommends that if public access to the water is restricted, all paper cups or paper cones be removed from the lavatories and faucet areas to reinforce the message that the water should not be consumed.

Bottled Water

The requirement for the use of bottled water, if water use is restricted and beverages are provided, is consistent with the FDA requirements of 21 CFR 333. This does not require that bottled water be provided, but it does require that bottled water be used to prepare beverages under these circumstances.

4.3.1 Total Coliform-Negative Routine Sample Result

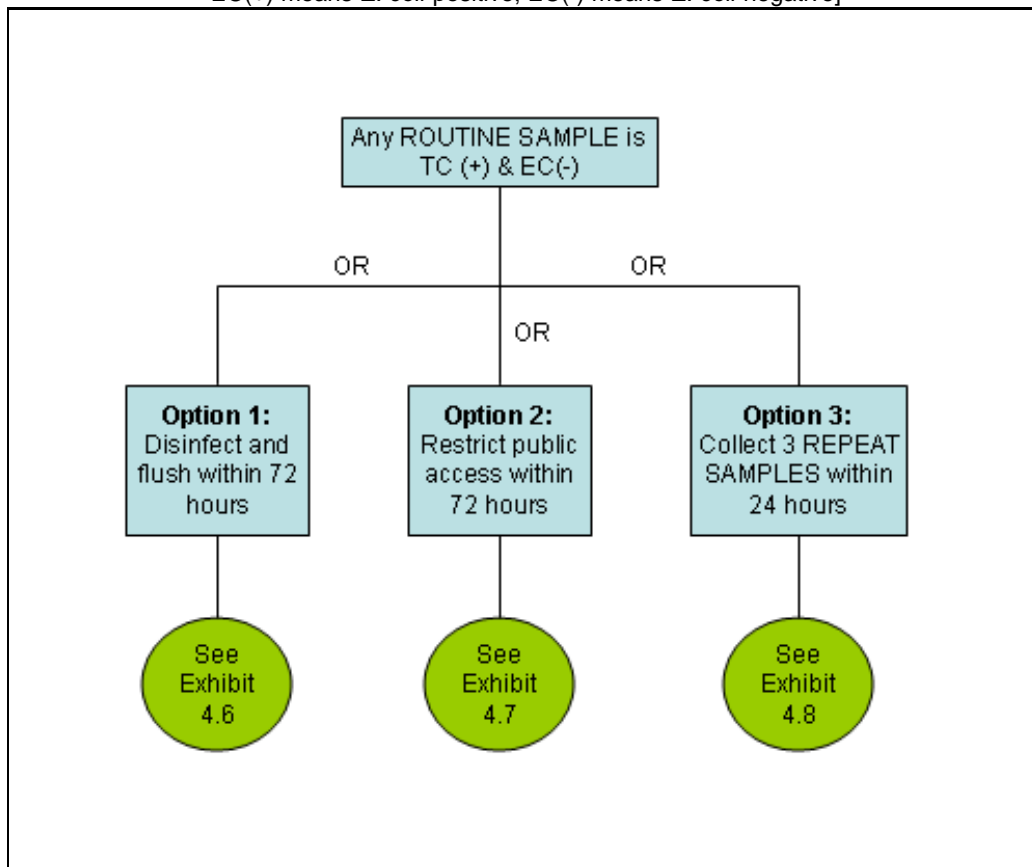
If total coliform bacteria are not detected in any routine sample in a monitoring period, the aircraft must continue collecting routine samples for total coliform analysis at the frequency specified in the coliform sampling plan [40 CFR 141.803(c)(1)]. A sample must be total coliform-positive before it is required to be analyzed for *E. coli*. Therefore, a sample that is total coliform-negative is also *E. coli*-negative and the aircraft should continue conducting routine disinfection and flushing.

4.3.2 Total Coliform-Positive and *E. coli*-Negative Routine Sample Result

A routine coliform sample result that is total coliform-positive but is *E. coli*-negative indicates the aircraft water system may be vulnerable to contamination by pathogens (e.g., viruses, bacteria, or parasitic protozoa from fecal contamination) that can cause disease. If any routine sample is total coliform-positive and *E. coli*-negative, the aircraft has three options: 1) disinfect and flush the water system within 72 hours; 2) disinfect and flush on an alternative schedule if public access to the water system is restricted within 72 hours; or 3) collect repeat samples within 24 hours and take further action, if necessary [40 CFR 141.803(c)(3)]. These three options are illustrated in Exhibit 4.5 and described in more detail below.

Exhibit 4.5 Overview of Options for Response to Total Coliform-Positive (*E. coli*-Negative) Sample Results

[TC(+) means total coliform-positive; TC(-) means total coliform-negative;
EC(+) means *E. coli*-positive; EC(-) means *E. coli*-negative]



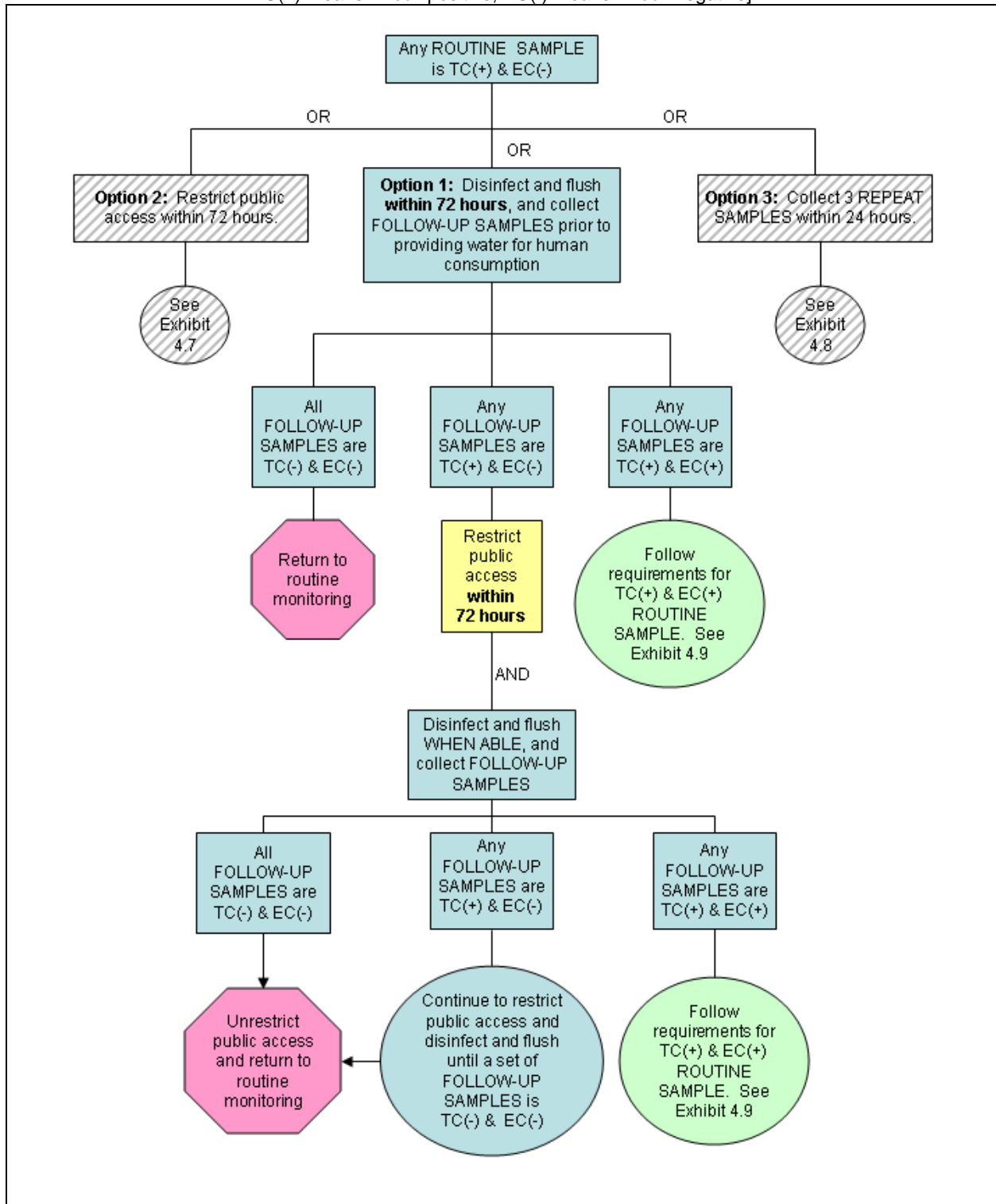
Option 1: Disinfect and Flush Within 72 Hours and Collect Follow-up Samples

If an aircraft chooses Option 1 in response to a routine total coliform-positive and *E. coli*-negative sample result, they must disinfect and flush the aircraft water system within 72 hours of being notified of the positive result and collect follow-up samples. After the follow-up samples are collected, water from the aircraft water system may be provided for human consumption (see Exhibit 4.6).

- If all of the follow-up sample results are total coliform-negative, the air carrier may return to routine coliform monitoring and continue serving water to the public. Public notification of the situation is not required if this option for corrective action is selected and successfully implemented.
- If either of the follow-up samples are total coliform-positive but *E. coli*-negative, the air carrier must restrict public access **within 72 hours** after receiving the sample results and disinfect and flush the water system again, with the process continuing until a complete set of follow-up samples is total coliform-negative. If the aircraft is returned to service, unrestricted access to the water system cannot be provided until a set of follow-up samples is total coliform-negative.
- If any of the follow-up samples are *E. coli*-positive, the air carrier must restrict public access **within 24 hours** after receiving the sample results and disinfect and flush the water system when able and collect follow-up samples. Restricted access must be maintained until a complete set of follow-up samples is coliform-negative. If the aircraft water system cannot be shut off or physically disconnected, or the flow of water otherwise prevented through the taps, then the corrective disinfection and flushing with follow-up sampling must be performed **within 72 hours** and restricted access must be maintained until a complete set of follow-up samples is coliform-negative.

**Exhibit 4.6 Total Coliform-Positive and *E. coli*-Negative Routine Samples:
Option 1: Disinfection and Flushing Details**

[TC(+) means total coliform-positive; TC(-) means total coliform-negative;
EC(+) means *E. coli*-positive; EC(-) means *E. coli*-negative]



Option 2: Restricting Public Access Within 72 Hours and Disinfecting and Flushing When Able

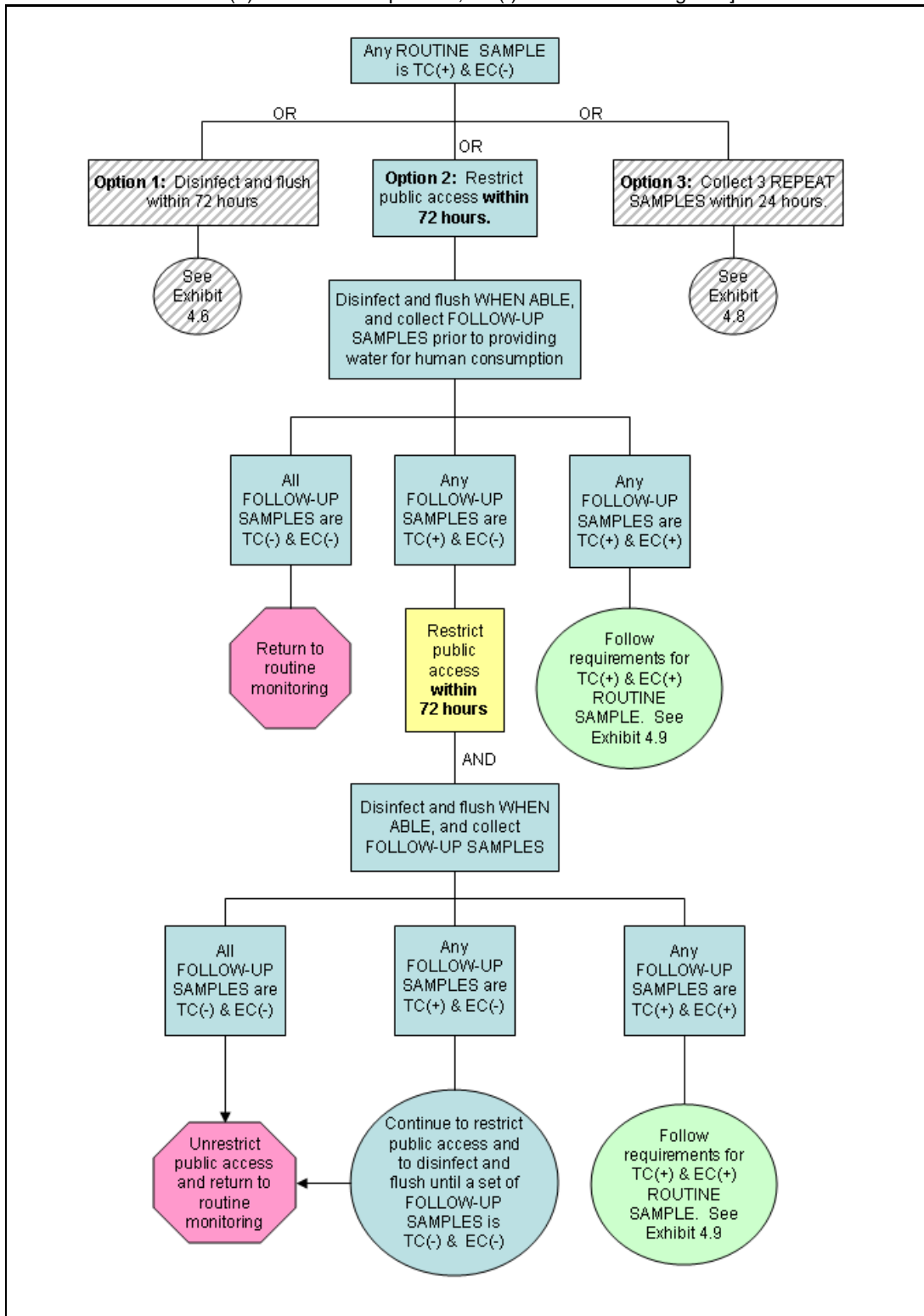
If an air carrier chooses Option 2 in response to a routine total coliform-positive and *E. coli*-negative sample result, they must restrict public access to the aircraft water system within 72 hours after the laboratory notifies them of the positive test result, provide public notice appropriately (see Chapter 6), and disinfect and flush the water system on an alternative schedule (see Exhibit 4.7). Restricting public access enables the air carrier to delay the corrective disinfection and flushing procedure and follow-up sampling until the activity can be scheduled at a more convenient time.

After disinfection and flushing and follow-up samples are collected, the aircraft water system can be unrestricted and water can be provided to passengers and crew.

- If all of the follow-up sample results are total coliform-negative, the system may return to routine coliform monitoring and continue serving water to the public.
- If either of the follow-up samples are total coliform-positive and *E. coli*-negative, the air carrier must restrict public access **within 72 hours** after receiving the sample results and disinfect and flush the water system again, with the process continuing until a complete set of follow-up samples is total coliform-negative. If the aircraft is returned to service, unrestricted access to the water system cannot be provided until a set of follow-up samples is total coliform-negative.
- If any of the follow-up samples are *E. coli*-positive, the air carrier must restrict public access **within 24 hours** after receiving the sample results and disinfect and flush the water system when able and collect follow-up samples. Restricted access must be maintained until a complete set of follow-up samples is coliform-negative. If the aircraft water system cannot be shut off or physically disconnected, or the flow of water otherwise prevented through the taps, then the corrective disinfection and flushing with follow-up sampling must be performed **within 72 hours** and restricted access must be maintained until a complete set of follow-up samples is coliform-negative.

Exhibit 4.7 Total Coliform-Positive and *E. coli*-Negative Routine Samples: Option 2: Restricting Public Access

[TC(+) means total coliform-positive; TC(-) means total coliform-negative;
EC(+) means *E. coli*-positive; EC(-) means *E. coli*-negative]



Option 3: Collecting Repeat Samples Within 24 Hours

If an air carrier chooses Option 3 in response to a routine total coliform-positive and *E. coli*-negative sample result, they must collect three repeat samples within 24 hours of learning of the result. One repeat sample must be collected from the same tap as the total coliform-positive routine sample, one sample must be collected from another galley tap, and the third sample must be collected from another lavatory tap, if these types of taps are available. If less than three taps are available, then the samples must be collected from the available taps within the aircraft water system. It may be necessary for more than one sample to be collected from the same tap. If samples cannot be collected within 24 hours, the air carrier must choose Option 1 or 2.

Exhibit 4.8 provides an illustration of actions that are required based on the analytical results of the repeat samples.

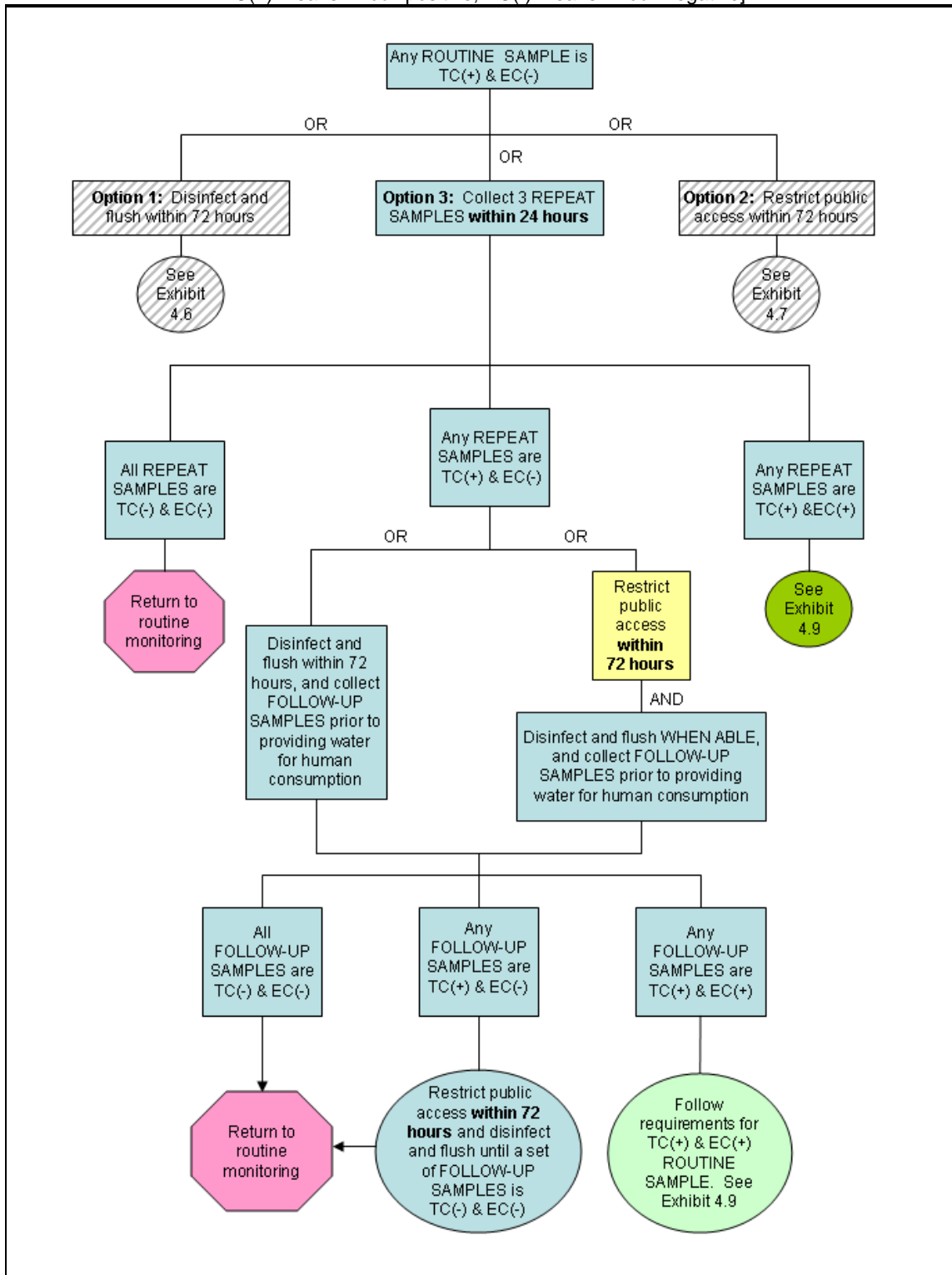
There are three possible analytical results and respective follow-up actions for repeat samples:

- If *all* of the repeat samples are total coliform-negative the aircraft returns to the routine monitoring frequency and need not restrict access to the water system or conduct corrective disinfection and flushing.
- If *any* of the three repeat samples indicate the presence of total coliforms *but* not the presence of *E. coli*, the air carrier can choose one of the following response options:
 - Conduct disinfecting and flushing of the aircraft water system **within 72 hours** of being notified of the positive result and collect follow-up samples. After the follow-up samples are collected, water from the aircraft water system may be provided for human consumption.
 - If all of the follow-up sample results are total coliform-negative, the system may return to routine coliform monitoring and continue serving water to the public.
 - If either of the follow-up samples are total coliform-positive, the air carrier must restrict public access **within 72 hours** and disinfect and flush the water system again, with the process continuing until a complete set of follow-up samples is total coliform-negative. If the aircraft is returned to service, unrestricted access to the water system cannot be provided until a set of follow-up samples is total coliform-negative.
 - If any of the follow-up samples are *E. coli*-positive, the air carrier must restrict public access **within 24 hours** and disinfect and flush the water system when able and collect follow-up samples. Restricted access must be maintained until a complete set of follow-up samples is coliform-negative. If the aircraft water system cannot be shut off or physically disconnected, or the flow of water otherwise prevented through the taps, then the corrective disinfection and flushing with follow-up sampling must be performed **within 72 hours** and restricted access must be maintained until a complete set of follow-up samples is coliform-negative.

- Restrict public access to the aircraft water system **within 72 hours** after the laboratory notifies them of the positive test result, provide public notice appropriately, and disinfect and flush the water system on an alternative schedule. After the follow-up samples are collected, water from the aircraft water system may be provided for human consumption.
 - If all of the follow-up sample results are total coliform-negative, the system may return to routine coliform monitoring and continue serving water to the public.
 - If either of the follow-up samples are total coliform-positive, the air carrier must restrict public access **within 72 hours** and disinfect and flush the water system again, with the process continuing until a complete set of follow-up samples is total coliform-negative. If the aircraft is returned to service, unrestricted access to the water system cannot be provided until a set of follow-up samples is total coliform-negative.
 - If any of the follow-up samples are *E. coli*-positive, the air carrier must restrict public access **within 24 hours** and disinfect and flush the water system when able and collect follow-up samples. Restricted access must be maintained until a complete set of follow-up samples is coliform-negative. If the aircraft water system cannot be shut off or physically disconnected, or the flow of water otherwise prevented through the taps, then the corrective disinfection and flushing with follow-up sampling must be performed **within 72 hours** and restricted access must be maintained until a complete set of follow-up samples is coliform-negative.
- If any of the repeat samples are *E. coli*-positive, the aircraft must meet the requirements for *E. coli*-positive routine or repeat samples described in Section 4.3.3.

**Exhibit 4.8 Total Coliform-Positive and *E. coli*-Negative Routine Samples:
Option 3: Repeat Sample Details**

[TC(+) means total coliform-positive; TC(-) means total coliform-negative;
EC(+) means *E. coli*-positive; EC(-) means *E. coli*-negative]



4.3.3 *E. coli*-Positive Routine or Repeat Sample Result Options

The presence of *E. coli* in a water sample indicates that the water may be contaminated with human or animal fecal waste. This is a serious situation and requires an immediate response (within 24 hours of notification of the sample result) by the air carrier.

If *E. coli* is present in any routine or repeat sample, the air carrier must restrict public access to the water system, including providing public notice, **within 24 hours** of learning of the test result. The air carrier must then conduct corrective disinfection and flushing when able and collect follow-up samples. Restricted access must be maintained until a complete set of follow-up samples is coliform-negative [40 CFR 141.803(c)(2)].

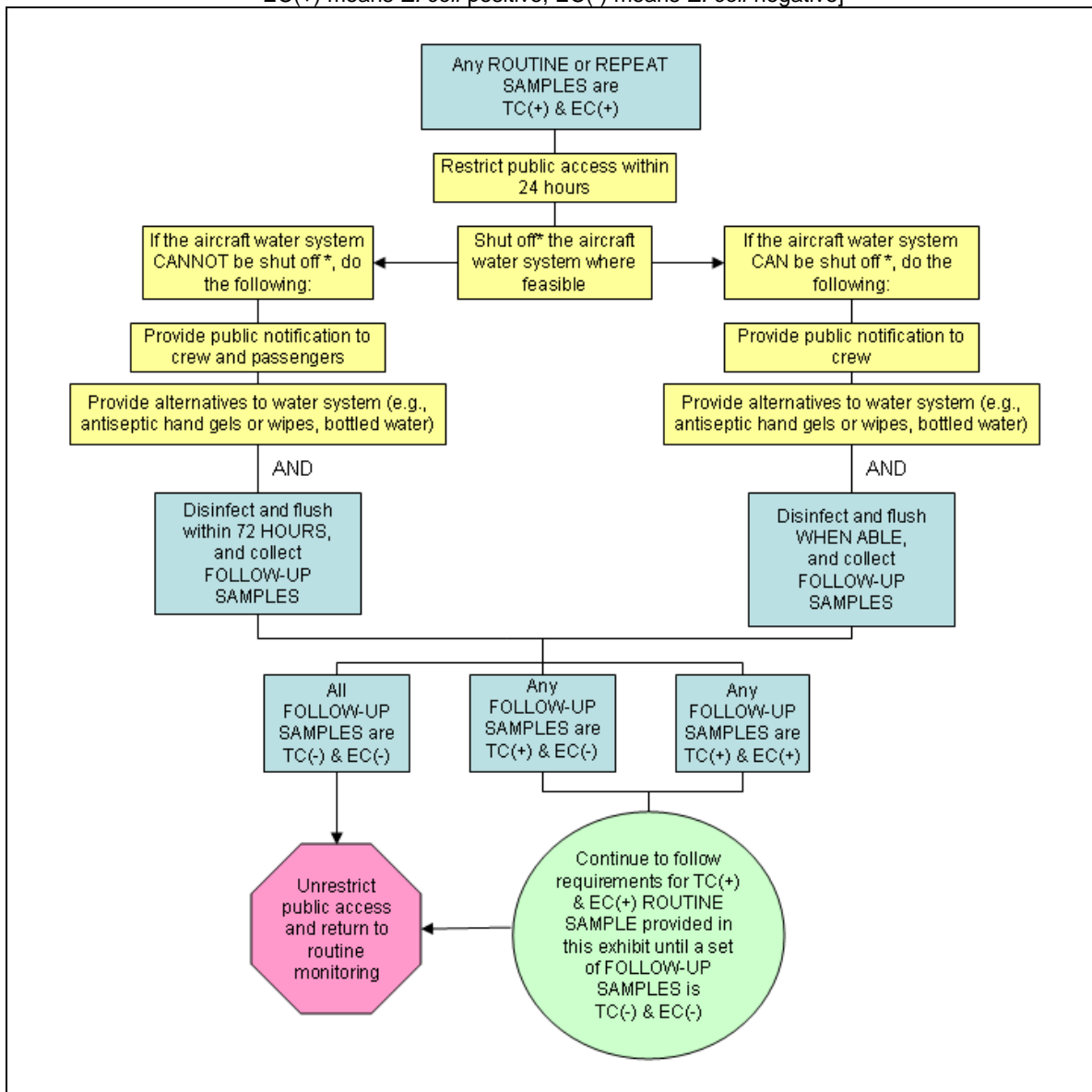
If the aircraft water system cannot be shut off or physically disconnected, or the flow of water otherwise prevented through the taps, then the air carrier must provide public notice **within 24 hours and conduct corrective disinfection and flushing no later than 72 hours after the laboratory notifies the air carrier of the *E. coli*-positive result and collect follow-up samples.** Restricted access must be maintained until a complete set of follow-up samples is coliform-negative.

Exhibit 4.9 presents the required actions based on *E. coli*-positive routine samples or *E. coli*-positive repeat samples that were collected in response to a total coliform-positive and *E. coli*-negative routine sample. Repeat sampling is not an option when any sample is *E. coli*-positive.

If passengers or crew are able to access the water, the air carrier must provide public notice to the passengers and crew **within 24 hours and disinfect and flush the aircraft water system no later than 72 hours** after the laboratory notifies the air carrier of the *E. coli*-positive result **and collect follow-up samples.**

Exhibit 4.9 *E. coli*-Positive Routine or Repeat Samples: Required Activities

[TC(+) means total coliform-positive; TC(-) means total coliform-negative;
EC(+) means *E. coli*-positive; EC(-) means *E. coli*-negative]



*Includes preventing the flow of water through the taps.

There are other violations or situations that require the corrective actions shown in Exhibit 4.9. Examples of other situations include:

- Failing to collect follow-up samples after corrective disinfection and flushing that was triggered by an *E. coli*-positive routine or repeat sample;
- Becoming aware of an *E. coli*-positive event that resulted from failing to board water from a safe watering point; and
- Boarding water that is otherwise determined to be unsafe due to non-compliance with the procedures for boarding water that are included in the aircraft O&M plan.

4.4 Suggested Sampling Protocol

The following is a suggested sampling protocol that could be used for the collection of routine, repeat, or follow-up samples. Critical steps in the sample collection procedure include ensuring the sample is representative of water provided to passengers and crew (including any supplemental treatment), the sample collection bottle does not become contaminated, and the faucet or fixture to be sampled will not contribute contamination from the external surface.

4.4.1 Materials and Preparation for Sampling

The laboratory that will perform the analyses should be contacted in advance of the planned sampling collection date. In advance, it should be determined if the laboratory will provide sample bottles, and if so, how many will be needed. Additionally, it should be determined whether the laboratory will provide a return shipping cooler and ice packs (shipment of ADWR samples on ice to obtain a shipping temperature of 10 degrees Celsius or less without freezing the sample is recommended). Sufficient time should be allowed to obtain materials and to agree on a sample submittal date.

All materials should be on-hand and ready for use at least 48 hours prior to sampling. (Note that a separate cooler or holding container for each day/location of sample collection will be needed if samples are not hand-delivered to the laboratory each day.) The analysis of the samples by the laboratory must begin within 30 hours of sample collection or the sample will be invalid and a replacement sample will be required [40 CFR 141.803(a)(4)].

Below is a list of suggested materials needed for sampling.

- 1) Sample collection sheet
- 2) Laboratory chain of custody form
- 3) Indelible pen
- 4) Sample bottles (150-mL sterile plastic with non-toxic cap and dechlorinating agent)
- 5) Cooler with ice packs (optional) (contained-ice packs are preferable to ice cubes)
- 6) Rubber, latex, or non-latex exam gloves

When collecting a sample, label the bottle (not the lid) prior to sample collection with the following information:

- Sample ID correlating to the sample tap location (e.g., lav or gal and aft or fore) and other information listed on the laboratory chain of custody form and data sheet
- Date and time of collection
- Analyses requested (e.g., total coliform)
- Sampler's initials

For each aircraft, total coliform samples must be collected from a galley tap and a lavatory tap unless there is only one tap. Both lavatory and galley samples should be collected from a cold water tap if possible. If the only sampling point in the lavatory or galley is a hot water tap or the

coffee maker, collect the sample at that location and indicate the sampling location on the sample collection sheet [40 CFR 141.803(b)].

During sampling, exam gloves should be used when handling samples to minimize sample contamination and exposure to sample preservatives. Bottles should be kept closed until ready to be filled.

4.4.2 Sample Collection

The following steps are recommended for routine, repeat, and post-disinfection follow-up sample collection. The term “tap” in this procedure means water tap, faucet, drinking fountain, or other fixture which provides water for human consumption to passengers or crew. Do not sample from leaking taps or taps which allow water to run down the outside of the fixture.

- 1) Put on gloves.
- 2) Open tap and allow water to run for at least 30 seconds to flush tap.
- 3) Reduce water flow so the stream is not greater than ¼ inch in diameter, or the width of a pencil. Check for steady flow; do not change the water flow once the sample collection has begun, as this could dislodge microbial growth.
- 4) Remove cap of total coliform sample bottle.
- 5) Be careful not to contaminate the bottle by touching the interior of the cap or the inside of the sample container. Do not place cap on counter (which may be contaminated) or in your pocket to prevent container contamination.
- 6) Place bottle under water stream allowing for an air gap between top of the bottle and the water tap. Hold the bottle in one hand and the cap in the other. Fill the bottle to the 100 mL fill line. If the bottle becomes overfilled, do not pour out the sample (this may lead to sample contamination); instead send it to the laboratory as is.
- 7) Do not rinse the bottle either before or after sample collection.
- 8) Replace cap and tighten. Turn off water.
- 9) Ensure that sample ID matches that recorded on the sample collection sheet.
- 10) Place bottles into Ziploc® or similar bag. Place bag in cooler or other transport container (packing the sample on ice (NOT dry ice) is recommended, but optional)
- 11) Complete chain of custody sheet provided by laboratory. Ensure that sample ID matches that on the label and data sheet. If chain of custody sheet is not provided in duplicate, photocopy it for your records.
- 12) Sign and date the following statement on the sample collection sheet. If there was any deviation from protocol, note this at the bottom of sample collection sheet.

I certify that all samples were collected in accordance with the protocol entitled “Protocol for Sampling Drinking Water on Aircraft.”

Signature

Date

4.5 Certified Laboratories and Analytical Methods

4.5.1 Certified Laboratories

The ADWR specifies that samples will be considered valid only if they are analyzed by a laboratory certified by a state or by EPA [40 CFR 141.803(a)(6)].

EPA's laboratory certification manual, Manual for the Certification of Laboratories Analyzing Drinking Water: Criteria and Procedures Quality Assurance, 5th Edition (EPA 815-R-05-004, January 2005) indicates that EPA's Office of Ground Water and Drinking Water (OGWDW) will accept National Environmental Laboratory Accreditation Program (NELAP) accreditation as equivalent to Drinking Water certification. There are some international laboratories that are accredited by the NELAP program (See <http://www.nelac-institute.org/accred-labs.php> or <http://www.nelac-institute.org/membership.php>).

The following link provides an explanation of the NELAP accreditation program:
<http://www.nelac-institute.org/accred-bodies.php>

4.5.2 Analytical Methods

The ADWR requires that a certified laboratory be used for all coliform sample analyses, and also requires a maximum holding time between sample collection and analysis for coliform samples of 30 hours.

EPA-approved analytical methodologies must be used for the analysis of total coliform bacteria and *E. coli*, as listed in 40 CFR 141.21(f)(3) and 141.21(f)(6) [40 CFR 141.803(a)(3)]. The current list of approved analytical methods for total coliforms and *E. coli* is also provided on EPA's web site at http://www.epa.gov/safewater/methods/pdfs/methods/methods_tcr.pdf.

Each sample need only be analyzed for the presence or absence of the organisms; enumeration of the bacteria present is not necessary.

Discuss with the laboratory the test methods it is certified to perform and the anticipated timeframe for reporting results, as well as its procedure for reporting results. Because of the availability of overnight shipping, the preferred laboratory may not be the one closest to the sampling location.

4.5.3 Sample Invalidation

EPA recognizes that in rare circumstances a total coliform-positive or *E. coli*-positive sample result may not reflect the water quality in the aircraft water system. The ADWR references the sample invalidation provisions of the Total Coliform Rule (TCR) as found in 40 CFR 141.21(c)(1)(i), (ii), and (iii) for invalidation by EPA, as the State, and in 40 CFR 141.21(c)(2) for invalidation by the certified laboratory.

These provisions address three scenarios when EPA may invalidate a total coliform-positive sample.

The first scenario is if the laboratory establishes that improper sample analysis caused the total coliform-positive result. If it is a routine sample that is invalidated, then a replacement routine sample must be collected and analyzed before the end of the monitoring period in order to avoid a violation for failure to collect the required routine sample(s). If it is a repeat sample that is invalidated, then a replacement repeat sample must be collected within 24 hours of being notified of the invalidated repeat sample. This timeframe is consistent with the requirements for collecting repeat samples within 24 hours of notification under the ADWR. If it is a follow-up sample that is invalidated, then a replacement follow-up sample should be collected as soon as possible to ensure compliance.

The second scenario, which is not readily applied to aircraft public water systems, allows EPA to determine that the total coliform-positive sample resulted from a domestic or other non-distribution system plumbing problem on the basis of the results of repeat samples. However, because all of the aircraft water system plumbing is the responsibility of the air carrier, from the storage tank filler neck to the tap, aircraft water systems do not have “domestic” or “other non-distribution system plumbing” that would justify the invalidation of a total coliform-positive sample.

The third scenario allows EPA to invalidate a sample if EPA has substantial grounds to believe that a total coliform-positive result is due to a circumstance or condition which does not reflect water quality in the distribution system. In this scenario, the system must still collect all required repeat samples and use them to determine compliance. There is no replacement sample required since the system has collected all repeat samples that are required under the ADWR and compliance has been determined. To invalidate a total coliform-positive sample under this scenario, EPA must document the decision and its rationale in writing and make the decision available to the public. The written documentation must state the specific cause of the total coliform-positive sample and what action the system has taken, or will take, to correct this problem. EPA may not invalidate a total coliform-positive sample solely on the grounds that all repeat samples are total coliform-negative.

Under the only laboratory-invalidation scenario, a laboratory must invalidate a total coliform sample (unless total coliforms are detected) if the sample produces a turbid culture in the absence of gas production using an analytical method where gas formation is examined (e.g., the Multiple-Tube Fermentation Technique), produces a turbid culture in the absence of an acid reaction in the Presence-Absence (P–A) Coliform Test, or exhibits confluent growth or produces colonies too numerous to count with an analytical method using a membrane filter (e.g., Membrane Filter Technique). If a laboratory invalidates a sample because of such interference the system must collect another sample from the same location as the original sample within 24 hours of being notified of the interference problem and have it analyzed for the presence of total coliforms. The system must continue to re-sample within 24 hours and have the samples analyzed until it obtains a valid result. EPA may waive the 24-hour time limit on a case-by-case basis.

4.6 Reporting Sample Results

The reporting requirements for sample results become effective October 19, 2011. As the primacy agency, EPA will oversee reporting by air carriers. To facilitate collection and analysis of aircraft water system data, EPA has developed the ADWR Reporting and Compliance System (ARCS), an Internet-based electronic database. Analytical results for microbiological testing will be reported directly to this database. ARCS will perform logic checks on data entered and calculate final results for accountability and regulatory oversight. This is intended to reduce reporting errors and limit the time involved in investigating, checking, and correcting errors at all levels. ARCS has a companion User Guide that provides information pertinent to users of the system. The user guide includes a description of the spreadsheet format and reporting method, how to access the downloadable spreadsheet and Web user interface, and other key information.

Air carriers should instruct laboratories to either manually enter analytical results into the EPA-managed Web-based data system, or to electronically upload data files from their laboratory information management systems (LIMS) to a Web-based data file submission program.

Regardless of the method or personnel used to report the data, these data files must be in a format prescribed by EPA. If an air carrier determines that its laboratory does not have the capability to report data electronically, it can submit a request to EPA to use an alternate reporting format. Air carriers may determine the best method of data upload and reporting that meets their needs. The ADWR does not require laboratory reporting nor prohibit consultants or other agents from gathering and reporting results on the carrier's behalf. If it is believed that a result was entered into the data system erroneously, the air carrier has the responsibility to notify the laboratory or responsible party to rectify the entry.

All routine sample results that are total coliform-negative must be reported to EPA no later than 10 calendar days following the end of the monitoring period in which the sampling occurred [40 CFR 141.806(b)(3)]. Remember that the length of the monitoring period depends on the routine coliform sampling frequency; therefore, air carriers may need to report the results monthly, quarterly, semiannually, or annually.

All routine, repeat, or follow-up sample results that are total coliform-positive or *E. coli*-positive must be reported to EPA no later than 10 calendar days after receiving the sample results.

Refer to Chapter 7 for more details on the requirements for reporting sampling results.

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5. Operations and Maintenance Plans

5.1 Overview of Requirements and Timeframes

Developing and implementing operations and maintenance (O&M) plans that cover every aircraft public water system is crucial to tailoring the National Primary Drinking Water Regulations to the unique needs of aircraft. This chapter discusses each of the ADWR requirements for O&M plans and includes example O&M practices used by some air carriers. These practices may not be applicable to all types of aircraft or all configurations of aircraft water systems.

For each aircraft listed in an air carrier's inventory, an aircraft water system O&M plan must be developed and its completion reported to EPA by April 19, 2011 [40 CFR 141.806(a)(1)]. A separate plan need not be developed for each aircraft – more than one aircraft may be covered by the same plan. However, each aircraft water system must be covered by an O&M plan. New aircraft added to the inventory after April 19, 2011, must be either added to an existing plan or a new plan developed and reported to EPA by the end of the first calendar quarter during which the aircraft is placed into operation as a public water system. Air carriers need not submit the O&M plans to EPA but EPA can request a copy of the plan at any time and may also view the plan during compliance audits. The ADWR requires air carriers to include the O&M plans in their FAA-accepted O&M programs [40 CFR 141.804(a)]. Also, any changes to the aircraft water system O&M plan must be included in the FAA-accepted air carrier O&M program.

In order to ensure that the appropriate multiple barriers to contamination are in place, each aircraft water system O&M plan must include the components described below [40 CFR 141.804(b)].

5.2 Watering Point Selection Requirement

The O&M plan must specify that all watering points must be selected in accordance with FDA regulations [21 CFR part 1240, subpart E]. The FDA regulations, in part, state, "Only potable water shall be provided for drinking and culinary purposes by any operator of a conveyance engaged in interstate traffic... Such water shall either have been obtained from watering points approved by the Commissioner of Food and Drugs, or, if treated aboard a conveyance, shall have been subjected to treatment approved by the Commissioner of Food and Drugs."

An official classification list of watering points that are in accordance with FDA regulations is anticipated to be available through the FDA website in late 2010. FDA's list of aircraft watering points and service areas is a complete list of known watering points and service areas on the day of its posting. The list is derived from FDA's Official Establishment Inventory (OEI) and supplemented by verifiable information from airline companies, airport authorities, and cooperating state health authorities with jurisdiction at US airports. The listing is scheduled to be updated quarterly. If a watering point is not listed or has not been approved, the FDA may permit its temporary use under such conditions as, in FDA's judgment, are necessary to prevent the

introduction, transmission, or spread of communicable disease [21 CFR 1240.83(c)]. The Internet website will provide FDA District Office contact information so that users of the watering point and service area can communicate directly with FDA to add, remove, or obtain permission for temporary use of a specific watering point and service area during a quarterly update period.

EPA and its federal partner FDA stress the importance of effective communication between all of the responsible parties along the aircraft water supply and transfer chain including public water systems serving airports, airport authorities, air carriers, and regulatory authorities (i.e., state drinking water primacy agencies, FDA, and EPA).

5.3 Routine and Corrective Disinfection and Flushing

The O&M plan must include specific information on the procedures and frequency of routine disinfection and flushing for aircraft water systems. The procedures and frequency must be in accordance with the manufacturer's recommendations [40 CFR 141.804(b)(2)]. EPA specifically designed the rule to allow air carriers to be consistent with the manufacturer recommendations for disinfecting and flushing aircraft water systems, instead of prescribing the frequency and the chemical type and concentration to be used. By allowing air carriers to be consistent with the manufacturer recommendations for disinfection and flushing, the rule requirements will automatically evolve with technological improvements in aircraft water tank lining and piping materials, and as more effective disinfectants are developed.

EPA understands that some manufacturers do not provide equipment disinfection and flushing recommendations and others specify that it be performed as required by the applicable regulating authority. Where a recommended routine disinfection and flushing frequency is not provided by the aircraft water system manufacturer, the air carrier must choose a disinfection and flushing frequency and corresponding routine coliform sampling frequency from the four options identified in the ADWR (see Section 4.2.3). In addition, air carriers may conduct disinfection and flushing more frequently, but not less frequently, than the manufacturer recommends. However, it is the responsibility of the air carrier to ensure the selected frequency would not result in damage to the aircraft water system's components.

The ADWR requires that the O&M plan identify the following details of disinfection and flushing practices [40 CFR 141.804(b)(2)]:

- Routine disinfection and flushing frequency (i.e., quarterly; at least three times per year; semi-annually; annually).
- Type of disinfecting agent – chemical used as the disinfectant (e.g., chlorine dioxide, chlorine, ozone, etc.).
- Disinfectant concentration – concentration of the disinfecting agent or the diluted disinfectant solution that is applied to the aircraft water system (e.g., milligrams per Liter (mg/L), parts per million (ppm)).

- Disinfectant contact time – amount of time the disinfecting agent or solution is in contact with aircraft water system components (e.g., 20 minutes, 1 hour, etc.).
- The flushing volume or flushing time – volume of potable water or length of time required to flush the disinfecting agent out of the aircraft water system (e.g., replace one tank volume, 5 minutes, etc.).

Corrective disinfection and flushing is triggered by the following situations:

- Total coliform-positive routine sample(s) if the corrective disinfection and flushing option is selected.
- Any repeat samples are total coliform-positive.
- E. coli is detected in any routine, repeat, or follow-up sample.
- An air carrier fails to conduct routine or corrective disinfection and flushing.
- An air carrier fails to collect routine, repeat, or follow-up coliform samples as required (see Chapter 4 for coliform monitoring requirements).
- An air carrier boards water from a watering point that is not in accordance with FDA regulations, that does not meet EPA drinking water standards for transient non-community water systems, or that may be unsafe due to noncompliance with the boarding procedures in the aircraft water system O&M plan.

The time frame in which air carriers must conduct corrective disinfection and flushing depends on which situation or event triggered the corrective action. See Chapter 8 for more information.

Chemicals used in the aircraft water system must meet all applicable laws and regulations and should be certified as meeting the standards of NSF/American National Standards Institute (ANSI) 60 or an equivalent standard. This ensures the chemical has been tested and found acceptable for use in public water supplies.

Examples of disinfection and flushing procedures.

Several air carriers submitted their aircraft water system disinfection and flushing procedures to EPA. Those procedures were found to have relatively common steps and recommendations. The following is a list of items that air carriers should consider to ensure disinfection and flushing procedures are effective. They are not intended to replace manufacturer's recommendations.

- Open all taps and completely drain the water system.
- Remove filters and replace filter caps to provide water-tight seal.
- Make up disinfectant solution following manufacturer's instructions.
- Fill water system tank with disinfectant solution and/or add water until full (full when water drains out of tank overflow).
- Ensure disinfected water flows from galley and lavatory taps and drinking fountains until proper disinfectant concentration is measured at all taps or the disinfectant is observed to

flow from the taps. Various procedures have been suggested to accomplish this task. For example:

- Flush galley and lavatory taps until disinfecting solution flows from the tap.
 - Flush toilets in vacuum waste systems 2 to 5 times with a 15 second interval between flushes.
 - Flush galley and lavatory taps for 3 minutes.
 - Flush galley taps enough to run 5 liters of solution through the tap.
 - Flush cold water tap in lavatory enough to fill sink, drain the sink, then flush hot water tap enough to fill sink.
- Top off water system tank with disinfectant solution.
 - Hold disinfectant solution in water system for predetermined contact time in accordance with manufacturer's recommendations.
 - Completely drain water system.
 - Flush the water system with potable water by allowing the water to flow from each tap until disinfectant is no longer observed or otherwise detected.
 - To ensure disinfectant has been flushed out of the water system, completely drain the water system after it has been flushed and refill again with potable water.
 - Install new filters (installation may be prior to collection of follow-up samples to ensure the filters do not degrade water quality).
 - Remove and clean tap aerators.
 - Adhere to procedures and considerations for electronic controls, system pressurization limits, and tag and safety circuit breakers.
 - If the aircraft will be parked for more than three days, drain the water system. When it is returned to service, perform the disinfection and flushing procedure and then fill the water system with potable water.
 - If the aircraft will be stored (i.e., taken out of service), conduct the following prior to storage: drain the water system, perform the disinfection and flushing procedure, and then drain the water system again so that there is no water in the system while the aircraft is stored. Before the aircraft is returned to service, conduct the following: perform the disinfection and flushing procedure, replace charcoal filters if installed, and fill with potable water.

5.4 Follow-up Sampling

The O&M plan must include written procedures for conducting follow-up coliform sampling after a corrective disinfection and flushing event takes place. Follow-up samples indicate whether the disinfection and flushing event was successful. See Section 4.3 for corrective actions based on sample results that require follow-up sampling and could be incorporated into an O&M plan, and Section 4.4 for recommended sampling procedures.

5.5 Training of Personnel

Training is required for air carrier staff and contractors responsible for operating and maintaining the aircraft water system [40 CFR 141.804(b)(4)]. This includes staff that board water, conduct sampling and disinfection and flushing, or perform self-inspections. Training may be tailored to individual job descriptions so that it is specific to the tasks the employees are charged with performing. For example, a person charged exclusively with boarding water will not have to be trained in the techniques for collecting and transporting coliform water samples if they will not be performing that duty.

The purpose of the training is to ensure that personnel participating in the performance or oversight of the aircraft water system are knowledgeable of the rule as it pertains to their job responsibilities. This includes implications of contaminated water on the health of the public served by the aircraft water system, effective operations and maintenance procedures for the system, the monitoring requirements of the ADWR, how compliance with the ADWR will be reported to EPA and tracked by EPA, and the air carrier-specific aspects of the rule such as the public notification requirements and aircraft water system shut-off procedures, if applicable.

The rule requires that, at a minimum, personnel are trained on the procedures for boarding water, collecting samples, disinfecting and flushing the water system, and the public health and safety reasons for the requirements of the ADWR.

The O&M plan must describe training requirements for all personnel involved with the O&M provisions of the ADWR. At a minimum, persons performing the activity and the supervisor of the person performing the activity should be included in the training. Based on input from the air carrier industry, EPA understands that many air carriers will integrate training requirements under the ADWR with the existing FAA regulated procedures and practices for aircraft operation and maintenance and carrier ground handling practices. For example, water system self-inspection training may be conducted in a manner consistent with existing FAA practices for inspection of an aircraft. Accordingly, the format and delivery method of the training is at the discretion of the air carrier so that carriers may customize their training programs in a manner appropriate to the carrier's operations, using a variety of training procedures to satisfy the requirements of the rule. In view of this situation, EPA has not developed a one-size fits all training plan.

Training should emphasize the use of sanitary practices in operating and maintaining the water system in order to maintain water quality and to protect public health. It should also address

What if individuals that board water or collect coliform samples are not air carrier personnel?

Air carrier personnel might not perform all of the duties of boarding water or sampling for coliform - these services are often provided by contracted entities.

Even if air carrier personnel do not perform the essential duties in the O&M plan, the air carrier is responsible for ensuring the entity providing the services is adequately trained on proper procedures. The air carrier need not provide the training, but must ensure adequately trained personnel are used.

reporting and recordkeeping requirements and procedures to ensure the air carrier remains in compliance with the ADWR.

The aircraft water system O&M plan must include the air carrier's program for training personnel responsible for water system O&M activities. The O&M plan can also serve as a training reference for personnel through inclusion of recommended operating procedures and guidance for making operational decisions. An up-to-date plan should always be accessible to operations staff.

The following training elements and topics are offered by EPA as an ADWR training program approach solely to assist air carriers. Carriers may develop their own programs as they deem appropriate based on the nature of their individual operations so long as they are consistent with, and ensure compliance with, the rule.

The O&M plan should describe the following elements of the training program:

- Training topics and typical training schedule, including the frequency and duration of the training for each pertinent personnel category.
- Training program for new staff.
- Refresher training for existing staff should be on an annual basis or more frequently as needed.

Training topics for aircraft water system personnel should include the following elements. Elements that are mandatory are noted.

- The public health and safety reasons for the ADWR requirements (mandatory).
- ADWR requirement details applicable to their duties.
- Acute contaminants, contaminant pathways, and control measures.
- Procedures for boarding water (mandatory).
- Sample collection procedures for coliform bacteria analysis and transport of samples to the laboratory (mandatory).
- Routine and corrective disinfection and flushing practices (mandatory).
- Procedures pertaining to aircraft water systems when aircraft are taken out-of-service and returned to service (e.g., draining, disinfection, flushing).
- Procedures for performing self-inspections.
- Backflow prevention and cross connection control.
- Water treatment equipment maintenance and replacement requirements.
- Reporting and recordkeeping requirements.

5.6 Procedures for Conducting Self-Inspections

The O&M plan must describe how self-inspections of the aircraft water system will be conducted, including but not limited to inspection of the storage tank, piping, supplemental treatment units, plumbing fixtures, valves, and backflow prevention devices [40 CFR 141.804(b)(5)].

The purpose of the self-inspection is to make sure the aircraft water system is intact and not compromised or subject to contamination. A thorough inspection is needed to determine:

- The ability of the water system to provide a safe and adequate supply of drinking water to the passengers and crew;
- The potential for degradation of the water quality or sanitary risks; and
- The system's reliability and vulnerability.

A complete self-inspection of the entire aircraft water system must be conducted no less frequently than once every five years [40 CFR 141.808(b)]. The first inspection must be completed by October 19, 2016, for aircraft that are included in the inventory as of October 19, 2011. EPA has provided flexibility in the rule so that a full self-inspection of an aircraft water system may be conducted over time rather than all at once so long as a complete self-inspection of the entire aircraft water system occurs no less frequently than once every five years. This allows air carriers to develop their own unique self-inspection procedures that coordinate, to the maximum extent possible, water system self-inspections with the existing aircraft inspection and maintenance process. An air carrier's self-inspection plan may include references to and explanations of those existing procedures.

In recognition that each air carrier's self-inspection procedures are likely to be unique since they will be based on each air carrier's unique FAA-accepted operation and maintenance program, EPA has not developed a "one-size fits all" set of self-inspection procedures for this guidance manual. Instead, EPA offers the following general guidance for consideration by air carriers in the development of self-inspection procedures.

The self-inspection procedures are intended to provide the degree of scrutiny necessary to identify potential public health risks and reliability issues associated with the aircraft water system. Generally, a self-inspection of the aircraft water system includes a visual inspection of the storage tank, distribution system, supplemental treatment, fixtures, valves, backflow prevention devices and fittings to detect cracks, leaks, corrosion, or damage, and to ensure that the distribution system piping is correctly attached with no cross-connections. A visual inspection is a visual examination of an interior or exterior area, installation, or assembly to detect obvious damage, failure, or irregularity. This level of inspection is made from within touching distance, unless otherwise specified by the manufacturer or determined to be necessary. For example, an air carrier may identify the need to perform an internal optical inspection of an aircraft's water tanks and piping if there are chronic water quality problems (taste, odor, and/or

positive sample results) that are not corrected by disinfection and flushing or if water flow has slowed. Also, a mirror may be necessary to enhance visual access to all exposed surfaces in the inspection area. This level of inspection is made under normally available lighting conditions such as daylight, hangar lighting, flashlight or drop-light and may require removal or opening of access panels or doors. Stands, ladders, or platforms may be required to gain proximity to the area being checked.

Specific reporting and recordkeeping requirements apply to aircraft self-inspections. These requirements are discussed in Chapter 7.

5.7 Procedures for Boarding Water

The operations and maintenance plan must include requirements and procedures for boarding water as discussed below.

5.7.1 Boarding Water within the United States

Within the United States, the air carrier must board water from watering points in accordance with Food and Drug Administration (FDA) regulations [21 CFR part 1240, subpart E]. It is advisable to periodically check FDA's website (www.fda.gov) for updated information and guidelines. For example, at a future date, FDA is planning to have a list of watering points and service areas that are in accordance with FDA regulations on its website.

FDA regulatory requirements are found in FDA regulations at 21 CFR part 1240, subpart E – Source and Use of Potable Water and 21 CFR part 1250, subpart D – Servicing Areas for Land and Air Conveyances. Published FDA guidance is found in the Guide to Inspection of Conveyances and Support Facilities, April 1995. <http://www.fda.gov/ICECI/Inspections/InspectionGuides/ucm074964.htm>. FDA Form 2528 Inspection Summary – Airline Service Area or Watering Point Sanitation further informs airlines on FDA criteria for determining compliance with FDA regulations.

5.7.2 Transferring Water Safely for Human Consumption

Water is transferred to aircraft at the airport's watering points using either water cabinets mounted on the airport terminal building or a mobile water cart or truck. The design, operation, and maintenance of watering point facilities are regulated by the FDA [21 CFR 1240 and 21 CFR 1250]. Accordingly, EPA defers to the FDA with respect to regulating watering points such as water cabinets, carts, trucks, and hoses from which aircraft board water. However, because aircraft board water via these temporary interconnections, the process of boarding water presents numerous opportunities for contamination of the drinking water. Therefore, the ADWR requires that air carriers have in their water system operations and maintenance plans procedures for boarding water [40 CFR 141.804(b)(6)] that include a description of how the water will be transferred from the watering point to the aircraft in a manner that ensures it will not become contaminated during the transfer.

5.7.3 Ensuring Water Boarded Outside of the US is Safe for Human Consumption

EPA understands that aircraft involved in international travel may board water from watering points at locations that are outside EPA and FDA's jurisdiction. Therefore, it is essential that air carriers have procedures in place to ensure that the water obtained from these sources is of a quality that is safe for consumption by passengers and crew. Accordingly, the ADWR requires that air carriers include in their aircraft water system operations and maintenance plans a description of how the air carrier will ensure that water boarded outside of the United States is safe for human consumption [40 CFR 141.804(b)(6)(iii)]. This procedural requirement is squarely within EPA's authority under SDWA to ensure that water that is boarded outside of the US and then served to consumers in the US is safe. Consequently, if an aircraft boards water not in accordance with its water system operation and maintenance plan procedures for boarding water outside of the US [40 CFR 141.804(b)(6)(iii)], the ADWR, under 40 CFR 141.803(h)(3) and (i)(3), requires an air carrier to perform the appropriate corrective actions on the aircraft (see Exhibits 5.1 and 5.2).

5.7.4 Emergency Procedures for Failure to Board Water from a Safe Watering Point

The Agency is aware that in limited circumstances water is boarded to operate essential systems such as toilets, but the watering point is not in accordance with FDA regulations or the water does not meet the NPDWRs. To address these circumstances, the ADWR requires that the O&M plan include emergency procedures to be used in the event that water is boarded to operate essential systems, such as toilets, but was boarded from a watering point not in accordance with FDA regulations, does not meet NPDWRs applicable to transient non-community water systems (found in 40 CFR 141.62 and 141.63, as applied to TNCWSs), or is otherwise determined to be unsafe due to non-compliance with the procedures specified in 40 CFR 141.804(b)(6). When situations such as these occur, the quality of the water that is boarded will determine the corrective action and public notification requirements. If the quality of the water to be boarded does not meet the NPDWRs for transient non-community water systems (i.e., total coliform; *E. coli*; nitrate; nitrite; or chlorine dioxide if the PWS serving the watering point (parent system) uses chlorine dioxide as a disinfectant or oxidant) but the situation is not related to an *E. coli*-positive sample result, then the air carrier must follow the requirements under 40 CFR 141.803(i) Failure to Board Water from a Safe Watering Point (non-*E. coli*-positive). Similarly, when water must be boarded from a watering point that is not in accordance with FDA regulations but the situation is not known to be related to an *E. coli*-positive sample result, then the air carrier must also follow the requirements under 40 CFR 141.803(i) Failure to Board Water from a Safe Watering Point (non-*E. coli*-positive).

If the water that must be boarded is known to have tested positive for *E. coli*, then the air carrier must follow the requirements under 40 CFR 141.803(h) Failure to Board Water from a Safe Watering Point (*E. coli*-positive).

It may be necessary for an air carrier to have different emergency response plans for different types of aircraft, for example, if some aircraft have a separate water system for toilets. Example

response plans for an *E. coli*-positive event and non-*E. coli*-positive event are provided as Exhibits 5.1 and 5.2, respectively.

Exhibit 5.1 Example Response Plan for Failure to Board Water from a Safe Watering Point (*E. coli*-positive event)

Response Plan: Failure to Board Water from a Safe Watering Point <i>[E. coli-positive event]</i>			
Step	Action	Timeframe	Responsible Party
1	<p>Restrict public access, including all of the following:</p> <p>Shut off water or otherwise prevent flow to taps, faucets, and fixtures, if possible.</p> <p>Develop and deliver public notice for crew (and post for passengers if water shut off or flow prevention to taps is not possible).</p> <p>Provide alternatives to water from the aircraft water system such as bottled water for drinking and coffee or beverage preparation; provide antiseptic hand gels or wipes.</p>	<p>As expeditiously as possible, but no later than 24 hours of learning of the event.</p>	
2	<p>Schedule and perform corrective disinfection and flushing of the aircraft water system.</p>	<p>As expeditiously as possible, but no later than 72 hours of learning of the event if the water system is not shut off or the flow prevented.</p> <p>When able, if water shut off or flow prevented.</p>	
3	<p>Collect two follow-up samples.</p>	<p>Immediately after corrective disinfection and flushing.</p>	
4	<p>If any follow-up samples are total coliform-positive or <i>E. coli</i>-positive, then repeat disinfection and flushing with follow-up sampling.</p>	<p>As expeditiously as possible, but no later than 72 hours of learning of the sample results if the water system is not shut off or the flow prevented.</p> <p>When able, if water shut off or flow prevented.</p>	
5	<p>Unrestrict public access to the water.</p>	<p>Only after a complete set of follow-up samples is total coliform-negative.</p>	
6	<p>Report event to the EPA ADWR Reporting and Compliance System.</p>	<p>Within 10 days of learning of the event.</p>	

Exhibit 5.2 Example Response Plan for Failure to Board Water from a Safe Watering Point (non-*E. coli*-positive event)

Response Plan: Failure to Board Water from a Safe Watering Point <i>[non-E. coli-positive event]</i>			
Step	Action	Timeframe	Responsible Party
1	<p>Restrict public access, including all of the following:</p> <p>Shut off water or otherwise prevent flow to taps, faucets, and fixtures, if possible.</p> <p>Develop and deliver public notice for crew (and post for passengers if water shut off or flow prevention to taps is not possible).</p> <p>Provide alternatives to water from the aircraft water system such as bottled water for drinking and coffee or beverage preparation; provide antiseptic hand gels or wipes.</p>	As expeditiously as possible, but no later than 72 hours of learning of the event.	
2	Schedule and perform corrective disinfection and flushing of the aircraft water system.	When able	
3	Collect two follow-up samples.	Immediately after corrective disinfection and flushing and prior to allowing public access to the water.	
4	Optional: unrestrict public access to the water.	Once follow-up samples are collected.	
5a	If either of the two follow-up samples is total coliform-positive and <i>E. coli</i> -negative, then restrict public access and repeat the disinfection and flushing procedures with follow-up sampling.	<p>Restrict public access as expeditiously as possible, but no later than 72 hours of learning of the sample results.</p> <p>Disinfect and flush when able.</p>	

Response Plan: Failure to Board Water from a Safe Watering Point <i>[non-E. coli-positive event]</i>			
Step	Action	Timeframe	Responsible Party
5b	If either of the two follow-up samples is total coliform-positive and <i>E. coli</i> -positive, then restrict public access and repeat the disinfection and flushing procedures with follow-up sampling.	Restrict access as expeditiously as possible, but no later than 24 hours of learning of the sample results. If water system not shut off or the flow prevented disinfect and flush within 72 hours. If water shut off or flow prevented, disinfect and flush when able.	
6	Unrestrict public access.	Only after a complete set of follow-up samples is total coliform-negative.	
7	Report event to the EPA ADWR Reporting and Compliance System.	Within 10 days of learning of the event.	

5.8 Coliform Sampling Plan

The O&M plan must include the monitoring plan for coliform bacteria. The coliform sampling plan is described in Chapter 4. Plan elements include but are not limited to:

- Coliform sample collection procedures
- Sample tap locations representative of the aircraft water system
- Frequency of coliform sampling and number of samples to be collected during each sampling event
- Frequency of routine disinfection and flushing
- Procedures for communicating sample results

5.9 Aircraft Water Systems Disconnect/Shut-off/Flow Prevention Statement

The O&M plan must include an explanation of whether the aircraft water system can be physically disconnected/shut-off or the flow of water through taps prevented. The O&M plan could include procedures for disconnecting/shutting off the water so personnel have a reference in the event restricting public access to the water becomes necessary.

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6. Public Notification

Due to the unique characteristics of aircraft water systems, the ADWR includes separate provisions for air carriers regarding public notification from those required of stationary water systems under Subpart Q of the NPDWRs. This chapter summarizes the public notification requirements for specific violations and situations under the ADWR. Some of the public notification requirements are the same for certain violations and/or situations; therefore, there is repetitive text in this chapter.

6.1 Purpose of Public Notification

Public notification requirements of the NPDWRs are intended to alert consumers to potential health risks from violations of the drinking water standards or other situations that may present a health risk. Public notification requirements for stationary systems are divided into three tiers to take into account the seriousness of the violation or situation and any potential adverse health effects that may be involved. Public notices related to acute health risks are categorized as tier 1, and typically must be provided within 24 hours of identification of the violation. Because many of the violations or situations encountered by aircraft water systems pose potential acute health risks (e.g., an *E. coli*-positive sample result), notification should be provided as soon as possible, but is required within 24 hours. All other violations or situations require notification within 72 hours. Timeframes for issuing notice for specific violations and situations are discussed in subsequent sections in this chapter.

Passengers and crew served by an aircraft water system have a right to be informed of problems with the drinking water. The right to know about drinking water problems extends not just to contamination but also to failure to perform required monitoring or maintenance. For example, when an air carrier fails to monitor, the quality of the water is unknown. If the carrier does not conduct routine disinfection and flushing, it cannot be sure the water system is adequately maintained.

Due to the transient nature of the public served by transient non-community water systems (TNCWSs) such as aircraft, public notice is provided by posting the notice at locations where passengers may access drinking water from the water system. Notification may be given to crew through written or verbal means in certain situations.

When a violation or situation arises that requires public notice, the notice can be provided only to the crew if passenger access to the water system is physically prevented through disconnecting or shutting off the water, or the flow of water prevented through the tap(s), or if water is supplied only to lavatory toilets and not to any lavatory or galley taps. If the passengers can access the water system, then public notice must be provided to them to warn them not to use the water even for hand washing or brushing teeth.

In all situations that require public notice, the ADWR requires that the crew receives notice to ensure that the crew understands and can explain why there is no water available or why the water, if accessible, should not be used for human consumption.

6.2 Notification of Passengers and Crew

Air carriers must issue public notice to crew for all events described below [40 CFR 141.805]. Notice to passengers may not be required in some cases.

- 1) When public access to the water is restricted due to a routine, repeat or follow-up total coliform-positive or *E. coli*-positive sample result [40 CFR 141.805(a)(1)].
- 2) Failure to perform routine disinfection and flushing or failure to collect required routine samples for coliforms [40 CFR 141.805(a)(2)].
- 3) Failure to collect the required follow-up samples in response to a sample result that is *E. coli*-positive [40 CFR 141.805(a)(3)].
- 4) Failure to collect the required repeat or follow-up samples in response to a sample result that is total coliform-positive and *E. coli*-negative [40 CFR 141.805(a)(4)].
- 5) When the air carrier becomes aware of an *E. coli*-positive event resulting from water that has been boarded from a watering point that is not in accordance with FDA regulations, that does not meet EPA standards for TNCWSs, or has been determined to be unsafe due to noncompliance with the procedures for boarding water [40 CFR 141.805(a)(5)].
- 6) When the air carrier becomes aware of a non-*E. coli*-positive event resulting from water that has been boarded from a watering point that is not in accordance with FDA regulations, that does not meet EPA standards for TNCWSs, or has been determined to be unsafe due to noncompliance with the procedures for boarding water [40 CFR 141.805(a)(6)].
- 7) EPA, the air carrier, or the crew otherwise determine that public notification is necessary to protect public health [40 CFR 141.805(a)(7)].

The specific notice requirements for each violation or situation are discussed further in the following sections. In most cases, the ADWR specifies health effects language that must be included in the notice to the crew. Standardized language ensures that the crew (and, indirectly, the passengers via the crew) receives a consistent message. Some of the standard language paragraphs contain bracketed sections. The brackets indicate where the necessary information specific to each event should be inserted, or where an applicable phrase could be selected. If the bracketed phrases request information, such as dates or number of samples, the required information should be inserted and then the brackets deleted.

Each public notice [40 CFR 141.805(b)]:

- Must be displayed in a conspicuous way when printed or posted;
- Must not contain overly technical language or very small print;
- Must not be formatted in a way that defeats the purpose of the notice;
- Must not contain language that nullifies the purpose of the notice; and

- Must contain information in the appropriate language(s) regarding the importance of the notice reflecting a good faith effort to reach the non-English speaking population served, including where applicable, an easily recognized symbol for non-potable water.

All events requiring notification to passengers and/or crew must also be reported to EPA within 10 days of the event triggering the notification, such as the air carrier being informed of sample results by the laboratory. This reporting must include an indication of whether the required notification was provided to passengers or crew or both [40 CFR 141.806(b)(4)]. The ADWR does not require that a copy of a notification be provided to EPA. However, a copy must be available for EPA review as part of an audit. Paper or electronic copies of notices must be kept for at least three years after issuance [40 CFR 141.807(f)]. See Chapter 7 for more information on recordkeeping and reporting requirements.

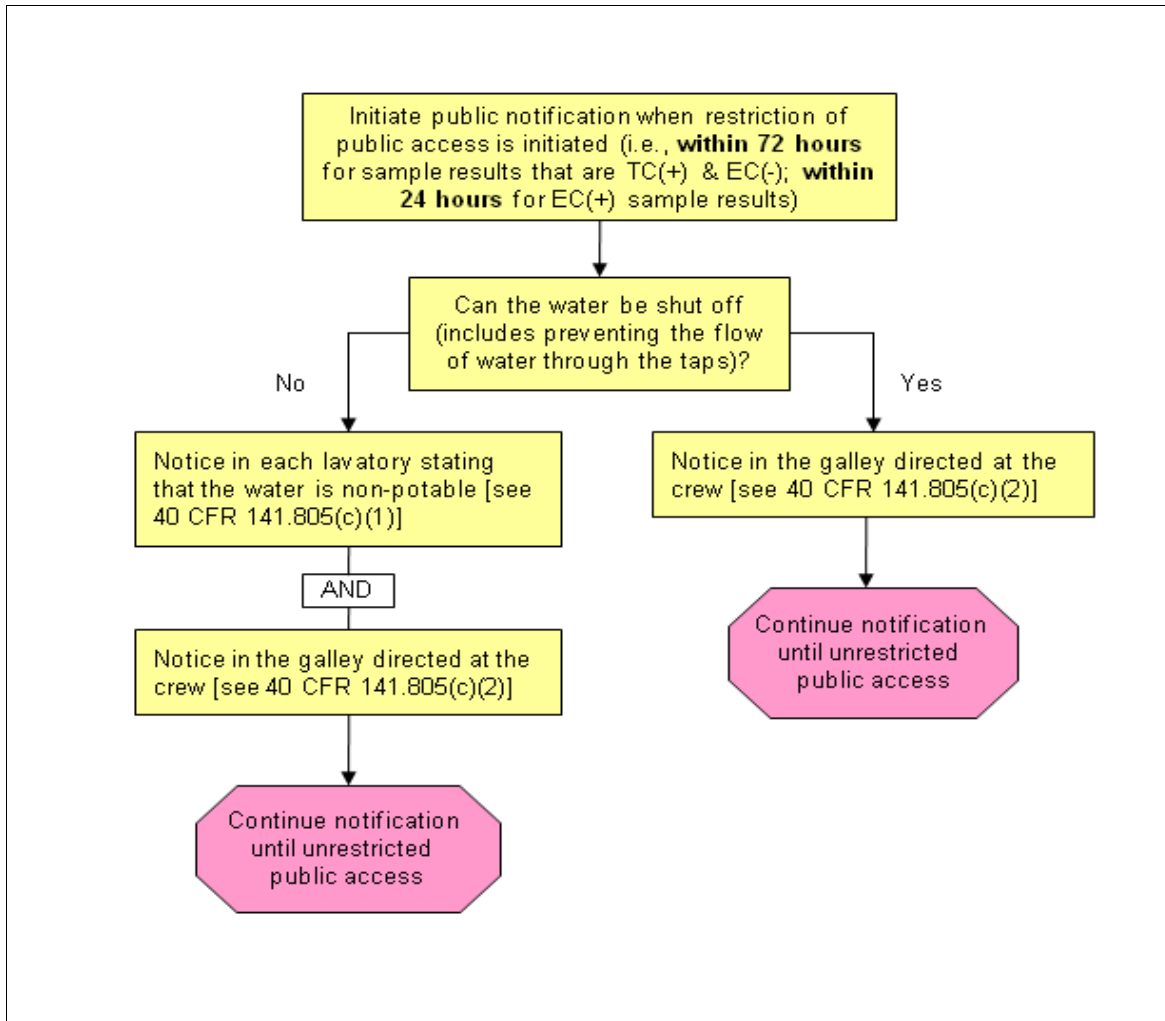
The four main events that trigger notice are described in detail in the remainder of this chapter. Appendix D of this manual contains example templates for notifying passengers and/or crew of violations or situations that require public notification under the ADWR.

6.2.1 Notice for Detection of *E. coli* or Total Coliform Bacteria

Public notification is required when public access to the aircraft water system is restricted in response to a total coliform-positive sample or an *E. coli*-positive sample [40 CFR 141.805(a)(1)]. Air carriers must issue notice within 72 hours of receiving sample results that are total coliform-positive and *E. coli*-negative [40 CFR 141.803(c)(3)(ii)] and within 24 hours of receiving sample results that are *E. coli*-positive [40 CFR 141.803(c)(2)(i)]. For a total coliform-positive routine or repeat sample that is *E. coli*-negative, air carriers are not automatically required to restrict public access. If they choose to collect repeat samples or conduct disinfection and flushing within 72 hours of learning of the positive sample, they are not required to restrict public access or provide public notification. Samples positive for *E. coli*, however, always require restriction of public access including public notification no later than 24 hours after the laboratory notifies the air carrier of the *E. coli*-positive result (see Chapter 4 for more information).

Exhibit 6.1 provides a flow-chart illustration of the public notification requirements associated with a total coliform-positive sample result (when public access to the water supply is restricted) or an *E. coli*-positive sample result.

Exhibit 6.1 Public Notification Requirements in Response to a Total Coliform-Positive or *E. coli*-Positive Sample Result



If passenger access to the water system is physically prevented through disconnecting or shutting off the water, or the flow of water prevented through the tap(s), or if water is supplied only to lavatory toilets and not to any lavatory or galley taps, then notice to passengers is not required, only to the crew (see Appendix D, Template 2 for *E. coli*-positive event and Template 3 for Total Coliform-positive non-*E. coli* event). In this situation, the notice to the crew may be conveyed either as a prominent notice in the galley or as a mandatory crew briefing as described in Section 6.2.5.

If passenger access to the water system cannot be physically prevented through disconnecting or shutting off the water, or the flow of water cannot be prevented through the tap(s), then public notice to the passengers is required. The public notice must consist of a prominently displayed, clear statement in each lavatory indicating that the water is non-potable and should not be used for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use (see Appendix D, Template 1). In this situation, the notice to the crew must be conveyed as a prominent notice in the galley.

- Notice to the crew must include the following: A clear statement that the water is non-potable and should not be used for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use.
- A description of the violation or situation triggering the notice, including the contaminant of concern.
- When the violation or situation occurred.
- Any potential adverse health effects from the violation or situation, including the required health effects language for total coliform bacteria or *E. coli* bacteria, as provided in this section.
- The population at risk, including sensitive subpopulations particularly vulnerable if exposed to the contaminant (the provided health effects language should address this element).
- What the air carrier is doing to correct the violation or situation.
- When the air carrier expects to return the system to unrestricted public access.

Use the following health effects language when any routine, repeat, or follow-up sample is total coliform-positive, but is negative for *E. coli*:

Coliform are bacteria that are naturally present in the environment and are used as an indicator that other, potentially harmful, bacteria may be present. Coliforms were found in [INSERT NUMBER OF SAMPLES DETECTED] samples collected and this is a warning of potential problems. If human pathogens are present, they can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

Use the following language for any routine, repeat, or follow-up sample that is positive for *E. coli* (note that in this situation, the notice for total coliform-positive samples is not issued, even though these samples would have also been total coliform-positive):

E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

The air carrier must continue to provide the notice until a set of follow-up samples is negative for total coliforms.

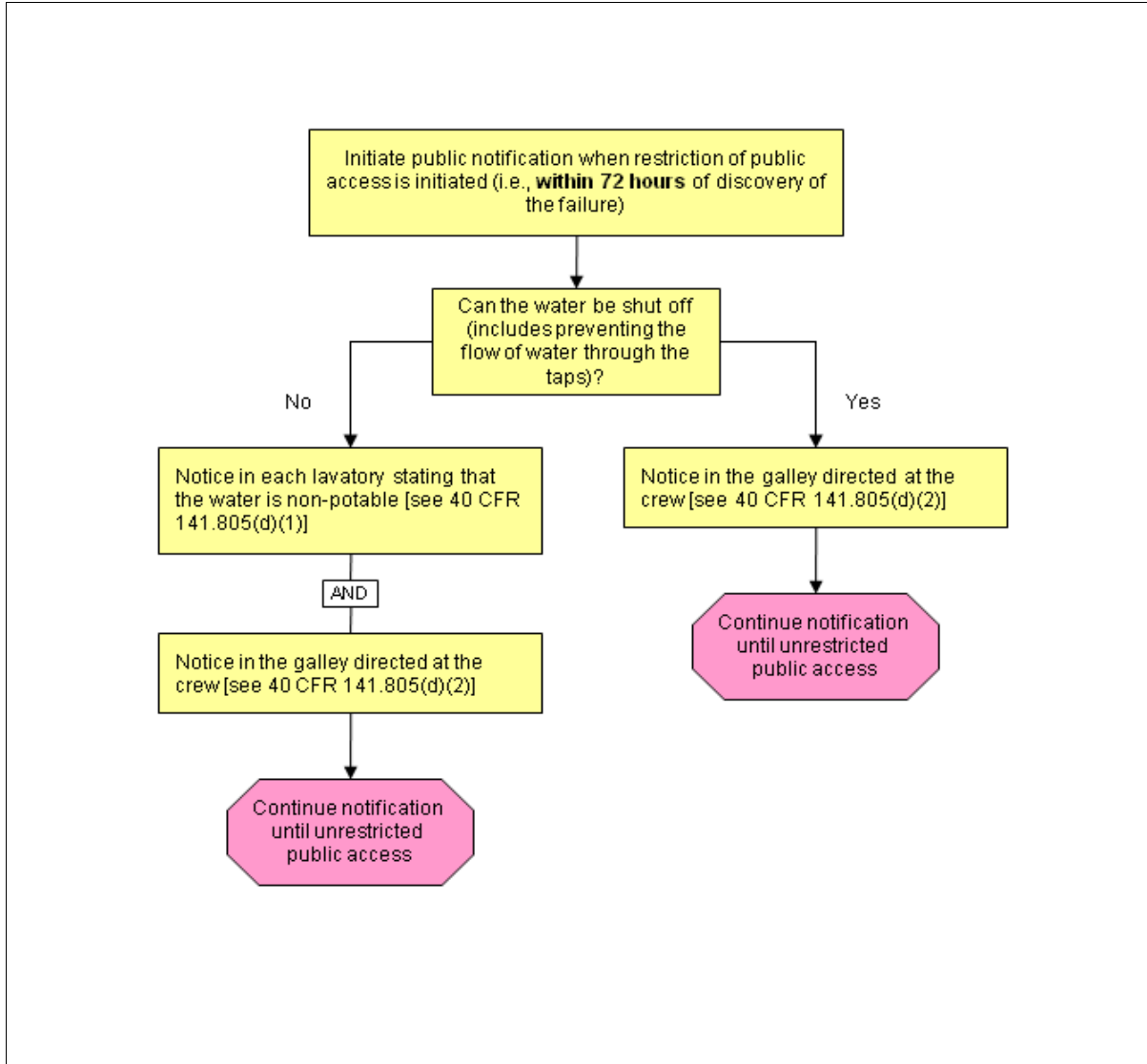
6.2.2 Notice for Failure to Monitor, Failure to Conduct Disinfection and Flushing, and Situations Where Water Does Not Meet Standards (Non-*E. coli*-Positive Event)

Air carriers must provide public notice if they fail to collect required routine samples, if they fail to perform required routine disinfection and flushing, or if they fail to collect repeat or follow-up samples in response to a sample result that is total coliform-positive and *E. coli*-negative. In addition, notice is required when an air carrier becomes aware of a non-*E. coli*-positive event resulting from water that has been boarded from a watering point not in accordance with FDA regulations, that does not meet EPA requirements for TNCWSs, or that has been otherwise determined to be unsafe due to non-compliance with the procedures for boarding water as described in the aircraft water system O&M plan [40 CFR 141.805(a)(2), (4), and (6)]. A “non-*E. coli*-positive” event is a situation that results in a non-acute event. In other words, the water quality issue is not due to an *E. coli* detection in the water supply, and unsafe boarding procedures have not knowingly resulted in *E. coli* in the water supply.

For all conditions described above, public notification must be issued to the passengers and/or crew and restriction of public access implemented **within 72 hours**.

Exhibit 6.2 provides a flow-chart illustration of the public notification requirements discussed in this section.

Exhibit 6.2 Public Notification Requirements for Failure to Monitor, Disinfect and Flush, or Board Water from a Safe Watering Point (Non-*E. coli*-Positive)



If passenger access to the water system is physically prevented by disconnecting or shutting off the water, or the flow of water prevented through the tap(s), or if water is supplied only to lavatory toilets and not to any lavatory or galley taps, then notice to passengers is not required, only to the crew [see Appendix D, Template 4 - Failure to Perform Routine Disinfection and Flushing Notice to the Crew; Template 5 - Failure to Perform Routine, Repeat, or Follow-up Monitoring After a Non-*E. coli*-Positive Sample Notice to the Crew; Template 6 - Boarding Water that Does Not Meet FDA Regulations or EPA Standards for Transient Non-community Water Systems (Boarded Water Quality or Boarding Procedures) Notice to the Crew (Non-*E. coli*-Positive)]. In this situation, the notice to the crew may be conveyed either as a prominent notice in the galley or as a mandatory crew briefing as described in Section 6.2.5.

If passenger access to the water system cannot be physically prevented through disconnecting or shutting off the water, or the flow of water cannot be prevented through the tap(s), then public notice to the passengers is required. The public notice must consist of a prominently displayed, clear statement in each lavatory indicating that the water is non-potable and should not be used for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use (see Appendix D, Template 1). In this situation, the notice to the crew must be conveyed as a prominent notice in the galley.

Notice to the crew must include the following:

- A clear statement that the water is non-potable and should not be used for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use.
- A clear statement that it is not known whether the water is contaminated because there was a failure to perform required routine disinfection and flushing; or a failure to perform required monitoring; or water was boarded from a watering point that is not in accordance with FDA regulations, or does not meet the NPDWRs applicable to TNCWSs, or has otherwise been determined to be unsafe due to noncompliance with the O&M procedures for boarding water. (Inclusion of the health effects language provided below should in many cases address this requirement.)
- When and where the unsafe water was boarded, or when the specific monitoring or disinfection and flushing requirement was not met.
- Any potential adverse health effects from exposure to waterborne pathogens that might be in the water, as appropriate. (Inclusion of the health effects language provided below addresses this requirement.)
- The population at risk, including sensitive subpopulations particularly vulnerable if exposed to the contaminant (the provided health effects language should address this element).
- A statement indicating when the system will be disinfected and flushed and returned to unrestricted public access.

Public notices for failure to conduct routine monitoring or disinfection and flushing, or repeat or follow-up monitoring in response to a sample result that is total coliform-positive and *E. coli*-negative, must include the following text. Notices for a non-*E. coli*-positive event resulting from water that has been boarded from a watering point not in accordance with FDA regulations, that does not meet EPA standards for TNCWSs, or is otherwise deemed unsafe due to noncompliance with the procedures in the aircraft water system O&M plan must also use the following language. Select the appropriate phrase from the options inside the brackets and delete the inapplicable phrases:

Because [REQUIRED MONITORING AND ANALYSIS WAS NOT CONDUCTED], [REQUIRED DISINFECTION AND FLUSHING WAS NOT CONDUCTED], [WATER WAS BOARDED FROM A WATERING POINT NOT IN ACCORDANCE WITH FDA REGULATIONS (21 CFR PART 1240, SUBPART E)] or [OTHER APPROPRIATE EXPLANATION], we cannot be sure of the quality of the drinking water at this time.

However drinking water contaminated with human pathogens can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

The air carrier must continue to provide the notice until a set of follow-up samples is negative for total coliforms.

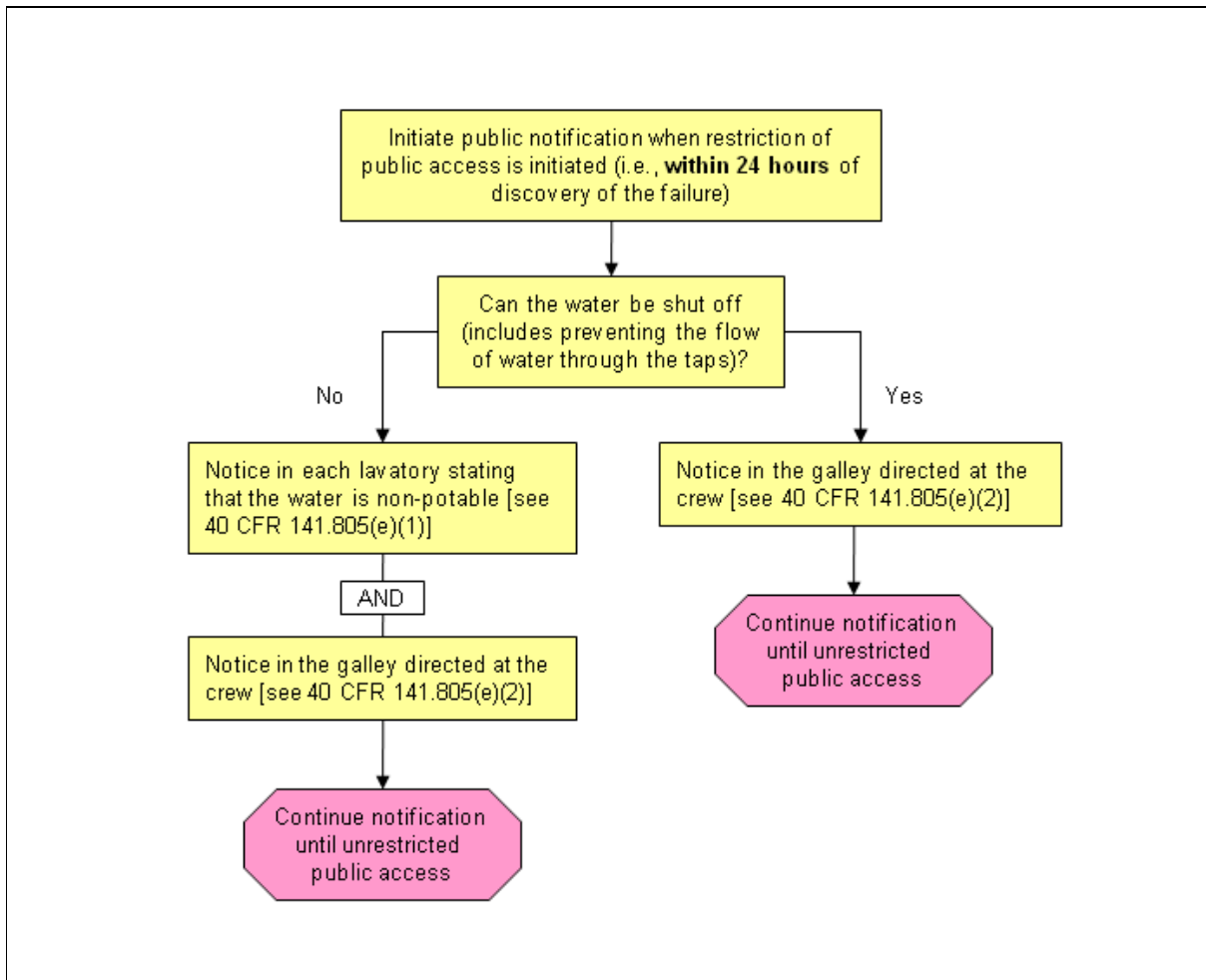
6.2.3 Notice for Failure to Conduct Follow-Up Monitoring and Situations Where Water Does Not Meet Standards (*E. coli*-Positive Event)

Air carriers must provide public notice if they fail to collect required follow-up samples in response to a sample result that is *E. coli*-positive. In addition, notice is required when an air carrier becomes aware of an *E. coli*-positive event resulting from water that has been boarded from a watering point not in accordance with FDA regulations, that does not meet EPA requirements for TNCWSs, or that has been otherwise determined to be unsafe due to non-compliance with the procedures for boarding water as described in the aircraft water system O&M plan [40 CFR 141.805(a)(3) and (5)]. An “*E. coli*-positive” event is an event where *E. coli* has been detected or is otherwise introduced in the water boarded on the aircraft.

For all conditions described above, public notification must be issued to the passengers and crew and restriction of public access implemented **within 24 hours**.

Exhibit 6.3 provides a flow-chart illustration of the public notification requirements discussed in this section.

Exhibit 6.3 Public Notification Requirements for Failure to Monitor, Disinfect and Flush, or Board Water from a Safe Watering Point (*E. coli*-Positive)



If passenger access to the water system is physically prevented by disconnecting or shutting off the water, or the flow of water prevented through the tap(s), or if water is supplied only to lavatory toilets and not to any lavatory or galley taps, then notice to passengers is not required, only to the crew [see Appendix D, Template 7 – Failure to Perform Follow-up Monitoring After an *E. coli*-Positive Sample Result Notice to the Crew; Template 8 – Boarding Water that Does Not Meet FDA Regulations or EPA Standards for Transient Non-community Water Systems (*E. coli*-Positive event) Notice to the Crew]. In this situation, the notice to the crew may be conveyed either as a prominent notice in the galley or as a mandatory crew briefing as described in Section 6.2.5.

If passenger access to the water system cannot be physically prevented through disconnecting or shutting off the water, or the flow of water prevented through the tap(s), then public notice to the passengers is required. The public notice must consist of a prominently-displayed, clear statement in each lavatory indicating that the water is non-potable and should not be used for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive

use (see Appendix D, Template 1). In this situation, the notice to the crew must be conveyed as a prominent notice in the galley.

Notice to the crew must include the following:

- A clear statement that the water is non-potable and should not be used for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use.
- A clear statement that the water is contaminated and there was a failure to conduct required monitoring; or a clear statement that the water is contaminated because water was boarded from a watering point that is not in accordance with FDA regulations, or the water does not meet requirements applicable to TNCWSs, or the water has otherwise been determined to be unsafe due to noncompliance with the O&M procedures for boarding water. (Inclusion of the health effects language provided below should in many cases address this requirement.)
- A description of the contaminant(s) of concern.
- When and where the unsafe water was boarded, or when the specific monitoring requirement was not met.
- Any potential adverse health effects from the situation, as appropriate. (Inclusion of the health effects language provided below addresses this requirement.)
- The population at risk, including sensitive subpopulations particularly vulnerable if exposed to the contaminant (the provided health effects language should address this element).
- What the air carrier is doing to correct the situation.
- When the air carrier expects to return the system to unrestricted public access.

Public notices for failure to conduct follow-up monitoring in response to a sample result that is *E. coli*-positive must include the following text.

Because required follow-up monitoring and analysis was not conducted after the aircraft water system tested positive for E. coli, we cannot be sure of the quality of the drinking water at this time. E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

Notices when an air carrier becomes aware of an *E. coli*-positive event that is a result of water that has been boarded from a watering point not in accordance with FDA regulations, that does not meet EPA standards for TNCWSs, or is otherwise deemed unsafe due to noncompliance with the procedures in the aircraft water system O&M plan must use the following language. Select the appropriate phrase from the options inside the brackets and delete the inapplicable phrases:

Water was boarded that is contaminated with E. coli because [WATER WAS BOARDED FROM A WATERING POINT NOT IN ACCORDANCE WITH FDA REGULATIONS (21 CFR ART 1240, SUBPART E)] or [OTHER APPROPRIATE EXPLANATION]. E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

The air carrier must continue to provide the notice until a set of follow-up samples is negative for total coliforms.

6.2.4 Notice Where Necessary to Protect Public Health

The ADWR provides for notice to be given where EPA, the carrier, or the crew determines it is necessary to protect public health from potentially serious health effects resulting from short-term exposure or specific conditions creating a public health risk [40 CFR 141.805(a)(7)]. This notice provision is intended to address unique circumstances where required notifications under other provisions in 40 CFR 141.805(a) may not be triggered or may otherwise prove to be inadequate under the circumstances. Accordingly, this notice provision would not apply to circumstances where the notification provisions set forth at 40 CFR 141.805(a)(1) through (a)(6) have been triggered. Furthermore, if passenger access to the water system is physically prevented through disconnecting or shutting off the water, or the flow of water prevented through the tap(s), or if water is supplied only to lavatory toilets, and not to any lavatory or galley taps, then only the crew notice under 40 CFR 141.805(c)(2), (d)(2), (e)(2), and (g) is required as appropriate. EPA understands that flight crews would be expected to comply with existing airline policies regarding communication with the public, including how to initiate, conduct, and document the public notification. This may include notifying or gaining approval from the pilot-in-command prior to conducting the public notification.

If the public water system that serves the airport has a violation or situation that requires public notification, they are required to notify their customers including the airport who in turn must notify the air carriers whose aircraft board water from the watering points at the airport. Air carriers can use the notice provided by the public water system for the crew notice if all public notification requirements under the ADWR are met or they can use information from the notice to supplement their notice.

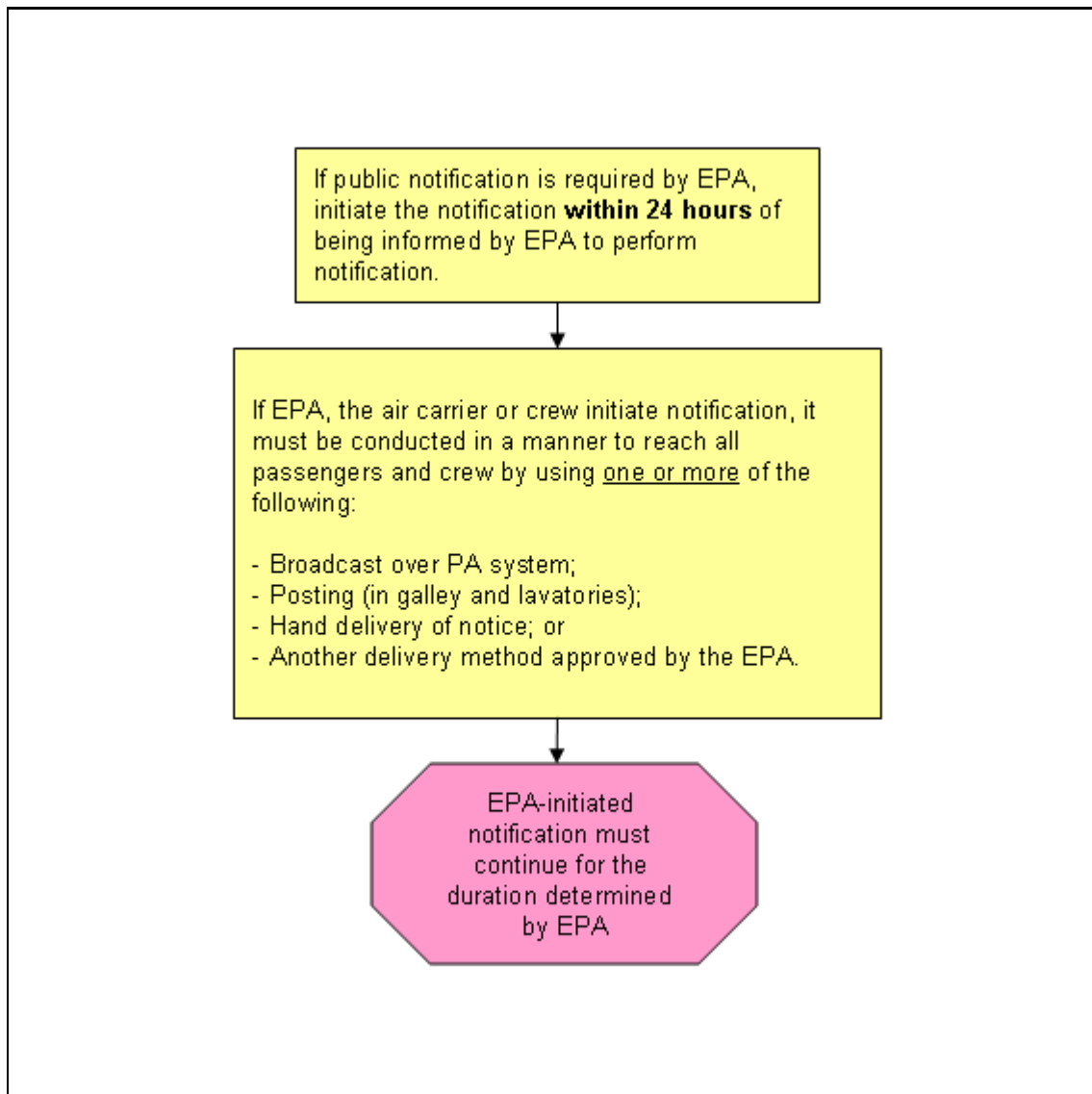
Notification must be reasonably calculated to reach all passengers and crew that are onboard the aircraft at the time the notification is made with one or more of the following forms of delivery applicable to this provision of the ADWR:

- 1) Broadcast over a public announcement (PA) system on aircraft;
- 2) Posting of the notice in conspicuous locations (such as all the galleys and lavatories in the affected aircraft);
- 3) Hand delivery of the notice to passengers and crew; or
- 4) Another delivery method approved in writing by EPA.

If EPA determines that public notification is necessary, air carriers must provide notification to passengers and crew within 24 hours of being informed by EPA to issue notification and must continue notification for the duration determined by EPA (see Appendix D, Template 9).

Exhibit 6.4 provides a flow-chart illustration of the public notification requirements when EPA, the air carrier, or the crew determines that notification is necessary to protect public health.

Exhibit 6.4 Public Notification Requirements When Notification is Deemed Necessary by EPA, the Air Carrier, or the Crew



While there are general requirements regarding the content of all public notices in the ADWR (found in 40 CFR 141.805(b) and described in Section 6.2 of this chapter), there are no specific content requirements for this situation. However, the content requirements specific to other

violations or situations requiring notification may be used as a guideline, when applicable. In addition, Template 9 in Appendix E provides an example of a notice that can be used for posting or hand delivery for this situation.

6.2.5 Crew-only Notice

Under the ADWR, in all situations when public notice must be provided, the rule allows for notice to be provided only to the crew so long as access to the water system is prevented by (1) disconnecting or shutting off the water, (2) preventing the flow of water through the tap(s), or (3) allowing water to be supplied only to lavatory toilets and not to any lavatory or galley tap. This provision of the ADWR ensures that the crew is notified of the water system status without the need for placing notices in each lavatory on the aircraft since the passengers would not be exposed to any health risks associated with the aircraft water system. However, input from air carriers expressed concern that if the required “prominent” notice to the crew is posted such that it is viewable by passengers, it may be misinterpreted without the understanding that they are not exposed to a risk because the aircraft water system has been shut-off. EPA understands this concern. Since the intent of this crew-only notice is to not notify the public when the system is inaccessible and does not represent a risk to passengers, the “prominent notice in the galley directed at the crew” does not need to be visible to the passengers. It need only be “prominent” with respect to the crew. EPA recognizes that any posted notices must be in accordance with FAA signage requirements.

EPA believes that the following procedure also satisfies the requirement of crew-only notification when access to the water system is prevented by (1) disconnecting or shutting off the water, (2) preventing the flow of water through the tap(s), or (3) allowing water to be supplied only to lavatory toilets and not to any lavatory or galley tap.

1. The “prominent notice to the crew” is read orally by the pilot to the entire crew during each pre-flight Crew Briefing for which attendance must be mandatory for all cabin crew members.
2. The oral notice must meet all of the applicable requirements in 40 CFR 141.805 including (c)(2), (d)(2), (e)(2), and (g).
3. A copy of the notice read to the crew by the pilot must be maintained as a record for three years as required under 40 CFR 141.807(f). EPA may request a copy of the notice at any time.

Under all situations involving crew-only notice, crew members must be prohibited from reactivating the water system once it has been established as inoperative. Access to the water system must not be restored until all of the applicable corrective action requirements of the ADWR have been met and the FAA regulations that govern the process for reactivating the water system have been followed.

The air carrier must keep copies of public notices that have been issued to passengers and crew as required by the ADWR for at least 3 years after issuance [40 CFR 141.807(f)]. Air carriers may keep electronic copies of these notices in lieu of paper copies.

7. Recordkeeping and Reporting

This chapter presents the recordkeeping and reporting requirements of the ADWR. The ADWR recordkeeping requirements are in 40 CFR 141.807, and reporting requirements can be found in 40 CFR 141.806.

7.1 Air Carrier Recordkeeping

Air carriers must keep records to document activities performed for compliance with the ADWR [40 CFR 141.807]. Many of the records which must be kept are *not* also reported to EPA. However, the records must be made available to EPA upon request. EPA may ask to view the records at any time as part of its ADWR oversight activities. EPA expects records to be made available within 14 calendar days of its request.

The ADWR does not specify a format in which the records must be retained or a location where they are to be housed. The air carrier's records retention system should be designed and organized to enable retrieval of specific records for each aircraft upon request by EPA. Records may include hard copy and/or electronic files.

7.1.1 Record Maintenance

Exhibit 7.1 summarizes the records that must be kept by the air carrier and the minimum time period they must be maintained. The dates are consistent with the recordkeeping requirements for similar items by other types of public water systems.

Exhibit 7.1 Duration of Record Maintenance

Type of Record to be Maintained	Minimum Retention Time
Bacteriological Analysis (Applies to all routine, repeat, and follow-up samples, including any replacement samples.)	5 Years
Aircraft Water System Disinfection and Flushing Events (Performed as routine and corrective action disinfection and flushing activities.)	5 Years
Self-Inspection	10 Years
Coliform Sampling Plans	Maintained on an Ongoing Basis
Water System Operations and Maintenance Plans	Maintained on an Ongoing Basis
Copies of Public Notices to Passengers and Crew	3 Years After Issuance

7.1.2 Information Included in Records

The ADWR is specific regarding the minimum information that must be included for each type of record that is required to be maintained. Additional information may also be retained at the air carriers' discretion.

- Records of **bacteriological analyses** include all sample results for routine, repeat, and follow-up samples (including any replacement samples) as well as results from any special purpose samples. All of the following information must be retained (this may be standard information entered on the laboratory data sheet accompanying the sample from collection through reporting of analysis results):
 - The date, time and place of sampling, and the name of the person who collected the sample.
 - Identification of the sample as a routine, repeat, follow-up, or other special purpose sample.
 - Date of the analysis.
 - Laboratory and person responsible for performing the analysis.
 - The analytical technique/method used.
 - The results of the analysis.
- Records of **disinfection and flushing** include all routine and corrective action disinfection and flushing events. The records may be kept as a compiled list of events for each aircraft, or as separate activity records. Because the procedures for disinfection and flushing events are included in the aircraft water system O&M plan, a separate record for procedures is not required. However, all of the following information must be recorded and maintained:
 - The date and time of the disinfection and flushing event.
 - The type of disinfection and flushing event: a routine disinfection and flushing event, a corrective action event, or an event that meets the criteria for both a routine and a corrective event (See Chapter 4).
- Records of **self-inspections** must include the following:
 - The completion date of each self-inspection. This may include completion dates of distinct aspects of the self-inspection, if the inspection is performed as a series of steps and not as a single activity.
 - Copies of any written reports, summaries, or communications related to a given self-inspection.
- Copies of **coliform sampling plans** must be available for review by EPA during compliance audits and upon request.
- Copies of aircraft water system **O&M plans** must be maintained in accordance with FAA requirements and available for review by EPA during compliance audits and upon request.
- Copies of **public notices** provided to passengers and crew must be maintained to document the information that was included in the notice.

7.2 Reporting Requirements

The reporting requirements of the ADWR pertain to an air carrier’s inventory of aircraft water systems, the coliform plan and sampling, the O&M plan and activities, public notification, self-inspections and deficiencies, and compliance audits [40 CFR 141.806].

7.2.1 Reporting Format

Unless EPA has approved an alternative method of reporting, the ADWR requires air carriers to report required information electronically. To facilitate the collection and analysis of aircraft water system data, EPA will use an Internet-based electronic data collection and management system (ADWR Reporting and Compliance System). Air carriers’ primary contact will be issued a username and password to access the ADWR Reporting and Compliance system. The data system will perform logic checks on data entered and will calculate final results for accountability and regulatory oversight. This system is intended to reduce reporting errors and limit the time involved in investigating, checking, and correcting errors at all levels.

The ADWR Reporting and Compliance System will have a companion User Guide that will provide information pertinent to users of the system. The User Guide will include a description of spreadsheet format and reporting method, how to access the downloadable spreadsheet and Web user interface, and other key information.

7.2.2 Aircraft Inventory

Air carriers are required to report a complete inventory of aircraft that are public water systems. In addition, they must report any changes to that inventory. Exhibit 7.2 summarizes the reporting timeline and pertinent information for establishing and maintaining an accurate inventory of aircraft water systems.

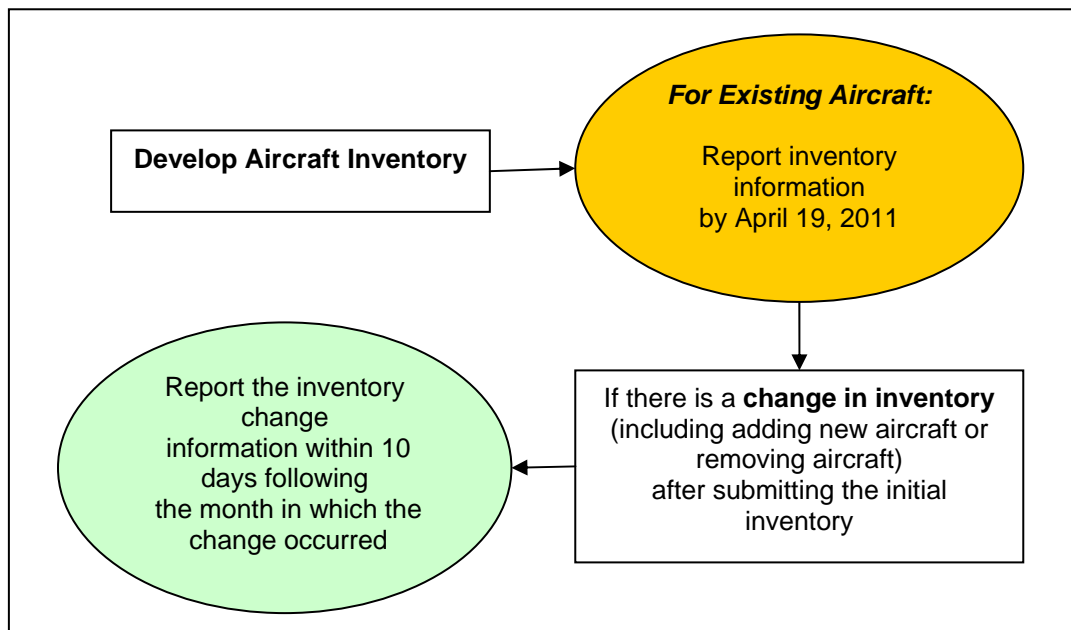
Exhibit 7.2 Reporting Aircraft Inventory

Reporting Item	Reporting Timeline	Information to Report to EPA
Aircraft Water System Inventory (existing aircraft)	April 19, 2011	Unique aircraft identifier number, active or inactive status, type and location of supplemental treatment, and whether the aircraft water system can be shut off or the flow of water prevented through the taps
Aircraft Water System Inventory (new aircraft)	Within the first calendar quarter of initial operation of the aircraft	Unique aircraft identifier number, active or inactive status, type and location of supplemental treatment, and whether the aircraft water system can be shut off or the flow of water prevented through the taps
Changes to Existing Inventory	No later than 10 days following the calendar month in which the change occurred	Changes to any of the information reported for the existing aircraft inventory

As illustrated in Exhibit 7.2, by April 19, 2011, air carriers must provide EPA a complete inventory of existing aircraft public water systems [40 CFR 141.806(b)]. Existing aircraft means any aircraft that was in operation when the final ADWR was published on October 19, 2009, or any aircraft that was brought into operation by April 19, 2011. The inventory will be reported directly to ADWR Reporting and Compliance System.

Changes to any information reported for the existing aircraft inventory must also be reported to ensure EPA has accurate information on aircraft public water systems for the ADWR implementation oversight program. Inventory changes (e.g., change of status from “active” to “inactive,” adding or removing aircraft, etc.) must be reported within 10 days following the calendar month in which the change occurred. If no changes are made during that month, no reporting is required. Exhibit 7.3 illustrates the reporting requirements for aircraft inventory.

Exhibit 7.3 Aircraft Inventory Reporting Requirements



Aircraft inventory reported to EPA must include all of the following information:

- The unique aircraft identifier number.
This may be the nose or tail number that is unique to the aircraft and is used for other aircraft tracking requirements.
- The status of the aircraft as active or inactive.
Refer to Section 3.2 for information on determining active and inactive status.

- The type and location of any supplemental treatment equipment installed on the aircraft water system.

Supplemental treatment equipment includes treatment applied to the finished water to maintain water quality or to change aesthetic water quality conditions. Examples include disinfection systems, carbon filters or particle removal filters on water lines, or other apparatus that changes the chemical, biological, or physical condition of the water. Although it is possible for increased temperature to cause changes to the chemical, biological, and physical condition of water, for the purposes of aircraft inventory, hot water heating units on coffee makers and/or hot water lines are not considered to be water treatment equipment.

- Whether the aircraft water system can be physically disconnected or shut off, or the flow of water prevented through the taps.

This information is important because the ability to shut off the supply of water to all faucets and other plumbing fixtures that provide water to passengers or crew affects the requirements for public notification and the timeframe for implementation of corrective disinfection and flushing.

7.2.3 Coliform Plan and Sampling

For each aircraft water system, air carriers must inform EPA when coliform sampling plans are completed and report the frequency of coliform monitoring. Copies of coliform sampling plans must be retained but they are not required to be submitted to EPA. However, EPA can request a copy of the plan at any time and may also view the plan during compliance audits. The frequency of coliform monitoring will be tracked and compared to the minimum requirements of the rule, and used as the basis for determining compliance with the provisions of the ADWR. Exhibit 7.4 summarizes the reporting items and timeline related to establishing and maintaining coliform sampling plans and conducting coliform monitoring.

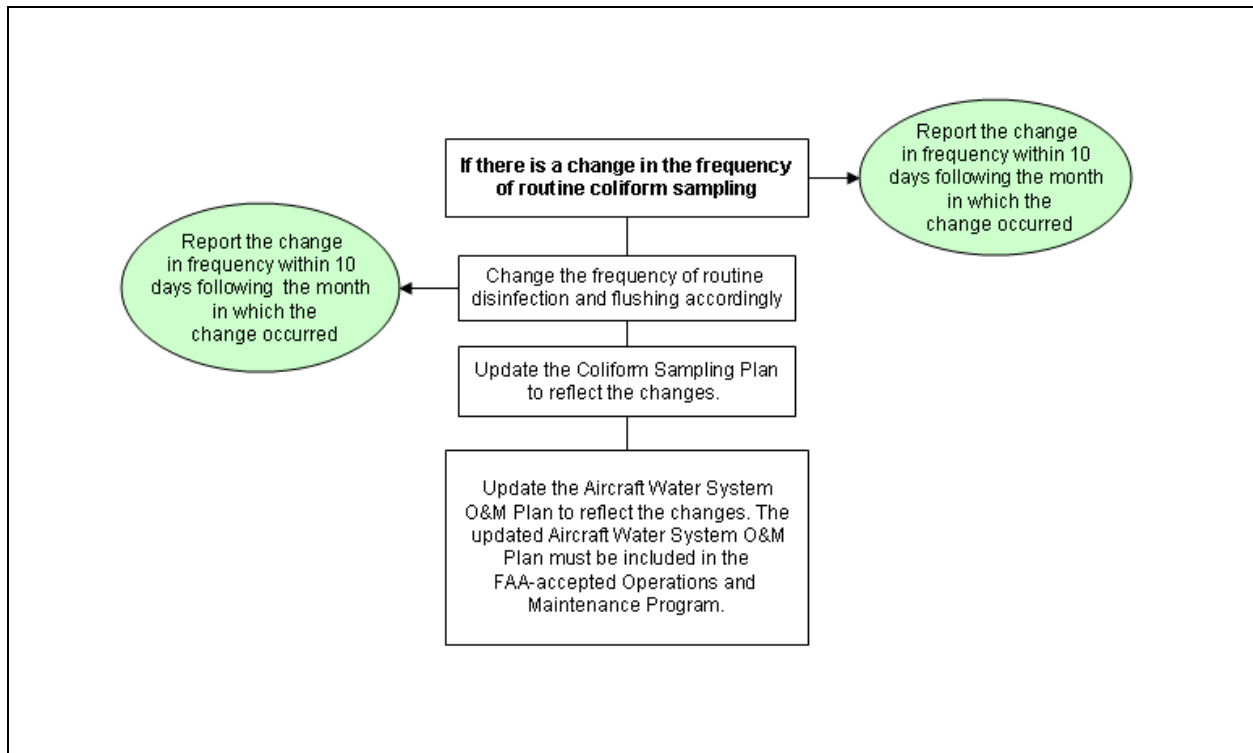
Exhibit 7.4 Reporting for Coliform Plan and Sampling

Reporting Item	Reporting Timeline	Information to Report to EPA
Coliform Sampling Plan (existing aircraft)	April 19, 2011	Date the plan has been developed and the frequency of routine coliform sampling for each aircraft
Coliform Sampling Plan (new aircraft)	Within the first calendar quarter of initial operation of the aircraft	Date the plan has been developed and the frequency of routine coliform sampling for each aircraft
Changes to required sampling frequency	No later than 10 days following the calendar month in which the change occurred	Changes to the required sampling frequency
All sample results that are TC(-) & EC(-) (routine, repeats and follow-up)	No later than 10 calendar days following the monitoring period in which the sampling occurred.	Sample results
Any routine sample TC(+) & EC(-)	Within 10 calendar days of receiving sample results	Sample results and, if applicable, whether required notification was provided to passengers and crew or crew only
Any sample TC(+) & EC(+) (routine, repeat, and follow-up)	Within 10 calendar days of receiving sample results	Sample results and whether required notification was provided to passengers and crew or crew only
Any repeat or follow-up sample	Within 10 calendar days of receiving sample results	Sample results and whether required notification was provided to passengers and crew or crew only
Return to routine monitoring	No later than 10 calendar days following the return to routine monitoring	Cessation of public notification or restricted public access requirements
Failure to conduct routine monitoring	Within 10 calendar days of discovery of the failure	Whether required notification was provided to passengers and crew or crew only
Failure to collect repeat samples	Within 10 calendar days of discovery of the failure	Whether required notification was provided to passengers and crew or crew only
Failure to collect follow-up samples	Within 10 calendar days of discovery of the failure	Whether required notification was provided to passengers and crew or crew only

For **existing** aircraft, both sampling frequencies and coliform sampling plan completion must be reported to EPA by April 19, 2011. For **new** aircraft placed into operation after the initial inventory is submitted, sampling frequencies and plan completion must be reported within the first calendar quarter of initial operation of the aircraft. See Chapter 4 for more information on coliform sampling plan requirements.

Changes in coliform sampling frequencies must be reported to EPA no later than 10 days following the calendar month in which the change occurred. Such changes must also be incorporated in the coliform sampling plan, although the plan itself need not be submitted. Changes to coliform sampling frequencies and coliform sampling plans require changes to disinfection and flushing frequencies and O&M plans. Exhibit 7.5 summarized the implications of changing the coliform sampling frequency.

Exhibit 7.5 Implications of Changes to Coliform Sampling Frequencies



In most cases, all coliform sampling results (routine, repeat, and follow-up) must be reported no later than 10 calendar days after the end of the monitoring period in which the samples were collected. The monitoring period is based on the monitoring frequency identified in the coliform sampling plan and may vary for different aircraft in an air carrier fleet. Thus, the monitoring period could be one month, one quarter (three months), six months, or 1 year.

If sample results (or any other event) trigger repeat sampling, or follow-up samples are collected after disinfection and flushing, the event must be reported to EPA within 10 days of being informed of sample results by the laboratory including whether the notification was provided to passengers and crew, or crew only.

All analytical sample results will be reported to the ADWR Reporting and Compliance System. Air carriers may instruct laboratories to either manually enter analytical results into EPA’s electronic data system, or to electronically upload data files from their laboratory information management systems (LIMS) to a Web-based data file submission program.

Regardless of the method or personnel used to report the data, these data files must be in a format prescribed by EPA. Air carriers may determine the best method of data upload and reporting that meets their needs. The ADWR does not require laboratory reporting or prohibit consultants or other agents from gathering and reporting results on the carrier's behalf. If it is believed that a result was entered into the data system erroneously, the air carrier is responsible for notifying the laboratory or responsible party to rectify the entry.

Failure to comply with the monitoring requirements of this regulation must also be reported to EPA within 10 calendar days. Failure to comply with monitoring requirements includes, but is not limited to, failure to collect routine samples according to the schedule in the coliform sampling plan, failure to collect repeat samples or follow-up samples within the time required, and failure to use a state or EPA-certified laboratory or EPA-approved analytical methods.

7.2.4 O&M Plans and Activities

For each aircraft water system, air carriers must inform EPA when the O&M plan is completed and report the frequency of routine disinfection and flushing. Copies of aircraft water system O&M plans must be retained but are not required to be submitted to EPA. However, EPA can request a copy of the plan at any time and may also view the plan during compliance audits. The frequency of routine disinfection and flushing will be tracked and compared to the minimum requirements of the rule, and used as the basis for determining compliance with the provisions of the ADWR. Exhibit 7.6 summarizes the reporting items and timeline that are related to establishing and maintaining O&M plans and conducting O&M activities.

Exhibit 7.6 Reporting O&M Plans and Activities

Reporting Item or Event	Reporting Timeline	Information to Report to EPA
Operations and Maintenance Plan (existing aircraft)	April 19, 2011	Plan has been developed and the frequency of routine disinfection and flushing for each aircraft
Operations and Maintenance Plan (new aircraft)	Within the first calendar quarter of initial operation of the aircraft	Plan has been developed and the frequency of routine disinfection and flushing for each aircraft
Changes to disinfection and flushing frequency	No later than 10 days following the calendar month in which the change occurred	Changes to disinfection and flushing frequency
Disinfecting and Flushing (routine)	Within 10 calendar days following the disinfection and flushing period in which the disinfection and flushing occurred.	Routine disinfection and flushing event was completed
Disinfecting and Flushing (corrective)	Within 10 calendar days of conducting disinfection and flushing	Corrective disinfection and flushing was completed and whether required notification was provided to passengers and crew or crew only
Restriction of public access	Within 10 calendar days of restriction	Notification was provided to passengers and crew or crew only, corrective action type, and reason
Shutting off an aircraft water system	Within 10 calendar days of notification	Whether the water system has been shut off
Failure to conduct disinfection and flushing	Within 10 calendar days of failure	Whether required notification was provided to passengers and crew or crew only and corrective actions implemented
Failure to board water from a safe watering point	Within 10 calendar days of identification of failure	Whether required notification was provided to passengers and crew or crew only and corrective actions implemented

For existing aircraft, both routine disinfection and flushing frequency and O&M plan completion must be reported to EPA by April 19, 2011. For new aircraft placed into operation after the initial inventory is submitted, frequency of routine disinfection and flushing and O&M plan completion must be reported within the first calendar quarter of initial operation of the aircraft. See Chapter 5 for more information on O&M plan requirements.

Changes in routine disinfection and flushing frequencies must be reported to EPA no later than 10 days following the calendar month in which the change occurred. Such changes must also be incorporated in the O&M plans, although the plan itself need not be submitted. Changes to the routine disinfection and flushing frequencies require changes to the routine coliform sampling frequencies and coliform sampling plans.

Failure to comply with the disinfection and flushing requirements of this regulation must also be reported to EPA within 10 calendar days of discovery of the failure. Failure to comply with

disinfection and flushing requirements includes failure to perform routine disinfection and flushing according to the schedule in the O&M plan, and failure to conduct corrective disinfection and flushing.

Anytime corrective action (i.e., restriction of public access or disinfection and flushing) is implemented, air carriers must notify EPA within 10 calendar days of the event and report the reason for the corrective action, the type of corrective action implemented, and whether required notification was provided to the passengers and crew or crew only.

7.2.5 Public Notification

All events requiring notification to passengers and crew must also be reported to EPA within 10 days of the event triggering the notification (see Exhibit 7.7). This reporting must include information on whether the required notification was provided to passengers and crew or crew only [40 CFR 141.806(b)(4)]. This does not require that a copy of a notification be provided to EPA; however, a copy must be available for EPA review as part of an audit.

Exhibit 7.7 Public Notification Reporting Requirements

Reporting Item	Reporting Timeline	Information to Report to EPA
Public notification to crew and passengers	Within 10 calendar days of notification	Whether required notification was provided to the passengers and crew or crew only
Public notification to crew only	Within 10 calendar days of notification	Whether required notification was provided to the passengers and crew or crew only

7.2.6 Self-Inspections

Air carriers must provide evidence of a self-inspection to EPA within 90 days of completion of the self-inspection [40 CFR 141.806(c)]; self-inspections of aircraft water systems are required every 5 years. The report must include evidence that all deficiencies identified in the inspection have been addressed. See Exhibit 7.8 on reporting requirements for self-inspections.

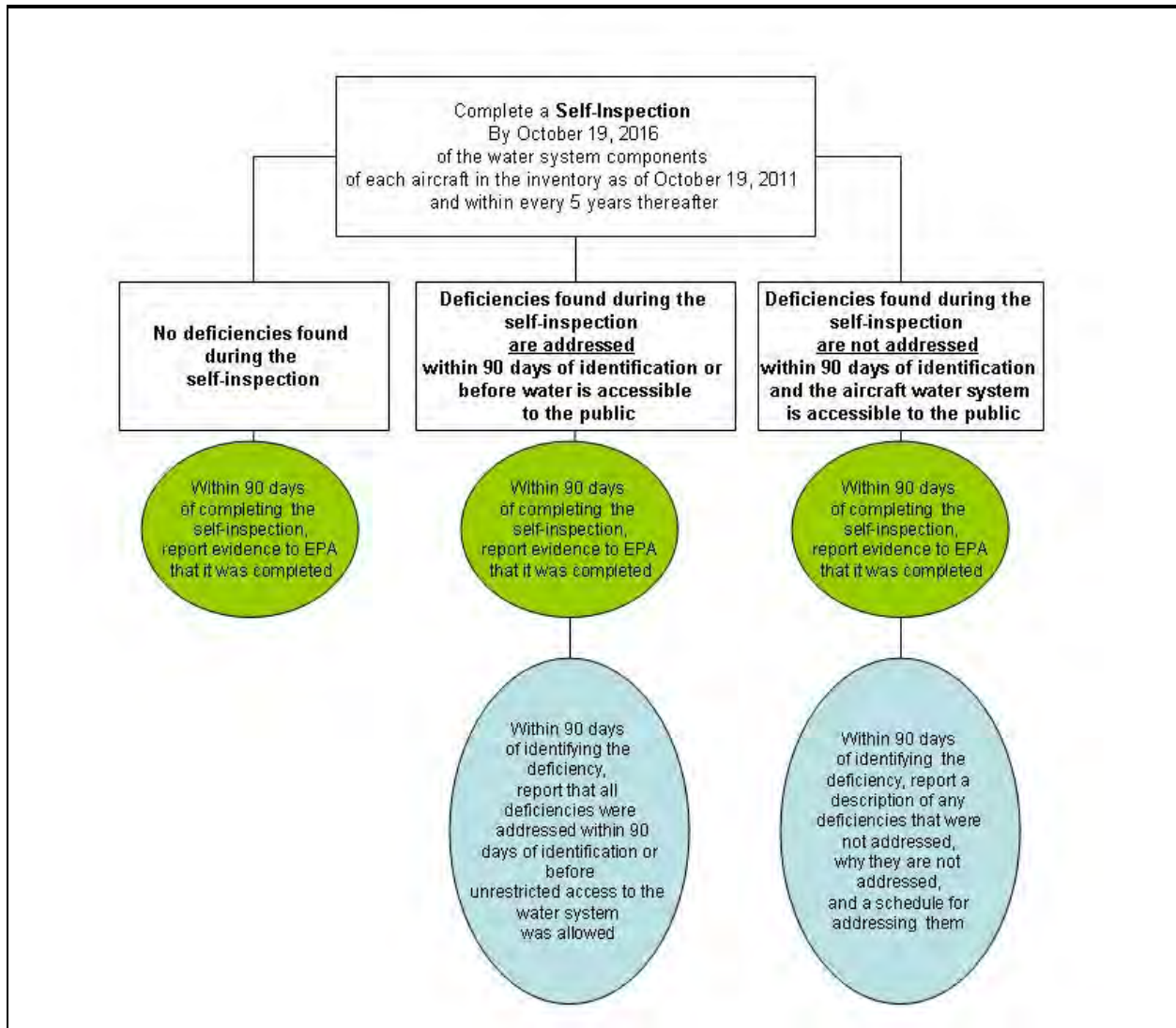
Exhibit 7.8 Self-Inspection Reporting

Reporting Item	Reporting Timeline	Information to Report to EPA
Completion of self-inspection	90 days after completion of the self-inspection	Provide evidence that a self-inspection was completed
Deficiencies identified during self-inspection	Within 90 days of identification of the deficiency	Notification that the deficiency has been addressed, or if not addressed, provide a description of the deficiency and an explanation of why it has not been addressed and a schedule for addressing the deficiency as soon as possible

EPA has provided flexibility in the rule so that a full self-inspection of an aircraft water system may be conducted over time rather than all at once so long as a complete self-inspection of the entire aircraft water system occurs no less frequently than once every five years. This allows air carriers to develop their own unique self-inspection procedures that coordinate, to the maximum extent possible, water system self-inspections with the existing aircraft inspection and maintenance process. Consequently, deficiencies may be identified periodically throughout the compliance period. If any deficiency has not been addressed within 90 days of identification of the deficiency, the air carrier must report a description of each unaddressed deficiency, an explanation as to why it has not been addressed, and a schedule for addressing each deficiency as quickly as possible [40 CFR 141.806(c)].

If more than 90 days have elapsed since a deficiency was identified and it has not been addressed, the aircraft will incur a violation of the ADWR if the aircraft is used in passenger service, even if public access to the water is restricted [40 CFR 141.808(c) and 141.810(e)]. If the aircraft is not returned to service, such as during extended or heavy maintenance, more than 90 days are allowed for addressing the deficiency without incurring a violation. Exhibit 7.9 illustrates the self-inspection reporting requirements.

Exhibit 7.9 Self-Inspection Reporting Requirements



7.2.7 Compliance Audits

Because EPA performs compliance audits, there are no reporting requirements for the air carrier related to completion of the audit. However, if deficiencies are identified during the audit, there are reporting requirements related to the status of the deficiency. If a deficiency is identified during a compliance audit, the carrier must report to EPA within 90 days of completion of the audit that the deficiency has been addressed. Exhibit 7.10 provides the compliance audit reporting requirements related to water system deficiencies.

Exhibit 7.10 Compliance Audit Reporting

Reporting Item	Reporting Timeline	Information to Report
Deficiencies identified during compliance audits	Within 90 days of notification of the deficiency	Notification that the deficiency has been addressed, or if not addressed, provide a description of the deficiency and an explanation of why it has not been addressed and a schedule for addressing the deficiency as soon as possible

If any deficiencies have not been addressed within 90 days of identification of the deficiency, the air carrier must report a description of each unaddressed deficiency, an explanation as to why it has not been addressed, and a schedule for addressing each deficiency as quickly as possible [40 CFR 141.806(c)].

If more than 90 days have elapsed since a deficiency was identified and it has not been addressed, the aircraft will incur a violation of the ADWR if the aircraft is used in passenger service, even if public access to the water is restricted [40 CFR 141.808(c) and 141.810(e)]. If the aircraft is not returned to service, such as during extended or heavy maintenance, more than 90 days are allowed for addressing the deficiency without incurring a violation.

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8. Violations of the Rule

Implementation and enforcement of National Primary Drinking Water Regulations applicable to aircraft public water systems is the responsibility of the EPA. Violations of the ADWR are specified in 40 CFR 141.810. Most of the violations involve failure of the air carrier to perform a specified action. An important exception is that any routine or repeat coliform sample result that is *E. coli*-positive is a violation of the ADWR.

Exhibit 8.1 summarizes rule violations and actions that the ADWR specifies must be taken in response to the violation, along with the rule citations. The exhibit also provides references to chapters in this guidance that provide further information on the ADWR requirements that were violated and the activity that is required in response to the violation. EPA's enforcement options, including penalties, are not addressed in this table.

In some cases, actions to bring the aircraft water system into compliance with the rule are not specified in the ADWR and will be determined by EPA. Exhibit 8.1 provides information on the violations to which this applies. EPA-required actions may be situation-specific.

Exhibit 8.1 Violations of the ADWR

-- Summary --

Violation	Required Response for the Violation (including citation)	Chapter Reference for Further Information
<p>Failure to perform any requirements in [40CFR 141.803 or 141.804]. This includes failure to: use analytical methods approved in accordance with 141.21(f)(3) and 141.21(f)(6) of the National Primary Drinking Water Regulations; and/or use laboratories certified by EPA or a “State”.</p>	<p>There are no rule citations specifying actions in response to these violations. Actions will be determined by EPA. One of the actions could include replacing the sample.</p>	Chapter 4
<p>Failure to perform routine disinfection and flushing [40 CFR 141.810(a)]. This includes failure to conduct routine disinfection and flushing as specified in the O&M plan.</p>	<p>The responses specified for this violation under 40 CFR 141.803(c)(3)(ii) are as follows:</p> <p>(1) Restrict public access to aircraft water system within 72 hours which includes:</p> <ul style="list-style-type: none"> • Physically disconnecting/shutting off aircraft water system, where feasible, or otherwise preventing the flow of water through the tap(s). • Providing public notification to passengers and crew per 40 CFR 141.805. • Providing alternatives to water from the aircraft water system (e.g., bottled water, antiseptic hand gels, etc.). <p>(2) Conduct disinfection and flushing.</p> <p>(3) Collect follow-up samples. Once samples are collected, aircraft water can be provided for human consumption.</p> <p>40 CFR 141.806(b)(5) requires the violation be reported to EPA within 10 calendar days of discovery of the failure.</p>	Chapter 4 Chapter 5 Chapter 6 Chapter 7

Violation	Required Response for the Violation (including citation)	Chapter Reference for Further Information
<p>Failure to perform corrective disinfection and flushing [40 CFR 141.810(a)]. This is triggered by sample results or failure to perform required activities.</p>	<p>40 CFR 141.806(b)(5) requires the violation be reported to EPA within 10 calendar days of discovery of the failure. By failing to perform corrective disinfection and flushing, the air carrier also would have failed to collect follow-up samples. Therefore, the air carrier must complete the required responses for failing to collect follow-up samples for an <i>E. coli</i>-positive or a total coliform-positive and <i>E. coli</i>-negative routine or repeat sample, whichever is applicable.</p>	<p>Chapter 4 Chapter 5 Chapter 7</p>
<p>Failure to restrict public access to the aircraft water supply by not physically disconnecting or shutting off the aircraft water system where feasible [40 CFR 141.810(a)]. This is triggered by sample results or failure to perform required activities.</p>	<p>By failing to restrict public access by not physically disconnecting or shutting off the aircraft water system when feasible, the air carrier also would have failed to perform corrective disinfection and flushing in the required timeframe and failed to collect the required follow-up samples. Therefore, the aircraft must complete the required responses for failing to collect follow-up samples for an <i>E. coli</i>-positive or a total coliform-positive and <i>E. coli</i>-negative routine or repeat sample, whichever is applicable.</p>	<p>Chapter 4 Chapter 5</p>
<p>Failure to restrict public access to the aircraft water supply by not providing public notification [40 CFR 141.810(a)]. This is triggered by sample results or failure to perform required activities.</p>	<p>There are no rule citations specifying actions in response to this violation. Actions will be determined by EPA.</p>	<p>Chapter 4 Chapter 6</p>
<p>Failure to restrict public access to the aircraft water supply by not providing alternatives to water or other measures [40 CFR 141.810(a)]. This is triggered by sample results or failure to perform required activities.</p>	<p>There are no rule citations specifying actions in response to this violation. Actions will be determined by EPA.</p>	<p>Chapter 4 Chapter 5</p>

Violation	Required Response for the Violation (including citation)	Chapter Reference for Further Information
<p>Failure to provide notification to passengers and crew [40 CFR 141.810(c)]. This includes public notification required for passengers and crew per [40 CFR 141.805] triggered by sample results, failure to perform required activities, or as determined by EPA, the air carrier, or the crew.</p>	<p>There are no rule citations specifying actions in response to this violation. Actions will be determined by EPA.</p>	<p>Chapter 6</p>
<p>Failure to collect routine coliform samples [40 CFR 141.810(a)]. This includes failure to collect and analyze the required number of coliform samples in accordance with the coliform monitoring plan.</p>	<p>The responses specified for this violation under 40 CFR 141.803(c)(3)(ii) are as follows:</p> <p>(1) Restrict public access to aircraft water system within 72 hours which includes:</p> <ul style="list-style-type: none"> • Physically disconnecting/shutting off aircraft water system, where feasible, or otherwise preventing the flow of water through the tap(s). • Providing public notification to passengers and crew per [40 CFR 141.805]. • Providing alternatives to water from the aircraft water system (e.g., bottled water, antiseptic hand gels, etc.). <p>(2) Conduct disinfection and flushing.</p> <p>(3) Collect follow-up samples. Once samples are collected, aircraft water can be provided for human consumption.</p> <p>40 CFR 141.806(b)(5) requires the violation be reported to EPA within 10 calendar days of discovery of the failure.</p>	<p>Chapter 4 Chapter 5 Chapter 7</p>

Violation	Required Response for the Violation (including citation)	Chapter Reference for Further Information
<p>Failure to collect repeat or follow-up samples as a result of a total coliform-positive and <i>E. coli</i>-negative result [40 CFR 141.810(a)]. This includes failure to conduct repeat sampling after routine samples are found to be positive for total coliform, and failure to conduct follow-up monitoring after corrective disinfection and flushing.</p>	<p>The responses specified for this violation under 40 CFR 141.803(c)(3)(ii) are as follows:</p> <p>(1) Restrict public access to aircraft water system within 72 hours which includes:</p> <ul style="list-style-type: none"> • Physically disconnecting/shutting off aircraft water system, where feasible, or otherwise preventing the flow of water through the tap(s). • Providing public notification to passengers and crew per [40 CFR 141.805]. • Providing alternatives to water from the aircraft water system (e.g., bottled water, antiseptic hand gels, etc.). <p>(2) Conduct disinfection and flushing.</p> <p>(3) Collect follow-up samples. Once samples are collected, aircraft water can be provided for human consumption.</p> <p>40 CFR 141.806(b)(5) requires the violation be reported to EPA within 10 calendar days of discovery of the failure.</p>	<p>Chapter 4 Chapter 5 Chapter 7</p>

Violation	Required Response for the Violation (including citation)	Chapter Reference for Further Information
<p>Failure to collect follow-up samples as a result of an <i>E. coli</i>-positive result [40 CFR 141.810(a)]. This includes failure to conduct follow-up monitoring after corrective disinfection and flushing when a routine sample is <i>E. coli</i>-positive.</p>	<p>The responses specified for this violation under 40 CFR 141.803(c)(2)(i), (ii), and (iii) are as follows:</p> <p>(1) Restrict public access to aircraft water system within 24 hours which includes:</p> <ul style="list-style-type: none"> • Physically disconnecting/shutting off aircraft water system, where feasible, or otherwise preventing the flow of water through the tap(s). • Providing public notification to passengers and crew per [40 CFR 141.805]. • Providing alternatives to water from the aircraft water system (e.g., bottled water, antiseptic hand gels, etc.). <p>(2) Conduct disinfection and flushing prior to resumption of unrestricted public access to the aircraft water system, or no later than 72 hours if the aircraft water system cannot be physically disconnected/shut off to the crew and passengers.</p> <p>(3) Collect follow-up samples. Follow-up samples results must be total coliform-negative before aircraft water can be provided for human consumption.</p> <p>40 CFR 141.806(b)(5) requires the violation be reported to EPA within 10 calendar days of discovery of the failure.</p>	<p>Chapter 4 Chapter 6 Chapter 7</p>

Violation	Required Response for the Violation (including citation)	Chapter Reference for Further Information
<p>Failure to board water from a safe watering point (non-<i>E. coli</i>-positive event) [40 CFR 141.810(a)]. When an air carrier becomes aware of a non-<i>E. coli</i>-positive event resulting from water that has been boarded from a watering point not in accordance with FDA regulations, does not meet EPA standards for transient non-community water systems, or has been determined unsafe due to noncompliance with procedures for boarding water specified in the O&M plan.</p>	<p>The responses specified for this violation under 40 CFR 141.803(c)(3)(ii) are as follows:</p> <p>(1) Restrict public access to aircraft water system within 72 hours which includes:</p> <ul style="list-style-type: none"> • Physically disconnecting/shutting off aircraft water system, where feasible, or otherwise preventing the flow of water through the tap(s). • Providing public notification to passengers and crew per [40 CFR 141.805]. • Providing alternatives to water from the aircraft water system (e.g., bottled water, antiseptic hand gels, etc.). <p>(2) Conduct disinfection and flushing.</p> <p>(3) Collect follow-up samples. Once samples are collected, aircraft water can be provided for human consumption.</p> <p>40 CFR 141.806(b)(4) requires the violation be reported to EPA within 10 calendar days of the event.</p>	<p>Chapter 4 Chapter 5 Chapter 6 Chapter 7</p>

Violation	Required Response for the Violation (including citation)	Chapter Reference for Further Information
<p>Failure to board water from a safe watering point (<i>E. coli</i>-positive event) [40 CFR 141.810(a)]. When an air carrier becomes aware of an <i>E. coli</i>-positive event resulting from water that has been boarded from a watering point not in accordance with FDA regulations, does not meet EPA standards for transient non-community water systems, or has been determined unsafe due to noncompliance with procedures for boarding water specified in the O&M plan.</p>	<p>The responses specified for this violation under 40 CFR 141.803(c)(2)(i), (ii), and (iii) are as follows:</p> <p>(1) Restrict public access to aircraft water system within 24 hours which includes:</p> <ul style="list-style-type: none"> • Physically disconnecting/shutting off aircraft water system, where feasible, or otherwise preventing the flow of water through the tap(s). • Providing public notification to passengers and crew per [40 CFR 141.805]. • Providing alternatives to water from the aircraft water system (e.g., bottled water, antiseptic hand gels, etc.). <p>(2) Conduct disinfection and flushing prior to resumption of unrestricted public access to the aircraft water system, or no later than 72 hours if the aircraft water system cannot be physically disconnected/shut off to the crew and passengers.</p> <p>(3) Collect follow-up samples. Follow-up samples results must be total coliform-negative before aircraft water can be provided for human consumption.</p> <p>40 CFR 141.806(b)(4) requires the violation be reported to EPA within 10 calendar days of the event.</p>	<p>Chapter 4 Chapter 5 Chapter 6 Chapter 7</p>

Violation	Required Response for the Violation (including citation)	Chapter Reference for Further Information
<p>Any <i>E. coli</i>-positive sample in any monitoring period [40 CFR 141.810(b)] (routine and repeat samples are used in this determination).</p>	<p>The responses specified for this violation under 40 CFR 141.803(c)(2)(i), (ii), and (iii) are as follows:</p> <p>(1) Restrict public access to aircraft water system within 24 hours which includes:</p> <ul style="list-style-type: none"> • Physically disconnecting/shutting off aircraft water system, where feasible, or otherwise preventing the flow of water through the tap(s). • Providing public notification to passengers and crew per [40 CFR 141.805]. • Providing alternatives to water from the aircraft water system (e.g., bottled water, antiseptic hand gels, etc.). <p>(2) Conduct disinfection and flushing prior to resumption of unrestricted public access to the aircraft water system, or no later than 72 hours if the aircraft water system cannot be physically disconnected/shut off to the crew and passengers.</p> <p>(3) Collect follow-up samples. Follow-up samples results must be total coliform-negative before aircraft water can be provided for human consumption.</p> <p>40 CFR 141.806(b)(4) requires the violation be reported to EPA within 10 calendar days of the event.</p>	<p>Chapter 4 Chapter 5 Chapter 7</p>
<p>Failure to comply with the reporting and recordkeeping requirements [40 CFR 141.810(d)]. This includes failure to report required information, results, or actions to EPA; and failure to retain records for the required time period or failure to retain the required information.</p>	<p>There are no rule citations specifying actions in response to this violation. Actions will be determined by EPA.</p>	<p>Chapter 7</p>

Violation	Required Response for the Violation (including citation)	Chapter Reference for Further Information
<p>Failure to conduct a self-inspection or address a deficiency in accordance with the O&M plan [40 CFR 141.810(e)]. Self-inspections are required every 5 years. Deficiencies noted during self-inspections or compliance audits must be addressed within 90 days of identification of the deficiency, or where such deficiency is identified during extended or heavy maintenance, before the aircraft is put back into service.</p>	<p>There are no rule citations specifying actions in response to this violation. Actions will be determined by EPA.</p>	<p>Chapter 5</p>
<p>Failure to develop a coliform sampling plan [40 CFR 141.810(f)]. Coliform sampling plans must be developed by April 19, 2011, for existing aircraft, or within the first calendar quarter of initial operation for new aircraft.</p>	<p>There are no rule citations specifying actions in response to this violation. Actions will be determined by EPA. One of the actions would include developing the plan.</p>	<p>Chapter 4</p>
<p>Failure to develop and follow operations and maintenance plan [40 CFR 141.810(f)]. Operations and maintenance plans must be developed by April 19, 2011, for existing aircraft, or within the first calendar quarter of initial operation for new aircraft.</p>	<p>There are no rule citations specifying actions in response to this violation. Actions will be determined by EPA. One of the actions would include developing the plan.</p>	<p>Chapter 5</p>

9. Other Water System Considerations

This chapter offers guidance on operations and management considerations for aircraft water systems that are beyond the regulatory requirements of the ADWR. These are not required practices, but this information may assist with maintaining the quality of water provided by aircraft water systems.

This chapter includes sections that address efforts to maintain water quality by limiting bacterial growth in water systems; supplemental treatment considerations; and additional communications strategies and recordkeeping practices. Although many of the practices may apply to a given aircraft water system or specific condition, they will not be applicable to all systems.

9.1 Water Age and Biofilm Management Considerations

Under certain conditions, the design and/or operation of aircraft water systems can cause water to be held for extended periods of time. Increased water age (described as the length of time water remains in the aircraft water system after it has been boarded and before it is used or flushed from the system) is a major factor in water quality degradation. Water quality degradation may include formation of disinfection byproducts (DBPs), accumulation of sediments, microbial growth such as biofilms, nitrification, taste and odor problems, and increased disinfectant decay. Thoroughly disinfecting and flushing the aircraft water system may help minimize and/or correct these problems.

Biofilm are thought to exist in all distribution systems and are accepted as a normal part of the distribution system. Biofilms are growths of microorganisms that are typically attached to the interior surfaces of piping, storage, and plumbing fixtures. Biofilm can entrain substances in the water (including waterborne pathogens) and later release these substances into the water, causing water quality problems such as tastes and odors and increased disinfectant demand. Biofilm can increase pipe corrosion, can affect pipe hydraulics, and make microbial disinfection more difficult. Microbes can enter distribution systems through physical gaps in the distribution system piping or tank, or due to contamination during the water transfer process to the aircraft. Microbial growth and biofilm development are a concern when an aircraft water system experiences excessive water age, higher temperatures, and when nutrients are present in the water.

Some air carriers “top off” or add water to the onboard storage tank on a repeated basis without completely draining the storage tank. This practice can cause stored water to have a longer water age. Many air carriers have existing procedures for draining a water system if the aircraft is going to be parked for an extended period of time. Some also have procedures for draining the water system due to either very cold or very warm ambient air temperatures. These practices protect the aircraft water system piping from breakage due to freezing, limit bacterial growth which can be enhanced in warm water, and also help to minimize water age. Draining of tanks every three days is a common practice for some air carriers where they do not have a high turn-over of the water through frequent high-volume boarding events.

Recommended practices to minimize water age include the following (when and where it is appropriate to dispose of the water should be considered):

1. Drain and refill tank frequently , when feasible, (e.g., daily, especially when aircraft are parked overnight in warm climates).
2. Limit the amount of water carried on the aircraft to only what is needed (due to the weight of water, air carriers typically do this but it is also a good practice for minimizing water age by maximizing water turn-over).
3. Conduct periodic disinfection and flushing more frequently than the manufacturer's recommendations if bacterial growth or water age is a concern. It is the responsibility of the air carrier to ensure that any increase in frequency would not result in damage to the aircraft water system's components.
4. Disinfect and flush the aircraft water system before serving water to the public if the water system has been worked on or the aircraft has been inactive or stored for an extended period (e.g., 3-days or more).

9.2 Considerations for Supplemental Treatment

The rule applies to aircraft that board only finished water for human consumption. In the ADWR, supplemental treatment is not required to be used with finished water that has been boarded on the aircraft. EPA believes the rule prescribes the minimum requirements necessary to provide safe drinking water to passengers and crew onboard aircraft, including the requirement to board finished water; boarding finished water in accordance with FDA requirements; transferring the water from the watering point to the aircraft in a manner that ensures it will not become contaminated during the transfer; compliance monitoring; corrective action; appropriate training of personnel; implementation of a water system operation and maintenance plan; self-inspections; compliance audits; reporting; and recordkeeping. However, supplemental treatment can provide an additional barrier of protection in the event of a failure in any of the basic protection barriers required under this rule. EPA believes the basic requirements of the ADWR, when performed consistently and diligently by the air carriers and their agents, provide assurance that drinking water onboard aircraft is safe for passengers and crew. Based on the information that EPA has at the time of this rulemaking, there is not sufficient information or data to support a requirement of supplemental treatment for aircraft water systems or for reducing any of the minimum requirements based on the installation of supplemental treatment. However, EPA plans to revisit this issue as part of the Six-Year review of the ADWR under SDWA Section 1412(b)(9) and as more data become available.

9.2.1 Type of Treatment Provided

Specific types of supplemental treatment installed on an aircraft public water system may provide an additional barrier against contamination. Installation of supplemental disinfection treatment units is an established practice in some corporate and charter jet fleets as well as in some new commercial passenger aircraft. Ultraviolet light disinfection systems are examples of supplemental disinfection units that are installed on some aircraft.

Supplemental treatment consisting of carbon adsorption and/or particle removal filters is intended to improve the aesthetic quality of the water and not to provide microbial inactivation. If not properly maintained, these units may harbor bacteria and promote biofilm growth.

Any supplemental treatment units installed onboard existing or new aircraft must be acceptable to FAA and FDA and must be installed, operated, and maintained in accordance with the manufacturer's plans and specifications and FAA requirements. Supplemental treatment units must not cause the water to violate the standards prescribed in the ADWR.

9.2.2 Supplemental Treatment Maintenance and Operator Training

It is important to educate aircraft maintenance personnel on the details regarding supplemental treatment, including ensuring the equipment is properly installed, operated, maintained, and inspected. Manufacturer's recommendations for installation, operation, and maintenance, as well as any issues that have been encountered, should be reviewed periodically and incorporated into the training program and the operations and maintenance plan for the aircraft water system.

The consequences of improperly installed, operated, or maintained treatment equipment can include the degradation of the quality of the water and a false-sense of confidence in the water provided to passengers and crew.

9.3 Communication Strategy

Stationary public water systems serving airports are usually community water systems and are required to meet more requirements than are aircraft water systems which are transient non-community water systems. Despite these requirements, stationary public water systems may experience temporary periods of non-compliance or water quality degradation. Accordingly, public water systems that sell or otherwise provide drinking water to other public water systems (i.e., to consecutive systems) are required to give public notice to the owner or operator of the consecutive system; the consecutive system is responsible for providing public notice to the persons it serves. Even though it is the responsibility of the stationary system to provide public notice to its users, it may be beneficial for airport personnel to establish strong communication links to the providers of water to the airport to ensure that the airport receives any drinking water public notice in a timely manner. Likewise, air carrier personnel should establish communication links with the appropriate airport personnel to ensure that they are notified immediately of any circumstances that may affect the quality of water supplied to the aircraft. Effective and timely communications between the public water system, airport, and air carrier may help the air carrier avoid unknowingly boarding water that does not meet the NPDWRs. Accordingly, EPA plans to work with FDA to help facilitate communication between all of the responsible parties along the aircraft water supply and transfer chain.

9.4 Recordkeeping Practices for Boarding of Water

Air carriers are not required by the ADWR to record the volume of water that is boarded onto aircraft, the date and time of boarding, or the location of boarding. The ADWR did not include such a requirement because of the large number of records the requirement would entail, and the limited value of the information. The information was believed to be of limited use since only finished water from watering points that are in accordance with FDA regulations is to be

boarded, and water from several sources may be mixed within a given aircraft water system at any time. This information, however, may be valuable to the air carrier in the event that onboard water is later implicated in a public health problem, or the onboard water is tested and found to contain coliform bacteria. If the water could be traced back to a specific location, the water quality issue could potentially be identified and resolved. Although the ADWR does not require information on water that is boarded, air carriers may implement this recordkeeping practice if desired.

References

USEPA Office of Ground Water and Drinking Water. 2002a. Health Risks From Microbial Growth and Biofilms in Drinking Water Distribution Systems. Available at: http://www.epa.gov/ogwdw/disinfection/tcr/pdfs/whitepaper_tcr_biofilms.pdf .

USEPA Office of Ground Water and Drinking Water. 2002b. Effects of Water Age on Distribution System Water Quality. Available at: http://www.epa.gov/ogwdw/disinfection/tcr/pdfs/whitepaper_tcr_waterdistribution.pdf

USEPA Office of Ground Water and Drinking Water. January 2005. Manual for the Certification of Laboratories Analyzing Drinking Water: Criteria and Procedures Quality Assurance. 5th Edition. (EPA 815-R-05-004).

WHO 2009. Guide to Hygiene and Sanitation in Aviation. 3rd Edition. Geneva, World Health Organization. Available at: http://www.who.int/water_sanitation_health/hygiene/ships/guide_hygiene_sanitation_aviation_3_edition.pdf

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Appendix A
***Federal Register* Publication of the Final ADWR Requirements**

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Agency. No substantive comments were provided by NDWAC.

On August 8, 2007, EPA consulted with the Department of Health and Human Services (HHS) on the proposed rule. EPA also consulted with HHS on the final rule and received a favorable response to the Agency's novel approach and development of the ADWR and no issues were raised as a result of the consultation.

L. Plain Language

Executive Order 12866 encourages Federal agencies to write rules in plain language. Whenever possible, EPA wrote the action in active voice, with simplified language, and displayed information in tables to make it easier for the public to read and understand.

M. Congressional Review Act

The Congressional Review Act, 5 U.S.C. 801 *et seq.*, as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. EPA will submit a report containing this rule and other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the United States prior to publication of the rule in the **Federal Register**. A Major rule cannot take effect until 60 days after it is published in the **Federal Register**. This action is not a "major rule" as defined by 5 U.S.C. 804(2). This rule will be effective November 18, 2009.

N. Analysis of the Likely Effect of Compliance With the ADWR on the Technical, Financial, and Managerial Capacity of Public Water Systems

Section 1420(d)(3) of SDWA, as amended, requires that, in promulgating a NPDWR, the Administrator shall include an analysis of the likely effect of compliance with the regulation on the technical, managerial, and financial (TMF) capacity of regulated entities. This analysis can be found in the Economic and Supporting Analyses document in EPA's public docket. Analyses reflect only the impact of new or revised requirements, as established by the ADWR; the impacts of previously established requirements are not considered.

VIII. References

ATA (Air Transport Association of America, Inc.) 2003. Air Transport Association: Aircraft Drinking Water Sampling Program, Final Report: December 31, 2003. <http://www.airlines.org>.

Canada. 2007a. Health Canada. Healthy Living. Aircraft Inspection Program—Frequently Asked Questions. http://www.hc-sc.gc.ca/hl-vs/travel-voyage/general/inspection/airplane-aeronefs_e.html.

Canada. 2007b. Health Canada. Healthy Living. Advisory. Health Canada cautions air travelers with compromised immune systems regarding water quality on aircraft. http://www.hc-sc.gc.ca/ahc-asc/media/advisories-avis/2006/2006_53_e.html.

Davison, A., Howard, G., Stevens, M., et al. 2005. Water, Sanitation and Health Protection and the Human Environment, World Health Organization, Geneva. Water Safety Plans: Managing drinking-water quality from catchment to consumer. http://www.who.int/water_sanitation_health/.

Lehtola, M., Torvinen, E., Kusnetsov, J., et al. 2007. Survival of Mycobacterium avium, Legionella pneumophila, Escherichia coli, and Caliciviruses in Drinking Water-Associated Biofilms Grown under High-Shear Turbulent Flow. Applied and Environmental Microbiology, 73:2854–2859.

USEPA. 1986. Water Supply Guidance 29: Plan for Implementation of the Safe Drinking Water Act on Interstate Carrier Conveyance.

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USEPA. 2008. Economic and Supporting Analyses; Aircraft Drinking Water Rule. EPA 816–D–08–002.

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USFDA. 2005. Title 21—Food and Drugs, Chapter 1—Food and Drug Administration, Part 1250—Interstate Conveyance Sanitation. <http://www.accessdata.fda.gov/>.

WHO. 1997. HACCP—Introducing the Hazard Analysis and Critical Control Point System. Geneva, Switzerland: WHO.

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List of Subjects in 40 CFR Part 141

Environmental protection, Chemicals, Indian-lands, Intergovernmental relations, Radiation protection, Reporting and recordkeeping requirements, Water supply.

Dated: October 5, 2009.

Lisa P. Jackson,
Administrator.

■ For the reasons set out in the preamble, title 40, chapter 1 of the Code of Federal Regulations is to be amended as follows:

PART 141—NATIONAL PRIMARY DRINKING WATER REGULATIONS

■ 1. The authority citation for part 141 continues to read as follows:

Authority: 42 U.S.C. 300f, 300g–1, 300g–2, 300g–3, 300g–4, 300g–5, 300g–6, 300j–4, 300j–9, and 300j–11.

■ 2. Part 141 is amended by adding a new subpart X to read as follows:

Subpart X—Aircraft Drinking Water Rule

Sec.

- 141.800 Applicability and compliance date.
- 141.801 Definitions.
- 141.802 Coliform sampling plan.
- 141.803 Coliform sampling.
- 141.804 Aircraft water system operations and maintenance plan.
- 141.805 Notification to passengers and crew.
- 141.806 Reporting requirements.
- 141.807 Recordkeeping requirements.
- 141.808 Audits and inspections.
- 141.809 Supplemental treatment.
- 141.810 Violations.

Subpart X—Aircraft Drinking Water Rule

§ 141.800 Applicability and compliance date.

(a) *Applicability*. The requirements of this subpart constitute the National Primary Drinking Water Regulations for aircraft that are public water systems and that board only finished water for human consumption. Aircraft public water systems are considered transient non-community water systems (TNCWS). To the extent there is a conflict between the requirements in this subpart and the regulatory requirements established elsewhere in this part, this subpart governs.

(b) *Compliance Date*. Aircraft public water systems must comply, unless otherwise noted, with the requirements of this subpart beginning October 19, 2011. Until this compliance date, air carriers remain subject to existing national primary drinking water regulations.

§ 141.801 Definitions.

As used in this subpart, the term: *Administrator* means the Administrator of the United States Environmental Protection Agency or his/her authorized representative.

Air Carrier means a person who undertakes directly by lease, or other arrangement, to engage in air transportation. The air carrier is responsible for ensuring all of the aircraft it owns or operates that are public water systems comply with all provisions of this subpart.

Aircraft means a device that is used or intended to be used for flight in the air.

Aircraft Water System means an aircraft that qualifies as a public water system under the Safe Drinking Water Act and the national primary drinking water regulations. The components of

an aircraft water system include the water service panel, the filler neck of the aircraft finished water storage tank, and all finished water storage tanks, piping, treatment equipment, and plumbing fixtures within the aircraft that supply water for human consumption to passengers or crew.

Aircraft Water System Operations and Maintenance Plan means the schedules and procedures for operating, monitoring, and maintaining an aircraft water system that is included in an aircraft operation and maintenance program accepted by the Federal Aviation Administration. (14 CFR part 43, 14 CFR part 91, 14 CFR part 121)

Finished Water means water that is introduced into the distribution system of a public water system and is intended for distribution and consumption without further treatment, except as treatment necessary to maintain water quality in the distribution system (e.g., supplemental disinfection, addition of corrosion control chemicals). (40 CFR 141.2)

Human Consumption means drinking, bathing, showering, hand washing, teeth brushing, food preparation, dishwashing, and maintaining oral hygiene.

Self Inspection means an onsite review of the aircraft water system, including the water service panel, the filler neck of the aircraft finished water storage tank; all finished water storage tanks, piping, treatment equipment, and plumbing fixtures; and a review of the aircraft operations, maintenance, monitoring, and recordkeeping for the purpose of evaluating the adequacy of such water system components and practices for providing safe drinking water to passengers and crew.

Watering point means the water supply, methods, and facilities used for the delivery of finished water to the aircraft. These facilities may include water trucks, carts, cabinets, and hoses.

§ 141.802 Coliform sampling plan.

(a) Each air carrier under this subpart must develop a coliform sampling plan covering each aircraft water system owned or operated by the air carrier that identifies the following:

(1) Coliform sample collection procedures that are consistent with the requirements of § 141.803(a) and (b).

(2) Sample tap location(s) representative of the aircraft water system as specified in § 141.803(b)(2) and (b)(4).

(3) Frequency and number of routine coliform samples to be collected as specified in § 141.803(b)(3).

(4) Frequency of routine disinfection and flushing as specified in the operations and maintenance plan under § 141.804.

(5) Procedures for communicating sample results promptly so that any required actions, including repeat and follow-up sampling, corrective action, and notification of passengers and crew, will be conducted in a timely manner.

(b) Each air carrier must develop a coliform sampling plan for each aircraft with a water system meeting the definition of a public water system by April 19, 2011.

(c) The coliform sampling plan must be included in the Aircraft Water System Operations and Maintenance Plan required in § 141.804. Any subsequent changes to the coliform sampling plan must also be included in the Aircraft Water System Operations and Maintenance Plan required in § 141.804.

§ 141.803 Coliform sampling.

(a) *Analytical Methodology.* Air carriers must follow the sampling and analysis requirements under this section.

(1) The standard sample volume required for total coliform analysis, regardless of analytical method used, is 100 mL.

(2) Air carriers need determine only the presence or absence of total coliforms and/or *E. coli*; a determination of density of these organisms is not required.

(3) Air carriers must conduct analyses for total coliform and *E. coli* in accordance with the analytical methods approved in § 141.21(f)(3) and 141.21(f)(6).

(4) The time from sample collection to initiation of analysis may not exceed 30 hours. Systems are encouraged but not required to hold samples below 10°C during transit.

(5) The invalidation of a total coliform sample result can be made only by the Administrator in accordance with

§ 141.21(c)(1)(i), (ii), or (iii) or by the certified laboratory in accordance with § 141.21(c)(2).

(6) Certified laboratories. For the purpose of determining compliance with this subpart, samples may be considered only if they have been analyzed by a laboratory certified by a State or EPA. For the purposes of this paragraph, “State” refers to a State or Tribe that has received primacy for public water systems (other than aircraft water systems) under section 1413 of SDWA.

(b) *Routine Monitoring.* For each aircraft water system, the sampling frequency must be determined by the disinfection and flushing frequency recommended by the aircraft water system manufacturer, when available, and as identified in the operations and maintenance plan in § 141.804.

(1) Except as provided in paragraph (b)(2) of this section, the air carrier must collect two 100 mL total coliform routine samples at the frequency specified in the sampling plan in § 141.802 and in accordance with paragraph (b)(3) of this section;

(2) The air carrier may collect one 100 mL total coliform routine sample at the frequency specified in the sampling plan in § 141.802 for aircraft with a removable or portable tank that is drained every day of passenger service, and the aircraft has only one tap. Aircraft meeting the requirements of this paragraph do not have to comply with paragraph (b)(4) of this section.

(3) Air carriers must perform routine monitoring for total coliform at a frequency corresponding to the frequency of routine disinfection and flushing as specified in the Table b–1 (Routine Disinfection and Flushing and Routine Sample Frequencies). Air carriers must follow the disinfection and flushing frequency recommended by the aircraft water system manufacturer, when available. Where the aircraft water system manufacturer does not specify a recommended routine disinfection and flushing frequency, the air carrier must choose a frequency from Table b–1 (Routine Disinfection and Flushing and Routine Sample Frequencies):

TABLE B–1—ROUTINE DISINFECTION AND FLUSHING AND ROUTINE SAMPLE FREQUENCIES

Minimum routine disinfection & flushing per aircraft	Minimum frequency of routine samples per aircraft
At least 4 times per year = At least once within every three-month period (quarterly).	At least 1 time per year = At least once within every twelve-month period (annually).
At least 3 times per year = At least once within every four-month period.	At least 2 times per year = At least once within every six-month period (semi-annually).

TABLE B-1—ROUTINE DISINFECTION AND FLUSHING AND ROUTINE SAMPLE FREQUENCIES—Continued

Minimum routine disinfection & flushing per aircraft	Minimum frequency of routine samples per aircraft
At least 2 times per year = At least once within every six-month period (semi-annually). At least 1 time per year or less = At least once within every twelve-month period (annually) or less.	At least 4 times per year = At least once within every three-month period (quarterly). At least 12 times per year = At least once every month (monthly).

(4) One sample must be taken from a lavatory and one from a galley; each sample must be analyzed for total coliform. If only one water tap is located in the aircraft water system due to aircraft model type and construction, then a single tap may be used to collect two separate 100 mL samples.

(5) If any routine, repeat, or follow-up coliform sample is total coliform-positive, the air carrier must analyze that total coliform-positive culture medium to determine if *E. coli* is present.

(6) Routine total coliform samples must not be collected within 72 hours after completing routine disinfection and flushing procedures.

(c) *Routine Coliform Sample Results.*

(1) Negative Routine Coliform Sample Results. If all routine sample results are total coliform-negative, then the air carrier must maintain the routine monitoring frequency for total coliform as specified in the sampling plan in § 141.802.

(2) Positive Routine *E. coli* Sample Results. If any routine sample is *E. coli*-positive, the air carrier must perform all of the following:

(i) *Restrict Public Access.* Restrict public access to the aircraft water system in accordance with paragraph (d) of this section as expeditiously as possible, but in no case later than 24 hours after the laboratory notifies the air carrier of the *E. coli*-positive result or discovery of the applicable failure as specified in paragraphs (g) and (h) of this section. All public access restrictions, including applicable public notification requirements, must remain in-place until the aircraft water system has been disinfected and flushed and a complete set of follow-up samples is total coliform-negative; and

(ii) *Disinfect and Flush.* Conduct disinfection and flushing in accordance with § 141.804(b)(2). If the aircraft water system cannot be physically disconnected or shut-off, or the flow of water otherwise prevented through the tap(s), then the air carrier must disinfect and flush the system no later than 72 hours after the laboratory notifies the air carrier of the *E. coli*-positive result or discovery of the applicable failure as

specified in paragraphs (g) and (h) of this section; and

(iii) *Follow-up Sampling.* Collect follow-up samples in accordance with paragraph (e) of this section. A complete set of follow-up sample results must be total coliform-negative before the air carrier provides water for human consumption from the aircraft water system and returns to the routine monitoring frequency as specified in the sampling plan required by § 141.802.

(3) Positive Routine Total Coliform Sample Results. If any routine sample is total coliform-positive and *E. coli*-negative, then the air carrier must perform at least one of the following three corrective actions and continue through with that action until a complete set of follow-up or repeat samples is total coliform-negative:

(i) *Disinfect and Flush.* In accordance with § 141.804(b)(2), conduct disinfection and flushing of the system no later than 72 hours after the laboratory notifies the air carrier of the total coliform-positive and *E. coli*-negative result. After disinfection and flushing is completed, the air carrier must collect follow-up samples in accordance with paragraph (e) of this section prior to providing water for human consumption from the aircraft water system. A complete set of follow-up sample results must be total coliform-negative before the air carrier returns to the routine monitoring frequency as specified in the sampling plan required by § 141.802; or

(ii) *Restrict Public Access.* In accordance with paragraph (d) of this section, restrict public access to the aircraft water system as expeditiously as possible, but in no case later than 72 hours after the laboratory notifies the air carrier of the total coliform-positive and *E. coli*-negative result or discovery of the applicable failure as specified in paragraphs (f), (g), and, (i) of this section. All public access restrictions, including applicable public notification requirements, must remain in-place until the aircraft water system has been disinfected and flushed, and a complete set of follow-up samples has been collected. The air carrier must conduct disinfection and flushing in accordance with § 141.804(b)(2). After disinfection

and flushing is completed, the air carrier must collect follow-up samples in accordance with paragraph (e) of this section prior to providing water for human consumption from the aircraft water system. A complete set of follow-up sample results must be total coliform-negative before the air carrier returns to the routine monitoring frequency as specified in the sampling plan required by § 141.802; or

(iii) *Repeat Sampling.* Collect three 100 mL repeat samples no later than 24 hours after the laboratory notifies the air carrier of the routine total coliform-positive and *E. coli*-negative result. Repeat samples must be collected and analyzed from three taps within the aircraft as follows: The tap which resulted in the total coliform-positive sample, one other lavatory tap, and one other galley tap. If fewer than three taps exist, then a total of three 100 mL samples must be collected and analyzed from the available taps within the aircraft water system.

(A) If all repeat samples are total coliform-negative, then the air carrier must maintain the routine monitoring frequency for total coliform as specified in the sampling plan in § 141.802.

(B) If any repeat sample is *E. coli*-positive, the air carrier must perform all the corrective actions as specified in paragraphs (c)(2)(i), (c)(2)(ii), and (c)(2)(iii) of this section.

(C) If any repeat sample is total coliform-positive and *E. coli*-negative, then the air carrier must perform the corrective actions specified in paragraphs (c)(3)(i) or (c)(3)(ii) of this section, and continue through with that action until a complete set of follow-up samples is total coliform-negative.

(d) *Restriction of public access.* Restriction of public access to the aircraft water system includes, but need not be limited to, the following:

(1) Physically disconnecting or shutting off the aircraft water system, where feasible, or otherwise preventing the flow of water through the tap(s);

(2) Providing public notification to passengers and crew in accordance with § 141.805.

(3) Providing alternatives to water from the aircraft water system, such as bottled water for drinking and coffee or

tea preparation; antiseptic hand gels or wipes in accordance with 21 CFR part 333—"Topical Anti-microbial Drug Products for Over-the-Counter Human Use" in the galleys and lavatories; and other feasible measures that reduce or eliminate the need to use the aircraft water system during the limited period before public use of the aircraft water system is unrestricted.

(e) *Post Disinfection and Flushing Follow-up Sampling.* Following corrective action disinfection and flushing, air carriers must comply with post disinfection and flushing follow-up sampling procedures that, at a minimum, consist of the following:

(1) For each aircraft water system, the air carrier must collect a complete set of total coliform follow-up samples consisting of two 100 mL total coliform samples at the same routine sample locations as identified in paragraphs (b)(2) and (b)(4) of this section.

(2) Follow-up samples must be collected prior to providing water to the public for human consumption from the aircraft water system.

(3) If a complete set of follow-up samples is total coliform-negative, the air carrier must return to the routine monitoring frequency for total coliform as specified in the sampling plan required by § 141.802.

(4) If any follow-up sample is *E. coli*-positive, the air carrier must perform all the corrective actions as specified in paragraphs (c)(2)(i), (c)(2)(ii), and (c)(2)(iii) of this section.

(5) If any follow-up sample is total coliform-positive and *E. coli*-negative the air carrier must restrict public access to the aircraft water system in accordance with paragraph (d) of this section as expeditiously as possible, but in no case later than 72 hours after the laboratory notifies the air carrier of the total coliform-positive and *E. coli*-negative result. All public access restrictions, including applicable public notification requirements, must remain in-place until the aircraft water system has been disinfected and flushed in accordance with § 141.804(b)(2) and a complete set of follow-up samples is total coliform-negative. The air carrier must collect follow-up samples in accordance with paragraph (e) of this section. A complete set of follow-up sample results must be total coliform-negative before the air carrier provides water for human consumption from the aircraft water system and returns to the routine monitoring frequency for coliform as specified in § 141.802.

(f) *Failure to Perform Required Routine Disinfection and Flushing or Failure to Collect Required Routine Samples.* If the air carrier fails to

perform routine disinfection and flushing or fails to collect and analyze the required number of routine coliform samples, the air carrier must perform all the corrective actions as specified in paragraph (c)(3)(ii) of this section.

(g) *Failure to Collect Repeat or Follow-up Samples.* If the air carrier fails to collect and analyze the required follow-up samples as a result of an *E. coli*-positive result, then the air carrier must perform all the corrective actions as specified in paragraphs (c)(2)(i), (c)(2)(ii), and (c)(2)(iii) of this section. If the air carrier fails to collect and analyze the required repeat samples or follow-up samples as a result of a total coliform-positive and *E. coli*-negative result, then the air carrier must perform all the corrective actions as specified in paragraph (c)(3)(ii) of this section.

(h) *Failure to Board Water from a Safe Watering Point (E. coli-positive).* For the aircraft water system, the air carrier must perform all the corrective actions specified in paragraphs (c)(2)(i), (c)(2)(ii), and (c)(2)(iii) of this section when it becomes aware of an *E. coli*-positive event resulting from:

(1) Boarding water from a watering point not in accordance with FDA regulations (21 CFR part 1240 subpart E), or

(2) Boarding water that does not meet NPDWRs applicable to transient non-community water systems (§§ 141.62 and 141.63, as applied to TNCWS),

(3) Boarding water that is otherwise determined to be unsafe due to non-compliance with the procedures specified in § 141.804(b)(6).

(i) *Failure to Board Water from a Safe Watering Point (non-E. coli-positive).* For the aircraft water system, the air carrier must perform all the corrective actions specified in paragraphs (c)(3)(ii) of this section when it becomes aware of a non-*E. coli*-positive event resulting from:

(1) Boarding water from a watering point not in accordance with FDA regulations (21 CFR part 1240, subpart E),

(2) Boarding water that does not meet NPDWRs applicable to transient non-community water systems (§§ 141.62 and 141.63, as applied to TNCWS), or

(3) Boarding water that is otherwise determined to be unsafe due to non-compliance with the procedures specified in § 141.804(b)(6).

§ 141.804 Aircraft water system operations and maintenance plan.

(a) Each air carrier must develop and implement an aircraft water system operations and maintenance plan for each aircraft water system that it owns or operates. This plan must be included

in a Federal Aviation Administration (FAA)-accepted air carrier operations and maintenance program (14 CFR part 43, 14 CFR part 91, 14 CFR part 121).

(b) Each aircraft water system operations and maintenance plan must include the following:

(1) Watering Point Selection Requirement. All watering points must be selected in accordance with Food and Drug Administration (FDA) regulations (21 CFR part 1240, subpart E).

(2) Procedures for Disinfection and Flushing. The plan must include the following requirements for procedures for disinfection and flushing of aircraft water system.

(i) The air carrier must conduct disinfection and flushing of the aircraft water system in accordance with, or is consistent with, the water system manufacturer's recommendations. The air carrier may conduct disinfection and flushing more frequently, but not less frequently, than the manufacturer recommends.

(ii) The operations and maintenance plan must identify the disinfection frequency, type of disinfecting agent, disinfectant concentration to be used, and the disinfectant contact time, and flushing volume or flushing time.

(iii) In cases where a recommended routine disinfection and flushing frequency is not specified by the aircraft water system manufacturer, the air carrier must choose a disinfection and flushing, and corresponding monitoring frequency specified in § 141.803(b)(3).

(3) Follow-up Sampling. The plan must include the procedures for follow-up sampling in accordance with § 141.803(e).

(4) Training Requirements. Training for all personnel involved with the aircraft water system operation and maintenance provisions of this regulation must include, but is not limited to the following:

(i) Boarding water procedures;

(ii) Sample collection procedures;

(iii) Disinfection and flushing procedures;

(iv) Public health and safety reasons for the requirements of this subpart.

(5) Procedures for Conducting Self-inspections of the Aircraft Water System. Procedures must include, but are not limited to, inspection of storage tank, distribution system, supplemental treatment, fixtures, valves, and backflow prevention devices.

(6) Procedures for Boarding Water.

The plan must include the following requirements and procedures for boarding water:

(i) Within the United States, the air carrier must board water from watering

points in accordance with Food and Drug Administration (FDA) regulations (21 CFR part 1240, subpart E).

(ii) A description of how the water will be transferred from the watering point to the aircraft in a manner that ensures it will not become contaminated during the transfer.

(iii) A description of how the carrier will ensure that water boarded outside the United States is safe for human consumption.

(iv) A description of emergency procedures that meet the requirements in § 141.803(h) and (i) that must be used in the event that the air carrier becomes aware that water was boarded to operate essential systems, such as toilets, but was boarded from a watering point not in accordance with FDA regulations, does not meet NPDWRs applicable to transient non-community water systems (§§ 141.62 and 141.63, as applied to TNCWSs), or is otherwise unsafe.

(7) Coliform Sampling Plan. The air carrier must include the coliform sampling plan prepared in accordance with § 141.802.

(8) Aircraft Water System Disconnect/ Shut-off, or Prevent Flow of Water Through the Tap(s) Statement. An explanation of whether the aircraft water system can be physically disconnected/shut-off, or the flow of water otherwise prevented through the tap(s) to the crew and passengers.

(c) For existing aircraft, the air carrier must develop the water system operations and maintenance plan required by this section by April 19, 2011;

(d) For new aircraft, the air carrier must develop the operations and maintenance plan required in this section within the first calendar quarter of initial operation of the aircraft.

(e) Any changes to the aircraft water system operations and maintenance plan must be included in the FAA-accepted air carrier operations and maintenance program.

§ 141.805 Notification to passengers and crew.

(a) Air carriers must give public notice for each aircraft in all of the following situations:

(1) Public access to the aircraft water system is restricted in response to a routine, repeat or follow-up total coliform-positive or *E. coli*-positive sample result in accordance with § 141.803(d);

(2) Failure to perform required routine disinfection and flushing or failure to collect required routine samples in accordance with § 141.803(f);

(3) Failure to collect the required follow-up samples in response to a

sample result that is *E. coli*-positive in accordance with § 141.803(g);

(4) Failure to collect the required repeat samples or failure to collect the required follow-up samples in response to a sample result that is total coliform-positive and *E. coli*-negative in accordance with § 141.803(g);

(5) In accordance with § 141.803(h), the air carrier becomes aware of an *E. coli*-positive event resulting from water that has been boarded from a watering point not in accordance with FDA regulations (21 CFR part 1240, subpart E), or that does not meet NPDWRs applicable to transient non-community water systems, or that is otherwise determined to be unsafe due to non-compliance with the procedures specified in § 141.804(b)(6);

(6) In accordance with § 141.803(i), the air carrier becomes aware of a non-*E. coli*-positive event resulting from water that has been boarded from a watering point not in accordance with FDA regulations (21 CFR part 1240, subpart E), or that does not meet NPDWRs applicable to transient non-community water systems, or that is otherwise determined to be unsafe due to non-compliance with the procedures specified in § 141.804(b)(6).

(7) The Administrator, the carrier, or the crew otherwise determines that notification is necessary to protect public health.

(b) Public notification:

(1) Must be displayed in a conspicuous way when printed or posted;

(2) Must not contain overly technical language or very small print;

(3) Must not be formatted in a way that defeats the purpose of the notice;

(4) Must not contain language that nullifies the purpose of the notice;

(5) Must contain information in the appropriate language(s) regarding the importance of the notice, reflecting a good faith effort to reach the non-English speaking population served, including, where applicable, an easily recognized symbol for non-potable water.

(c) Public notification for paragraph (a)(1) of this section must meet the requirements of paragraph (b) of this section in addition to the following:

(1) Public notification must include a prominently displayed, clear statement in each lavatory indicating that the water is non-potable and should not be used for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use; and

(2) A prominent notice in the galley directed at the crew which includes:

(i) A clear statement that the water is non-potable and should not be used for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use;

(ii) A description of the violation or situation triggering the notice, including the contaminant(s) of concern;

(iii) When the violation or situation occurred;

(iv) Any potential adverse health effects from the violation or situation, as appropriate, under paragraph (g) of this section;

(v) The population at risk, including sensitive subpopulations particularly vulnerable if exposed to the contaminant in the drinking water;

(vi) What the air carrier is doing to correct the violation or situation; and

(vii) When the air carrier expects to return the system to unrestricted public access.

(3) If passenger access to the water system is physically prevented through disconnecting or shutting off the water, or the flow of water prevented through the tap(s), or if water is supplied only to lavatory toilets, and not to any lavatory or galley taps, then only the notice specified in paragraph (c)(2) of this section is required.

(4) Air carriers must initiate public notification when restriction of public access is initiated in accordance with § 141.803(d) and must continue until the aircraft water system is returned to unrestricted public access.

(d) Public notification for paragraphs (a)(2), (a)(4), and (a)(6) of this section must meet the requirements of paragraph (b) of this section in addition to the following:

(1) Public notification must include a prominently displayed, clear statement in each lavatory indicating that the water is non-potable and should not be used for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use; and

(2) A prominent notice in the galley directed at the crew which includes:

(i) A clear statement that the water is non-potable and should not be used for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use;

(ii) A clear statement that it is not known whether the water is contaminated because there was a failure to perform required routine disinfection and flushing; or a failure to perform required monitoring; or water was boarded from a watering point not in accordance with FDA regulations, or that does not meet NPDWRs applicable to transient noncommunity water systems, or that is otherwise determined

to be unsafe due to noncompliance with the procedures specified in § 141.804(b)(6);

(iii) When and where the unsafe water was boarded or when the specific monitoring or disinfection and flushing requirement was not met;

(iv) Any potential adverse health effects from exposure to waterborne pathogens that might be in the water, as appropriate, under paragraph (g) of this section;

(v) The population at risk, including sensitive subpopulations particularly vulnerable if exposed to the contaminant in the drinking water; and

(vi) A statement indicating when the system will be disinfected and flushed and returned to unrestricted public access.

(3) If passenger access to the water system is physically prevented through disconnecting or shutting off the water, or the flow of water prevented through the tap(s), or if water is supplied only to lavatory toilets, and not to any lavatory or galley taps, then only the notice specified in paragraph (d)(2) of this section is required.

(4) Air carriers must initiate public notification when restriction of public access is initiated in accordance with § 141.803(d) and must continue until the aircraft water system is returned to unrestricted public access.

(e) Public notification for paragraphs (a)(3) and (a)(5) of this section must meet the requirements of paragraph (b) of this section in addition to the following:

(1) Public notification must include a prominently displayed, clear statement in each lavatory indicating that the water is non-potable and should not be used for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use; and

(2) A prominent notice in the galley directed at the crew which includes:

(i) A clear statement that the water is non-potable and should not be used for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use;

(ii) A clear statement that the water is contaminated and there was a failure to conduct required monitoring; or a clear statement that water is contaminated because water was boarded from a watering point not in accordance with FDA regulations, or that does not meet NPDWRs applicable to transient noncommunity water systems, or that is otherwise determined to be unsafe due to noncompliance with the procedures specified in § 141.804(b)(6);

(iii) A description of the contaminant(s) of concern;

(iv) When and where the unsafe water was boarded or when the specific monitoring requirement was not met;

(v) Any potential adverse health effects from the situation, as appropriate, under paragraph (g) of this section;

(vi) The population at risk, including sensitive subpopulations particularly vulnerable if exposed to the contaminant in the drinking water;

(vii) A statement indicating what the air carrier is doing to correct the situation; and

(viii) When the air carrier expects to return the system to unrestricted public access.

(3) If passenger access to the water system is physically prevented through disconnecting or shutting off the water, or the flow of water prevented through the tap(s), or if water is supplied only to lavatory toilets, and not to any lavatory or galley taps, then only the notice specified in paragraph (e)(2) of this section is required.

(4) Air carriers must initiate public notification when restriction of public access is initiated in accordance with § 141.803(d) and must continue public notification until a complete set of required follow-up samples are total coliform-negative.

(f) Public notification for paragraph (a)(7) of this section must meet the requirements of paragraph (b) of this section in addition to the following:

(1) Notification must be in a form and manner reasonably calculated to reach all passengers and crew while on board the aircraft by using one or more of the following forms of delivery:

(i) Broadcast over public announcement system on aircraft;

(ii) Posting of the notice in conspicuous locations throughout the area served by the water system. These locations would normally be the galleys and in the lavatories of each aircraft requiring posting;

(iii) Hand delivery of the notice to passengers and crew;

(iv) Another delivery method approved in writing by the Administrator.

(2) Air carriers must initiate public notification within 24 hours of being informed by EPA to perform notification and must continue notification for the duration determined by EPA.

(g) In each public notice to the crew, air carriers must use the following standard health effects language that corresponds to the situations in paragraphs (a)(1) through (a)(6) of this section.

(1) Health effects language to be used when public notice is initiated due to the detection of total coliforms only (not

E. coli) in accordance with paragraph (a)(1) of this section:

Coliform are bacteria that are naturally present in the environment and are used as an indicator that other, potentially harmful, bacteria may be present. Coliforms were found in [INSERT NUMBER OF SAMPLES DETECTED] samples collected and this is a warning of potential problems. If human pathogens are present, they can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

(2) Health effects language to be used when public notice is initiated due to any *E. coli*-positive routine, repeat, or follow-up sample in accordance with paragraph (a)(1) of this section:

E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

(3) Health effects language to be used when public notice is initiated due to a failure to conduct routine monitoring or routine disinfection and flushing in accordance with paragraph (a)(2) of this section; or when there is a failure to conduct repeat or follow-up sampling in accordance with paragraph (a)(4) of this section; or in accordance with paragraph (a)(6) of this section, when the air carrier becomes aware of a non-*E. coli*-positive event that is the result of water that was boarded from a watering point not in accordance with FDA regulations (21 CFR part 1240, subpart E), or that does not meet NPDWRs applicable to transient non-community water systems, or that is otherwise determined to be unsafe due to non-compliance with the procedures specified in § 141.804(b)(6):

Because [REQUIRED MONITORING AND ANALYSIS WAS NOT CONDUCTED], [REQUIRED DISINFECTION AND FLUSHING WAS NOT CONDUCTED] [WATER WAS BOARDED FROM A WATERING POINT NOT IN ACCORDANCE WITH FDA REGULATIONS (21 CR 1240 SUBPART E)], or [OTHER APPROPRIATE EXPLANATION], we cannot be sure of the quality of the drinking water at this time. However, drinking water contaminated with human pathogens can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

(4) Health effects language to be used when public notice is initiated due to a

failure to conduct required follow-up monitoring in response to a sample result that is *E. coli*-positive in accordance with paragraph (a)(3) of this section; or in accordance with paragraph (a)(5) of this section, when the air carrier becomes aware of an *E. coli*-positive event that is the result of water that was boarded from a watering point not in accordance with FDA regulations (21 CFR part 1240, subpart E), or that does not meet NPDWRs applicable to transient non-community water systems, or that is otherwise determined to be unsafe due to non-compliance with the procedures specified in § 141.804(b)(6):

Because required follow-up monitoring and analysis was not conducted after the aircraft water system tested positive for *E. coli*, we cannot be sure of the quality of the drinking water at this time. *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

OR

Water was boarded that is contaminated with *E. coli* because [WATER WAS BOARDED FROM A WATERING POINT NOT IN ACCORDANCE WITH FDA REGULATIONS (21 CR 1240 SUBPART E)], or [OTHER APPROPRIATE EXPLANATION]. *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

§ 141.806 Reporting requirements.

(a) The air carrier must comply with the following requirements regarding reporting of the development of the coliform sampling plan, the operations and maintenance plan, and the disinfection and flushing and coliform sampling frequencies.

(1) The air carrier must report to the Administrator that it has developed the coliform sampling plan required by § 141.802, which covers each existing aircraft water system, as well as report the frequency for routine coliform sampling identified in the coliform sampling plan by April 19, 2011. The air carrier must report to the Administrator that it has developed its operations and maintenance plan required by § 141.804 and report the frequency for routine disinfection and flushing by April 19, 2011;

(2) For each new aircraft meeting the definition of an aircraft water system, which becomes operational after publication of this subpart, the air carrier must report to the Administrator that it has developed the coliform sampling plan required by § 141.802, as well as report the frequency for routine coliform sampling identified in the coliform sampling plan, within the first calendar quarter of initial operation of the aircraft. The air carrier must report to the Administrator that it has developed the aircraft water system operations and maintenance plan required by § 141.804, and report the frequency for routine disinfection and flushing within the first calendar quarter of initial operation of the aircraft.

(b) The air carrier must report the following information to the Administrator:

(1) A complete inventory of aircraft that are public water systems by April 19, 2011. Inventory information includes, at a minimum, the following:

- (i) The unique aircraft identifier number;
- (ii) The status (active or inactive) of any aircraft as an aircraft water system as defined in § 141.801;
- (iii) The type and location of any supplemental treatment equipment installed on the water system; and
- (iv) Whether the aircraft water system can be physically disconnected or shut-off, or the flow of water prevented through the tap(s).

(2) Changes in aircraft inventory no later than 10 days following the calendar month in which the change occurred. Changes in inventory information include, at a minimum, the following:

- (i) Change in the unique identifier number for any new aircraft, or any aircraft removed from the carrier's fleet;
- (ii) Change in status (active or inactive) of any aircraft as an aircraft water system as defined in § 141.801; and
- (iii) Change to the type and location of any supplemental treatment equipment added to or removed from the water system.

(iv) Change to whether the aircraft water system can be physically disconnected or shut-off, or the flow of water prevented through the tap(s).

(3) All sampling results no later than 10 calendar days following the monitoring period in which the sampling occurred. The monitoring period is based on the monitoring frequency identified in the coliform sampling plan required under § 141.802. Routine disinfection and flushing events must be reported no later than 10

calendar days following the disinfection and flushing period in which the disinfection and flushing occurred. The disinfection and flushing period is based on the frequency identified in the operations and maintenance plan required under § 141.804.

(4) All events requiring notification to passengers or crew, or non-routine disinfection and flushing, or non-routine sampling, within 10 days of the event (e.g., notification of positive sample result by laboratory), including information on whether required notification was provided to passengers or crew or both.

(5) Failure to comply with the monitoring or disinfection and flushing requirements of this subpart within 10 calendar days of discovery of the failure.

(6) Changes in disinfection and flushing and coliform sampling frequencies no later than 10 days following the calendar month in which the change occurred. Changes to an aircraft's routine coliform sampling frequency and routine disinfection and flushing frequency must be included in the aircraft water system operation and maintenance plan that is included in the air carrier operations and maintenance program accepted by FAA in accordance with § 141.804.

(c) The air carrier must provide evidence of a self-inspection to the Administrator within 90 days of completion of the self-inspection required under § 141.808(b), including reporting whether all deficiencies were addressed in accordance with § 141.808(c). The air carrier must also report to the Administrator within 90 days that any deficiency identified during a compliance audit conducted in accordance with § 141.808(a) has been addressed. If any deficiency has not been addressed within 90 days of identification of the deficiency, the report must also include a description of the deficiency, an explanation as to why it has not yet been addressed, and a schedule for addressing it as expeditiously as possible.

(d) All information required to be reported to the Administrator under this subpart must be in an electronic format established or approved by the Administrator. If an air carrier is unable to report electronically, the air carrier may use an alternative approach that the Administrator approves.

§ 141.807 Recordkeeping requirements.

(a) The air carrier must keep records of bacteriological analyses for at least 5 years and must include the following information:

(1) The date, time, and place of sampling, and the name of the person who collected the sample;

(2) Identification of the sample as a routine, repeat, follow-up, or other special purpose sample;

(3) Date of the analysis;

(4) Laboratory and person responsible for performing the analysis;

(5) The analytical technique/method used; and

(6) The results of the analysis.

(b) The air carrier must keep records of any disinfection and flushing for at least 5 years and must include the following information:

(1) The date and time of the disinfection and flushing; and

(2) The type of disinfection and flushing (*i.e.*, routine or corrective action).

(c) The air carrier must keep records of a self-inspection for at least 10 years and must include the following information:

(1) The completion date of the self-inspection; and

(2) Copies of any written reports, summaries, or communications related to the self-inspection.

(d) The air carrier must maintain sampling plans and make such plans available for review by the Administrator upon request, including during compliance audits.

(e) The air carrier must maintain aircraft water system operations and maintenance plans in accordance with FAA requirements, and make such plans available for review by the Administrator upon request, including during compliance audits.

(f) The air carrier must keep copies of public notices to passengers and crew issued as required by this subpart for at least 3 years after issuance.

§ 141.808 Audits and inspections.

(a) The Administrator may conduct routine compliance audits as deemed necessary in providing regulatory oversight to ensure proper implementation of the requirements in this subpart. Compliance audits may include, but are not limited to:

(1) Bacteriological sampling of aircraft water system;

(2) Reviews and audits of records as they pertain to water system operations and maintenance such as log entries, disinfection and flushing procedures, and sampling results; and

(3) Observation of procedures involving the handling of finished water, watering point selection, boarding of water, operation, disinfection and flushing, and general maintenance and self-inspections of aircraft water system.

(b) Air carriers or their representatives must perform a self-inspection of all water system components for each aircraft water system no less frequently than once every 5 years.

(c) The air carrier must address any deficiency identified during compliance audits or routine self-inspections within 90 days of identification of the deficiency, or where such deficiency is identified during extended or heavy maintenance, before the aircraft is put back into service. This includes any deficiency in the water system's design, construction, operation, maintenance, or administration, as well as any failure or malfunction of any system component that has the potential to cause an unacceptable risk to health or that could affect the reliable delivery of safe drinking water.

§ 141.809 Supplemental treatment.

(a) Any supplemental drinking water treatment units installed onboard existing or new aircraft must be acceptable to FAA and FDA; and must be installed, operated, and maintained in accordance with the manufacturer's plans and specifications and FAA requirements.

(b) Water supplemental treatment and production equipment must produce water that meets the standards prescribed in this part.

§ 141.810 Violations.

An air carrier is in violation of this subpart when, for any aircraft water system it owns or operates, any of the following occur:

(a) It fails to perform any of the requirements in accordance with § 141.803 or § 141.804.

(b) It has an *E. coli*-positive sample in any monitoring period (routine and repeat samples are used in this determination).

(c) It fails to provide notification to passengers and crew in accordance with § 141.805.

(d) It fails to comply with the reporting and recordkeeping requirements of this subpart.

(e) It fails to conduct a self-inspection or address a deficiency in accordance with § 141.808.

(f) It fails to develop a coliform sampling plan in accordance with § 141.802, or fails to have and follow an operations and maintenance plan, which is included in a FAA accepted program in accordance with § 141.804.

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Appendix B
ADWR Quick Reference Guide

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Aircraft Drinking Water Rule: A Quick Reference Guide

Overview of the Rule

Title	Aircraft Drinking Water Rule (ADWR) 74 FR 53590. October 19, 2009
Purpose	To ensure that safe and reliable drinking water is provided to aircraft passengers and crew by amending and consolidating National Primary Drinking Water Regulations for aircraft public water systems (PWSs).
General Description	To protect against disease-causing microbiological contaminants through the required development and implementation of aircraft water system operations and maintenance plans. The plans include routine disinfection and flushing of the water system, air carrier training requirements for key personnel, and periodic sampling of the onboard drinking water, as well as self-inspections of each aircraft water system and immediate notification of passengers and crew when violations or specific situations occur.
Aircraft Covered by the ADWR	The ADWR applies only to aircraft with onboard water systems that provide water for human consumption through pipes and regularly serve an average of at least twenty-five individuals daily, at least 60 days out of the year, and that board only finished water for human consumption. Human consumption includes water for drinking, hand washing, food preparation, and oral hygiene.
Components of an Aircraft Water System	Aircraft water systems include the water service panel, the filler neck of the aircraft finished water storage tank, and all finished water storage tanks, piping, treatment equipment, and plumbing fixtures within the aircraft that supply water to passengers or crew.

Major Provisions

Operations and Maintenance (O&M Plan)

Air carriers develop and implement an O&M plan for each aircraft water system in active service. More than one aircraft can be covered by the same O&M plan. The water system O&M plan must be included in a Federal Aviation Administration-accepted aircraft operations and maintenance program. If a new aircraft or PWS is added to an air carrier fleet, the aircraft is added to an existing O&M plan or a new O&M plan is developed. The O&M plan for the new aircraft is implemented by the end of the first calendar quarter during which the aircraft is placed into service.

Each aircraft water system O&M plan includes:	<ul style="list-style-type: none"> ▶ Watering point selection requirement – all water sources must be from a watering point selected in accordance with Food and Drug Administration regulations [21 CFR part 1240 subpart E]. ▶ Procedures for routinely disinfecting and flushing the aircraft water system in accordance with the manufacturer's recommendations. ▶ Procedures for follow-up coliform sampling after a corrective disinfection and flushing event. ▶ Training requirements for all staff involved with the O&M provisions of the rule and those managing or conducting the coliform sampling requirements of the rule. ▶ Self-inspection procedures, procedures for boarding water, and the coliform sampling plan. ▶ A statement of whether the aircraft water system can be physically disconnected or shut off so that the flow of water through the tap(s) is prevented.
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Coliform Sampling Plan

Air carriers develop a coliform sampling plan covering each aircraft owned or operated by the carrier. Sampling plans are developed for each new aircraft by the end of the calendar quarter in which the aircraft is placed in service.

At a minimum, all plans include the following:	<ul style="list-style-type: none"> ▶ Coliform sample collection procedures. ▶ Sample tap location(s) representative of the aircraft water system, including both galley and lavatory taps. ▶ Frequency and number of routine coliform samples to be collected. ▶ Frequency of routine disinfection and flushing as specified in the operations and maintenance plan. ▶ Procedures for communicating sample results to ensure any required actions including repeat and follow-up sampling, corrective action, and notification of passengers and crew are conducted in a timely manner.
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Routine Disinfection and Flushing

Air carriers routinely disinfect and flush aircraft PWSs at the frequency recommended by the water system manufacturer or, if not specified by the manufacturer, may choose from one of four options.



Coliform Sampling Requirements

All aircraft PWSs sample for total coliform bacteria according to the frequency and procedures described in the coliform sampling plan. The routine sampling frequency is based on the routine disinfection and flushing frequency—the more often an aircraft PWS disinfects, the less often it is required to monitor for coliform.

Routine coliform samples may be collected immediately prior to but not within 72 hours after a routine disinfection and flushing event.

Each routine, repeat, or follow-up sample that is positive for total coliform is tested for the presence of *E. coli*. If any sample is positive for *E. coli*, public notification and corrective disinfection and flushing are triggered. Air carriers select from specified options for follow-up and corrective measures when routine coliform samples indicate total coliform but *E. coli* contamination is not present. The options include collecting 3 repeat samples within 24 hours or disinfecting and flushing the system with follow-up sampling.

- ▶ The disinfection and flushing procedure must be completed within 72 hours unless public access is restricted.
- ▶ If any repeat sample is positive for coliform, public notification and corrective disinfection and flushing with follow-up sampling are triggered.

Corrective Disinfection and Flushing

If corrective disinfection and flushing is opted or required, air carriers follow the procedures in their O&M plans. Unscheduled flight disruptions to perform corrective disinfection and flushing can be minimized by shutting off the water or preventing the flow of water to the taps. Before allowing unrestricted access to the aircraft water system, a complete set of two follow-up samples must be collected and submitted for analysis after the disinfection and flushing event if triggered by a total coliform-positive sample, and must be reported as total coliform-negative if triggered by an *E. coli*-positive sample.

Self-Inspection

Each aircraft PWS must be inspected by the air carrier at least every 5 years according to the procedures in their O&M plans. At a minimum, the self-inspection procedures for an aircraft water system must include inspection of the storage tank, distribution system, supplemental treatment, fixtures, valves, and backflow prevention devices. Any deficiencies detected must be addressed, and any deficiency that is unresolved within 90 days of identification of the deficiency must be reported to EPA.

Public Notification

Notification of passengers and crew onboard the aircraft is required when:

- ▶ Any sample results are total coliform-positive or *E. coli*-positive.
- ▶ An air carrier fails to perform required routine disinfection and flushing.
- ▶ An air carrier fails to collect required samples.
- ▶ An air carrier boards water from a watering point that does not meet FDA regulations, EPA standards, or is otherwise determined to be unsafe.
- ▶ EPA, the air carrier, or crew determines public notification is necessary to protect public health.

For *E. coli*-positive events or when EPA, the air carrier, or crew determines public notification is necessary, notice must be issued within 24 hours. For all other situations, notice must be issued within 72 hours.

- ▶ Notice to passengers need not be provided if the water is shut off, if flow of water to taps is prevented, or if water is supplied only to the lavatory toilets and not the lavatory or galley taps.

Reporting and Recordkeeping Requirements

Air carriers submit compliance information to EPA including sampling results; all events requiring public notification and corrective disinfection and flushing; notification of failure to comply with monitoring or disinfection and flushing requirements; and evidence of self-inspection, along with a report of unresolved deficiencies. Most reporting will be done electronically to the ADWR Reporting and Compliance System, a database developed and supported by EPA.

Records of coliform sampling, disinfection and flushing, self-inspections, and public notices are kept by the air carrier. Sampling plans and O&M plans are maintained and made available for EPA review.

Key Dates

<p>Within 18 months of the final rule <i>April 19, 2011</i></p>	<ul style="list-style-type: none"> ▶ Develop a coliform sampling plan and report to EPA that it has been completed. ▶ Develop O&M plans that cover every aircraft PWS and report to EPA that they have been completed. ▶ Report the coliform sampling and disinfection and flushing frequencies to EPA for each aircraft. ▶ Report the complete air carrier inventory of aircraft that are PWSs to EPA.
<p>24 months after the final rule <i>October 19, 2011</i></p>	<ul style="list-style-type: none"> ▶ The compliance date for all other rule requirements applies, unless otherwise noted.

For additional information on the ADWR

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at www.epa.gov/drink; or contact your EPA Regional Office.

Appendix C
Example Coliform Sampling Plan

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[AIR CARRIER]

Coliform Sampling Plan for [AIRCRAFT MAKE/MODEL]

**Prepared for
[AIR CARRIER] Personnel and Contractors**

[REVISION # AND DATE OF SAMPLING PLAN]

**In Compliance with United States Environmental Protection Agency
Aircraft Drinking Water Rule
40 CFR Part 141 - Subpart X**

1. Background & Purpose

The purpose of this Coliform Sampling Plan (CSP) is to describe the activities that will be performed by [AIR CARRIER] personnel and contractors to collect drinking water samples from onboard aircraft water systems. Specifically, this CSP outlines the objectives and methods that will be used to comply with the Aircraft Drinking Water Rule (ADWR) and includes monitoring frequencies, procedures, and analytical methods to be used by [AIR CARRIER] for drinking water sampling for total coliform. In addition, it describes the lines of communication for reporting sample results. This CSP has been prepared in accordance with ADWR requirements.

The purpose of monitoring the aircraft water systems for total coliform is to determine compliance with the ADWR by ensuring the water meets water quality levels determined safe by Environmental Protection Agency (EPA). The data collected must be of sufficient quality to clearly determine if the water onboard the aircraft consistently meets the standards of the ADWR for total coliform and to avoid false identification of regulatory standard exceedances.

Any [AIR CARRIER] employee or contractor will abide by the protocol set forth in this CSP for the collection of drinking water samples from aircraft water systems.

2. Applicability

This CSP applies to [AIRCRAFT MAKE/MODEL] and covers the following aircraft: [AIRCRAFT FAA AIRCRAFT REGISTRY ID NUMBER (a.k.a tail number or N-number)].

Inventory data on each aircraft identified in this CSP, including if the aircraft has a lavatory and/or galley with a drinking water tap, the number of taps, lavatories, galleys and other information, has been submitted to EPA in accordance with the ADWR requirements through the ADWR Reporting and Compliance System.

All terms not defined in this CSP shall have their ordinary meaning, unless such terms are defined in the ADWR, in which case the statute or regulatory definitions will apply.

3. Routine Monitoring Frequency

The manufacturer of the onboard water systems for [AIRCRAFT MAKE/MODEL] has recommended that routine disinfection and flushing be conducted at a rate frequency of [once in a one-month period (monthly), at least once within every three month period (quarterly), at least once within every four month period, at least once within every six-month period (semi-annually), or at least once within every 12-month period (annually) or less]. [AIR CARRIER] has chosen to follow the manufacturer's recommendations (or [AIR CARRIER] has chosen to disinfectant and flush at a rate more frequent than manufacturer's recommendations: [SPECIFY RATE FREQUENCY FROM ABOVE LIST]).

Consequently, routine total coliform samples will be collected at a rate of [at least once within every twelve-month period (annually), at least once within every six-month period (semi-annually), at least once within every three-month period (quarterly), or at least once every month (monthly)].

4. Analyses to be Performed

Sampling may occur at any time during normal airline operations or maintenance activities. However, routine total coliform samples must not be collected within 72 hours after completing a routine disinfection and flushing.

All drinking water samples collected from the onboard aircraft water system shall be analyzed for total coliform. In the event of a total coliform-positive result, the sample shall be analyzed for *E.coli*.

Each total coliform sample will be sent to be analyzed by a State- or EPA-certified laboratory for analysis of the drinking water sample(s). In the event of a total coliform-positive sample result, the sample will be analyzed for *E. coli*. The protocol for sample collection is described in Section 9 of this CSP.

5. Aircraft Sampling Sites

In accordance with the ADWR, routine coliform samples will be collected from one galley and one lavatory tap [change if only one tap available] for total coliform during each monitoring period from each aircraft identified in this CSP.

The [AIRCRAFT MAKE/MODEL] contains [NUMBER] galley(s) and [NUMBER] lavatory(s) with taps. The following diagram illustrates the location of the galleys and lavatories. The sample locations will be rotated each monitoring period to ensure the entire aircraft water system is sampled periodically. In addition, during each monitoring period, a sample will be collected from a galley and a lavatory at opposite ends of the aircraft, whenever possible.

[PROVIDE DIAGRAM OF LOCATION OF AIRCRAFT LAVATORIES AND GALLEYS]

Both lavatory and galley samples should be collected from a cold water tap if possible. If the only sampling point in the lavatory or galley is a hot water tap or the coffee maker, collect the sample at that location and indicate the sampling location on the sample collection sheet. [Suggest adding: If a sample is collected from a hot water tap, record the temperature of the water on the sample collection sheet if available. Temperature maybe a useful diagnostic tool.]

6. Analytical Methods

Specific details regarding the compliance criteria and sample requirements are illustrated in Table 1. All analytical methods for total coliform and *E. coli* to be used by the analytical laboratories shall be those approved by the EPA for drinking water analysis as provided in 40 CFR 141.21(f)(3) and 141.21(f)(6). Current approved analytical methods are provided in Table 2.

Table 1: Sample Requirements

Analyte	Compliance Criteria	Holding Time	Sample Volume (Bottle)	Preservative ¹
Total Coliform, <i>E. coli</i>	Presence-absence. If present, test for <i>E. coli</i>	30 hours (not to exceed)	100 mL (150-mL Sterile Plastic with non-toxic cap)	Cool to 4°C 0.008% Na ₂ S ₂ O ₃

¹ Preservative to be added to empty bottle by laboratory prior to sample collection.

Table 2. Approved Analytical Methods [40 CFR 141(f)(3) and 141.21(f)(6)]

Organism	Methodology ¹²	Citation ¹	
Total Coliforms ²	Total Coliform Fermentation Technique ^{3,4,5}	9221A, B.	
	Total Coliform Membrane Filter Technique ⁶	9222A, B, C.	
	Presence-Absence (P-A) Coliform Test ^{5,7}	9221D.	
	ONPG-MUG Test ⁸	9223.	
	Colisure Test. ⁹		
	E*Colite [®] Test. ¹⁰		
	m-ColiBlue24 [®] Test. ¹¹		
	ReadyCult [®] Coliforms 100 Presence/Absence Test. ¹³		
	Membrane Filter Technique using Chromocult [®] Coliform Agar. ¹⁴		
	Colitag [®] Test. ¹⁵		
	<i>E. coli</i>	Total Coliform Membrane Filter Technique ⁶	9222A, B, C.
		E*Colite [®] Test. ¹⁰	
		m-ColiBlue24 [®] Test. ¹¹	
		ReadyCult [®] Coliforms 100 Presence/Absence Test. ¹³	
		Membrane Filter Technique using Chromocult [®] Coliform Agar. ¹⁴	
Colitag [®] Test. ¹⁵			
Membrane Filtration, Two Step. ^{16, 17}		9222G	
MMO-MUG. ¹⁸			
Colisure Test. ¹⁹			

¹Standard Methods for the Examination of Water and Wastewater, 18th edition (1992), 19th edition (1995), or 20th edition (1998). American Public Health Association, 1015 Fifteenth Street, NW., Washington, DC 20005. The cited methods published in any of these three editions may be used. In addition, the following online versions may also be used: 9221 A, B, D-99, 9222 A, B, C-97, and 9223 B-97. Standard Methods Online are available at <http://www.standardmethods.org>. The year in which each method was approved by the Standard Methods Committee is designated by the last two digits in the method number. The methods listed are the only Online versions that may be used.

²The time from sample collection to initiation of analysis may not exceed 30 hours. Systems are encouraged but not required to hold samples below 10 deg. C during transit.

³Lactose broth, as commercially available, may be used in lieu of lauryl tryptose broth, if the system conducts at least 25 parallel tests between this medium and lauryl tryptose broth using the water normally tested, and this comparison demonstrates that the false-positive rate and false-negative rate for total coliform, using lactose broth, is less than 10 percent.

⁴If inverted tubes are used to detect gas production, the media should cover these tubes at least one-half to two-thirds after the sample is added.

⁵No requirement exists to run the completed phase on 10 percent of all total coliform-positive confirmed tubes.

⁶MI agar also may be used. Preparation and use of MI agar is set forth in the article, "New medium for the simultaneous detection of total coliform and *Escherichia coli* in water" by Brenner, K.P., et al., 1993, Appl. Environ. Microbiol. 59:3534-3544. Also available from the Office of Water Resource Center (RC-4100T), 1200 Pennsylvania Avenue, NW., Washington, DC 20460, EPA/600/J-99/225. Verification of colonies is not required.

⁷Six-times formulation strength may be used if the medium is filter-sterilized rather than autoclaved.

⁸The ONPG-MUG Test is also known as the Autoanalysis Collect System.

⁹A description of the Colisure Test, Feb 28, 1994, may be obtained from IDEXX Laboratories, Inc., One IDEXX Drive, Westbrook, Maine 04092. The Colisure Test may be read after an incubation time of 24 hours.

¹⁰A description of the E*Colite[®]Test, "Presence/Absence for Coliforms and *E. Coli* in Water," Dec 21, 1997, is available from Charm Sciences, Inc., 36 Franklin Street, Malden, MA 02148-4120.

¹¹A description of the m-ColiBlue24[®]Test, Aug 17, 1999, is available from the Hach Company, 100 Dayton Avenue, Ames, IA 50010.

¹²EPA strongly recommends that laboratories evaluate the false-positive and negative rates for the method(s) they use for monitoring total coliforms. EPA also encourages laboratories to establish false-positive and false-negative rates within their own laboratory and

sample matrix (drinking water or source water) with the intent that if the method they choose has an unacceptable false-positive or negative rate, another method can be used. The Agency suggests that laboratories perform these studies on a minimum of 5% of all total coliform-positive samples, except for those methods where verification/confirmation is already required, e.g., the M-Endo and LES Endo Membrane Filter Tests, Standard Total Coliform Fermentation Technique, and Presence-Absence Coliform Test. Methods for establishing false-positive and negative-rates may be based on lactose fermentation, the rapid test for β -galactosidase and cytochrome oxidase, multi-test identification systems, or equivalent confirmation tests. False-positive and false-negative information is often available in published studies and/or from the manufacturer(s).

¹³The ReadyCult[®] Coliforms 100 Presence/Absence Test is described in the document, "ReadyCult[®] Coliforms 100 Presence/Absence Test for Detection and Identification of Coliform Bacteria and *Escherichia coli* in Finished Waters", November 2000, Version 1.0, available from EM Science (an affiliate of Merck KGaA, Darmstadt Germany), 480 S. Democrat Road, Gibbstown, NJ 08027-1297. Telephone number is (800) 222-0342, e-mail address is: adellenbusch@emscience.com.

¹⁴Membrane Filter Technique using Chromocult[®] Coliform Agar is described in the document, "Chromocult[®] Coliform Agar Presence/Absence Membrane Filter Test Method for Detection and Identification of Coliform Bacteria and *Escherichia coli* in Finished Waters", November 2000, Version 1.0, available from EM Science (an affiliate of Merck KGaA, Darmstadt Germany), 480 S. Democrat Road, Gibbstown, NJ 08027-1297. Telephone number is (800) 222-0342, e-mail address is: adellenbusch@emscience.com.

¹⁵Colitag[®] product for the determination of the presence/absence of total coliforms and *E. coli* is described in "Colitag[®] Product as a Test for Detection and Identification of Coliforms and *E. coli* Bacteria in Drinking Water and Source Water as Required in National Primary Drinking Water Regulations," August 2001, available from CPI International, Inc., 5580 Skylane Blvd., Santa Rosa, CA, 95403, telephone (800) 878-7654, Fax (707) 545-7901, Internet address <http://www.cpiinternational.com>.

¹⁶EC medium supplemented with 50 $\mu\text{g}/\text{mL}$ of 4-methylumbelliferyl-beta-D-glucuronide (MUG) (final concentration). The 18th edition (1992) may be used if at least 10 mL of EC medium is supplemented with 50 $\mu\text{g}/\text{mL}$ of MUG before autoclaving. The inner inverted fermentation tube may be omitted. If the 18th edition is used, apply the procedure in paragraph 40 CFR 141.21(f)(5) for transferring a total coliform-positive culture to EC medium supplemented with MUG, incubate the tube at 44.5 ± 0.2 °C for 24 ± 2 hours, and then observe fluorescence with an ultraviolet light (366 nm) in the dark. If fluorescence is visible, *E. coli* are present.

¹⁷Nutrient agar supplemented with 100 $\mu\text{g}/\text{mL}$ of 4-methylumbelliferyl-beta-D-glucuronide (MUG) (final concentration). The 18th edition (1992) may be used if the membrane filter containing a total coliform-positive colony(ies) is transferred to nutrient agar, as described in Method 9221B (paragraph 3) of Standard Methods (18th edition), supplemented with 100 $\mu\text{g}/\text{mL}$ of MUG. If the 18th edition is used, incubate the agar plate at 35 °C for 4 hours and then observe the colony(ies) under ultraviolet light (366 nm) in the dark for fluorescence. If fluorescence is visible, *E. coli* are present.

¹⁸Minimal Medium ONPG-MUG (MMO-MUG) Test, as set forth in the article "National Field Evaluation of a Defined Substrate Method for the Simultaneous Detection of Total Coliforms and *Escherichia coli* from Drinking Water: Comparison with Presence-Absence Techniques" (Edberg et al.), Applied and Environmental Microbiology, Volume 55, pp. 1003-1008, April 1989. (Note: The Autoanalysis Colilert System is an MMO-MUG test). If the MMO-MUG test is total coliform-positive after a 24-hour incubation, test the medium for fluorescence with a 366-nm ultraviolet light (preferably with a 6-watt lamp) in the dark. If fluorescence is observed, the sample is *E. coli* -positive. If fluorescence is questionable (cannot be definitively read) after 24 hours incubation, incubate the culture for an additional four hours (but not to exceed 28 hours total), and again test the medium for fluorescence. The MMO-MUG Test with hepes buffer in lieu of phosphate buffer is the only approved formulation for the detection of *E. coli*.

¹⁹The Colisure Test. A description of the Colisure Test may be obtained from the Millipore Corporation, Technical Services Department, 80 Ashby Road, Bedford, MA 01730.

7. Materials Required

- Sample collection sheet
- Laboratory chain of custody form
- Indelible pen
- Sample bottles (150-mL sterile plastic with non-toxic cap and dechlorinating agent)
- Cooler with ice packs (optional) (contained-ice packs are preferable to ice cubes)
- Rubber, latex, or non-latex exam gloves
- Safety glasses

8. Safety and Sample Integrity

- Rubber/latex gloves shall be utilized when handling samples to minimize sample contamination and exposure to sample preservatives.
- Safety glasses shall be worn when filling sample bottles.
- Bottles are to be kept closed until ready to be filled.

9. Sampling Procedures

A. *Pre-sampling Activities*

Notify laboratory and place order for sample bottles, labels, and cooler(s) at least 48 hours prior to sampling. (Note: You will need a separate cooler for each day/location of sample collection.)

B. *Sampling Event Preparation*

1. Notify ramp personnel to refrain from servicing aircraft water system until completion of sampling.
2. Pre-label all bottles with the following information:
 - Sample ID correlating to the sample tap site location [lav or gal] and location (e.g., aft, or fore, #1 gal, #2 lav) and other information listed on the laboratory chain of custody form and sample collection sheet
 - Date and time of collection
 - Analyses requested (e.g., total coliform)
 - Sampler's initials

C. *Total Coliform Sampling Procedures*

The following steps are to be followed any time total coliform samples are collected from an aircraft (e.g., routine, repeats, or follow-up samples). The term "tap" in this procedure means water tap, faucet, drinking fountain, or other fixture which provides water for human consumption to passengers or crew. Do not sample from leaking taps or taps which allow water to run down the outside of the fixture.

- 1) Put on gloves.
- 2) Open tap and allow water to run for at least 30 seconds to flush tap.
- 3) Reduce water flow so the stream is not greater than ¼ inch in diameter, or the width of a pencil. Check for steady flow; do not change the water flow once the sample collection has begun, as this could dislodge microbial growth.
- 4) Remove cap of total coliform sample bottle.
- 5) Be careful not to contaminate the bottle by touching the interior of the cap or the inside of the sample container. Do not place cap on counter (which may be contaminated) or in your pocket to prevent container contamination.
- 6) Place bottle under water stream allowing for an air gap between top of the bottle and the water tap. Hold the bottle in one hand and the cap in the other. Fill the bottle to the 100 mL fill line. If the bottle becomes overfilled, do not pour out the sample (this may lead to sample contamination); instead send it to the laboratory as is.
- 7) Do not rinse the bottle either before or after sample collection.
- 8) Replace cap and tighten. Turn off water.
- 9) Ensure that sample ID matches that recorded on the sample collection sheet.
- 10) Place bottles into Ziploc® or similar bag. Place bag in cooler or other transport container (packing the sample on ice (NOT dry ice) is recommended, but optional)
- 11) Complete chain of custody sheet provided by laboratory. Ensure that sample ID matches that on the label and data sheet. If chain of custody sheet is not provided in duplicate, photocopy it for your records.
- 12) Sign and date the following statement on the sample collection sheet. If there was any deviation from protocol, note this at the bottom of sample collection sheet.

I certify that all samples were collected in accordance with the sample procedures provided in the “Coliform Sampling Plan for [AIRCRAFT MAKE/MODEL]”.

Signature

Date

13) Submit samples to:

[LABORATORY NAME, ADDRESS] (for those samples collected in [HUB NAME OR AIRCRAFT LOCATION])

14) The lab shall receive samples within 24 hours of collection.

10. Procedures for Communicating Sample Results

The laboratory will report results in accordance with the *Manual for Certification of Laboratories Analyzing Drinking Water* to: [NAME and ADDRESS]. The laboratory reports will include the date and time of sample receipt, date and time of analysis, protocol used and analyst performing the test.

All sample collection sheets and associated chain of custodies should be forwarded to: [NAME and ADDRESS]

[AIR CARRIER or NAME] will report all routine, repeat, and follow-up sample results that are total coliform-negative to the ADWR Reporting and Compliance system within 10 calendar days following the end of the monitoring period in which the samples were collected.

[AIR CARRIER or NAME] will report all routine, repeat, and follow-up sample results that are total coliform- or *E. coli*-positive to the ADWR Reporting and Compliance system within 10 calendar days of receiving the analytical results.

Table 3 summarizes the lines of communication for specific events related to coliform monitoring.

Table 3: Lines of Communication for Coliform Sampling Results

Event	Primary Contact	Back-up Contact
Receiving sample results from the Analytical Laboratory	Name: Phone Number: E-Mail:	Name: Phone Number: E-Mail:
Reporting routine, repeat, and follow-up sample results to EPA (including positive results)	Name: Phone Number: E-Mail:	Name: Phone Number: E-Mail:
Reporting total coliform or <i>E. coli</i> -positive sample results to [LIST APPROPRIATE DEPARTMENT OR NAME]	Name: Phone Number: E-Mail:	Name: Phone Number: E-Mail:
Ensuring corrective actions are implemented in accordance with ADWR	Name: Phone Number: E-Mail:	Name: Phone Number: E-Mail:

11. Attachments (list all separate documents)

1. Sample Collection Sheet

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Appendix D
Public Notification Templates

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This appendix contains example templates for notifying passengers and crew of violations or situations that require public notification under the ADWR

The templates are as follows:

- **Notice to the Passengers – Template 1.** This template can be used for all ADWR violations or situations requiring public notification to passengers. This notice is required when passenger access to the water cannot be physically prevented through disconnecting or shutting of the water, or preventing the flow of water through the taps. This notice must be posted in the lavatory of the aircraft.
- ***E. coli*-Positive Notice to the Crew – Template 2.** This template can be used for notifying the crew when a routine, repeat, or follow-up sample tests positive for *E. coli* bacteria. This is a prominent notice to the crew in the galley of the aircraft.
- **Total Coliform-Positive Notice to the Crew – Template 3.** This template can be used for notifying the crew when a routine or repeat sample tests positive for total coliform bacteria and public access to the aircraft water system has been restricted. This is a prominent notice to the crew in the galley of the aircraft.
- **Failure to Perform Routine Disinfection and Flushing Notice to the Crew – Template 4.** This template can be used for notifying the crew if the aircraft carrier fails to perform routine disinfection and flushing of the aircraft water system. This is a prominent notice to the crew in the galley of the aircraft.
- **Failure to Perform Routine, Repeat, or Follow-up Monitoring Notice to the Crew – Template 5.** This template can be used for notifying the crew if the aircraft carrier fails to collect routine, repeat, or follow-up samples. This is a prominent notice to the crew in the galley of the aircraft.
- **Boarding Water that Does Not Meet FDA Regulations or EPA Standards for Transient Non-community Water Systems (Boarded Water Quality or Boarding Procedures) Notice to the Crew – Template 6.** This template can be used for notifying the crew when the air carrier becomes aware of an event which has resulted from water that has been boarded from a watering point that is not in accordance with FDA regulations, does not meet EPA standards for transient non-community water systems, or is otherwise determined unsafe because boarding procedures under the ADWR were not followed. In this case, these events are referred to as “non-*E. coli*-positive” events because *E. coli* is either not detected or not applicable to the event. This is a prominent notice to the crew in the galley of the aircraft.
- **Failure to Perform Follow-up Monitoring After an *E. coli*-Positive Sample Result Notice to the Crew – Template 7.** This template can be used for notifying the crew if the aircraft carrier fails to collect follow-up samples after a routine or repeat sample result is *E. coli*-positive. This is a prominent notice to the crew in the galley of the aircraft.
- **Boarding Water that Does Not Meet FDA Regulations or EPA Standards for Transient Non-community Water Systems (*E. coli*-positive event) Notice to the Crew – Template 8.** This template can be used for notifying the crew when the air carrier

becomes aware of an *E. coli*-positive event which has resulted from water that has been boarded from a watering point that is not in accordance with FDA regulations, does not meet EPA standards for transient non-community water systems, or is otherwise determined unsafe because boarding procedures under the ADWR were not followed. In this case, these events are referred to as “*E. coli*-positive” events because *E. coli* has been detected or was otherwise introduced in the water boarded on the aircraft. This is a prominent notice to the crew in the galley of the aircraft.

- **Notification to Protect Public Health as Determined by EPA, the Carrier, or the Crew – Template 9.** This template can be used when EPA, the carrier, or the crew determines it is necessary to issue notice to protect public health. This template is a generic template that should be modified to reflect the specific situation that is not covered by the prescribed templates (Templates 2 through 8). This template is intended for both the crew and passengers and should be posted in conspicuous locations (e.g., the galley and lavatories). With regard to the crew, prior to issuing a notice, the crew should first go through the proper chain of command/authority to determine whether a notice should be issued and, if so, the type of notice that should be provided.

Mandatory language, which must be included as written (with blanks filled in), is presented in italics in each template. For more information on the requirements for public notification under the ADWR including a list of violations or situations requiring public notification and the required timeframe, format and content of the notices, refer to Chapter 6 of this manual.

WARNING

DO NOT DRINK THE WATER



The water is non-potable. Do not use it for human consumption, which includes drinking, food or beverage preparation, hand washing, or teeth brushing.

DRINKING WATER WARNING

DO NOT DRINK THE WATER

E. coli Bacteria were Found in the Water Supply on [give date]

The water is non-potable. Do not use it for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use.

One of our [routine/repeat/follow-up] coliform samples tested positive for *E. coli*.

Possible Health Effects

E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

People at increased risk should be particularly careful to avoid this water.

Steps We Are Taking

[Describe corrective action (e.g., We have disconnected the aircraft water system. We will disinfect and flush the water system as soon as possible and conduct follow-up sampling to ensure the water no longer contains *E. coli* bacteria.)]

We will inform you when additional samples show no *E. coli* bacteria and you may drink the water. We anticipate resolving the problem within [estimated time frame].

This notice is provided by [Aircraft Carrier]. Date distributed: _____.

DRINKING WATER WARNING

Tests Show Presence of Coliform Bacteria in Water

The water is non-potable. Do not use it for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use.

We are required to sample for coliform bacteria on our aircraft [list frequency (i.e., monthly, quarterly, semi-annually, annually)]. On [give date], we received notice that the sample collected on [give date] showed the presence of total coliform bacteria in our water.

What This Means

This is not an emergency. Total coliform bacteria themselves are generally not harmful.

Coliform are bacteria that are naturally present in the environment and are used as an indicator that other, potentially harmful, bacteria may be present. Coliforms were found in [INSERT NUMBER OF SAMPLES DETECTED] samples collected and this is a warning of potential problems. If human pathogens are present, they can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

People at increased risk should be particularly careful to avoid this water.

Steps We Are Taking

[Describe corrective action (e.g., We will disinfect and flush the water system as soon as possible and conduct follow-up sampling to ensure the water no longer contains coliform bacteria.)]

We will inform you when additional samples show no coliform bacteria. We anticipate resolving the problem within [estimated time frame].

This notice is provided by [Aircraft Carrier]. Date distributed: _____.

**Failure to Perform Routine Disinfection and Flushing Notice to the Crew –
Template 4**

DRINKING WATER WARNING

Routine Disinfection and Flushing was Not Performed

The water is non-potable. Do not use it for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use.

We are required to routinely disinfect and flush our water system. On [give date], we failed to perform routine disinfection and flushing and, therefore, it is not known whether the water is contaminated.

What This Means

Because required disinfection and flushing was not conducted, we cannot be sure of the quality of the drinking water at this time. However, drinking water contaminated with human pathogens can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

People at increased risk should be particularly careful to avoid this water.

Steps We Are Taking

We will disinfect and flush the water system on [give date]. We anticipate having the water system back in service on [estimated date].

This notice is provided by [Aircraft Carrier]. Date distributed: _____.

Failure to Perform Routine, Repeat, or Follow-up Monitoring Notice to the Crew – Template 5

DRINKING WATER WARNING

[(Routine/Repeat/Follow-up)] Coliform Sampling was Not Conducted

The water is non-potable. Do not use it for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use.

We were required to collect [(routine) OR (repeat) OR (follow-up)] coliform samples. On [give date], we failed to perform the required monitoring and, therefore, it is not known whether the water is contaminated.

What This Means

Because required monitoring and analysis was not conducted, we cannot be sure of the quality of the drinking water at this time. However, drinking water contaminated with human pathogens can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

People at increased risk should be particularly careful to avoid this water.

Steps We Are Taking

We will disinfect and flush the water system on [give date]. We anticipate having the water system back in service on [estimated date].

This notice is provided by [Aircraft Carrier]. Date distributed: _____.

**Boarding Water that Does Not Meet FDA Regulations or EPA Standards for
Transient Non-community Water Systems (Boarded Water Quality or Boarding
Procedures) Notice to the Crew – Template 6**

DRINKING WATER WARNING

Water was Boarded from a Watering Point that Does Not Meet Requirements

The water is non-potable. Do not use it for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use.

We are required to board water on the aircraft that meets FDA regulations and EPA standards and follows the boarding procedures prescribed in the Aircraft Drinking Water Rule (ADWR). On [give date], water was boarded from [provide watering point location] which was not in accordance with FDA regulations, or did not meet EPA standards for transient non-community water systems, or was otherwise determined to be unsafe due to noncompliance with the procedures for boarding water under the ADWR and, therefore, it is not known whether the water is contaminated.

What This Means

Because [(water was boarded from a watering point not in accordance with FDA Regulations (21 CFR part 1240, subpart E) OR (other appropriate explanation)], we cannot be sure of the quality of the drinking water at this time. However, drinking water contaminated with human pathogens can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

People at increased risk should be particularly careful to avoid this water.

Steps We Are Taking

We will disinfect and flush the water system on [give date]. We anticipate having the water system back in service on [estimated date].

This notice is provided by [Aircraft Carrier]. Date distributed: _____.

**Failure to Perform Follow-up Monitoring After an *E. coli*-Positive Sample Result
Notice to the Crew – Template 7**

DRINKING WATER WARNING

DO NOT DRINK THE WATER

Follow-up Sampling was Not Conducted After *E. coli* Bacteria were Found in the Water Supply

The water is non-potable. Do not use it for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use.

We were required to collect follow-up samples after being notified that our water tested positive for *E. coli*. On [give date], we failed to perform the required monitoring.

What This Means

*Because required follow-up monitoring and analysis was not conducted after the aircraft water system tested positive for *E. coli*, we cannot be sure of the quality of the drinking water at this time. *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.*

People at increased risk should be particularly careful to avoid this water.

Steps We Are Taking

We will disinfect and flush the water system and collect follow-up samples on [give date]. We anticipate having the water system back in service on [estimated date].

This notice is provided by [Aircraft Carrier]. Date distributed: _____.

**Boarding Water that Does Not Meet FDA Regulations or EPA Standards for
Transient Non-community Water Systems (*E. coli*-Positive event) Notice to the
Crew – Template 8**

DRINKING WATER WARNING

DO NOT DRINK THE WATER

***E. coli* Bacteria were Found in the Water Supply Because Water was Boarded from a Watering Point that Did Not Meet Requirements**

The water is non-potable. Do not use it for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use.

We are required to board water on the aircraft that meets FDA regulations and EPA standards and follows the boarding procedures prescribed in the Aircraft Drinking Water Rule (ADWR). On [give date], water was boarded from [provide watering point location] which was not in accordance with FDA regulations, or did not meet EPA standards for transient non-community water systems, or was otherwise determined to be unsafe due to noncompliance with the procedures for boarding water under the ADWR. As a result, *E. coli* bacteria were found in the water supply.

What This Means

Water was boarded that is contaminated with E. coli because [(water was boarded from a watering point not in accordance with FDA Regulations (21 CFR part 1240, subpart E) OR (other appropriate explanation)]. E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

People at increased risk should be particularly careful to avoid this water.

Steps We Are Taking

We will disinfect and flush the water system on [give date]. We anticipate having the water system back in service on [estimated date].

This notice is provided by [Aircraft Carrier]. Date distributed: _____.

DRINKING WATER WARNING

DO NOT DRINK THE WATER

The water is non-potable. Do not use it for drinking, food or beverage preparation, hand washing, teeth brushing, or any other consumptive use.

[Insert text to describe the situation triggering the notice].

What This Means

The unsafe situation observed by the crew could lead to contamination of this aircraft's drinking water. Short term health effects caused by drinking water contamination can pose increased risk for sensitive populations.

People with severely compromised immune systems, people with an infant, people with young children, pregnant women, and some elderly should be particularly careful to avoid this water.

Steps We Are Taking

[Describe corrective action].

This notice is provided by [Aircraft Carrier]. Date distributed: _____.

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Appendix E
Example Water Safety Plan for an Air Carrier

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Example Water Safety Plan for an Air Carrier (Revision Date: [list date])

Section 1. Goals and Objectives

Instructions: State the air carrier’s goals and objectives for developing and implementing a water safety plan for aircraft water systems.

Example: This water safety plan (WSP) summarizes Airline XYZ’s comprehensive and systematic risk management approach for assuring the safety of drinking water onboard [Make/Model] aircraft. Although the water safety plan is not required by regulation, Airline XYZ believes the water safety plan is a necessary component of a proactive risk management approach to ensure safe drinking water is obtained, boarded, and maintained for use by aircraft passengers and crew.

Section 2. Jurisdictional Requirements

Instructions: List all federal, state, and local regulations, standards and guidelines that are pertinent to the aircraft water transfer and supply chain.

Example: See Table 2.1 below.

Table 2.1. Summary of Aircraft Water System Jurisdictional Requirements for Airline XYZ

Title	Reference
<i>Regulations</i>	
Aircraft Drinking Water Rule	http://water.epa.gov/lawsregs/rulesregs/sdwa/airlinewater/regs.cfm
Food and Drug Administration, Control of Communicable Diseases, FDA certification of aircraft sanitation systems including potable water, sewage, and galleys.	21 CFR 1240. http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcr/CFRSearch.cfm?fr=1240.83
Food and Drug Administration, Interstate Conveyance Sanitation, approval and certification of watering points	21 CFR 1250. US Food and Drug Administration. 2005. Code of Federal Regulations Subchapter L Part 1250 Interstate Conveyance Sanitation [Online] Available: http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcr/CFRSearch.cfm?CFRPart=1250
<i>Standards</i>	
FAA Airworthiness Standards	http://edocket.access.gpo.gov/cfr_2003/14cfr43.9.htm
<i>Guidelines</i>	
Guidance Manual for the ADWR	USEPA 2010 www.water.epa.gov/lawsregs/rulesregs/sdwa/airlinewater
WHO Guide to Hygiene and Sanitation in Aviation, Third edition	http://www.who.int/water_sanitation_health/hygiene/ship/s/guide_hygiene_sanitation_aviation_3_edition.pdf

(2009)	
FDA Guide to Inspection of Interstate Carriers and Support Facilities	http://www.fda.gov/ICECI/Inspections/InspectionGuides/ucm074964.htm
NSF/ANSI ¹ Standard 60 – Drinking Water Treatment Chemicals – Health Effects	http://www.nsf.org/business/water_distribution/index.asp?program=WaterDistributionSys
NSF/ANSI Standard 61 Drinking Water System Components – Health Effects	http://www.nsf.org/business/water_distribution/index.asp?program=WaterDistributionSys

¹NSF = National Sanitation Foundation International; ANSI = American National Standards Institute

Section 3. Water Safety Team

Instructions: Identify your employees and other stakeholders that share responsibility for providing safe drinking water to aircraft passengers and crews. Identify each individual’s specific roles and responsibilities. List responsible parties for each airport location used to board water for the aircraft addressed by this WSP.

Example:

Name Title Organization	Roles and Responsibilities	Contact Information
Susan Smith Water Quality Officer Airline XYZ	Development and implementation of Water Safety Plan and procedures for transferring water from watering point to onboard water system; compliance with ADWR; staff training.	Phone: Fax: Email:
John Jones Maintenance Director Airline XYZ	Development and implementation of aircraft water system flushing and disinfection program, and associated employee and vendor training.	Phone: Fax: Email:
International Airport ([City], [State])		
Joe Jones Chief Engineer Massachusetts Water Resources Authority	Potable water supply: Source of supply meets federal and state drinking water regulations.	Phone: Fax: Email:
Jim Jones Maintenance Director City Airport	Drinking water quality is maintained within airport water system.	Phone: Fax: Email:
Jeff Jones Field Supervisor	Drinking water quality is maintained at watering point (transfer point from	Phone: Fax:

Contract Service Co.	source/airport water system to aircraft water system). Watering point meets FDA regulations and has no potential sources of contamination.	Email:
Vendor A	Aircraft water system flushing and disinfection as directed by Airline XYZ.	Phone: Fax: Email:
Vendor B	Aircraft water system flushing and disinfection as directed by Airline XYZ.	Phone: Fax: Email:
Vendor C	Aircraft water system flushing and disinfection as directed by Airline XYZ.	Phone: Fax: Email:
		Phone: Fax: Email:
Airport (XYZ) (List Contacts for Each Airport Served)		

Section 4. Aircraft Water System Description and Inventory

Instructions: Describe aircraft water system using a brief narrative, overall system schematic and a table summarizing key specifications for system components.

Examples:

The components of the aircraft water system include the water service panel, the filler neck of the aircraft finished water storage tank, the onboard water storage tank(s), piping, treatment equipment, galley and lavatory faucets, and any other plumbing fixtures that supply water to passengers or crew. For (insert make/model) aircraft owned and operated by Airline XYZ, the following components are also included (provide details):

(Insert schematic for each make/model owned and operated by air carrier that is addressed by this WSP)

Figure 4.1. Example Schematic of Aircraft Water System

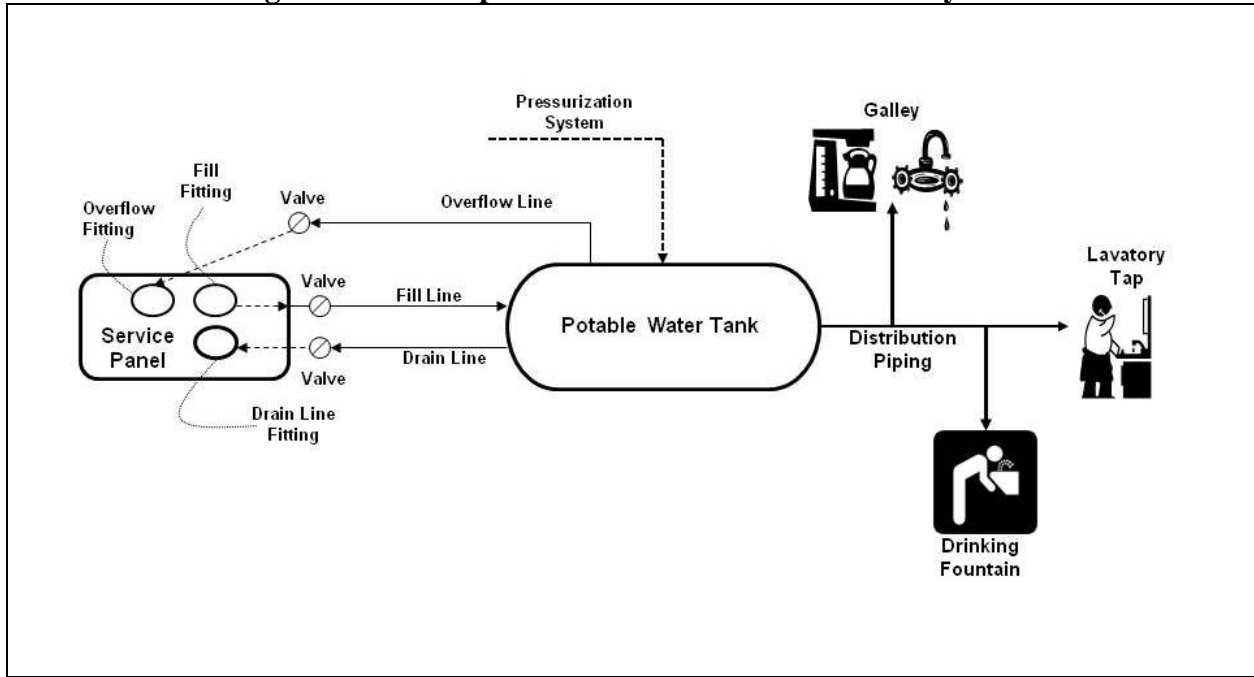


Table 4.1. Example Summary of Aircraft Water System Components (List Aircraft Type)

Component	Specifications	Operation and Maintenance Schedule
Storage tank (fixed)	1 tank, 200 gallons, plastic	Drain if aircraft idle for >48 hrs; drain, clean and disinfect every 3 months.
Storage Tank (removable)	2 tanks, 5 gallons each, plastic	Drain, clean and disinfect each use.
Fill line	1 inch (list material of construction)	Disinfect and flush every 3 months.
Distribution lines	$\frac{3}{4}$ and 1 inch (list materials of construction)	Disinfect and flush every 3 months.
Tank overflow lines	1 inch, (list material of construction)	Disinfect and flush every 3 months.
Particulate Filter	Make and Model	Replace filter every 4 months or every 1,000 hours.

Section 5. Hazard Assessment

Instructions: Identify potential hazards and their relative risk for your aircraft water system (low, medium, high). Identify control measures used to mitigate each potential hazard.

Example:

Table 5.1 Example Summary of Potential Hazard Events and Control Measures

Potential Hazard Event (Estimated Risk Level)	Control Measures
Water to be boarded is known to have a NPDWR maximum contaminant level (MCL) or treatment technique violation that poses a potential significant public health threat (e.g., acute violation of the coliform MCL, acute violation of the surface water treatment rules, or exceeding the nitrate or nitrite MCL). (High risk level)	<ul style="list-style-type: none"> - Do not board water, if operational needs (e.g., flush toilets) can be met without boarding additional water. - If operational needs cannot be met, board water and: <ul style="list-style-type: none"> • Restrict public access per 40 CFR 141.803(d). • Notify passengers and crew per 40 CFR 141.805.
Use of watering point, including transfer and delivery systems, not approved by FDA under 21 CFR 1240.83 (High)	<ul style="list-style-type: none"> - If used, aircraft is non-compliant with FDA regulations - If not used, identify alternate watering points in accordance with FDA regulations.
Boarded water degrades within onboard water system (biofilm growth). (Low)	<ul style="list-style-type: none"> -Conduct routine total coliform monitoring. -Routinely disinfect and flush aircraft water system.
Contaminant enters onboard water system due to system design flaw. (Low to medium; high risk if <i>E. coli</i>)	<ul style="list-style-type: none"> • Restrict public access per 40 CFR 141.803(d) as warranted by monitoring results. • Notify passengers and crew per 40 CFR 141.805. • Disinfect and flush aircraft water system. • Resample aircraft water. • Repeat disinfection, flushing, and follow-up sampling if necessary. • Determine if other maintenance or system modifications are needed to prevent future contamination events.

Backflow due to failure of backflow prevention devices (Medium; high if sewage is present)	<ul style="list-style-type: none"> • Restrict public access per 40 CFR 141.803(d) as warranted by monitoring results. • Notify passengers and crew per 40 CFR 141.805. • Disinfect and flush aircraft water system. • Sample aircraft water. • Inspect and repair failed backflow prevention devices.
Water quantity insufficient to meet minimum sanitary water demands during flight. (Low to medium)	<ul style="list-style-type: none"> • Restrict public access per 40 CFR 141.803(d) and based on need (i.e. only enough water available to flush toilets). • Notify passengers and crew if water is not shut off at taps. Notify crew only if water is shut off.

Section 6. Operations & Maintenance Plan

Instructions: Describe standard operating procedures (SOPs) for routine operations of the onboard water system including boarding water from the airport watering point; collecting water samples for regulatory compliance; draining the water system; disinfection and flushing of the water system; and related personnel training requirements. Describe maintenance practices including disinfection and flushing. Include technical references that provide details of regulatory requirements and/or recommended practices.

Example:

Table 6.1. Example Summary of O&M Practices

O&M Practice	Description	Reference
Watering Point Selection Requirement	A statement that all water that is boarded onto the aircraft will be from a watering point in accordance with FDA regulations.	ADWR Guidance Manual (2010); 21 CFR 1240.83; 21CFR 1250.67; FDA Manual of Sanitation
Practices for Boarding Potable Water and non-potable water	1. Confirm that transfer point meets FDA requirements. 2. See detailed practices in O&M Plan.	ADWR Guidance Manual (2010); 21CFR 1240.83.

Coliform Sampling Plan	Coliform sampling protocol for routine, repeat and follow-up samples; list of certified laboratories; analytical methods; representative sample locations; frequency and number of routine, repeat and follow-up samples; reporting sampling results.	ADWR Guidance Manual (2010)
Draining System	Procedures for completely draining aircraft water system.	WHO (2006). Health Aspects of Plumbing. FDA Manual of Sanitation
Cleaning Water Storage Tank(s)	Draining procedures; frequency of routine disinfection and flushing; disinfection procedures; flushing procedures; disinfecting agent; disinfectant concentration; disinfectant contact time; flushing volume or flushing time.	Aircraft Manufacturer's Guidelines; 21CFR 1250.82.
Disinfection and Flushing	Frequency of routine disinfection and flushing; disinfection procedures; flushing procedures; disinfecting agent; disinfectant concentration; disinfectant contact time; flushing volume or flushing time.	Aircraft Manufacturer's Guidelines; 21CFR 1250.82;
Cross Connection Control	Inspect system for potential cross connections; install and maintain backflow prevention devices as needed.	21CFR 1250.82; FDA Manual of Sanitation.
Maintenance for Treatment Equipment Including Filter Cartridges	Frequency and procedures for replacing filter cartridges.	21 CFR 1240.90; FDA Manual of Sanitation
Maintenance Procedures	Review FAA-accepted aircraft water system O&M plan	14 CFR 43 – Maintenance, Preventive Maintenance, Rebuilding, and Alteration; 21CFR 1250.30.
Self-inspection Procedures	Inspection of the storage tank, piping, supplemental treatment, plumbing fixtures, valves, and backflow prevention devices.	ADWR Guidance Manual (2010)

Personnel Training	Training topics include: public health and safety issues; ADWR requirements, sample collection, boarding water, flushing and disinfection procedures, communications and emergency plan, O&M plan	ADWR Guidance Manual (2010); WHO Guide to Hygiene and Sanitation in Aviation, Third edition (2009).
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Section 7. Communications and Emergency Plan

Instructions: Identify specific events that require communication, and the communications strategy needed to address the event.

Example:

Table 7.1 Communications and Emergency Plan

Event	Communications Strategy	Key Contacts
ADWR monitoring yields positive result.	If source of water is known, notify PWS and Airport Water System Manager of water quality issue and to discuss possible resolution. Notify public per 40 CFR 141.805. Report to EPA per 40 CFR 141.806.	Contact Name: Phone: Fax: Email:
Coliform monitoring was not conducted as required.	Notify passengers and crew per corrective action requirement (see Table 8.2 below). Report to EPA.	Contact Name: Phone: Fax: Email:
Disinfection and flushing of aircraft water system was not conducted as required.	Notify passengers, crew, EPA per corrective action requirement (see Table 8.2 below).	Contact Name: Phone: Fax: Email:
Backflow prevention device does not pass testing/inspection.	Inspector notifies Air Carrier.	Contact Name: Phone: Fax: Email:
Source water monitoring detects contamination.	PWS notifies Air Carrier and Airport. Air Carrier contacts alternate PWS.	Contact Name: Phone: Fax: Email:

Boarded water quality meets federal and state regulations for finished water.	PWS sends periodic reports (annual water quality reports or more frequent if issues arise) on regulatory compliance. Air Carrier calls PWS to discuss any water quality issues.	Contact Name: Phone: Fax: Email:
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Section 8. Corrective Actions

Instructions: Identify corrective actions that will be implemented if ADWR requirements are not met (See Table 8.1). Maintain record of corrective actions taken and how/when problems were resolved (See Table 8.2).

Examples:

Table 8.1 Summary of Corrective Actions

ADWR-related Issue	Corrective Action
Failure to board water from a safe watering point (<i>E. coli</i>-positive).	Perform all of the following corrective actions: 1. Restrict public access per 40 CFR 141.803(d) as expeditiously as possible and within 24 hours after laboratory notifies air carrier of sample results. Restriction applies until aircraft water system has been disinfected and flushed and a complete set of follow-up samples is total coliform-negative. 2. Disinfect and flush per 40 CFR 141.804(b)(2). 3. Conduct follow-up sampling per 40 CFR 141.803(e).
Failure to board water from a safe watering point (non-<i>E. coli</i>-positive).	Disinfect and flush per 40 CFR 141.804(b)(2). Notify passengers and crew.
Failure to disinfect and flush. This includes failure to conduct routine disinfection and flushing as specified in the O&M plan and failure to conduct corrective disinfection and flushing.	1. Notify passengers and crew. 2. Within 10 calendar days of discovery of failure, report failure to EPA per 40 CFR 141.806.

ADWR-related Issue	Corrective Action
<p>Failure to monitor for coliforms. This includes failure to monitor according to the frequency in the coliform monitoring plan, along with failure to analyze total coliform-positive samples for <i>E. coli</i>, failure to conduct repeat sampling after routine samples are found to be positive for total coliform, and failure to conduct follow-up monitoring after disinfection and flushing.</p>	<p>(1) For failure to collect routine, repeat or follow-up samples, restrict public access to aircraft water system; (2) Notify passengers and crew as expeditiously as possible, but in no case later than 24 hours after discovery of failure to collect required samples or after being notified by EPA of failure to collect required samples, whichever comes first, (3) conduct disinfection and flushing within 72 hours (if water system cannot be disconnected), (4) collect follow-up samples. (5) Within 10 calendar days, report failure to EPA per 40 CFR 141.806.</p>
<p>Failure to conduct a self-inspection or address a deficiency in accordance with 40 CFR 141.808. Self-inspections are required every 5 years. Deficiencies identified during self-inspections or compliance audits must be addressed within 90 days. Deficiencies identified during extended or heavy maintenance must be addressed before the aircraft is returned to service.</p>	<p>Conduct a self-inspection and provide evidence to EPA that the self-inspection was completed and whether all deficiencies have been addressed [40 CFR 141.806(c)]. Report to EPA a description of any deficiencies not addressed, an explanation as to why it has not yet been addressed, and a schedule for addressing any deficiencies as expeditiously as possible.</p>
<p>Failure to develop a coliform sampling plan in accordance with 40 CFR 141.802. Coliform sampling plans must be developed by April 19, 2011.</p>	<p>Report to EPA within 10 calendar days of discovery of the failure.</p>
<p>Failure to perform any of the requirements for coliform sampling (per 40 CFR 141.803) or the O&M plan (per 40 CFR 141.804).</p>	<p>Perform the requirements specified in 40 CFR 141.803 or 40 CFR 141.804 as applicable, and report to EPA. Notify passengers and crew.</p>
<p>Routine sample is total coliform-positive and <i>E. coli</i>-negative.</p>	<p>Perform at least one of the following three corrective actions and continue with that action until a complete set of repeat samples is total coliform-negative or a complete set of follow-up samples is collected:</p> <ol style="list-style-type: none"> 1. Disinfect and flush per 40 CFR 141.804(b)(2). 2. Restrict public access per 40 CFR 141.803(d). 3. Conduct repeat sampling per 40 CFR 141.803(c).

ADWR-related Issue	Corrective Action
Routine sample is <i>E. coli</i>-positive.	Perform all of the following corrective actions: <ol style="list-style-type: none"> 1. Restrict public access per 40 CFR 141.803(d) as expeditiously as possible and within 24 hours after laboratory notifies air carrier of sample results. Restriction applies until aircraft water system has been disinfected and flushed and a complete set of follow-up samples is total coliform-negative. 2. Disinfect and flush per 40 CFR 141.804(b)(2). 3. Conduct follow-up sampling per 40 CFR 141.803(e).
Repeat sample is <i>E. coli</i>-positive.	Perform all of the following corrective actions: <ol style="list-style-type: none"> 1. Restrict public access per 40 CFR 141.803(d) as expeditiously as possible and within 24 hours after laboratory notifies air carrier of sample results. Restriction applies until aircraft water system has been disinfected and flushed and a complete set of follow-up samples is total coliform-negative. 2. Disinfect and flush per 40 CFR 141.804(b)(2).
Failure to provide notification to passengers and crew in accordance with 40 CFR 141.805.	Implement public notification and the correction necessary to remove the need for public notification.
Failure to comply with the reporting and recordkeeping requirements of the ADWR.	Implement a reporting and recordkeeping process and procedure.

Table 8.2. Summary of Corrective Actions Taken and Problem Resolution

Event Identified (Date)	Corrective Actions Taken (Date)	Source of Problem Identified	Date Problem Was Resolved
Failure to conduct routine monitoring for coliforms (9/1/09)	Restrict public access to aircraft water system (9/2/09). Notify passengers and crew (9/2/09). System disinfected and flushed (9/4/09). New employees trained (9/5/09). Follow-up samples collected (9/5/09).	New employees needed training in sampling requirements and procedures.	9/7/09

Section 9. Recordkeeping

Instructions: Identify all documents related to aircraft water system and Water Safety Plan. List the date for the current revision and location of the document.

Example:

Document	Revision Date	Location of Master Copy
Coliform Sampling Plan	Sept. 2009	Server X, Corporate Office
Bacteriological Analyses	2004-2009	Server A, Corporate Lab
Operations & Maintenance Plan	March 2009	Server X, Corporate Office
Disinfection and Flushing Records	2004-2009	Server Z, Corporate Office
Corrective Action Reports to EPA	Multiple	Server Z, Corporate Office
Self-Inspection Records	1999-2009	Server Z, Corporate Office
Public Notices	2010-2013	Server Z, Corporate Office

Section 10. Annual Review of Water Safety Plan

Instructions: Review Sections 1-8 of Water Safety Plan and update/revise as needed. Complete review at least annually and whenever there is a change in process, procedures, equipment, regulations etc. Include revision date on title page of Plan. Distribute revised Plan to Water Safety Team and other stakeholders.