DoD Manual 4715.05, Volume 3

Overseas Environmental Baseline Guidance Document: Water

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Purpose: This manual, known as the OEBGD, is composed of multiple volumes, each addressing specific areas of environmental management such as conservation; air and toxics; water; hazardous materials, storage tanks, spills, and pesticides; and waste. In accordance with the authority in DoD Directives (DoDDs) 5134.01 and 4715.1E and the July 13, 2018 Deputy Secretary of Defense Memorandum, and the requirements in DoD Instruction (DoDI) 4715.05:

- This manual:
  - Implements policy, assigns responsibilities, and provides standards to protect human health and the environment on enduring installations under DoD control outside the United States.
  - Considers and, where relevant, incorporates generally accepted federal environmental standards applicable to DoD installations, facilities, and actions in the United States, and incorporates requirements of U.S. law that have extraterritorial application to the DoD.
  - Is used by DoD lead environmental components (LECs) to establish and update final governing standards (FGSs).
  - Establishes baseline environmental standards for installations in countries for which an FGS is not required or has not been developed.
- This volume identifies environmental standards for installations to ensure:
  - The safety of water that is provided for human consumption.
  - The control of discharges of wastewater and stormwater into the waters of the host nation (HN)

TABLE OF CONTENTS

TABLES

SECTION 1: GENERAL ISSUANCE INFORMATION

1.1. APPLICABILITY.

a. This volume applies to:

(1) OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff (CJCS) and the Joint Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the DoD (referred to collectively in this issuance as the "DoD Components").

(2) Actions of the DoD Components on installations, as defined in DoDI 4715.05, under DoD control outside the United States.

(3) Support functions for U.S. military vessels, ships, aircraft, and space vehicles provided by the DoD Components, including management and disposal of off-loaded waste or hazardous materials.

b. Does not apply to:

(1) U.S. military vessels, ships, aircraft, or space vehicles.

(2) Off-installation training.

(3) Contingency locations, which are addressed in DoDI 4715.22.

(4) Facilities and activities associated with the Naval Nuclear Propulsion Program, in accordance with Executive Order (E.O.) 12344 and conducted pursuant to Section 7158 of Title 42, United States Code.

(5) Actions to remediate environmental contamination, which are addressed in DoDI 4715.08.

(6) Environmental analyses conducted in accordance with E.O. 12114.

(7) DoD installations that do not have the potential to affect the natural environment (e.g., activities that are primarily administrative) or where, in consultation with the Assistant Secretary of Sustainment (ASD(S)), the geographic Combatant Commander has determined that no significant force health protection or environmental threats exist.

(8) Activities, systems, operations, and areas where DoD has no authority or responsibility including cooperative security locations.

c. Does not create any rights or obligations enforceable against the United States, DoD, or any of its components, nor does it create any standard of care or practice for individuals.

Although this manual refers to other DoDDs, DoDIs, and DoD manuals, it is intended only to coordinate the requirements of those issuances as required to implement the policies in DoDI 4715.05. This manual does not change other DoDDs, DoDIs, or DoD manuals or alter DoD policies. Conflicts, issues, or concerns related to the country-specific FGS or this manual should be presented to the LEC or the Combatant Commander, as appropriate.

1.2. POLICY.

In accordance with the policy in DoDI 4715.05, the DoD:

a. Manages and applies installation assets to sustain the DoD national defense mission; uses environmental, safety, and occupational health management systems in mission planning and execution across all military operations and activities; and ensures all organizations plan, program, and budget to manage the environmental, safety, and occupational health risks that their activities generate.

b. Establishes, maintains, and complies with the FGSs to protect human health and the environment for those foreign countries identified by the Under Secretary of Defense for Acquisition and Sustainment or listed in the Appendix to Enclosure 3 of DoDI 4715.05. The FGSs will reconcile the requirements of applicable international agreements and applicable HN environmental standards with E.O. 12088 and this manual.

SECTION 2: RESPONSIBILITIES

2.1. DOD COMPONENT HEADS.

The DoD Component heads:

a. Apply this volume when no FGS applies.

b. Plan, program, and budget to meet the standards contained in this volume.

2.2. COMBATANT COMMANDERS.

In addition to the responsibilities in Paragraph 2.1., and through the CJCS, the Combatant Commanders:

a. Provide general oversight and coordination with the DoD LECs, as necessary, to carry out their missions in accordance with this volume.

b. Adjudicate requests for exceptions to the requirements of this volume in accordance with DoDI 4715.05, when the Military Department requesting the exception is also the DoD LEC. When the Combatant Commander is the DoD LEC and requests an exception, the request is elevated to the ASD(S) for adjudication.

2.3. COMMANDER, UNITED STATES EUROPEAN COMMAND (USEUCOM).

The Commander, USEUCOM, is designated as the DoD Theater Environmental Coordinator for Europe due to the unique construct and influence of the European Union. In addition to the responsibilities in Paragraphs 2.1. and 2.2., the Commander, USEUCOM, oversees the consistent application of this volume at installations within the European Union and geographically located within the USEUCOM area of responsibility. Additional guidance is provided in Enclosure 4 of DoDI 4715.05.

SECTION 3: GENERAL OEBGD GUIDANCE

3.1. USE OF THIS VOLUME AND FGSS.

DoD LECs use this volume to conduct the comparative analysis of water required to develop each country-specific FGS. The comparative analysis considers HN environmental standards, international agreements, and the standards found in this volume, with the more protective standard being used to establish the FGS. The FGSs ensure consistent application of environmental standards for all installations operated by DoD Components within an HN. Compliance with the standards of this volume is achieved by complying with the current FGSs, since the standards of this volume are reflected in the FGSs. In cases where updates or revisions to this volume have not yet been considered and incorporated into an FGS, installations must comply with the more protective standard, whether it is found in this volume or the FGS.

a. For DoD Components on DoD installations in foreign countries for which FGSs are not required, or have yet to be established, installations must comply with applicable international agreements, applicable HN environmental standards pursuant to Section 1-801 of E.O. 12088, and this volume. In cases of conflicting requirements, the DoD Components will normally comply with the standard that is more protective of human health and the environment.

b. DoD Components will consult with the DoD LEC or, if no DoD LEC is designated, with the applicable Combatant Commander on actions that could seriously affect mission, involve a substantial commitment of funds, or set a precedent.

3.2. WATER MANAGEMENT.

This volume contains standards for the management of drinking water, wastewater, and stormwater on DoD installations outside the United States. These standards apply to all facilities, tenants, operations, and activities under DoD control on the installation.

3.3. EFFECTIVE DATES.

Standards identified in this manual are effective immediately upon publication. Installations and DoD Components must plan, program, and budget in accordance with Section 6 of Enclosure 3 of DoDI 4715.05.**3.4. NONCOMPLIANCE TERMINOLOGY**.Terms such as "noncompliance," "out of compliance," "violation," "exceedance," "nonconformity," and "nonconformance" are used synonymously to describe the condition of failing to meet a standard or a specific limit or value within a standard in this manual.

3.5. SAMPLING AND ANALYTICAL CONSIDERATIONS.

a. In many cases, standards of this manual are based on specific monitoring, sampling, and analytical methods that must be considered when determining compliance or comparing with HN standards.

b. Laboratory analyses necessary to implement the FGS or this volume must normally be conducted in a laboratory that has been certified by a U.S. or HN regulatory authority, or accredited through the DoD Environmental Laboratory Accreditation Program, for the applicable test method and follows required quality assurance and quality control protocol. In the absence of a certified laboratory, analyses may also be conducted at a laboratory that has an established reliable record of quality assurance compliance with standards for the applicable test method that are generally recognized by appropriate industry or scientific organizations.

c. Field sample and data collection must be conducted by personnel with demonstrated experience in the applicable test method and sampling. All procedures used for testing, quality assurance, and reporting of results should be those commonly accepted in the field of air pollution control.

3.6. RECORDKEEPING.

All records generated while implementing the standards in this manual must be maintained by installations in accordance with the FGS, this manual, DoDI 5015.02, and DoD Component policies.

3.7. RELATED PROGRAMS.

Additional guidance about related programs and initiatives that may apply outside the United States is included in other DoD policies and issuances.

a. Pollution prevention is addressed in DoDD 4715.1E and DoDIs 4715.23 and 4150.07.

b. Management of emerging contaminants perfluorooctane sulfonate and perfluorooctanoic acid are addressed in the June 10, 2016 ASD(S) Memorandum.

SECTION 4: DRINKING WATER

4.1. INTRODUCTION.

This section contains standards on the safety of water provided for human consumption. It includes requirements for DoD non-public water systems (NPWSs) and requirements for DoD public water systems (PWSs) that produce water, as well as those that purchase or are provided water from an HN PWS.

4.2. GENERAL.

Installation commanders are responsible for ensuring that water provided for human consumption is safe, regardless of whether the water is produced by the installation or obtained from an HN PWS. Applicability of specific standards in this section is delineated by the classification of the system(s) providing water on the installation. DoD systems are classified as either NPWSs or PWSs, with PWSs further classified as community water systems (CWSs), non-transient, non-community water systems (NTNCWSs), and transient, non-community water systems (TNCWSs) (see Glossary definition of PWS). Samples taken to conform to the standards of this section must be validated by independent testing or validated supplier testing.

a. NPWSs.

DoD NPWSs must be monitored for coliform bacteria (total coliforms and E. coli), at a minimum, and disinfectant residuals periodically (e.g., quarterly, or before and during operation of an infrequently or seasonally used NPWS) in accordance with the appropriate DoD medical authority. DoD NPWSs are not required to meet any of the additional requirements of this section.

b. PWSs.

DoD PWSs must provide proper monitoring and treatment for all water provided for human consumption in accordance with the requirements of this section. For drinking water that is purchased or otherwise provided from an HN treatment plant or other source, Paragraphs 4.2.b.(1) through (5) are only applicable within the installation fenceline. Additionally, DoD PWSs must meet the following general standards:

(1) Design, Operation, and Maintenance.

(a) Implement and comply with the design, operation, and maintenance guidelines in accordance with Unified Facilities Criteria (UFC) 3-230-01, UFC 3-230-02, and UFC 3-230-03.

(b) Maintain a map or drawing of the complete PWS.

(c) Perform water distribution system operation and maintenance practices:

1. Maintain a detectable disinfectant residual throughout the water distribution system, except where determined unnecessary by the appropriate DoD medical authority.

2. Implement proper procedures for repairing and replacing mains, including disinfection and bacteriological testing.

3. Conduct an annual water main flushing program.

4. Properly operate and maintain storage tanks and reservoirs, including cleaning and inspection.

5. Maintain distribution system components, including hydrants and valves.

6. Maintain a continuous positive pressure of at least 138 kilopascals [20 pounds per square inch] in the water distribution system.

(d) Establish a cross-connection control and backflow prevention program.

(e) Use only lead-free pipe, pipe or plumbing fitting or fixture, solder, and flux in the installation or repair of water systems and plumbing systems for drinking water.

(2) Documentation and Recordkeeping

Maintain all corrective actions, monitoring, and analytical records for at least 3 years, except:

(a) Bacteriological records – 5 years (except source water *Cryptosporidium* and *E. coli*).

(b) *Cryptosporidium* and *E. coli* source water records – 10 years.

(c) Chemical records – 10 years.

(d) Cross-connection and backflow prevention testing and repair records – 10 years.

(3) Source Water Protection.

(a) Protect all groundwater and surface water sources of drinking water from contamination by operations on DoD installations by:

1. Suitable placement and construction of wells.

2. Suitable placement of the new intake (heading) to all water treatment facilities.

3. Proper siting and maintaining septic systems and on-site treatment units.

4. Appropriate land use management.

5. Appropriate stormwater management.

6. Appropriate wellhead protection program.

(b) Conduct sanitary surveys of the water system at least every 3 years for surface water systems, as well as groundwater under the influence of surface water, and every 5 years for systems using groundwater, or as warranted. Sanitary surveys consist of an on-site inspection of the water source, treatment, distribution system, finished water storage, pumping facilities and controls, monitoring and reporting data, system management and operation, and compliance with operator requirements. Requirements for sanitary surveys state that off-installation surveys should be coordinated with the HN authorities.

(c) Manage underground injection on DoD installations to protect underground water supply sources. Installations must not dispose of hazardous waste or wastewater by underground injection (does not preclude the disposal of sanitary wastewater in septic systems and small capacity cesspools that have been sited, constructed, and operated with the approval of appropriate DoD authorities).

(d) Conduct (and update as necessary) vulnerability assessments that include, but are not limited to, a review of:

1. Pipes and constructed conveyances; physical barriers; water collection, pretreatment, treatment, storage, and distribution facilities; and electronic, computer, or other automated systems used by the DoD PWS.

2. Use, storage, or handling of various chemicals.

3. Operation and maintenance of the water storage, treatment, and distribution systems.

(4) Contingency Plan.

Develop and update, as necessary, an emergency contingency plan to ensure the provision of water fit for human consumption despite interruptions from natural disasters and service interruptions. At a minimum, the plan must identify:

(a) Plans, procedures, and equipment that can be implemented or used in the event of an intentional or unintentional disruption.

(b) Key personnel.

(c) Procedures to restore service, including supplemental sampling procedures.

(d) Procedures to isolate damaged lines.

(e) Alternative water supplies.

(f) Installation public notification procedures.

(5) Source Water Sampling for DoD PWSs with HN PWS Sources.

DoD PWSs that purchase or are provided water from an HN PWS, and that are required to perform source water sampling in accordance with Paragraphs 4.7., 4.9., and 4.11., must perform sampling at the point of entry to the installation before any additional treatment by the installation.

4.3. PERSONNEL QUALIFICATIONS.

a. The appropriate installation point of contact must designate an operator in responsible charge to be the certified operator who makes decisions regarding the daily operational activities of a PWS, water treatment facility, or distribution system, that directly impact the quality or quantity of drinking water.

b. Operators in responsible charge must:

(1) Be appropriately trained according to the level of complexity of the DoD PWS they operate and oversee.

(2) Be certified by having successfully completed, and been licensed through, a U.S. State-approved water system operator certification course, a similar HN course, or a course that meets industry standards and practices.

(3) Maintain current certification for the duration of the appointment.

4.4. COLIFORM BACTERIA REQUIREMENTS.

a. Monitoring Program.

DoD PWSs must comply with the total coliform-related operational evaluation level (OEL) and E. coli maximum contaminant level (MCL). Each DoD PWS must develop and maintain a written sample siting plan that is representative of water throughout the distribution system. The plan must identify routine and repeat sampling sites and a sample collection schedule. Total coliform samples must be collected in accordance with the written sample siting plan.

(1) The total coliform-related OEL is exceeded whenever more than 5 percent of samples per month for a system examining 40 or more samples a month, or two or more samples per month when a system analyzes less than 40 samples per month, are confirmed positive for total coliforms.

(2) The MCL for *E. coli* is exceeded whenever:

(a) A routine *E. coli* positive sample is followed by a repeat total coliform positive sample or a repeat *E. coli* positive sample.

(b) A routine total coliform positive sample is followed by any repeat sample that is positive for *E. coli*.

(c) Any required repeat samples are not collected following an *E. coli* positive routine sample.

(d) Any repeat total coliform positive sample is not tested for *E. coli.*

(3) Whenever the OEL or *E. coli* MCL is exceeded, complete an assessment to determine if any sanitary defects exist and, if found, take corrective action.

b. Monitoring Plan and Sampling.

Each DoD PWS must develop and maintain a written monitoring plan and collect routine samples in accordance with the monitoring frequency provided in Table 1. Seasonal DoD PWSs that do not maintain positive pressure throughout the distribution system must develop a startup plan to be completed before providing water at the beginning of the season.

Table 1. Total Coliform Monitoring Frequency

POPULATION SERVED	NUMBER OF SAMPLES[a]	POPULATION SERVED	NUMBER OF SAMPLES[a]
25 to 1,000[b]	1	59,001 to 70,000	70
1,001 to 2,500	2	70,001 to 83,000	80
2,501 to 3,300	3	83,001 to 96,000	90
3,301 to 4,100	4	96,001 to 130,000	100
4,101 to 4,900[c]	5	130,001 to 220,000	120
4,901 to 5,800	6	220,001 to 320,000	150
5,801 to 6,700	7	320,001 to 450,000	180
6,701 to 7,600	8	450,001 to 600,000	210
7,601 to 8,500	9	600,001 to 780,000	240
8,501 to 12,900	10	780,001 to 970,000	270
12,901 to 17,200	15	970,001 to 1,230,000	300
17,201 to 21,500	20	1,230,001 to 1,520,000	330
21,501 to 25,000	25	1,520,001 to 1,850,000	360
25,001 to 33,000	30	1,850,001 to 2,270,000	390
33,001 to 41,000	40	2,270,001 to 3,020,000	420
41,001 to 50,000	50	3,020,001 to 3,960,000	450
50,001 to 59,000	60	3,960,001 or more	480

[a] Minimum number of routine samples per month.
[b] A non-community water system (NCWS) using groundwater and serving a population of 1,000 or less may monitor once in each calendar quarter during which the system provides water, provided a sanitary survey conducted within the last 5 years shows the system is supplied solely by a protected groundwater source and free of sanitary defects.
[c] Systems that use groundwater, serve a population of less than 4,900, and collect samples from different sites may collect all samples on a single day. All other systems must collect samples at regular intervals throughout the month.

c. Follow-up Sampling and Assessment.

(1) A DoD PWS with initial samples testing positive for total coliforms must collect repeat samples as soon as possible, preferably within 24 hours of being notified of the positive result. Repeat sample locations are required at the same tap as the original sample plus an upstream and downstream sample, each within five service connections of the original tap. Monitoring must continue until total coliforms are no longer detected or the system determines the OEL has been exceeded and an assessment is initiated.

(2) When any routine or repeat sample tests positive for total coliforms, it must be tested for *E. coli*. *E. coli* testing can be foregone on a total coliform positive sample if *E. coli* is assumed to be present.

(3) If a DoD PWS has an indication of coliform contamination (e.g., as a result of an OEL exceedance, *E. coli* MCL violation, performance failure), it must be assessed to determine if any sanitary defects exist. If sanitary defects are found, the system must take corrective action.

d. Notification.

If a DoD PWS has exceeded the total coliform-related OEL or E. coli MCL, the PWS must complete the notification in accordance with Paragraph 4.16. as follows:

(1) Total Coliform-Related OEL. Notify the appropriate DoD medical authority within 24 hours of the DoD PWS receiving notification of an exceedance of the OEL. There is no requirement to notify the public of exceedance of the OEL if the OEL was not triggered by an *E. coli* MCL exceedance.

(2) *E. coli* MCL. Notify the appropriate DoD medical authority as soon as possible, but no later than the end of the same day the command responsible for operating the DoD PWS is notified of the result. Because an acute risk to public health may exist, the installation public must be notified as soon as possible, but not later than 24 hours after the command responsible for operating the DoD PWS is notified of the test result.

4.5. INORGANIC CHEMICAL REQUIREMENTS.

a. DoD PWSs must ensure that the water distributed for human consumption does not exceed inorganic chemical MCLs provided in Table 2, as applicable based on the system classification.

Table 2. Inorganic Chemical MCLs

CONTAMINANT	MCL (mg/L unless otherwise noted)
Arsenic[a]	0.010
Antimony[a]	0.006
Asbestos[a]	7 million fibers/liter (longer than 10 micrometers)
Barium[a]	2.0
Beryllium[a]	0.004

CONTAMINANT	MCL (mg/L unless otherwise noted)
Cadmium[a]	0.005
Chromium[a]	0.1
Cyanide[a]	0.2 (as free cyanide)
Fluoride[b]	4.0
Fluoride (Secondary MCL)[c]	2.0
Mercury[a]	0.002
Nickel[d]	
Nitrate[e]	10 (as N)
Nitrite[e]	1 (as N)
Total Nitrite and Nitrate[e]	10 (as N)
Selenium[a]	0.05
Sodium[d]	
Thallium[a]	0.002

mg/L = milligram per liter
[a] MCLs apply to CWSs and NTNCWSs.
[b] MCL applies only to CWSs.
[c] Fluoride secondary MCL applies to CWSs for notification purposes only.
[d] No MCL established or in effect. Monitoring is required so that concentration levels can be made available on request. Sodium and nickel levels must be reported to the DoD medical authority on receipt of analysis.
[e] MCLs apply to CWSs, NTNCWSs, and TNCWSs.

(1) Except for nitrate, nitrite, and total nitrate and nitrite, for systems monitored quarterly or more frequently, a system is out of compliance if the annual running average concentration of an inorganic chemical exceeds the MCL.

(2) For systems monitored annually or less frequently, a system is out of compliance if a single sample exceeds the MCL.

(3) For nitrate, nitrite, and total nitrate and nitrite, system compliance is determined by averaging the single sample that exceeds the MCL with its confirmation sample; if this average exceeds the MCL, the system is out of compliance.

b. Systems must be monitored for inorganic chemicals at the frequency provided in Table 3.

Table 3. Inorganic Chemical Monitoring Requirements

CONTAMINANT	GROUNDWATER BASELINE REQUIREMENT	SURFACE WATER BASELINE REQUIREMENT	TRIGGER THAT INCREASES MONITORING	REDUCED MONITORING
Arsenic	1 sample/every 3 years	Annual sample	>MCL	
Antimony	1 sample/every 3 years	Annual sample	>MCL	
Barium	1 sample/every 3 years	Annual sample	>MCL	
Beryllium	1 sample/every 3 years	Annual sample	>MCL	
Cadmium	1 sample/every 3 years	Annual sample	>MCL	
Chromium	1 sample/every 3 years	Annual sample	>MCL	
Cyanide	1 sample/every 3 years	Annual sample	>MCL	
Fluoride	1 sample/every 3 years	Annual sample	>MCL	
Mercury	1 sample/every 3 years	Annual sample	>MCL	
Nickel	1 sample/every 3 years	Annual sample		
Selenium	1 sample/every 3 years	Annual sample	>MCL	
Thallium	1 sample/every 3 years	Annual sample	>MCL	
Sodium	1 sample/every 3 years	Annual sample		
Asbestos[a]	1 sample/every 9 years	1 sample/every 9 years	>MCL	Yes
Total Nitrate/Nitrite	Annual sample	Quarterly	≥50% Nitrite MCL	
Nitrate	Annual sample[b]	Quarterly[b]	≥50% MCL[c]	Yes[d]
Nitrite	Annual sample[b]	Quarterly[b]	≥50% MCL[c]	Yes[e]
Corrosivity[f]	Once	Once		

Table 4. Inorganic Chemical Monitoring Requirements, Continued

CONTAMINANT	GROUNDWATER BASELINE REQUIREMENT	SURFACE WATER BASELINE REQUIREMENT	TRIGGER THAT INCREASES MONITORING	REDUCED MONITORING
[a] Necessity for analysis is predicated upon a sanitary survey conducted by the PWS. [b] Any sampling point with an analytical value greater than or equal to 0.5 mg/L as N (50 percent of the nitrite MCL) must begin sampling for nitrate and nitrite separately. Since nitrite readily converts to nitrate, a system can conclude that if the total nitrate/nitrite value of a sample is less than 50 percent of the nitrite MCL, then the value of nitrite in the sample would also be below 50 percent of its MCL. [c] Increased monitoring frequency must be quarterly for at least 1 year following any one sample for nitrate or nitrite in which the concentration is greater than or equal to 50 percent of the MCL. Groundwater systems may return to baseline monitoring requirements if all sample results are less than the nitrate or nitrite MCLs. [d] The appropriate DoD medical authority may reduce repeat sampling frequency for surface water systems to annually if after 1 year results are less than 50 percent of the MCL. [e] The appropriate DoD medical authority may reduce repeat sampling frequency to one annual sample if results are less than 50 percent of the MCL. [f] PWSs must be analyzed to determine the corrosivity entering the distribution system. Two samples (one mid-winter and one mid-summer) must be collected at the entry point of the distribution system for systems using surface water and groundwater under the direct influence (GWUDI). One sample must be collected for systems using only groundwater. Corrosivity characteristics of the water must include measurements of pH, calcium, hardness, alkalinity, temperature, total dissolved solids, and calculation of the Langelier Saturation Index.				

(1) Sampling Location.

After any application of treatment, a minimum of one sample must be taken from water systems at every entry point to the distribution system or in the distribution system at a point that is representative.

(2) Increased Monitoring.

Increased monitoring must be performed quarterly and must begin in the next quarter after receipt of the sample result that triggered increased monitoring. Increased quarterly monitoring requires a minimum of two consecutive quarterly samples for groundwater systems and at least four consecutive quarterly samples for surface water systems. If all results are less than the increased monitoring trigger criteria, then the system may return to baseline monitoring requirements. Additional increased monitoring requirements relating to nitrate and nitrite are specified in Table 3.

c. If a DoD PWS is out of compliance, the installation must complete the notification in accordance with Paragraph 4.16. as soon as possible. If the nitrate, nitrite, or total nitrate and nitrite MCLs are exceeded, it is considered an acute health risk and the installation must complete the notification to:

(1) The appropriate DoD medical authority as soon as possible, but in no case later than the end of the same day the command responsible for operating the PWS is notified of the result.

(2) The installation public as soon as possible, but not later than 72 hours after the command responsible for operating the DoD PWS is notified of the test result. If the installation

is only monitoring annually on the basis of direction from the appropriate DoD medical authority, it must immediately increase monitoring in accordance with Table 3 until corrective actions are completed and authorities determine the system is reliable and consistent.

4.6. FLUORIDE REQUIREMENTS.

a. DoD PWSs adding fluoride (i.e., practicing fluoridation) for dental health should fluoridate to 0.7 mg/L unless fluoridation is prohibited or restricted by HN regulations.

(1) Where HN regulations do not allow fluoridation to a concentration of 0.7 mg/L, fluoridate to the concentration specified by HN regulations.

(2) Where HN regulations specify fluoride concentrations within a range, fluoridate to a concentration within the range that is closest to 0.7 mg/L.

b. DoD PWSs practicing fluoridation must sample at least daily for operational control of fluoridation. They must also analyze samples collected in the distribution system in conjunction with bacteriological samples. The command responsible for operating the DoD PWS must consider the presence of populations at risk for dental health effects and ensure fluoride is maintained throughout the distribution system when determining which bacteriological sampling sites will be monitored for fluoride.

c. DoD PWSs must be monitored for fluoride at the entry point to the distribution system as specified in Table 3 to determine compliance with the fluoride MCL.

d. An installation commander responsible for a DoD CWS must ensure that the fluoride content of drinking water does not exceed the MCL of 4 mg/L and should ensure the fluoride content does not exceed the secondary MCL of 2.0 mg/L, as stated in Table 2.

(1) If any sample exceeds the MCL, the installation must complete the notification requirements specified in Paragraph 4.16.

(2) If fluoride exceeds the secondary MCL, but not the MCL, the command responsible for operating the DoD CWSs must notify the appropriate DoD medical authority within 14 calendar days and the installation public within 1 year, in accordance with Paragraph 4.16. Notification of the installation public must be included in the annual consumer confidence report.

4.7. LEAD AND COPPER REQUIREMENTS.

DoD CWSs and NTNCWSs must not exceed action levels (distinguished from the MCL) of 0.015 mg/L of lead or 1.3 mg/L of copper in more than 10 percent of tap water samples collected during any monitoring period. An action level exceedance triggers other requirements that include water quality parameter monitoring, corrosion control treatment, source water monitoring and treatment, public education, and lead service line replacement.

a. Affected DoD systems must conduct monitoring in accordance with Table 4. DoD installations and facilities must sample or ensure sampling is completed regardless of system ownership. High-risk sampling sites must be targeted by conducting a materials evaluation of the distribution system. Sampling sites must be selected based on a hierarchical approach.

Table 5. Monitoring Requirements for Lead and Copper Water Quality Parameters

POPULATION SERVED	NO. OF SITES FOR STANDARD MONITORING[a]	NO. OF SITES FOR REDUCED MONITORING[b]	NO. OF SITES FOR WATER QUALITY PARAMETERS[c]
>100,000	100	50	25
10,001 - 100,000	60	30	10
3,301 - 10,000	40	20	3
501 - 3,300	20	10	2
101 - 500	10	5	1
≤100	5	5	1

[a] Every 6 months for lead and copper.
[b] Annually for lead and copper if action levels are met during each of two consecutive 6-month monitoring periods. Any small- or medium-sized system (serving a population of less than 50,000) that meets the lead and copper action levels during 3 consecutive years may reduce the monitoring for lead and copper from annually to once every 3 years. Annual or triennial sampling must be conducted during the four warmest months of the year.
[c] This monitoring must be conducted by all large systems (serving a population of greater than 50,000). Small- and medium-sized systems must monitor water quality parameters when action levels are exceeded. Samples must be representative of water quality throughout the distribution system and include a sample from the entry to the distribution system. Samples must be taken in duplicate for pH, alkalinity, calcium, conductivity or total dissolved solids, and water temperatures to allow a corrosivity determination (via a Langelier Saturation Index or other appropriate saturation index); additional parameters are orthophosphate when a phosphate inhibitor is used and silica when a silicate inhibitor is used.

(1) For CWS, priority is given to single-family residences that contain copper pipe with lead solder installed after 1982, contain lead pipes, or are served by lead service lines; then, structures, including multi-family residences with the foregoing characteristics; and, finally, residences and structures with copper pipe with lead solder installed before 1983.

(2) NTNCWS sampling sites must consist of structures that contain copper pipe with lead solder installed after 1982, contain lead pipes, or are served by lead service lines. First draw samples must be collected from a cold water kitchen or bathroom tap; nonresidential samples must be taken at an interior tap from which water is typically drawn for consumption.

b. The installation must provide public notification, including corrective actions that may be taken, concerning the lead content of materials used in distribution or plumbing systems or the corrosivity of water that has caused leaching, which indicates a potential health threat if exposed to leaded water.

c. Action levels are exceeded based on the 90th percentile level. The 90th percentile level is calculated by multiplying the number of valid samples sorted in ascending order by 0.9 (e.g., 10

samples x 0.9 = 9; thus, use 9th highest lead and copper test results to compare to action level). If an action level is exceeded, the installation must:

(1) Collect additional monitoring of water quality parameters as specified in Table 4.

(2) Pursue optimal corrosion control treatment.

(a) If action levels are exceeded after implementation of applicable corrosion control and source water treatment, lead service lines must be replaced if the lead service lines cause the lead action level to be exceeded.

(b) Discontinue lead service line replacement whenever lead monitoring results do not exceed the action level in tap samples for two consecutive 6-month monitoring periods.

(c) Return to the standard monitoring schedule identified in Table 4.

d. The installation commander must implement an education program for installation personnel (including United States and HN) within 60 days after the end of the monitoring period in which the action level was exceeded and must complete the notification in accordance with Paragraph 4.16. as soon as possible, but in no case later than 14 calendar days after the violation.

4.8. ORGANIC CHEMICAL REQUIREMENTS.

a. DoD CWSs and NTNCWSs must ensure that synthetic organic chemicals (SOCs) and volatile organic chemicals (VOCs) in water distributed to people do not exceed the MCLs delineated in Table 5.

Table 6. Organic Chemical MCLs

ORGANIC CHEMICALS	mg/L	DETECTION LIMIT, mg/L
SOCs		
Alachlor	0.002	0.0002
Atrazine	0.003	0.0001
Benzo[a]pyrene	0.0002	0.00002
Carbofuran	0.04	0.0009
Chlordane	0.002	0.0002
Dalapon	0.2	0.001
2,4-D	0.07	0.0001
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	0.00002
Di (2-ethylhexyl) adipate	0.4	0.0006
Di (2-ethylhexyl) phthalate	0.006	0.0006
Dinoseb	0.007	0.0002
Diquat	0.02	0.0004
Endrin	0.002	0.00001
Endothall	0.1	0.009
Ethylene dibromide (EDB)	0.00005	0.00001
Glyphosate	0.7	0.006
Heptachlor	0.0004	0.00004
Heptachlorepoxide	0.0002	0.00002
Hexachlorobenzene	0.001	0.0001
Hexachlorocyclopentadiene	0.05	0.0001
Lindane	0.0002	0.00002
Methoxychlor	0.04	0.0001
Oxamyl (Vydate)	0.2	0.002
PCBs (as decachlorobiphenyls)	0.0005	0.0001
Pentachlorophenol	0.001	0.00004
Picloram	0.5	0.0001
Simazine	0.004	0.00007
2,3,7,8-TCDD (Dioxin)	0.00000003	0.000000005
Toxaphene	0.003	0.001
2,4,5-TP (Silvex)	0.05	0.0002
VOCs		
Benzene	0.005	0.0005
Carbon tetrachloride	0.005	0.0005
o-Dichlorobenzene	0.6	0.0005
cis-1,2-Dichloroethylene	0.07	0.0005
trans-1,2-Dichloroethylene	0.1	0.0005
1,1-Dichloroethylene	0.007	0.0005
1,1,1-Trichloroethane	0.20	0.0005
1,2-Dichloroethane	0.005	0.0005
Dichloromethane	0.005	0.0005
1,1,2-Trichloroethane	0.005	0.0005
1,2,4-Trichloro-benzene	0.07	0.0005
1,2-Dichloropropane	0.005	0.0005

Table 5. Organic Chemical MCLs, Continued

ORGANIC CHEMICALS	mg/L	DETECTION LIMIT, mg/L
VOCs		
Ethylbenzene	0.7	0.0005
Monochlorobenzene	0.1	0.0005
para-Dichlorobenzene	0.075	0.0005
Styrene	0.1	0.0005
Tetrachloroethylene	0.005	0.0005
Trichloroethylene	0.005	0.0005
Toluene	1.0	0.0005
Vinyl chloride	0.002	0.0005
Xylene (total)	10	0.0005
OTHER ORGANICS		
Acrylamide	treatment technique 0.05% dosed at 1 part per million[a]	
Epichlorohydrin	treatment technique 0.01% dosed at 20 parts per million[a]	

PCB = polychlorinated biphenyl
[a] Only applies when adding these polymer flocculants to the treatment process. No sampling is required; the system certifies that dosing is within specified limits.

(1) Systems monitoring quarterly or more frequently are out of compliance if the annual running average concentration of an organic chemical, for each sample point, exceeds the MCL.

(2) Systems monitoring annually or less frequently with a detection greater than the MCL are not out of compliance until an annual average is calculated and exceeds the MCL. The annual average is based on the annual or less frequent sample result and the quarterly monitoring sample results, required under the increased monitoring criteria delineated in Table 6.

b. CWSs and NTNCWSs must be monitored for SOCs and VOCs according to the schedule stated in Table 6.

Table 6. Organic Chemical Monitoring Requirements

CONTAMINANT	BASE MONITORING FREQUENCY		TRIGGER FOR INCREASED MONITORING	REDUCED MONITORING
	GROUNDWATER	SURFACE WATER		
VOCs	One sample every 3 years	Annual	>0.0005 mg/L	Yes[a, b]
SOCs	Four consecutive quarterly samples every 3 years	Four consecutive quarterly samples every 3 years	>Detection limit[c]	Yes[b, d]

[a] Systems that have demonstrated they are reliably and consistently below MCLs may reduce monitoring to annually (one sample every year). After 3 years of annual samples with no detections, systems may return to the base monitoring frequency.
[b] Monitoring frequency may be reduced if warranted based on a sanitary survey of the PWS.
[c] Detection limits provided in Table 5 or as determined by the best available testing methods.
[d] For systems monitoring at the base monitoring frequency with one round of no detections (e.g., 4 consecutive quarters with no detections) may further reduce monitoring frequency to the following: systems serving a population greater than 3,300 may reduce to two consecutive quarterly samples within 1 year during a period of 3 years; systems serving a population less than 3,300 may reduce to one sample every 3 years.

(1) New DoD CWSs or NTNCWSs beginning operation must initially collect four consecutive quarterly samples to determine compliance with established VOC and SOC MCLs. New systems with no detections during the initial sampling event must continue monitoring at the base monitoring frequencies in Table 6.

(2) CWSs and NTNCWSs must choose sampling location in accordance with the following:

(a) Groundwater systems must take a minimum of one sample at every entry point that is representative of each well after treatment.

(b) Surface water systems must take a minimum of one sample at every entry point to the distribution system at a point that is representative of each source after treatment.

(3) A CWS or NTNCWS monitoring at the base monitoring frequency or a reduced monitoring frequency that exceeds the trigger for increased monitoring in any one sample must continue or immediately begin quarterly monitoring. Monitoring must continue until the system demonstrates that it is reliably and consistently below the MCLs (i.e., when there is enough confidence that future sampling results will be sufficiently below the MCL to justify reducing the quarterly monitoring frequency). For example, water systems with widely varying analytical results or analytical results that are just below the MCL would not meet this criterion.

(a) Groundwater systems must have a minimum of two consecutive quarterly samples with no detections or detections below the MCL to demonstrate the system is reliably and consistently below MCLs.

(b) Surface water systems must have a minimum of four consecutive quarterly samples with no detections or detections below the MCL to demonstrate the system is reliably and consistently below MCLs.

(4) A CWS or NTNCWS that detects a VOC or SOC above the MCL must continue or immediately begin quarterly monitoring and continue monitoring for a minimum of 4 consecutive quarters, until a system demonstrates that it is reliably and consistently below the MCL.

c. If a CWS or NTNCWS is out of compliance, the notification in accordance with Paragraph 4.16. must be completed as soon as possible, but no later than 14 days after the violation. The installation must continue monitoring, as noted in Table 6, and must continue until the installation commander determines the system is back in compliance and all necessary corrective measures have been implemented.

4.9. DISINFECTANT/DISINFECTION BYPRODUCTS (DDBP) REQUIREMENTS.

a. DDBP Precursor Requirements.

DoD PWSs with surface water and GWUDI as the source water:

(1) Using conventional filtration treatment must monitor each treatment plant water source for total organic carbon (TOC) on a monthly basis. Samples must be taken from the source water before treatment and the treated water (i.e., paired samples) not later than the point of combined filter effluent turbidity monitoring. Source water alkalinity must also be monitored at the same time. Systems with average treated water TOC of less than 2.0 mg/L for 2 consecutive years, or less than 1.0 mg/L for 1 year, may reduce TOC and alkalinity to one paired sample per plant per quarter.

(2) Not using conventional filtration treatment must monitor only source water TOC before any treatment on a monthly basis. Source water TOC must be monitored quarterly for systems on reduced total trihalomethanes (TTHM) and haloacetic acids (five) (HAA5) monitoring frequences.

b. DDBP Requirements for CWSs and NTNCWSs.

DoD CWSs and NTNCWSs that add a disinfectant (i.e., an oxidant, such as chlorine, chlorine dioxide, chloramines, or ozone) to any part of their treatment process, including disinfectant added by a local water supplier, must meet the following requirements.

(1) Comply with the following MCLs and maximum residual disinfectant levels (MRDLs):

(a) TTHM MCL of 0.080 mg/L

(b) HAA5 MCL of 0.060 mg/L

(c) Chlorite MCL of 1.0 mg/L

(d) Bromate MCL of 0.010 mg/L

(e) Chlorine MRDL of 4.0 mg/L (as Cl_2)

(f) Chloramines MRDL of 4.0 mg/L (as Cl_2)

(2) Noncompliance is determined as:

(a) For TTHM or HAA5, when any locational running annual average (LRAA), computed quarterly for each sampling location, exceeds the MCL.

(b) For chlorite, when the average concentration of any three-sample set (i.e., one monthly sample set from within the distribution system) exceeds the MCL.

(c) For bromate, when a running yearly average of samples, computed quarterly, exceeds the MCL.

(d) For chlorine or chloramine, when a running yearly average of monthly averages of all samples, computed quarterly, exceeds the MRDL. Operators may increase residual disinfectant levels of chlorine or chloramines in the distribution system to a level and for a time

necessary to protect public health to address specific microbiological contamination problems caused by circumstances such as distribution line breaks, storm runoff events, source water contamination, or cross connections.

(e) For chlorine dioxide, when:

1. Any daily sample from the entrance to the distribution system exceeds the MRDL and if one or more of the three samples taken the following day from within the distribution system exceeds the MRDL, or the system fails to take any distribution system samples. The MRDL for chlorine dioxide may be exceeded for short periods to address specific microbiological contamination problems.

2. Any two consecutive daily samples exceed the MRDL even if none of the distribution samples exceed the MRDL.

3. Monitoring is not performed at the entrance to the distribution system on the day following an exceedance of the chlorine dioxide MRDL.

(3) Routinely monitor TTHM, HAA5, chlorine dioxide, chloramine, chlorine, and ozone in accordance with Table 7. Determine sample locations as follows:

Table 7. DDBP Monitoring Requirements

SOURCE WATER TYPE	POPULATION SERVED BY SYSTEM	ANALYTE AND ROUTINE MONITORING FREQUENCY	NUMBER OF SAMPLING LOCATIONS
Surface water or GWUDI	50,000 or more	TTHM & HAA5 – Quarterly	8
Surface water or GWUDI	10,000 – 49,999	TTHM & HAA5 –Quarterly	4
Surface water or GWUDI	Serving 500 to 9,999	TTHM & HAA5 – Quarterly	2
Surface water or GWUDI	499 or less	TTHM & HAA5[a] - Yearly	2
Groundwater	10,000 or more	TTHM & HAA5 – Quarterly	4
Groundwater	500 - 9,999	TTHM & HAA5 – Yearly	2
Groundwater	499 or less	TTHM & HAA5 – Yearly	2
WATER SYSTEM CRITERIA		ANALYTE AND ROUTINE MONITORING FREQUENCY	
Water systems using chlorine dioxide		Chlorite - Daily and Monthly	
		Chlorine Dioxide – Daily	
Water systems using ozone		Bromate – Monthly	
Water systems using chlorine		Chlorine - Same time and location as monthly bacteriological samples in accordance with Paragraph 4.4.	

Table 7. DDBP Monitoring Requirements, Continued

WATER SYSTEM CRITERIA	ANALYTE AND ROUTINE MONITORING FREQUENCY
Water systems using chloramines	Chloramines –Same time and location as monthly bacteriological samples in accordance with Paragraph 4.4.
Water systems using surface water or GWUDI	TOC – Monthly
[a] A surface water or GWUDI water system serving a population of 499 or less must sample two locations per year to meet routine monitoring requirements. Samples must be collected during the month of warmest water temperature. Reduced monitoring is not allowed.	

(a) For TTHM and HAA5, CWSs and NTNCWs must collect the number of samples listed in Table 7. One of the samples must be taken at a location in the distribution system reflecting the maximum residence time of water in the system. If a maximum residence time sample location is identified on a dead-end line, ensure that the sample location is at or before the last consumer and not at the very end of the dead-end line. One of the samples must be taken at a location closer to the entry point to the distribution system or at a location where disinfectant residuals (e.g., chlorine and chloramines) are regularly detected. If more than two sample locations are required, one of the remaining samples must be collected at a location representative of the average residence time. Any other remaining samples must be taken at representative locations in the distribution system. Dual sample sets must be collected at each sampling location.

(b) CWSs and NTNCWSs using chlorine dioxide for disinfection or oxidation must take daily chlorite and chlorine dioxide samples at the entrance to the distribution system. Systems must also collect monthly chlorite samples within the distribution system, with one as close as possible to the first customer, one in a location representative of average residence time, and one as close as possible to the end of the distribution system (reflects maximum residence time within the distribution system).

(c) CWSs and NTNCWSs using ozone for disinfection or oxidation must take at least one monthly bromate sample at the entrance to the distribution system for each treatment plant in the system using ozone under normal operating conditions.

(d) CWSs and NTNCWSs using chlorine for disinfection or oxidation must sample for chlorine at the same time and location in the distribution systems as total coliforms.

(e) CWSs and NTNCWSs using chloramine for disinfection or oxidation must sample for chloramine (as either total chlorine or combined chlorine) at the same time and location in the distribution systems as total coliforms.

(4) Increased monitoring is required as follows:

(a) For TTHM and HAA5, systems monitoring annually or less frequently must increase monitoring frequency to quarterly at all sample locations if a TTHM sample result is greater than 0.080 mg/L or a HAA5 sample result is greater than 0.060 mg/L at any location.

Quarterly sampling must continue for 4 consecutive quarters to calculate the LRAA for compliance determination. For systems monitoring annually, if no annual TTHM sample result is greater than 0.080 mg/L or HAA5 sample result is greater than 0.060 mg/L, the sample result for each monitoring location is considered the LRAA for that monitoring location.

(b) For chlorite, additional monitoring is required when a daily sample exceeds the chlorite MCL. A three-sample set (following the monthly sample set protocol) must be collected the following day. Further distribution system monitoring is not required in that month unless the chlorite concentration at the entrance to the distribution system again exceeds the MCL.

(c) For chlorine dioxide, if the MRDL is exceeded, three additional samples must be taken the following day as follows:

1. If chlorine is used to maintain a disinfectant residual in the distribution system and there are one or more disinfection addition points after the entrance to the distribution system (i.e., booster chlorination), the system must collect one sample as close as possible to the first customer, one sample in a location representative of average residence time, and one sample as close as possible to the end of the distribution system (reflects maximum residence time within the distribution system).

2. If chlorine dioxide or chloramines are used to maintain a disinfectant residual in the distribution system, or if chlorine is used to maintain a disinfectant residual and there are no disinfection addition points after the entrance to the distribution system (i.e., no booster chlorination), systems must take three samples in the distribution system as close as possible to the first customer at intervals of not less than 6 hours.

(5) Reduced monitoring is as follows:

(a) Systems using ozone may reduce bromate monitoring from monthly to once per quarter if the yearly average raw water bromide concentration is less than or equal to 0.0025 mg/L based on monthly measurements for 1 year.

(b) Systems using chlorine dioxide may reduce chlorite monitoring from monthly to quarterly if, after 1 year, the chlorite concentration in all samples taken in the distribution system is below the MCL and no daily sample exceeds the MCL. Daily samples must still be collected. Monthly sample set monitoring resumes when any one daily sample exceeds the MCL.

(c) Systems using surface water or GWUDI source water may reduce TTHM and HAA5 monitoring as follows:

1. Systems serving a population of 499 or less are not eligible for reduced monitoring.

2. Systems serving a population of 500 or more must meet all of the following conditions to be eligible for reduced monitoring.

a. LRAA for TTHM is no more than 0.040 mg/L.

b. Annual average for HAA5 is no more than 0.030 mg/L.

c. At least 1 year of routine monitoring has been completed.

d. LRAA source water TOC level is no more than 4.0 mg/L before treatment.

3. Systems serving a population of 500 – 9,999 that meets the eligibility requirements in Paragraphs 4.9.a.(5)(c)2.a. through 4.9.a.(5)(c)2.d. may reduce monitoring frequency to two sample locations per year. Dual sample sets must be collected at each sampling location. Samples must be collected during the month of warmest water temperature. One sample location must be at the location representative of maximum residence time and one location must be at a location closer to the entry point to the distribution system. Systems remain on the reduced schedule as long as the annual sample result at any location is no more than 0.060 mg/L for TTHM or 0.045 mg/L for HAA5, or if the source water annual average TOC is greater than 4.0 mg/L. Systems that do not meet these levels must revert to routine monitoring the following quarter.

4. Systems serving a population of 10,000 – 49,999 that meets the eligibility requirements in Paragraphs 4.9.a.(5)(c)2.a. through 4.9.a.(5)(c)2.d. may reduce monitoring frequency to two sample locations per quarter. Dual sample sets must be collected at each sampling location. Samples must be collected during the month of warmest water temperature. One sample location must be at the location representative of maximum residence time and one location must be at a location closer to the entry point to the distribution system. Systems may remain on the reduced schedule as long as the LRAA is no more than 0.040 mg/L for TTHM and 0.030 mg/L for HAA5, or if the source water annual average TOC is greater than 4.0 mg/L. Systems that do not meet these levels must revert to routine monitoring the following quarter.

5. Systems serving a population of 50,000 or more that meet the eligibility requirements of Paragraphs 4.9.a.(5)(c)2.a. through 4.9.a.(5)(c)2.d. may reduce monitoring of TTHM and HAA5 to four sample locations per quarter. Dual sample sets must be collected at each sampling location. Samples must be collected during the warmest month of water during the sampling period. One sample location must be at the location representative of maximum residence time and one location must be at a location closer to the entry point to the distribution system. Systems may remain on the reduced schedule as long as the LRAA is no more than 0.040 mg/L for TTHM and 0.030 mg/L for HAA5, and the source water annual average TOC is not greater than 4.0 mg/L. Systems that do not meet these levels must revert to routine monitoring the following quarter.

(d) Systems using groundwater (not under the influence of surface water) source water may reduce TTHM and HAA5 monitoring as follows:

1. Systems must meet all of the following conditions to be eligible for reduced monitoring.

a. LRAA for TTHM is no more than 0.040 mg/L.

b. LRAA for HAA5 is no more than 0.030 mg/L.

c. At least 1 year of routine monitoring has been completed.

2. Systems serving a population of 10,000 or more that meet the eligibility requirements of Paragraphs 4.9.a.(5)(d)1.a. through 4.9.a.(5)(d)1.c. may reduce monitoring of TTHM and HAA5 to two sample locations per year. Dual sample sets must be collected at each sampling location. Samples must be collected during the month of warmest water temperature. One sample location must be at the location representative of maximum residence time and one location must be at a location closer to the entry point to the distribution system. Systems may remain on the reduced schedule as long as the annual sample result at any location is no more than 0.060 mg/L for TTHM or 0.045 mg/L for HAA5. Systems that do not meet these levels must revert to routine monitoring the following quarter.

3. Systems serving a population of 500 – 9,999 that meet the eligibility requirements of Paragraphs 4.9.a.(5)(d)1.a. through 4.9.a.(5)(d)1.c. may reduce monitoring of TTHM and HAA5 to one sampling location per year. A dual sample set must be collected at the location representative of maximum residence time. Samples must be collected during the month of warmest water temperature. Systems may remain on the reduced schedule as long as the annual sample result at the location is no more than 0.060 mg/L for TTHM or 0.045 mg/L for HAA5. Systems that do not meet these levels must revert to routine monitoring the following quarter.

4. Systems serving a population of 499 or less that meet the eligibility requirements of Paragraphs 4.9.a.(5)(d)1.a. through 4.9.a.(5)(d)1.c. may reduce monitoring of TTHM and HAA5 to two sample locations every 3 years. Dual sample sets must be collected at each sampling location. Samples must be collected during the month of warmest water temperature. One sample location must be at the location representative of maximum residence time and one location must be at a location closer to the entry point to the distribution system. Systems remain on the reduced schedule as long as the annual sample result at any location is no more than 0.060 mg/L for TTHM or 0.045 mg/L for HAA5. Systems that do not meet these levels must revert to routine monitoring the following quarter.

(6) If a CWS or NTNCWS is out of compliance as described in Paragraph 4.9.a.(2), the installation must perform the notification in accordance with Paragraph 4.16. as soon as possible, but in no case later than 14 calendar days after the violation, and undertake corrective measures.

c. DDBP Requirement for TNCWSs.

A TNCWS that uses chlorine dioxide as a disinfectant or oxidant must comply with the chlorine dioxide MRDL of 0.8 mg/L and the associated monitoring requirements for chlorine dioxide.

4.10. RADIONUCLIDE REQUIREMENTS.

a. A DoD CWS must comply with the radionuclide MCLs in Table 8 and associated monitoring requirements.

Table 8. Radionuclide MCLs

CONTAMINANT	MCL
Gross Alpha[a]	15 pCi/L
Combined Radium-226 and -228	5 pCi/L
Beta Particle and Photon Radioactivity[b]	4 mrem/year
Uranium	30 micrograms per liter

mrem/year = millirem per year, pCi/L = picoCuries per liter
[a] Gross alpha activity includes radium-226, but excludes radon and uranium.
[b] Beta particle and photon activity is also referred to as gross beta activity from manmade radionuclides.

(1) Routine Monitoring.

All CWSs using groundwater, surface water, or both groundwater and surface water must sample at every entry point (i.e., sampling points) to the distribution system that is representative of all sources being used under normal operating conditions.

(a) For gross alpha activity and radium-226 and radium-228, and uranium, systems must be tested once every 4 years. Testing must be conducted using an annual composite of four consecutive quarterly samples or the average of four samples obtained at quarterly intervals at a representative point in the distribution system.

(b) Gross alpha only may be analyzed if activity is less than or equal to 5 pCi/L. Where radium-228 may be present, radium-226 and/or -228 analyses should be performed when activity is greater than 2 pCi/L.

1. If the average annual concentration is less than 50 percent of the MCL, analysis of a single sample may be substituted for the quarterly sampling procedure.

2. A system with two or more sources having different concentrations of radioactivity must monitor source water in addition to water from a free-flowing tap.

3. If the installation introduces a new water source, these contaminants must be monitored within the first year after introduction.

(c) All CWSs must monitor for beta particle and photon radioactivity every 9 years to include tritium and strontium-90. Monitoring consists of four consecutive quarterly samples at each entry point to the distribution system.

1. If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity is greater than 50 pCi/L for any sample, that sample must be further analyzed to identify the major radioactive constituents present and the appropriate doses must be calculated and summed to determine compliance with the MCL for beta particle and photon radioactivity.

2. CWSs may analyze for naturally occurring potassium-40 beta particle activity from the same or equivalent sample used for gross beta particle activity analysis. CWSs are

allowed to subtract the potassium-40 beta particle activity value from the total gross beta particle activity value to determine if the resultant value greater than 50 pCi/L.

3. The potassium-40 beta particle activity must be calculated by multiplying elemental potassium concentrations (in mg/L) by a factor of 0.82.

(2) Follow-up Requirements.

(a) If the annual average of sample results exceeds the MCL for gross alpha activity, radium-226 and radium-228 (combined), or uranium, the installation must provide the notification in accordance with Paragraph 4.16. within 14 calendar days. Monitoring must continue until corrective actions are completed and the average annual concentration no longer exceeds the respective MCL. Continued monitoring for gross alpha-related contamination must occur quarterly.

(b) The beta particle and photon radioactivity MCL is exceeded if the average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water produces an annual dose equivalent to the total body or any internal organ greater than 4 mrem/year. The concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents must be calculated on the basis of 2 liters per day (LPD) drinking water intake using the 168-hour data list in the National Bureau of Standards Handbook 69. If the beta particle and photon radioactivity MCL is exceeded, the installation must:

1. Provide the notification in accordance with Paragraph 4.16. within 14 calendar days.

2. Increase monitoring frequency to monthly as delineated in Paragraph 4.10.a.(2)(c).

(c) CWSs that exceed the beta particle and photon radioactivity MCL must conduct monthly monitoring beginning the month after the exceedance occurs. CWSs return to routine monitoring (4 consecutive quarters every 9 years) when the rolling average of 3 monthly samples is less than the MCL. Routine monitoring begins in the quarter immediately after the rolling average of 3 monthly samples is less than the MCL.

4.11. SURFACE WATER TREATMENT REQUIREMENTS.

DoD PWSs that use surface water sources or GWUDI must meet the surface water treatment requirements. Only DoD PWSs that use surface water sources or GWUDI, and are in the control of the watershed or treatment plant in accordance with Paragraph 4.2, must meet the surface water treatment requirements.

a. Unfiltered Systems.

(1) Systems that use unfiltered surface water or GWUDI must analyze the raw water for total coliforms or fecal coliforms at least weekly and for turbidity at least daily, and must continue as long as the unfiltered system is in operation.

(a) If the total coliforms or fecal coliforms exceed 100/100 milliliters (mL) and 20/100 mL, respectively, in excess of 10 percent of the samples collected in the previous 6 months, appropriate filtration must be applied.

(b) Appropriate filtration must also be applied if turbidity of the source water immediately before the first or only point of disinfectant application exceeds 5 nephelometric turbidity units (NTU). If the turbidity exceeds the limit, the installation must provide notification in accordance with Paragraph 4.16. as soon as possible, but no later than 14 calendar days after the violation, and undertake corrective action.

(2) Disinfection must achieve at least 99.9 percent (3.0-log) inactivation of *Giardia lamblia* cysts and 99.99 percent (4.0-log) inactivation of viruses by meeting applicable CT values, as shown in Tables 12 through 29 in Appendix 4A. Note that ultraviolet (UV) disinfection converts hypochlorite to chloride. Therefore, log removal for chlorine disinfection residual following UV disinfection is available only if chlorine is added to re-establish a disinfectant residual.

(a) Disinfection systems must have redundant components to ensure uninterrupted disinfection during operational periods.

(b) Disinfectant residual must be monitored immediately after disinfection once every 4 hours that the system is in operation. Disinfectant residual measurements in the distribution system must be made at the same times as total coliforms are sampled.

(c) Disinfectant residual of water entering the distribution system cannot be less than 0.2 mg/L for greater than 4 hours.

(d) Water in a distribution system with a heterotrophic bacteria concentration less than or equal to 500/mL measured as heterotrophic plate count is considered to have a detectable disinfectant residual for the purpose of determining compliance with the surface water treatment requirements.

(e) If disinfectant residuals in the distribution system are undetected in more than 5 percent of monthly samples for 2 consecutive months, appropriate filtration must be implemented if the undetected disinfectant residuals are due to a deficiency in treatment and not due to a deficiency in the distribution system, such as cross-connection contamination.

(f) Surface water and GWUDI systems that make changes to their disinfection practices (e.g., change in disinfectant or application point) in order to meet the DDBP requirements in Paragraph 4.9. must ensure that protection from microbial pathogens is not compromised.

(3) To the extent that DoD PWSs have the ability, systems must maintain a watershed control program that minimizes the potential for contamination by *Giardia lamblia* cysts and

viruses in the source water. The water system should demonstrate that it can control all human activities that may have an adverse impact on the microbial quality of the source water. GWUDI systems may use a wellhead protection program to meet the requirements of a watershed control program. At a minimum, a watershed control program must:

(a) Characterize the watershed hydrology and land ownership.

(b) Identify watershed characteristics and activities that may have an adverse effect on source water quality.

(c) Monitor the occurrence of activities that may have an adverse effect on source water quality.

(4) Installations must physically cover all finished water reservoirs, holding tanks, and storage water facilities.

b. Filtered Systems.

(1) Filtered water systems must provide a combination of disinfection and filtration that achieves a total of 99.9 percent (3.0-log) removal and inactivation of *Giardia lamblia* cysts, 99.99 percent (4.0-log) removal and inactivation of viruses, and 99 percent (2.0-log) removal of *Cryptosporidium* through filtration.

(2) The turbidity of filtered water must be monitored at least once every 4 hours. The turbidity of filtered water for direct and conventional filtration systems must not exceed 0.3 NTU (1 NTU for slow sand and diatomaceous earth filters) in 95 percent of the analyses in a month, with a maximum of 1 NTU (5 NTU for slow sand and diatomaceous earth filters). If the turbidity exceeds the limit, the installation must provide notification in accordance with Paragraph 4.16. as soon as possible, but no later than 14 calendar days after the violation, and undertake corrective action.

(3) Disinfection must provide the remaining log removal of *Giardia lamblia* cysts and viruses not obtained by the filtration technology applied. Proper conventional treatment typically removes 2.5-log *Giardia*/2.0-log viruses/2.0-log *Cryptosporidium*. Proper direct filtration and diatomaceous earth filtration remove 2.0-log *Giardi*a/1.0-log viruses/2.0-log *Cryptosporidium*. Slow sand filtration removes typically removes 2.0-log *Giardia*/2.0-log viruses/2.0-log *Cryptosporidium*. Less log removal may be assumed if treatment is not properly applied.

(4) Disinfection residual maintenance and monitoring requirements are the same as those for unfiltered systems outlined in Paragraph 4.11.a.(2).

(5) Surface water and GWUDI systems that make changes to their disinfection practices (e.g., change in disinfectant or application point) in order to meet the DDBP requirements in Paragraph 4.9. must ensure that protection from microbial pathogens is not compromised.

(6) Use of alternate filtration technologies such as membrane processes and cartridge or bag filters for treatment of surface water for microbial contaminants must be approved by the appropriate DoD authority.

(7) Conventional or direct filtration systems must continuously monitor (every 15 minutes) the individual filter turbidity for each filter used at the system. Systems with two or fewer filters may monitor combined filter effluent turbidity continuously instead of individual filter turbidity monitoring. If a system exceeds 1.0 NTU in two consecutive measurements for 3 months in a row for the same filter, the installation must conduct an assessment of the filter within 14 calendar days.

(a) The assessment must include at least the following components: assessment of filter performance, development of a filter profile, identification and prioritization of factors limiting filter performance, assessment of the applicability of corrections, and preparation of a self-assessment report.

(b) If a system exceeds 2.0 NTU (in two consecutive measurements 15 minutes apart) for 2 months in a row, a comprehensive performance evaluation (CPE) must be conducted within 90 days. The CPE will review and analyze a treatment plant's performance-based capabilities and associated administrative, operation, and maintenance practices. The CPE is conducted to identify factors that may be adversely impacting a plant's capability to achieve compliance and emphasizes approaches that can be implemented without significant capital improvements.

(c) The CPE must consist, at a minimum, of the following components: assessment of plant performance, evaluation of major unit processes, identification and prioritization of performance limiting factors, assessment of the applicability of comprehensive technical assistance, and preparation of a CPE report.

(8) Installations must cover all finished water reservoirs, holding tanks, and storage water facilities.

c. Enhanced Treatment for *Cryptosporidium* for Systems that Use Surface Water or GWUDI.

(1) Unfiltered Systems.

(a) Initial Round of Source Water Monitoring.

A system serving at least 10,000 people must sample their source water for *Cryptosporidium*, *E. coli*, and turbidity at least monthly for 24 months. Systems serving less than 10,000 people must sample their source water for *Cryptosporidium* at least twice per month for 12 months or at least monthly for 24 months.

1. Systems that operate less than 6 months per year and monitor for *Cryptosporidium* must collect at least six *Cryptosporidium* samples per year during each of 2 years of monitoring. Samples must be evenly spaced throughout the plant's operation period. Systems must sample their source water only during the time that the plant operates.

2. A system that begins using a new source of surface water or GWUDI after the system is required to begin the initial round of source water monitoring must monitor the new source. The new system must also comply with determining the mean *Cryptosporidium* level, *Cryptosporidium* inactivation treatment requirements, and the second round of source water monitoring that must start not later than 6 years following the initial determination of the mean *Cryptosporidium* level.

3. Unfiltered systems are not required to conduct initial source water monitoring if the system provides a total of at least 3.0-log *Cryptosporidium* inactivation.

(b) Determine Mean *Cryptosporidium* Level.

Following the completion of the initial round of source water monitoring, calculate the arithmetic mean of all the *Cryptosporidium* sample concentrations reported.

1. The unfiltered system must report the arithmetic mean for approval to the appropriate DoD medical authority no later than 6 months after the month the system is required to complete the initial round of source water monitoring.

2. The arithmetic mean *Cryptosporidium* level must incorporate a summary of the source water monitoring data used for the calculation.

(c) Cryptosporidium Inactivation Requirements.

Systems with a mean *Cryptosporidium* level of 0.01 oocysts per liter (oocysts/L) or less must provide at least 2.0-log *Cryptosporidium* inactivation. Systems with a mean *Cryptosporidium* level of greater than 0.01 oocysts/L must provide at least 3.0-log *Cryptosporidium* inactivation.

(d) Inactivation Treatment Technology Requirements.

Unfiltered systems must use chlorine dioxide, ozone, or UV to meet the *Cryptosporidium* inactivation requirements. Unfiltered systems must meet the *Cryptosporidium* inactivation requirements using a minimum of two disinfectants. Each of two disinfectants must separately achieve the total inactivation required for *Cryptosporidium*, *Giardia*, or viruses.

(e) Second Round of Source Water Monitoring.

Initiate the second round of source water monitoring 9 years after the initial round. A system must meet the requirements for monitoring parameters, frequency, and duration as described in Paragraph 4.11.c.(1)(a) unless the system provides a total of at least 3.0-log *Cryptosporidium* inactivation, equivalent to meeting the treatment requirements for unfiltered systems with a mean *Cryptosporidium* concentration greater than 0.01 oocysts/L.

1. The unfiltered system must report the arithmetic mean for approval to the appropriate DoD medical authority no later than 6 months after the month the system is required to complete the second round of source water monitoring. The arithmetic mean *Cryptosporidium* level must incorporate a summary of the source water monitoring data used for the calculation.

2. If the mean *Cryptosporidium* level for unfiltered systems changes following the second round of source water monitoring, and if the systems must provide a different level of *Cryptosporidium* treatment as a result of this change, the system must develop a schedule to meet treatment requirements.

(2) Filtered Systems.

(a) Initial Round of Source Water Monitoring.

A system serving at least 10,000 people must sample its source water for *Cryptosporidium*, *E. coli*, and turbidity at least monthly for 24 months. A system serving less than 10,000 people must sample its source water for *E. coli* at least once every 2 weeks for 12 months but may avoid *E. coli* monitoring if it is required to sample for *Cryptosporidium*. Systems serving fewer than 10,000 people must sample their source for *Cryptosporidium* at least twice per month for 12 months or at least monthly for 24 months if they use lake or reservoir sources and the annual mean *E. coli* concentration is greater than 10 *E. coli*/100 mL, or use flow stream sources and the annual mean *E. coli* concentration is greater than 50 *E. coli*/100 mL. Systems serving fewer than 10,000 people using GWUDI sources must comply with requirements for *Cryptosporidium* monitoring based on the *E. coli* level that applies to the nearest surface body. If no surface water body is nearby, the system must comply based on the requirements that apply to systems using lake or reservoir sources.

1. Systems that operate less than 6 months per year and monitor for *Cryptosporidium* must collect at least six *Cryptosporidium* samples per year during each of 2 years of monitoring. Samples must be evenly spaced throughout the plant's operation period. Systems must sample their source water only during the time the plant operates.

2. A system that begins using a new source of surface water or GWUDI, after the system is required to begin the initial round of source water monitoring, must monitor the new source. The new system must also comply with determining bin classification, *Cryptosporidium* inactivation treatment requirements, and the second round of source water monitoring which must start not later than 6 years following the initial bin determination.

3. Filtered systems are not required to conduct initial source water monitoring if the system provides a total of at least 5.5-log *Cryptosporidium* inactivation.

(b) Determination of Cryptosporidium Bin Classification.

Following the completion of the initial round of source water monitoring, systems must calculate an initial *Cryptosporidium* bin concentration for each plant for which monitoring was required. If the monthly *Cryptosporidium* sampling frequency varies, systems must first compute a monthly average for each month of monitoring. Systems must then use these monthly average concentrations, rather than individual sample concentrations. Use Table 9 to determine initial bin classification.

Table 9. Bin Classification for Filtered Systems

BIN CLASSIFICATION	*CRYPTOSPORIDIUM* BIN CONCENTRATION
Bin 1	< 0.075 oocysts/L
Bin 2	0.075 oocysts/L ≤ *Cryptosporidium* < 1.0 oocysts/L
Bin 3	1.0 oocysts/L ≤ *Cryptosporidium* < 3.0 oocysts/L
Bin 4	*Cryptosporidium* ≥3.0 oocysts/L

1. For systems that collected a total of at least 48 samples, the bin concentration is equal to the arithmetic mean of all sample concentrations.

2. For systems that collected a total of at least 24 samples, but no more than 47 samples, the bin concentration is equal to the highest arithmetic mean of all sample concentrations in any 12 consecutive months during which the *Cryptosporidium* samples were collected.

3. For systems serving less than 10,000 people that monitor for *Cryptosporidium* for only 1 year (i.e., collect 24 samples in 12 months), the bin concentration is equal to the arithmetic mean of all sample concentrations.

4. For systems that operate only part of the year and that monitor fewer than 12 months per year, the bin concentration is equal to the highest arithmetic mean of all sample concentrations during any year of *Cryptosporidium* monitoring.

(c) Inactivation Treatment Technology Requirements.

Systems must provide the level of additional treatment for Cryptosporidium inactivation specified in Table 10.

Table 10. Additional Treatment for *Cryptosporidium* Inactivation

BIN CLASSIFICATION OF SYSTEM	FILTRATION SYSTEMS			
	CONVENTIONAL FILTRATION TREATMENT (INCLUDING SOFTENING)	DIRECT FILTRATION	SLOW SAND OR DIATOMACEOUS EARTH FILTRATION	ALTERNATIVE FILTRATION TECHNOLOGIES
Bin 1	No additional treatment	No additional treatment	No additional treatment	No additional treatment
Bin 2	1.0-log treatment	1.5-log treatment	1.0-log treatment	4.0-log removal and inactivation
Bin 3[a]	2.0-log treatment	2.5-log treatment	2.0-log treatment	5.0-log removal and inactivation
Bin 4[a]	2.5-log treatment	3.0-log treatment	2.5-log treatment	5.5-log removal and inactivation

[a] Systems classified in Bins 3 and 4 must achieve at least 1.0-log of additional *Cryptosporidium* treatment using either one or a combination of the following: bag filters, bank filtration, cartridge filters, chlorine dioxide, membranes, ozone, or UV.

(d) Second Round of Source Water Monitoring.

Initiate a second round of source water monitoring 9 years after the initial round. A system must meet the requirements for monitoring parameters, frequency, and duration as described in Paragraph 4.11.c.(2)(a) unless the system provides a total of at least 5.5-log of treatment for *Cryptosporidium*, which is equivalent to meeting the treatment requirements of Bin 4.

1. Filtered systems must recalculate their *Cryptosporidium* bin concentration following completion of the second round of source water monitoring.

2. If the classification for a filtered system changes following the second round of source water monitoring, the system must give the level of treatment required for *Cryptosporidium*.

3. Filtered systems may use one or more of the treatment and management options listed in Table 11.

Table 11. Microbial Toolbox

OPTIONS	*CRYPTOSPORIDIUM* TREATMENT CREDIT AND IMPLEMENTATION CRITERIA
SOURCE PROTECTION AND MANAGEMENT	
Watershed control program[a]	0.5-log credit for program comprising required elements, annual program status report, and regular watershed survey.
PRE-FILTRATION	
Pre-sedimentation basin with coagulation	0.5-log credit during any month that pre-sedimentation basins achieve a monthly mean reduction of 0.5-log or greater in turbidity or alternative State-approved performance criteria.[b]
Two-stage lime softening	0.5-log credit for two-stage softening where chemical addition and hardness precipitation occur in both stages. All plant flow must pass through both stages.[c]
Bank filtration	0.5-log credit for 25-foot setback; 1.0-log credit for 50-foot setback; aquifer must be unconsolidated sand containing at least 10% fines; average turbidity in wells must be less than 1 NTU.[d]

Table 11. Microbial Toolbox, Continued

TREATMENT PERFORMANCE	
Combined filter performance	0.5-log credit for combined filter effluent turbidity less than or equal to 0.15 NTU in at least 95% of measurements each month.
Individual filter performance	0.5-log credit (in addition to 0.5-log combined filter performance credit) if individual filter effluent turbidity is less than or equal to 0.15 NTU in at least 95% of samples each month in each filter and is never greater than 0.3 NTU in two consecutive measurements in any filter.
ADDITIONAL FILTRATION	
Bag or cartridge filters (individual filters)	Up to 2.0-log credit based on the removal efficiency demonstrated during challenge testing[e] with a 1.0-log factor of safety.
Bag or cartridge filters (in series)	Up to 2.5-log credit based on the removal efficiency demonstrated during challenge testing[e] with a 0.5-log factor of safety.
Membrane filtration	Log credit equivalent to removal efficiency demonstrated in challenge testing, direct integrity testing, and continuous indirect integrity monitoring. The required testing applies to other pathogens if membrane removal credits are claimed.
Second stage filtration	0.5-log credit for second separate granular media filtration stage if treatment train includes coagulation before first filter.
Slow sand filters	2.5-log credit as secondary filtration step; 3.0-log credit as a primary filtration process.[f]
INACTIVATION	
Chlorine dioxide	Log credit based on measured CT in relation to Table 27.
Ozone	Log credit based on measured CT in relation to Table 28.
UV	Log credit based on validated UV dose in relation to Table 29.[g]

[a] Unfiltered systems are not eligible for credit.

[b] To be eligible, basins must be operated continuously with coagulant addition and all plant flow must pass through basins.

[c] Single-stage softening is credited as equivalent to conventional treatment.

[d] Systems using wells followed by filtration when conducting source water monitoring must sample the well to determine bin classification and are not eligible for additional credit.

[e] Bag and cartridge filter systems must complete challenge testing in order to receive *Cryptosporidium* treatment credit. The challenge testing must meet the following criteria:

i. Test must be performed full-scale, identical to the construction, configuration (i.e., either individual filters or in series) and housing of the original system.

ii. Test must be conducted using *Cryptosporidium* or a surrogate that is removed no more efficiently than *Cryptosporidium*. A method capable of discreetly quantifying the specific microorganism or surrogate must be used to determine concentration. Turbidity may not be used.

iii. Maximum feed water concentration is based on the detection limit of the microorganism or surrogate and it can be computed using this equation:

$$\text{Maximum Feed Concentration} = (1 \times 10^4) \times (\text{Filter Detection Limit})$$

iv. Test must be conducted at the maximum design flow rate for the filter as specified by manufacturer.

v. Removal efficiency of a filter is determined by applying this formula:

$$LRV = LOG_{10}(C_f) - LOG_{10}(C_p)$$

Where: LRV = Log removal value demonstrated during challenge test.
C_f = Feed concentration measured during challenge test (same units as C_p).
C_p = Filtrate concentration measured during the challenge test (same units as C_f).

If *Cryptosporidium* or surrogate is not detected in the filtrate, then the term C_p must be set equal to the detection limit.

vi. Each filter tested must be challenged with *Cryptosporidium* or the surrogate during three periods over the filtration cycle: (1) within 2 hours of startup of a new filter; (2) when the pressure drop is between 45 and 55 percent of the terminal pressure drop; and (3) at the end of the cycle after pressure drop has reached 100 percent of the terminal pressure drop. The LRV for the filter (LRV_{filter}) must be assigned the value of the minimum LRV observed during the three challenge periods for that filter.

Table 11. Microbial Toolbox, Continued

vii. If fewer than 20 filters are tested, the overall removal efficiency for the filter product line must be set equal to the lowest LRV_{filter} among the filters tested. If 20 or more filters are tested, the overall removal efficiency for the filter product line must be set equal to the 10^{th} percentile of the set of LRV_{filter} values for the various filters tested.

viii. If a previously tested filter is modified in a manner that could change the removal efficiency of the filter product line, challenge testing to demonstrate the removal efficiency of the modified filter must be conducted and submitted to the appropriate DoD medical authority.

[f] No prior chlorination for either option.

[g] Reactor validation testing required to establish UV dose and associated operating conditions.

4.12. GROUNDWATER TREATMENT REQUIREMENTS.

a. DoD PWSs that use only groundwater supplies not under the influence of surface water must provide adequate treatment. Systems that fail to meet the requirements for adequate treatment for longer than 24 hours must provide the notification in accordance with Paragraph 4.16. as soon as possible, but in no case later than 14 calendar days after the violation, and undertake corrective action.

b. Groundwater systems must provide treatment that reliably achieves at least a 4.0-log treatment of viruses (using disinfection, or a combination filtration and disinfection) before or at the first customer for the groundwater source. Groundwater systems are not allowed to discontinue 4.0-log treatment of viruses.

(1) Disinfection Treatment.

(a) Groundwater systems using chlorine for disinfection must achieve 4.0-log inactivation of viruses by meeting applicable CT values as shown in Table 19 in Appendix 4A.

(b) Groundwater systems using chlorine dioxide for disinfection must achieve 4.0-log inactivation of viruses by meeting applicable CT values as shown in Table 21 in Appendix 4A.

(c) Groundwater systems using ozone for disinfection must achieve 4.0-log inactivation of viruses by meeting applicable CT values as shown in Table 22 in Appendix 4A. Groundwater systems that use ozone must also add a chemical disinfectant (chlorine, chloramines, chlorine dioxide) to maintain a disinfectant residual in accordance with Paragraph 4.2.b.(1)(c)1.

(d) Groundwater systems are not allowed to use UV for disinfection as the only treatment provided. Groundwater systems may use UV in combination with another disinfectant or in combination with filtration to achieve 4.0-log inactivation of viruses. Groundwater systems that use UV must also add a chemical disinfectant (chlorine, chloramines, chlorine dioxide) to maintain a disinfectant residual in accordance with Paragraph 4.2.b.(1)(c)1.

(e) Groundwater systems providing disinfection treatment must meet the following monitoring requirements:

1. Groundwater systems serving a population of more than 3,300 must continuously monitor the residual disinfectant at the entry point to the distribution system and must record the lowest residual disinfectant concentration each day that the system is in operation. The lowest daily residual disinfectant concentration must be used to determine if 4.0-log inactivation of viruses is achieved. If the system fails to achieve a 4.0-log inactivation of viruses for more than 1 day, the system is in violation of the treatment requirements and must provide public notification in accordance with Paragraph 4.16. as soon as possible, but in no case later than 14 calendar days after the violation, and undertake corrective action.

2. Groundwater systems serving a population of 3,300 or less must monitor and record the residual disinfectant at the entry point to the distribution system each day that the system is in operation. The recorded residual disinfectant concentration must be used to determine if 4.0-log inactivation of viruses is achieved. If the system fails to achieve a 4.0-log inactivation of viruses for more than 1 day, the system is in violation of the treatment requirements and must provide public notification in accordance with Paragraph 4.16. as soon as possible, but no later than 14 calendar days after the violation, and undertake corrective action.

(2) Filtration and Disinfection Treatment.

(a) Groundwater systems using filtration and disinfection treatment must achieve a total 4.0-log treatment of viruses either through disinfection treatment alone (in accordance with the disinfection treatment requirements in Paragraph 4.12.b.(1)) or through a combination of filtration and disinfection treatment in accordance with the following requirements.

1. Groundwater systems using conventional filtration, direct filtration, diatomaceous earth filtration, or slow sand filtration must meet the turbidity requirements for filtered systems in Paragraph 4.11.b.(2).

2. Groundwater systems using conventional or slow sand filtration that meet the turbidity requirements and provide proper filtration treatment achieve 2.0-log virus removal and must achieve 2.0-log virus inactivation through disinfection for a total 4.0-log treatment of viruses.

3. Groundwater systems using direct filtration or diatomaceous earth filtration that meet the turbidity requirements and provide proper filtration treatment achieve 1.0-log virus removal and must achieve 3.0-log virus inactivation through disinfection for a total 4.0-log treatment of viruses. Proper filtration treatment is generally considered to be operation and maintenance in accordance with best industry standards and practices (e.g., consistent use of a chemical coagulant). Less log removal may be assumed if treatment is not properly applied.

4. Groundwater systems must comply with the disinfection treatment and monitoring requirements as delineated under disinfection treatment in Paragraph 4.12.b.(1)(e).

(b) Groundwater systems using alternative filtration technology, such as membrane filtration, must demonstrate to the appropriate DoD medical authority that the alternative filtration technology, in combination with disinfection treatment, consistently achieves 4.0-log treatment of viruses.

4.13. FILTER BACKWASH REQUIREMENTS.

To prevent microbes and other contaminants from passing through and into finished drinking water, DoD PWSs must ensure that recycled streams (i.e., recycled filter backwash water, sludge thickener supernatant, and liquids from dewatering processes) are treated by direct and conventional filtration processes. This requirement only applies to DoD PWSs that:

a. Use surface water or GWUDI and are in control of the treatment plant in accordance with Paragraph 4.2.

b. Use direct or conventional filtration processes.

c. Recycle spent filter backwash water, sludge thickener supernatant, or liquids from dewatering processes.

4.14. ALTERNATIVE WATER SUPPLIES.

Installations will, if necessary to protect public health, only use alternative water sources, including point-of-entry and point-of-use treatment devices, bottled water, and bulk water supplies that are approved by the installation commander upon recommendation by the appropriate DoD medical and veterinary authority.

a. The use of point-of-use treatment devices to comply with microbiological contaminant requirements (e.g., coliform bacteria) and VOC MCLs is prohibited.

b. Point-of-entry and point-of-use treatment devices used to comply with drinking water quality requirements of this section must be owned, operated, and maintained by the water system.

c. Monitoring for applicable contaminants covered by this section is required.

d. Bottled water is water that is sealed in bottles, packages, or other containers by commercial (non-military) interests for human consumption. When purchased as an alternative drinking source, bottled water must originate from a U.S. Army Veterinary Services approved source.

4.15. CONSUMER CONFIDENCE REPORTS.

DoD CWSs must deliver to the population served by the CWS a consumer confidence report (i.e., water quality report) annually by July 1. The report will provide water quality data collected during the prior calendar year. Delivery can be accomplished through one or more of the following methods: posting to an installation website, publication in an installation newspaper, posting in public places such as community centers in housing areas, and hand or postal delivery. At a minimum, consumer confidence reports must include:

a. Name, phone number, and e-mail for a water system contact person.

b. Source(s) of water.

c. Definitions (e.g., definition of MCL).

d. Information about contaminants detected.

e. Information about compliance with drinking water standards in this section.

f. Additional information, as appropriate, regarding system operations, drinking water quality, and public information.

4.16. NOTIFICATION REQUIREMENTS.

a. When a DoD PWS is out of compliance as set forth in this section, the appropriate DoD medical authority and installation population must be notified within the time frames identified in Paragraphs 4.4. through 4.12. The notice must provide:

(1) A clear and readily understandable explanation of the violation.

(2) Any potential adverse health effects; the population at risk.

(3) The steps being taken to correct the violation.

(4) The necessity for seeking an alternative water supply, if any.

(5) Any preventive measures the consumer should take until the violation is corrected.

b. The appropriate DoD medical authority must coordinate notification of HN authorities in cases where HN populations are at risk.

APPENDIX 4A: DRINKING WATER DISINFECTION TABLES

Table 12. Estimated Baffling Factors

BAFFLING CONDITION	BAFFLING FACTOR	BAFFLING DESCRIPTION
Partial Bypass	0.0	Tank with common inlet and outlet.
Unbaffled (mixed flow)	0.1	None, agitated basin, very low length to width ratio, high inlet and outlet flow velocities.
Poor	0.3	Single or multiple unbaffled inlets and outlets, no intra-basin baffles.
Average	0.5	Baffled inlet or outlet with some intra-basin baffles.
Superior	0.7	Perforated inlet baffle, serpentine or perforated intra-basin baffles, outlet weir or perforated launders.
Perfect (plug flow)	1.0	Very high length to width ratio (pipeline flow), perforated inlet, outlet, and intra-basin baffles.

Table 13. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 0.5 °C [32.9 °F] or Lower[a]

CHLORINE CONCENTRATION (mg/L)	pH ≤ 6 LOG INACTIVATIONS						pH = 6.5 LOG INACTIVATIONS						pH = 7.0 LOG INACTIVATIONS						pH = 7.5 LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤ 0.4	23	46	69	91	114	137	27	54	82	109	136	163	33	65	98	130	163	195	40	79	119	158	198	237
0.6	24	47	71	94	118	141	28	56	84	112	140	168	33	67	100	133	167	200	40	80	120	159	199	239
0.8	24	48	73	97	121	145	29	57	86	115	143	172	34	68	103	137	171	205	41	82	123	164	205	246
1	25	49	74	99	123	148	29	59	88	117	147	176	35	70	105	140	175	210	42	84	127	169	211	253
1.2	25	51	76	101	127	152	30	60	90	120	150	180	36	72	108	143	179	215	43	86	130	173	216	259
1.4	26	52	78	103	129	155	31	61	92	123	153	184	37	74	111	147	184	221	44	89	133	177	222	266
1.6	26	52	79	105	131	157	32	63	95	126	158	189	38	75	113	151	188	226	46	91	137	182	228	273
1.8	27	54	81	108	135	162	32	64	97	129	161	193	39	77	116	154	193	231	47	93	140	186	233	279
2	28	55	83	110	138	165	33	66	99	131	164	197	39	79	118	157	197	236	48	95	143	191	238	286
2.2	28	56	85	113	141	169	34	67	101	134	168	201	40	81	121	161	202	242	50	99	149	198	248	297
2.4	29	57	86	115	143	172	34	68	103	137	171	205	41	82	124	165	206	247	50	99	149	199	248	298
2.6	29	58	88	117	146	175	35	70	105	139	174	209	42	84	126	168	210	252	51	101	152	203	253	304
2.8	30	59	89	119	148	178	36	71	107	142	178	213	43	86	129	171	214	257	52	103	155	207	258	310
3	30	60	91	121	151	181	36	72	109	145	181	217	44	87	131	174	218	261	53	105	158	211	263	316

CHLORINE CONCENTRATION (mg/L)	pH ≤ 8 LOG INACTIVATIONS						pH = 8.5 LOG INACTIVATIONS						pH = 9.0 LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤ 0.4	46	92	139	185	231	277	55	110	165	219	274	329	65	130	195	260	325	390
0.6	48	95	143	191	238	286	57	114	171	228	285	342	68	136	204	271	339	407
0.8	49	98	148	197	246	295	59	118	177	236	295	354	70	141	211	281	352	422
1	51	101	152	203	253	304	61	122	183	243	304	365	73	146	219	291	364	437
1.2	52	104	157	209	261	313	63	125	188	251	313	376	75	150	226	301	376	451
1.4	54	107	161	214	268	321	65	129	194	258	323	387	77	155	232	309	387	464
1.6	55	110	165	219	274	329	66	132	199	265	331	397	80	159	239	318	398	477
1.8	56	113	169	225	282	338	68	136	204	271	339	407	82	163	245	326	408	489
2	58	115	173	231	288	346	70	139	209	278	348	417	83	167	250	333	417	500
2.2	59	118	177	235	294	353	71	142	213	284	355	426	85	170	256	341	426	511
2.4	60	120	181	241	301	361	73	145	218	290	363	435	87	174	261	348	435	522

Table 13. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 0.5 °C [32.9 °F] or Lower,[a] Continued

CHLORINE CONCENTRATION (mg/L)	pH ≤ 8 LOG INACTIVATIONS						pH = 8.5 LOG INACTIVATIONS						pH = 9.0 LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
2.6	61	123	184	245	307	368	74	148	222	296	370	444	89	178	267	355	444	533
2.8	63	125	188	250	313	375	75	151	226	301	377	452	91	181	272	362	453	543
3	64	127	191	255	318	382	77	153	230	307	383	460	92	184	276	368	460	552

°C = degree Celsius, °F = degree Fahrenheit
[a] $CT_{99.9}$ = CT for 3.0-log inactivation.

Table 14. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 5.0 °C [41 °F][a]

CHLORINE CONCENTRATION (mg/L)	pH ≤ 6 LOG INACTIVATIONS						pH = 6.5 LOG INACTIVATIONS						pH = 7.0 LOG INACTIVATIONS						pH = 7.5 LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤ 0.4	16	32	49	65	81	97	20	39	59	78	98	117	23	46	70	93	116	139	28	55	83	111	138	166
0.6	17	33	50	67	83	100	20	40	60	80	100	120	24	48	72	95	119	143	29	57	86	114	143	171
0.8	17	34	52	69	86	103	20	41	61	81	102	122	24	49	73	97	122	146	29	58	88	117	146	175
1	18	35	53	70	88	105	21	42	63	83	104	125	25	50	75	99	124	149	30	60	90	119	149	179
1.2	18	36	54	71	89	107	21	42	64	85	106	127	25	51	76	101	127	152	31	61	92	122	153	183
1.4	18	36	55	73	91	109	22	43	65	87	108	130	26	52	78	103	129	155	31	62	94	125	156	187
1.6	19	37	56	74	93	111	22	44	66	88	110	132	26	53	79	105	132	158	32	64	96	128	160	192
1.8	19	38	57	76	95	114	23	45	68	90	113	135	27	54	81	108	135	162	33	65	98	131	163	196
2	19	39	58	77	97	116	23	46	69	92	115	138	28	55	83	110	138	165	33	67	100	133	167	200
2.2	20	39	59	79	98	118	23	47	70	93	117	140	28	56	85	113	141	169	34	68	102	136	170	204
2.4	20	40	60	80	100	120	24	48	72	95	119	143	29	57	86	115	143	172	35	70	105	139	174	209
2.6	20	41	61	81	102	122	24	49	73	97	122	146	29	58	88	117	146	175	36	71	107	142	178	213
2.8	21	41	62	83	103	124	25	49	74	99	123	148	30	59	89	119	148	178	36	72	109	145	181	217
3	21	42	63	84	105	126	25	50	76	101	126	151	30	61	91	121	152	182	37	74	111	147	184	221

CHLORINE CONCENTRATION (mg/L)	pH ≤ 8 LOG INACTIVATIONS						pH = 8.5 LOG INACTIVATIONS						pH = 9.0 LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤ 0.4	33	66	99	132	165	198	39	79	118	157	197	236	47	93	140	186	233	279
0.6	34	68	102	136	170	204	41	81	122	163	203	244	49	97	146	194	243	291
0.8	35	70	105	140	175	210	42	84	126	168	210	252	50	100	151	201	251	301
1	36	72	108	144	180	216	43	87	130	173	217	260	52	104	156	208	260	312
1.2	37	74	111	147	184	221	45	89	134	178	223	267	53	107	160	213	267	320

Table 14. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 5.0 °C [41 °F],[a] Continued

CHLORINE CONCENTRATION (mg/L)	pH ≤ 8 LOG INACTIVATIONS						pH = 8.5 LOG INACTIVATIONS						pH = 9.0 LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
1.4	38	76	114	151	189	227	46	91	137	183	228	274	55	110	165	219	274	329
1.6	39	77	116	155	193	232	47	94	141	187	234	281	56	112	169	225	281	337
1.8	40	79	119	159	198	238	48	96	144	191	239	287	58	115	173	230	288	345
2	41	81	122	162	203	243	49	98	147	196	245	294	59	118	177	235	294	353
2.2	41	83	124	165	207	248	50	100	150	200	250	300	60	120	181	241	301	361
2.4	42	84	127	169	211	253	51	102	153	204	255	306	61	123	184	245	307	368
2.6	43	86	129	172	215	258	52	104	156	208	260	312	63	125	188	250	313	375
2.8	44	88	132	175	219	263	53	106	159	212	265	318	64	127	191	255	318	382
3	45	89	134	179	223	268	54	108	162	216	270	324	65	130	195	259	324	389

[a] $CT_{99.9}$ = CT for 3.0-log inactivation.

Table 15. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 10 °C [50 °F][a]

CHLORINE CONCENTRATION (mg/L)	pH ≤ 6 LOG INACTIVATIONS						pH = 6.5 LOG INACTIVATIONS						pH = 7.0 LOG INACTIVATIONS						pH = 7.5 LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤ 0.4	12	24	37	49	61	73	15	29	44	59	73	88	17	35	52	69	87	104	21	42	63	83	104	125
0.6	13	25	38	50	63	75	15	30	45	60	75	90	18	36	54	71	89	107	21	43	64	85	107	128
0.8	13	26	39	52	65	78	15	31	46	61	77	92	18	37	55	73	92	110	22	44	66	87	109	131
1	13	26	40	53	66	79	16	31	47	63	78	94	19	37	56	75	93	112	22	45	67	89	112	134
1.2	13	27	40	53	67	80	16	32	48	63	79	95	19	38	57	76	95	114	23	46	69	91	114	137
1.4	14	27	41	55	68	82	16	33	49	65	82	98	19	39	58	77	97	116	23	47	70	93	117	140
1.6	14	28	42	55	69	83	17	33	50	66	83	99	20	40	60	79	99	119	24	48	72	96	120	144
1.8	14	29	43	57	72	86	17	34	51	67	84	101	20	41	61	81	102	122	25	49	74	98	123	147
2	15	29	44	58	73	87	17	35	52	69	87	104	21	41	62	83	103	124	25	50	75	100	125	150
2.2	15	30	45	59	74	89	18	35	53	70	88	105	21	42	64	85	106	127	26	51	77	102	128	153
2.4	15	30	45	60	75	90	18	36	54	71	89	107	22	43	65	86	108	129	26	52	79	105	131	157
2.6	15	31	46	61	77	92	18	37	55	73	92	110	22	44	66	87	109	131	27	53	80	107	133	160
2.8	16	31	47	62	78	93	19	37	56	74	93	111	22	45	67	89	112	134	27	54	82	109	136	163
3	16	32	48	63	79	95	19	38	57	75	94	113	23	46	69	91	114	137	28	55	83	111	138	166

Table 15. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 10 °C [50 °F],[a] Continued

CHLORINE CONCENTRATION (mg/L)	pH ≤ 8 LOG INACTIVATIONS						pH = 8.5 LOG INACTIVATIONS						pH = 9.0 LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤ 0.4	25	50	75	99	124	149	30	59	89	118	148	177	35	70	105	139	174	209
0.6	26	51	77	102	128	153	31	61	92	122	153	183	36	73	109	145	182	218
0.8	26	53	79	105	132	158	32	63	95	126	158	189	38	75	113	151	188	226
1	27	54	81	108	135	162	33	65	98	130	163	195	39	78	117	156	195	234
1.2	28	55	83	111	138	166	33	67	100	133	167	200	40	80	120	160	200	240
1.4	28	57	85	113	142	170	34	69	103	137	172	206	41	82	124	165	206	247
1.6	29	58	87	116	145	174	35	70	106	141	176	211	42	84	127	169	211	253
1.8	30	60	90	119	149	179	36	72	108	143	179	215	43	86	130	173	216	259
2	30	61	91	121	152	182	37	74	111	147	184	221	44	88	133	177	221	265
2.2	31	62	93	124	155	186	38	75	113	150	188	225	45	90	136	181	226	271
2.4	32	63	95	127	158	190	38	77	115	153	192	230	46	92	138	184	230	276
2.6	32	65	97	129	162	194	39	78	117	156	195	234	47	94	141	187	234	281
2.8	33	66	99	131	164	197	40	80	120	159	199	239	48	96	144	191	239	287
3	34	67	101	134	168	201	41	81	122	162	203	243	49	97	146	195	243	292

[a] $CT_{99.9}$ = CT for 3.0-log inactivation.

Table 16. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 15 °C [59 °F][a]

CHLORINE CONCENTRATION (mg/L)	pH ≤ 6 LOG INACTIVATIONS						pH = 6.5 LOG INACTIVATIONS						pH = 7.0 LOG INACTIVATIONS						pH = 7.5 LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤ 0.4	8	16	25	33	41	49	10	20	30	39	49	59	12	23	35	47	58	70	14	28	42	55	69	83
0.6	8	17	25	33	42	50	10	20	30	40	50	60	12	24	36	48	60	72	14	29	43	57	72	86
0.8	9	17	26	35	43	52	10	20	31	41	51	61	12	24	37	49	61	73	15	29	44	59	73	88
1	9	18	27	35	44	53	11	21	32	42	53	63	13	25	38	50	63	75	15	30	45	60	75	90
1.2	9	18	27	36	45	54	11	21	32	43	53	64	13	25	38	51	63	76	15	31	46	61	77	92
1.4	9	18	28	37	46	55	11	22	33	43	54	65	13	26	39	52	65	78	16	31	47	63	78	94
1.6	9	19	28	37	47	56	11	22	33	44	55	66	13	26	40	53	66	79	16	32	48	64	80	96
1.8	10	19	29	38	48	57	11	23	34	45	57	68	14	27	41	54	68	81	16	33	49	65	82	98
2	10	19	29	39	48	58	12	23	35	46	58	69	14	28	42	55	69	83	17	33	50	67	83	100
2.2	10	20	30	39	49	59	12	23	35	47	58	70	14	28	43	57	71	85	17	34	51	68	85	102
2.4	10	20	30	40	50	60	12	24	36	48	60	72	14	29	43	57	72	86	18	35	53	70	88	105
2.6	10	20	31	41	51	61	12	24	37	49	61	73	15	29	44	59	73	88	18	36	54	71	89	107
2.8	10	21	31	41	52	62	12	25	37	49	62	74	15	30	45	59	74	89	18	36	55	73	91	109
3	11	21	32	42	53	63	13	25	38	51	63	76	15	30	46	61	76	91	19	37	56	74	93	111

CHLORINE CONCENTRATION (mg/L)	pH ≤ 8 LOG INACTIVATIONS						pH = 8.5 LOG INACTIVATIONS						pH = 9.0 LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤ 0.4	17	33	50	66	83	99	20	39	59	79	98	118	23	47	70	93	117	140
0.6	17	34	51	68	85	102	20	41	61	81	102	122	24	49	73	97	122	146
0.8	18	35	53	70	88	105	21	42	63	84	105	126	25	50	76	101	126	151
1	18	36	54	72	90	108	22	43	65	87	108	130	26	52	78	104	130	156
1.2	19	37	56	74	93	111	22	45	67	89	112	134	27	53	80	107	133	160
1.4	19	38	57	76	95	114	23	46	69	91	114	137	28	55	83	110	138	165
1.6	19	39	58	77	97	116	24	47	71	94	118	141	28	56	85	113	141	169
1.8	20	40	60	79	99	119	24	48	72	96	120	144	29	58	87	115	144	173
2	20	41	61	81	102	122	25	49	74	98	123	147	30	59	89	118	148	177
2.2	21	41	62	83	103	124	25	50	75	100	125	150	30	60	91	121	151	181
2.4	21	42	64	85	106	127	26	51	77	102	128	153	31	61	92	123	153	184
2.6	22	43	65	86	108	129	26	52	78	104	130	156	31	63	94	125	157	188
2.8	22	44	66	88	110	132	27	53	80	106	133	159	32	64	96	127	159	191
3	22	45	67	89	112	134	27	54	81	108	135	162	33	65	98	130	163	195

[a] $CT_{99.9}$ = CT for 3.0-log inactivation.

Table 17. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 20 °C [68 °F][a]

CHLORINE CONCENTRATION	pH ≤ 6 LOG INACTIVATIONS						pH = 6.5 LOG INACTIVATIONS						pH = 7.0 LOG INACTIVATIONS						pH = 7.5 LOG INACTIVATIONS					
(mg/L)	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤ 0.4	6	12	18	24	30	36	7	15	22	29	37	44	9	17	26	35	43	52	10	21	31	41	52	62
0.6	6	13	19	25	32	38	8	15	23	30	38	45	9	18	27	36	45	54	11	21	32	43	53	64
0.8	7	13	20	26	33	39	8	15	23	31	38	46	9	18	28	37	46	55	11	22	33	44	55	66
1	7	13	20	26	33	39	8	16	24	31	39	47	9	19	28	37	47	56	11	22	34	45	56	67
1.2	7	13	20	27	33	40	8	16	24	32	40	48	10	19	29	38	48	57	12	23	35	46	58	69
1.4	7	14	21	27	34	41	8	16	25	33	41	49	10	19	29	39	48	58	12	23	35	47	58	70
1.6	7	14	21	28	35	42	8	17	25	33	42	50	10	20	30	39	49	59	12	24	36	48	60	72
1.8	7	14	22	29	36	43	9	17	26	34	43	51	10	20	31	41	51	61	12	25	37	49	62	74
2	7	15	22	29	37	44	9	17	26	35	43	52	10	21	31	41	52	62	13	25	38	50	63	75
2.2	7	15	22	29	37	44	9	18	27	35	44	53	11	21	32	42	53	63	13	26	39	51	64	77
2.4	8	15	23	30	38	45	9	18	27	36	45	54	11	22	33	43	54	65	13	26	39	52	65	78
2.6	8	15	23	31	38	46	9	18	28	37	46	55	11	22	33	44	55	66	13	27	40	53	67	80
2.8	8	16	24	31	39	47	9	19	28	37	47	56	11	22	34	45	56	67	14	27	41	54	68	81
3	8	16	24	31	39	47	10	19	29	38	48	57	11	23	34	45	57	68	14	28	42	55	69	83
CHLORINE CONCENTRATION	pH ≤ 8 LOG INACTIVATIONS						pH = 8.5 LOG INACTIVATIONS						pH = 9.0 LOG INACTIVATIONS											
(mg/L)	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0						
≤ 0.4	12	25	37	49	62	74	15	30	45	59	74	89	18	35	53	70	88	105						
0.6	13	26	39	51	64	77	15	31	46	61	77	92	18	36	55	73	91	109						
0.8	13	26	40	53	66	79	16	32	48	63	79	95	19	38	57	75	94	113						
1	14	27	41	54	68	81	16	33	49	65	82	98	20	39	59	78	98	117						
1.2	14	28	42	55	69	83	17	33	50	67	83	100	20	40	60	80	100	120						
1.4	14	28	43	57	71	85	17	34	52	69	86	103	21	41	62	82	103	123						
1.6	15	29	44	58	73	87	18	35	53	70	88	105	21	42	63	84	105	126						
1.8	15	30	45	59	74	89	18	36	54	72	90	108	22	43	65	86	108	129						
2	15	30	46	61	76	91	18	37	55	73	92	110	22	44	66	88	110	132						
2.2	16	31	47	62	78	93	19	38	57	75	94	113	23	45	68	90	113	135						
2.4	16	32	48	63	79	95	19	38	58	77	96	115	23	46	69	92	115	138						
2.6	16	32	49	65	81	97	20	39	59	78	98	117	24	47	71	94	118	141						
2.8	17	33	50	66	83	99	20	40	60	79	99	119	24	48	72	95	119	143						
3	17	34	51	67	84	101	20	41	61	81	102	122	24	49	73	97	122	146						

[a] $CT_{99.9}$ = CT for 3.0-log inactivation.

Table 18. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 25 °C [77 °F][a]

CHLORINE CONCENTRATION (mg/L)	pH ≤ 6 LOG INACTIVATIONS						pH = 6.5 LOG INACTIVATIONS						pH = 7.0 LOG INACTIVATIONS						pH = 7.5 LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤ 0.4	4	8	12	16	20	24	5	10	15	19	24	29	6	12	18	23	29	35	7	14	21	28	35	42
0.6	4	8	13	17	21	25	5	10	15	20	25	30	6	12	18	24	30	36	7	14	22	29	36	43
0.8	4	9	13	17	22	26	5	10	16	21	26	31	6	12	19	25	31	37	7	15	22	29	37	44
1	4	9	13	17	22	26	5	10	16	21	26	31	6	12	19	25	31	37	8	15	23	30	38	45
1.2	5	9	14	18	23	27	5	11	16	21	27	32	6	13	19	25	32	38	8	15	23	31	38	46
1.4	5	9	14	18	23	27	6	11	17	22	28	33	7	13	20	26	33	39	8	16	24	31	39	47
1.6	5	9	14	19	23	28	6	11	17	22	28	33	7	13	20	27	33	40	8	16	24	32	40	48
1.8	5	10	15	19	24	29	6	11	17	23	28	34	7	14	21	27	34	41	8	16	25	33	41	49
2	5	10	15	19	24	29	6	12	18	23	29	35	7	14	21	27	34	41	8	17	25	33	42	50
2.2	5	10	15	20	25	30	6	12	18	23	29	35	7	14	21	28	35	42	9	17	26	34	43	51
2.4	5	10	15	20	25	30	6	12	18	24	30	36	7	14	22	29	36	43	9	17	26	35	43	52
2.6	5	10	16	21	26	31	6	12	19	25	31	37	7	15	22	29	37	44	9	18	27	35	44	53
2.8	5	10	16	21	26	31	6	12	19	25	31	37	8	15	23	30	38	45	9	18	27	36	45	54
3	5	11	16	21	27	32	6	13	19	25	32	38	8	15	23	31	38	46	9	18	28	37	46	55

CHLORINE CONCENTRATION (mg/L)	pH ≤ 8 LOG INACTIVATIONS						pH = 8.5 LOG INACTIVATIONS						pH = 9.0 LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤ 0.4	8	17	25	33	42	50	10	20	30	39	49	59	12	23	35	47	58	70
0.6	9	17	26	34	43	51	10	20	31	41	51	61	12	24	37	49	61	73
0.8	9	18	27	35	44	53	11	21	32	42	53	63	13	25	38	50	63	75
1	9	18	27	36	45	54	11	22	33	43	54	65	13	26	39	52	65	78
1.2	9	18	28	37	46	55	11	22	34	45	56	67	13	27	40	53	67	80
1.4	10	19	29	38	48	57	12	23	35	46	58	69	14	27	41	55	68	82
1.6	10	19	29	39	48	58	12	23	35	47	58	70	14	28	42	56	70	84
1.8	10	20	30	40	50	60	12	24	36	48	60	72	14	29	43	57	72	86
2	10	20	31	41	51	61	12	25	37	49	62	74	15	29	44	59	73	88
2.2	10	21	31	41	52	62	13	25	38	50	63	75	15	30	45	60	75	90
2.4	11	21	32	42	53	63	13	26	39	51	64	77	15	31	46	61	77	92
2.6	11	22	33	43	54	65	13	26	39	52	65	78	16	31	47	63	78	94
2.8	11	22	33	44	55	66	13	27	40	53	67	80	16	32	48	64	80	96
3	11	22	34	45	56	67	14	27	41	54	68	81	16	32	49	65	81	97

[a] $CT_{99.9}$ = CT for 3.0-log inactivation.

Table 19. CT Values for Inactivation of Viruses by Free Chlorine

TEMPERATURE (°C)	2.0-LOG INACTIVATION		3.0-LOG INACTIVATION		4.0-LOG INACTIVATION	
	pH 6-9	pH 10	pH 6-9	pH 10	pH 6-9	pH 10
0.5	6	45	9	66	12	90
5	4	30	6	44	8	60
10	3	22	4	33	6	45
15	2	15	3	22	4	30
20	1	11	2	16	3	22
25	1	7	1	11	2	15

Table 20. CT Values for Inactivation of *Giardia* Cysts by Chlorine Dioxide

INACTIVATION	TEMPERATURE					
	≤ 1 °C [33.8 °F]	5 °C [41 °F]	10 °C [50 °F]	15 °C [59 °F]	20 °C [68 °F]	25 °C [77 °F]
0.5-log	10	4.3	4	3.2	2.5	2
1.0-log	21	8.7	7.7	6.3	5	3.7
1.5-log	32	13	12	10	7.5	5.5
2.0-log	42	17	15	13	10	7.3
2.5-log	52	22	19	16	13	9
3.0-log	63	26	23	19	15	11

Table 21. CT Values for Inactivation of Viruses by Free Chlorine Dioxide pH 6-9

INACTIVATION	TEMPERATURE					
	≤ 1 °C [33.8 °F]	5 °C [41 °F]	10 °C [50 °F]	15 °C [59 °F]	20 °C [68 °F]	25 °C [77 °F]
2.0-log	8.4	5.6	4.2	2.8	2.1	1.4
3.0-log	25.6	17.1	12.8	8.6	6.4	4.3
4.0-log	50.1	33.4	25.1	16.7	12.5	8.4

Table 22. CT Values for Inactivation of *Giardia* Cysts by Ozone

INACTIVATION	TEMPERATURE					
	≤ 1 °C [33.8 °F]	5 °C [41 °F]	10 °C [50 °F]	15 °C [59 °F]	20 °C [68 °F]	25 °C [77 °F]
0.5-log	0.48	0.32	0.23	0.16	0.12	0.08
1.0-log	0.97	0.63	0.48	0.32	0.24	0.16
1.5-log	1.5	0.95	0.72	0.48	0.36	0.24
2.0-log	1.9	1.3	0.95	0.63	0.48	0.32
2.5-log	2.4	1.6	1.2	0.79	0.60	0.40
3.0-log	2.9	1.9	1.43	0.95	0.72	0.48

Table 23. CT Values for Inactivation of Viruses by Free Ozone

INACTIVATION	TEMPERATURE					
	≤ 1 °C [33.8 °F]	5 °C [41 °F]	10 °C [50 °F]	15 °C [59 °F]	20 °C [68 °F]	25 °C [77 °F]
2.0-log	0.9	0.6	0.5	0.3	0.25	0.15
3.0-log	1.4	0.9	0.8	0.5	0.4	0.25
4.0-log	1.8	1.2	1.0	0.6	0.5	0.3

Table 24. CT Values for Inactivation of *Giardia* Cysts by Chloramine pH 6-9

INACTIVATION	TEMPERATURE					
	≤ 1 °C [38 °F]	5 °C [41 °F]	10 °C [50 °F]	15 °C [59 °F]	20 °C [68 °F]	25 °C [77 °F]
0.5-log	635	365	310	250	185	125
1.0-log	1,270	735	615	500	370	250
1.5-log	1,900	1,100	930	750	550	375
2.0-log	2,535	1,470	1,230	1,000	735	500
2.5-log	3,170	1,830	1,540	1,250	915	625
3.0-log	3,800	2,200	1,850	1,500	1,100	750

Table 25. CT Values for Inactivation of Viruses by Chloramine

INACTIVATION	TEMPERATURE					
	≤ 1 °C [33.8 °F]	5 °C [41 °F]	10 °C [50 °F]	15 °C [59 °F]	20 °C [68 °F]	25 °C [77 °F]
2.0-log	1,243	857	643	428	321	214
3.0-log	2,063	1,423	1,067	712	534	356
4.0-log	2,883	1,988	1,491	994	746	497

Table 26. UV Dose for Viruses Inactivation Credit (mJ/cm^2)

LOG INACTIVATION	
2.0	3.0
100	143

mJ/ cm^2 = millijoules per square centimeter
milliwatt-second per square centimeter is equivalent to mJ/cm^2

Table 27. CT Values (mg•min/L) for *Cryptosporidium* Inactivation by Chlorine Dioxide[a]

INACTIVATION	WATER TEMPERATURE					
	1 °C [33.8 °F]	5 °C [41 °F]	10 °C [50 °F]	15 °C [59 °F]	20 °C [68 °F]	25 °C [77 °F]
0.5-log	305	214	138	89	58	38
1.0-log	610	429	277	179	116	75
1.5-log	915	643	415	268	174	113
2.0-log	1,220	858	553	357	232	150
2.5-log	1,525	1,072	691	447	289	188
3.0-log	1,830	1,286	830	536	347	226

mg•min/L = milligrams x minute per liter
[a] Systems may use this equation to determine log credit between the indicated values:
Log credit = $(0.001506 \times (1.09116)^{Temp}) \times CT$

Table 28. CT Values (mg•min/L) for *Cryptosporidium* Inactivation by Ozone[a]

INACTIVATION	WATER TEMPERATURE					
	1 °C [33.8 °F]	5 °C [41 °F]	10 °C [50 °F]	15 °C [59 °F]	20 °C [68 °F]	25 °C [77 °F]
0.5-log	12	7.9	4.9	3.1	2.0	1.2
1.0-log	23	16	9.9	6.2	3.9	2.5
1.5-log	35	24	15	9.3	5.9	3.7
2.0-log	46	32	20	12	7.8	4.9
2.5-log	58	40	25	16	9.8	6.2
3.0-log	69	47	30	19	12	7.4

[a] Systems may use this equation to determine log credit between the indicated values:
Log credit = $(0.0397 \times (1.09757)^{Temp}) \times CT$

Table 29. UV Dose for *Cryptosporidium* Inactivation Credit

INACTIVATION	*CRYPTOSPORIDIUM* UV DOSE (mJ/cm^2)
0.5-log	1.6
1.0-log	2.5
1.5-log	3.9
2.0-log	5.8
2.5-log	8.5
3.0-log	12
3.5-log	15
4.0-log	22

SECTION 5: WASTEWATER AND STORMWATER

5.1. INTRODUCTION.

This section contains standards on the control of discharges of wastewater and stormwater into waters of the HN and to protect the aquatic environment and groundwater resources. It includes, but is not limited to: control of direct discharges of non-industrial pollutants, direct and indirect discharges of industrial pollutants, and stormwater runoff associated with industrial and construction activities.

5.2. GENERAL.

Installation commanders are responsible for ensuring that wastewater discharges and stormwater management activities comply with the standards of this section, as applicable.

a. Personnel Qualifications.

(1) Wastewater.

Installations must ensure that personnel responsible for operating or overseeing domestic wastewater treatment systems (DWTS) or equipment are appropriately trained, on a recurring basis, to perform their duties according to the complexity of the systems they operate or oversee.

(2) Stormwater.

Personnel who work in areas where industrial materials or activities are exposed to stormwater, or who are responsible for implementing activities necessary to meet the conditions of the stormwater pollution prevention plan (SWPPP) (e.g., inspectors, maintenance personnel) must be trained in appropriate best management practices (BMPs) applicable to their work.

b. UFC Guidelines.

Installations must implement and follow the design, operation, and maintenance guidelines in accordance with UFC 3-240-01, UFC 3-240-02, and UFC 3-240-13FN when operating wastewater treatment systems or conducting wastewater treatment.

c. Complaint System.

Establish a system that involves the LEC, as appropriate, to investigate water pollution complaints from individuals or HN water pollution control authorities.

d. Recordkeeping Requirements.

Retain the following records for 3 years:

(1) Effluent concentration, or other measurement specified for each regulated parameter.

(2) Daily volume of effluent discharge from each point source.

(3) Test procedures for the analysis of pollutants.

(4) Date, exact place, and time of sampling and measurements.

(5) Name of the person who performed the sampling or measurements.

(6) Date of analysis.

(7) Records documenting personnel training and certification.

(8) Records of complaints.

5.3. EFFLUENT LIMITATIONS FOR DIRECT DISCHARGES OF NON-INDUSTRIAL POLLUTANTS.

These requirements apply to installations that have DWTS that directly discharge non-industrial pollutants to waters of the HN.

a. Non-industrial Effluent Limits.

(1) Biochemical Oxygen Demand (5-day measure) (BOD5).

(a) The 30-day average must not exceed 30 mg/L.

(b) The 7-day average must not exceed 45 mg/L.

(c) Carbonaceous biochemical oxygen demand (5-day measure) ($CBOD_5$) may be substituted for BOD_5. The $CBOD_5$ test procedure suppresses the nitrification component in the BOD_5 test procedure, thereby reducing the value or effects and lowering the oxygen demand. When $CBOD_5$ is substituted for BOD_5, these limits apply:

1. 30-day average must not exceed 25 mg/L.

2. The 7-day average must not exceed 40 mg/L.

(2) Total Suspended Solids (TSS).

(a) The 30-day average must not exceed 30 mg/L.

(b) The 7-day average must not exceed 45 mg/L.

(3) pH. The effluent pH values must be maintained between 6.0 and 9.0.

b. Alternate Requirements for Facilities Using Trickling Filters or Stabilization Ponds.

If a facility uses a trickling filter or waste stabilization pond as the principal process and provides significant biological treatment of the wastewater, but cannot consistently achieve the BOD_5 and TSS limits of Paragraphs 5.3.a.(1) and 5.3.a.(2), these effluent limitations apply:

(1) BOD_5.

1. The 30-day average must not exceed 45 mg/L.

2. The 7-day average must not exceed 65 mg/L.

(2) TSS.

1. The 30-day average must not exceed 45 mg/L.

2. The 7-day average must not exceed 65 mg/L.

(3) pH.

The effluent pH values must be maintained between 6.0 and 9.0.

c. Monitoring.

Monitoring requirements apply to all regulated facilities. The monitoring frequency (including both sampling and analysis) in Table 30 includes all three parameters that are regulated (BOD_5, TSS, and pH). Samples must be collected at the point of discharge to the waters of the HN.

Table 30. DWTS Discharge Monitoring Requirements

PLANT CAPACITY		MONITORING FREQUENCY
MGD	LPD	
0.001 - 0.99	3785 –3,747,557	Monthly
1.0 - 4.99	3,785,412 – 18,892,206	Weekly
> 5.0	18,927,060	Daily
MGD = million gallons per day		

d. Limited Effluent Standards.

For DWTS sampling once per month, the single monthly sample must comply with the 30-day average limit. For DWTS sampling weekly, the weekly sample must comply with the level for the 7-day average, and the 30-day average is calculated by determining the average of all samples taken within the same calendar month.

5.4. EFFLUENT LIMITATIONS FOR NON-CATEGORICAL INDUSTRIAL INDIRECT DISCHARGES.

The following effluent limits apply to all discharges of pollutants to DWTSs and associated collection systems from process wastewater for which categorical standards have not been established. See Paragraph 5.5. for categorical industrial discharge standards.

a. Solid or Viscous Pollutants.

The discharge of solid or viscous pollutants that would result in an obstruction to the domestic wastewater treatment plant flow is prohibited.

b. Ignitability and Explosivity.

(1) The discharge of wastewater with a closed cup flashpoint of less than 60 °C [140 °F] is prohibited.

(2) The discharge of waste with any of the following characteristics is prohibited:

(a) A liquid solution that contains more than 24 percent alcohol by volume and has a flash point less than 60 °C [140 °F].

(b) A non-liquid that, under standard temperature and pressure, can cause a fire through friction.

(c) An ignitable compressed gas.

(d) An oxidizer, such as peroxide.

c. Reactivity and Fume Toxicity.

The discharge of any of the following wastes is prohibited:

(1) Wastes that are normally unstable and readily undergo violent changes without detonating.

(2) Wastes that react violently with water.

(3) Wastes that form explosive mixtures with water or form toxic gases or fumes when mixed with water.

(4) Cyanide or sulfide waste that can generate potentially harmful toxic fumes, gases, or vapors.

(5) Waste capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

(6) Wastes that contain explosives regulated as hazardous materials in accordance with Section 4 of Volume 4.

(7) Wastes that produce any toxic fumes, vapors, or gases with the potential to cause safety problems or harm to workers.

d. Corrosivity.

It is prohibited to discharge pollutants with the potential to be structurally corrosive to the DWTS. In addition, no discharge of wastewater below a pH of 5.0 is allowed, unless the DWTS is specifically designed to handle that type of wastewater.

e. Oil and Grease.

The discharge of the following oils that can pass through, or cause interference to, the DWTS is prohibited: petroleum oil, non-biodegradable cutting oil, and products of mineral oil origin.

f. Spills and Batch Discharges (Slugs).

Activities or installations that have a significant potential for spills or batch discharges must develop a slug prevention plan containing these minimum requirements:

(1) Description of discharge practices, including non-routine batch discharges.

(2) Description of stored chemicals.

(3) Plan for immediately notifying the DWTS of slug discharges and discharges that would violate prohibitions under this section, including procedures for subsequent written notification within 5 days.

(4) Necessary practices to prevent accidental spills. This would include proper inspection and maintenance of storage areas, handling and transfer of materials, loading and unloading operations, control of plant site runoff, and worker training.

(5) Procedures for building containment structures or equipment.

(6) Necessary measures to control toxic organic pollutants and solvents.

(7) Procedures and equipment for emergency response, and any subsequent plans necessary to limit damage suffered by the treatment plant or the environment.

g. Trucked and Hauled Waste.

The discharge of trucked and hauled waste into the DWTS, except at locations specified by the DWTS operator, is prohibited.

h. Heat.

Heat in amounts that inhibit biological activity in the DWTS resulting in interference, but in no case in such quantities that the temperature of the process water at the DWTS exceeds 40 °C [104 °F].

5.5. EFFLUENT LIMITATIONS FOR CATEGORICAL INDUSTRIAL DISCHARGES, DIRECT OR INDIRECT.

Any installations that have activities that fall into any of the industrial categories listed below must comply with the following effluent limitations (i.e., either direct or indirect discharge limitations at the source of the discharge).

a. Electroplating.

The following discharge standards apply to electroplating operations in which metal is electroplated on any basis material and to related metal finishing operations as set forth in the various subparts. These standards apply whether such metal finishing operations are conducted in conjunction with electroplating, independently, or as part of some other operation. Electroplating subparts are identified as:

(1) Electroplating of Common Metals.

Discharges of pollutants in process waters resulting from the process in which a material is electroplated with copper, nickel, chromium, zinc, tin, lead, cadmium, iron, aluminum, or any combination thereof.

(2) Electroplating of Precious Metals.

Discharges of pollutants in process waters resulting from the process in which a material is plated with gold, silver, iridium, palladium, platinum, rhodium, ruthenium, or any combination thereof.

(3) Anodizing.

Discharges of pollutants in process waters resulting from the anodizing of ferrous and nonferrous materials.

(4) Metal Coatings.

Discharges of pollutants in process waters resulting from the chromating, phosphating, or immersion plating on ferrous and nonferrous materials.

(5) Chemical Etching and Milling.

Discharges of pollutants in process waters resulting from the chemical milling or etching of ferrous and nonferrous materials.

(6) Electroless Plating.

Discharges of pollutants in process waters resulting from the electroless plating of a metallic layer on a metallic or nonmetallic substrate.

(7) Printed Circuit Board Manufacturing.

Discharges of pollutants in process waters resulting from the manufacture of printed circuit boards, including all manufacturing operations required or used to convert an insulating substrate to a finished printed circuit board.

(8) Discharge Standards for Electroplating Facilities.

(a) The discharge standards in Table 31 apply to facilities in the electroplating in Paragraphs 5.5.a.(1) through 5.5.a.(7) that directly or indirectly discharge less than 38,000 LPD [10,000 gallons per day (GPD)].

Table 31. Standards for Electroplating Facilities Discharging Less Than 38,000 LPD [10,000 GPD]

POLLUTANT	MAXIMUM DAILY DISCHARGE LIMIT (mg/L)	4-DAY AVERAGE (mg/L)
Cyanide, amenable	5.0	2.7
Lead	0.6	0.4
Cadmium	1.2	0.7
Total Toxic Organics (TTO)[a]	4.57	---

[a] Components of TTO are identified in Table 32.

Table 32. Components of TTO

VOLATILE ORGANICS	
Acrolein (Propenyl)	Bromodichloromethane
Acrylonitrile	1,1,2,2-Tetrachloroethane
Methyl chloride (chloromethane)	1,2-Dichloropropane
Methyl bromide (bromomethane)	1,3-Dichloropropylene (1,3-Dichloropropene)
Vinyl Chloride (chloroethylene)	Trichloroethene
Chloroethane	Dibromochloromethane
Methylene Chloride (9 dichloromethane)	1,1,2-Trichloroethane
1,1-Dichloroethene	Benzene
1,1-Dichloroethane	2-Chloroethyl vinyl ether (mixed)
1,2-Dichloroethane	Bromoform (tribromomethane)
1,2-trans-Dichloroethene	Tetrachloroethene
Chloroform (trichloromethane)	Toluene
1,1,1-Trichloroethane	Chlorobenzene
Carbon Tetrachloride (tetrachloromethane)	Ethylbenzene
BASE/NEUTRAL EXTRACTABLE ORGANICS	
N-nitrosodimethylamine	Diethyl phthalate
bis (2-chloroethyl) ether	1,2-Diphenylhydrazine
1,3-Dichlorobenzene	N-nitrosodiphenylamine
1,4-Dichlorobenzene	4-Bromophenyl phenyl ether
1,2-Dichlorobenzene	Hexachlorobenzene
bis(2-chloroisopropyl)-ether	Phenanthrene

Hexachloroethane	Anthracene
N-nitrosodi-n-propylamine	Di-n-butyl phthalate
Nitrobenzene	Fluoranthene
Isophorone	Pyrene
bis (2-chloroethoxy) methane	Benzidine

Table 32. Components of TTO, Continued

BASE/NEUTRAL EXTRACTABLE ORGANICS	
1,2,4-trichlorobenzene	Butyl benzyl phthalate
Naphthalene	1,2-benzoanthracene (benzo (a) anthracene)
Hexachlorobutadiene	Chrysene
Hexachlorocyclopentadiene	3,3-Dichlorobenzidine
2-Chloronaphthalene	bis (2-ethylhexyl) phthalate
Acenaphthylene	Di-n-octyl phthalate
Dimethyl Phthalate	3,4-Benzofluoranthene (benzo (b) fluoranthene)
2,6-Dinitrotoluene	11,12-Benzofluoranthene (benzo (k) fluoranthene)
Acenaphthene	Benzo (a) pyrene (3,4-benzopyrene)
2,4-Dinitrotoluene	Indeno (1,2,3-cd) pyrene (2,3-o-phenylene pyrene)
Fluorene	1,2,5,6-Dibenzanthracene (dibenezo (a,h) anthracene)
4-Chlorophenyl phenyl ether	1,12-Benzoperylene (benzo (g,h,i) perylene)
ACID EXTRACTABLE ORGANICS	
2-Chlorophenol	2,4,6-Trichlorphenol
Phenol	2,4-Dinitrophenol
2-Nitrophenol	4-Nitrophenol
2,4-Dimethylphenol	p-Chloro-m-cresol
2,4-Dichlorophenol	Pentachlorophenol
4,6-Dinitro-o-cresol	
PESTICIDES/PCBS	
Alpha-Endosulfan	Endrin
Beta-Endosulfan	Endrin aldehyde
Endosulfan sulfate	Heptachlor
Alpha-BHC	Heptachlor Epoxide (BHC-hexachlorocyclohexane)
Beta-BHC	Toxaphene
Delta-BHC	PCB-1242 (Arochlor 1242)
Gamma-BHC	PCB-1254 (Arochlor 1254)
4,4-DDT	PCB-1221 (Arochlor 1221)
4,4-DDE (p,p-DDX)	PCB-1232 (Arochlor 1232)
(p,p-TDE)	PCB-1248 (Arochlor 1248)
Aldrin	PCB-1260 (Arochlor 1260)
Chlordane (technical mixture and metabolites)	PCB-1016 (Arochlor 1016)
Dieldrin	
PCB = polychlorinated biphenyls	

(b) The discharge standards in Table 33 apply to facilities that perform activities that fall into any of the electroplating category subparts in Paragraphs 5.5.a.(1) through 5.5.a.(7) that directly, or indirectly, discharge 38,000 LPD [10,000 GPD] or more.

Table 33. Wastewater Standards for Electroplating Facilities Discharging 38,000 LPD [10,000 GPD] or More

POLLUTANT	MAXIMUM DAILY DISCHARGE LIMIT (mg/L)	4-DAY AVERAGE (mg/L)
Cyanide, total	1.9	1.0
Copper	4.5	2.7
Nickel	4.1	2.6
Chrome	7.0	4.0
Zinc	4.2	2.6
Lead	0.6	0.4
Cadmium	1.2	0.7
Total Metals[a]	10.5	6.8
TTO[b]	2.13	---
Silver[c]	1.2	0.7

[a] The sum of the concentration or mass of copper, nickel, chromium (total), and zinc.
[b] Components of TTO are identified in Table 32.
[c] Standard for silver only applies to facilities that electroplate precious metals.

b. Monitoring.

Conduct monitoring of categorical industrial discharges (including both sampling and analysis) quarterly for all parameters that are specified in Paragraph 5.5. dealing with industrial dischargers.

(1) Samples must be collected at the point of discharge before any mixing with the receiving water.

(2) Sampling for TTO may not be required if the commanding officer determines that no discharge of concentrated toxic organics into the wastewater has occurred and the facility has implemented a TTO management plan. Components of TTO are identified in Table 32.

5.6. PESTICIDES.

Installations that discharge pesticides directly to waters of the HN must follow the BMPs in Section 8 of Volume 4.

5.7. COOLING WATER INTAKE STRUCTURES.

Installations that have facilities designed to withdraw more than 7.57 million LPD [2 MGD] of water from waters of the HN, and that use at least 25 percent of the water they withdraw exclusively for cooling purposes, must minimize impingement and entrainment of aquatic species.

5.8. SEPTIC SYSTEMS.

Septic systems must be sited, constructed, and operated with the approval of appropriate DoD authorities. Installations must not discharge to a septic system any wastewater containing industrial pollutants in levels that will inhibit biological activity. Such discharges are prohibited. Known discharges of industrial pollutants to existing septic systems must be eliminated, and appropriate actions must be taken to eliminate contamination.

5.9. CESSPOOLS.

a. Large capacity cesspools (i.e., cesspools with a capacity to serve 20 or more people per day) are prohibited.

b. Small capacity cesspools must be managed consistent with the septic systems requirements of Paragraph 5.8.

5.10. SLUDGE DISPOSAL.

All sludge produced during the treatment of wastewater must be disposed of in accordance with the guidance for hazardous waste in Section 5 of Volume 5 or solid waste in Section 4 of Volume 5, as appropriate.

5.11. UNDERGROUND INJECTION WELLS.

Installations must not dispose of wastewater by underground injection. This does not preclude the disposal of sanitary wastewater in septic systems and small capacity cesspools that have been sited, constructed, and operated with the approval of appropriate DoD authorities.

5.12. STORMWATER MANAGEMENT.

Develop and implement SWPPPs for activities to include applicable requirements in Paragraphs 5.12.a. through 5.12.d. Update the SWPPP every 5 years, at a minimum.

a. Exposure to Precipitation.

Minimize exposure of manufacturing, processing, and material storage areas (including loading and unloading, storage, disposal, cleaning, maintenance, and fueling operations) to rain, snow, snowmelt, and runoff by either locating these industrial materials and activities inside or protecting them with storm-resistant coverings. To accomplish this:

(1) Use grading, berming, or curbing to prevent stormwater from adjacent sites from entering these areas and contain runoff of contaminated flows from these areas, unless infeasible.

(2) Locate materials, equipment, and activities so that potential leaks and spills are contained or able to be contained or diverted before discharge.

(3) Clean up spills and leaks promptly using dry methods (e.g., absorbents) to prevent the discharge of pollutants;

(4) Store leaky vehicles and equipment indoors, unless impractical. If stored outdoors, repair leaks, remove fluids, or use drip pans and absorbents.

(5) Use spill and overflow protection equipment.

(6) Perform all vehicle and equipment cleaning operations indoors, under cover, or in bermed areas that prevent runoff and run-on and that capture any overspray.

(7) Drain fluids from equipment and vehicles that will be decommissioned, are unserviceable, or will remain unused for extended periods of time.

b. Good Housekeeping Practices.

Implement good housekeeping practices to keep clean all exposed areas that are potential sources of pollutants. Such measures include, but are not limited to:

(1) Sweep or vacuum at regular intervals.

(2) Store materials in appropriate containers.

(3) Keep all dumpsters under cover or fit with a lid that must remain closed when not in use.

(4) Minimize the potential for waste, garbage, and floatable debris to be discharged to receiving waters by keeping exposed areas free of such materials or by intercepting them before they are discharged.

c. Illicit Storm Sewer Discharge Detection and Elimination.

Implement programs to detect and eliminate illicit discharges to storm sewer systems that discharge to waters of the HN. Such programs must include these elements:

(1) Creation of a storm sewer system map showing the location of all stormwater inlets, stormwater outfalls, and locations of all waters of the HN that receive discharges from those outfalls. These maps should include, as applicable:

(a) Direction of stormwater flow and slopes (before and after grading).

(b) Areas and timing of soil disturbance, areas that will not be disturbed, natural features to be preserved.

(c) Locations of BMPs identified in the SWPPP.

(d) Locations and timing of stabilization measures, locations of storage areas.

(e) Areas where stabilization has been accomplished.

(2) Installation-wide prohibition of non-stormwater discharges into the storm sewer system, to the extent practicable.

(3) A plan to detect and address non-stormwater discharges, including prohibited dumping, into the storm sewer system.

(4) Education of installation personnel, facilities, and tenant commands about the hazards associated with prohibited discharges and improper disposal of waste.

d. Construction and Development Activities.

Installations or activities that engage in construction and development activities, including constructing buildings and roadways and clearing land, must implement the following measures to control effluent in stormwater discharges:

(1) Control stormwater volume and velocity to minimize soil erosion in order to minimize pollutant discharges.

(2) Control stormwater discharges, including both peak flowrates and total stormwater volume, to minimize channel and streambank erosion and scour in the immediate vicinity of discharge points.

(3) Provide and maintain natural buffers around waters of the HN. Direct stormwater to vegetated areas and maximize stormwater infiltration through use of low-impact development practices (identified by UFC 3-210-10) to reduce pollutant discharges, unless infeasible.

(4) Minimize soil compaction. Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted.

(5) Preserve topsoil, unless impractical. Preserving topsoil is not required where the intended function of a specific area of the site dictates that the topsoil be disturbed or removed.

(6) Initialize soil stabilization whenever any clearing, grading, excavating, or other earth disturbing activities have permanently ceased on any portion of the site, or temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days. In arid, semi-arid, and drought-stricken areas where initiating vegetative stabilization measures immediately is infeasible, alternative stabilization measures must be employed as appropriate.

(7) Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, and other materials present on the site to precipitation and to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a discharge of pollutants, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use).

GLOSSARY

G.1. ACRONYMS.

ASD(S)	Assistant Secretary of Defense for Sustainment
BMP	best management practice
BOD_5	biochemical oxygen demand (5-day measure)
°C	degrees Celsius
$CBOD_5$	carbonaceous biochemical oxygen demand (5-day measure)
CJCS	Chairman of the Joint Chiefs of Staff
CPE	comprehensive performance evaluation
CT	See definition in Paragraph G.2.
CWS	community water system
DDBP	disinfectant/disinfection byproducts
DoDD	DoD directive
DoDI	DoD instruction
DWTS	domestic wastewater treatment system
E.O.	Executive order
°F	degrees Fahrenheit
FGS	final governing standard
GPD	gallons per day
GWUDI	groundwater under the direct influence
HAA5	haloacetic acids (five)
HN	host nation
L	liter
LEC	lead environmental component
LPD	liters per day
LRAA	locational running annual average
LRV	log removal value
MCL	maximum contaminant level
mg/L	milligram per liter
mg•min/L	milligrams x minute per liter
MGD	million gallons per day
mJ/cm^2	millijoules per square centimeter
mL	milliliter
mrem/year	millirem per year

MRDL	maximum residual disinfectant level
NCWS	non-community water system
NPWS	non-public water system
NTNCWS	non-transient, non-community water system
NTU	nephelometric turbidity unit
OEL	operational evaluation level
oocysts/L	oocysts per liter
pCi/L	picoCuries per liter
PCB	polychlorinated biphenyls
PWS	public water system
SOC	synthetic organic chemical
SWPPP	stormwater pollution prevention plan
TNCWS	transient, non-community water system
TOC	total organic carbon
TSS	total suspended solids
TTHM	total trihalomethanes
TTO	total toxic organics
UFC	United Facilities Criteria
USEUCOM	United States European Command
UV	Ultraviolet
VOC	volatile organic chemical

G.2. DEFINITIONS.

Unless otherwise noted, these terms and their definitions are for the purposes of this volume.

TERM	DEFINITION
4-day average	The arithmetic mean of pollutant parameter values for samples collected in a period of 4 consecutive days.
7-day average	The arithmetic mean of pollutant parameter values for samples collected in a period of 7 consecutive days.
30-day average	The arithmetic mean of pollutant parameter values for samples collected in a period of 30 consecutive days.

TERM	DEFINITION
action level	The concentration of a substance in water that establishes appropriate treatment for a water system.
applicable HN environmental standards	Defined in DoDI 4715.05.
appropriate DoD medical authority	The medical professional designated by the in-theater DoD Component commander to be responsible for resolving medical issues necessary to provide safe drinking water at the DoD Component's installations.
BMP	Mandatory schedule of activities, prohibition of practices, maintenance procedure, or other management practices to prevent or reduce the pollution of waters of the HN. BMPs also include mandatory treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.
BODs	The 5-day measure of the dissolved oxygen used by microorganisms in the biochemical oxidation of organic matter. The pollutant parameter is biochemical oxygen demand (i.e., biodegradable organics in terms of oxygen demand).
bottled water	Water that is intended for human consumption and that is sealed in bottles or other containers with no added ingredients except that it may optionally contain safe and suitable antimicrobial agents, and meets the requirements of Section 165.110 of Title 21, Code of Federal Regulations and applicable DoD sanitation standards.
CBODs	The 5-day measure of the pollutant parameter, CBOD, used as an alternative to BOD_5. Measures the dissolved oxygen consumed by microorganisms in the oxidation of organic matter in a body of water in which the contribution from nitrogenous bacteria has been suppressed.
cesspool	A drywell that receives untreated sanitary waste and sometimes has an open bottom or perforated sides.
consumer confidence report	An annual water quality report that a CWS is required to provide to its customers.

TERM	DEFINITION
cross connection	Any actual or potential connection between the public water supply and a source of contamination or pollution.
CT	The product of residual disinfectant concentration, C, in mg/L determined before or at the first customer and corresponding disinfectant contact time, T, in minutes and a dimensionless baffling factor that accounts for mixing effects. Baffling factors may be estimated, or obtained from Table 12, or from tracer surveys. CT values appear in Tables 13 through 29.
CWS	See the definition of "PWS."
daily discharge	The discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement (e.g., concentration), the daily discharge is calculated as the average measurement of the pollutant over the day.
diatomaceous earth filtration	A water treatment process of passing water through a precoat of diatomaceous earth deposited onto a support membrane while additional diatomaceous earth is continuously added to the feed water to maintain the permeability of the precoat, resulting in substantial particulate removal from the water.
direct discharge	Any discharge of pollutants other than an indirect discharge.
direct filtration	Water treatment, including chemical coagulation, possibly flocculation and filtration, but not sedimentation.
discharge of a pollutant	Any addition of any pollutant or combination of pollutants to waters of the HN from any point source.
disinfectant	Any oxidant, including, but not limited to, chlorine, chlorine dioxide, chloramines, and ozone, intended to kill or inactivate pathogenic microorganisms in water.
distribution system	A network of pipes leading from a treatment plant to customers.
DoD NPWS	An NPWS that provides water for human consumption to DoD installations. The maintenance and monitoring are the responsibility of DoD (e.g., a DoD-owned and -operated NPWS, a DoD-owned and contractor-operated NPWS, or a DoD-privatized NPWS).

TERM	DEFINITION
DoD PWS	A PWS that provides water for human consumption to DoD installations. The maintenance and monitoring are the responsibility of DoD (e.g., a DoD-owned and -operated PWS, a DoD-owned and contractor-operated PWS, or a DoD-privatized PWS).
dual sample set	A set of two samples collected at the same time and location, with one sample analyzed for TTHM and the other sample analyzed for a group of HAA5. Dual sample sets are collected for the purposes of determining compliance with the TTHM and HAA5 MCLs.
DWTS	Any DoD or HN facility designed to treat wastewater before its discharge to waters of the HN and where the majority of such wastewater is made up of domestic sewage.
effluent limitation	Any restriction imposed on quantities, discharge rates, and concentrations of pollutants that are ultimately discharged from point sources into waters of the HN.
enduring location	Defined in DoDI 4715.05.
entrainment	Any life stages of fish or shellfish in the intake water flow entering and passing through a cooling water intake structure and into a cooling water system, including the condenser or heat exchanger.
FGS	Defined in DoDI 4715.05.
first draw sample	A 1-liter sample of tap water that has been standing in plumbing at least 6 hours and is collected without flushing the tap.
GWUDI of surface water	Any water below the surface of the ground with significant occurrence of insects or other microorganisms, algae, or large diameter pathogens, such as *Giardia lamblia*; or significant and relatively rapid shifts in water characteristics, such as turbidity, temperature, conductivity, or pH, which closely correlate to climatological or surface water conditions.
HAA5	The sum of the concentrations in mg/L of the haloacetic acid compounds monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid.
human consumption	The act of drinking, bathing, showering, hand washing, teeth brushing, food preparation, dishwashing, and maintaining oral hygiene.

TERM	DEFINITION
illicit discharge	Any discharge to a storm sewer that is not composed entirely of stormwater. Unless identified as a source of contamination, the following discharges are not considered illicit: groundwater, irrigation water, discharges from potable water sources, diverted surface water flows, foundation drains, air conditioning condensation, water from crawl space pumps, individual residential car washing, dechlorinated swimming pool discharges, and street wash water.
impingement	The entrapment of any life stages of fish and shellfish on the outer part of an intake structure or against a screening device during periods of intake water withdrawal.
indirect discharge	An introduction of pollutants in process wastewater to a DWTS.
industrial wastewater treatment system	Any DoD facility other than a DWTS designed to treat process wastewater before its discharge to waters of the HN.
industry standards and practices	Applicable or recognized standards and practices relevant to the design, construction, installation, operation and maintenance, inspection, and repair of facilities and equipment.
installation	Defined in DoDI 4715.05.
interference	Any addition of any pollutant or combination of pollutant discharges that inhibits or disrupts the DWTS, its treatment processes or operations, or its sludge-handling processes, use, or disposal.
international agreement	Defined in DoDI 4715.05.
lead-free	Containing a maximum lead content of 0.2 percent for solder and flux, and a weighted average of not more than 0.25 percent lead when used with respect to wetted surface material.
lead service line	A service line made of lead that connects the water main to the building inlet, and any lead pigtail, gooseneck, or other fitting that is connected to such line.
log	The percentage of microorganisms removed or inactivated by a drinking water treatment process (e.g., a 1.0-log reduction relates to a 90-percent reduction, a 2.0-log reduction relates to a 99-percent reduction, a 3.0-log reduction relates to a 99.9-percent reduction).

TERM	DEFINITION
LRAA	The average of sample analytical results for samples taken at a particular monitoring location during the previous 4 calendar quarters.
maximum daily discharge limit	The highest allowable daily discharge based on volume as well as concentration.
MCL	The maximum permissible level of a contaminant in water that is delivered to the free-flowing outlet of the ultimate user of a PWS except for turbidity for which the maximum permissible level is measured after filtration. Contaminants added to the water under circumstances controlled by the user, except those resulting from the corrosion of piping and plumbing caused by water quality, are excluded.
secondary MCL	An MCL used to control contaminants in drinking water that primarily affect the aesthetic qualities relating to the public acceptance of drinking water. At higher concentrations of these contaminants, health implications may exist in addition to aesthetic degradation.
MRDL	The level of a disinfectant added for water treatment measured at the consumer's tap, which may not be exceeded without the possibility of adverse health effects.
NCWS	See the definition of "PWS."
NPWS	A water system that does not meet the definition of a PWS and provides water for human consumption (e.g., a water system consisting of a well and disinfection treatment serving a single building at an infrequently used training range).
NTNCWS	See the definition of "PWS."
OEL	A coliform limit that, if exceeded, requires the water system to evaluate its operation, maintenance, design, sampling, and monitoring, as applicable, to identify sanitary defects that must be corrected.
point-of-entry treatment device	A treatment device applied to the drinking water entering a facility to reduce contaminants in drinking water throughout the facility.

TERM	DEFINITION
point-of-use treatment device	A treatment device applied to a tap to reduce contaminants in drinking water at that tap.
point source	Any discernible, confined, and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, or rolling stock. Does not include vessels, aircraft, or any conveyance that merely collects natural surface flows of precipitation.
pollutant	Includes, but is not limited to: dredged soil; solid waste; incinerator residue; filter backwash; sewage; garbage; sewage sludge; munitions; chemical waste; biological material; radioactive material; heat; wrecked or discarded equipment; rock; sand; cellar dirt; and industrial, municipal, and agricultural waste discharged into water.
process wastewater	Any water that, during manufacturing or processing, comes into direct contact with, or results from the production or use of, any raw material, intermediate product, finished product, by-product, or waste product.
PWS	A system for providing piped water to the public for human consumption, if the system has at least 15 service connections or regularly serves a daily average of at least 25 individuals at least 60 days of the year. This includes any collection, treatment, storage, and distribution facilities under control of the operator of these systems, and any collection or pretreatment storage facilities not under such control that are used primarily in connection with these systems. A PWS is either a CWS or an NCWS: CWS: A PWS that has at least 15 service connections used by year-round residents, or that regularly serves at least 25 year-round residents. NCWS: A PWS that is not a CWS. An NCWS is either a TNCWS or an NTNCWS. NTNCWS: A PWS that is not a CWS and that regularly serves at least 25 of the same persons over 6 months per year. Examples include schools, factories, office buildings, and hospitals that have their own water systems. TNCW: A PWS that provides water to at least 25 persons, but not the same 25 persons, at least 6 months per year. Examples include, but are not limited to, gas stations, motels, and seasonal campgrounds that have their own water sources.

TERM	DEFINITION
regulated facilities	Those facilities with criteria established in Section 5, such as DWTS, industrial wastewater treatment systems, or industrial discharges.
sanitary survey	An on-site review of the water source, facilities, equipment, operation, and maintenance of a PWS to evaluate the adequacy of these elements for producing and distributing water for human consumption.
slow sand filtration	Water treatment process where raw water passes through a bed of sand at a low velocity (1.2 feet per hour) resulting in particulate removal by physical and biological mechanisms.
standards	Substantive elements of U.S. laws and federal regulations applicable to DoD installations, facilities, and actions in the United States or that have extraterritorial application.
stormwater	Runoff and drainage from wet weather events such as rain, snow, ice, sleet, and hail.
surface water	In the context of drinking water standards in Section 4, water that is open to the atmosphere and subject to surface runoff. Seawater is not surface water, provided that seawater intakes for a desalination plant are located such that intakes are not influenced by surface water runoff or point source discharges.
TNCWS	See the definition of "PWS."
TSS	The pollutant parameter total filterable suspended solids.
TTHM	The sum of the concentration in mg/L of chloroform, bromoform, dibromochloromethane, and bromodichloromethane.
TTO	The summation of all quantifiable values greater than 0.01 mg/L for the toxic organics in Table 32.
underground injection	A subsurface emplacement through a bored, drilled, driven, or dug well where the depth is greater than the largest surface dimension, whenever the principal function of the well is emplacement of any fluid.
United States	Defined in DoDI 4715.05.

TERM	DEFINITION
vulnerability assessment	The process the commander uses to determine the susceptibility to attack from the full range of threats to the security of personnel, family members, and facilities, which provides a basis for determining antiterrorism measures that can protect personnel and assets from terrorist attacks.
waters of the HN	Surface water including the territorial seas recognized under customary international law, including: All waters that are currently used, were used in the past, or may be susceptible to use in commerce. Waters that are or could be used for recreation or other purposes. Waters where fish or shellfish are or could be taken and sold. Waters that are used or could be used for industrial purposes by industries. Waters including lakes, rivers, streams (including intermittent streams), sloughs, prairie potholes, or natural ponds. Tributaries of waters identified in this definition. Exclusions to waters of the HN are domestic or industrial waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of Section 5. This exclusion applies to only manmade bodies of water that were neither originally waters of the HN nor resulted from impoundment of waters of the HN.

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