SCOPE & DEFINITIONS

This chapter contains criteria for providing potable water.

Action Level – The concentration of a substance in water that establishes appropriate treatment for a water system.

Appropriate DoD Medical Authority – The medical professional designated by the in-theater component commander to be responsible for resolving medical issues necessary to provide safe drinking water at the component's installations.

Community Water System (CWS) – A public water system having at least 15 service connections used by year-round residents, or which regularly serves at least 25 year-round residents.

Concentration/Time (CT) – The product of residual disinfectant concentration, C, in mg/L determined before or at the first customer, and the corresponding disinfectant contact time, T, in minutes. CT values appear in Tables 3.11 through 3.24.

Conventional Treatment – Water treatment including chemical coagulation, flocculation, sedimentation, and filtration.

Diatomaceous Earth Filtration – A water treatment process of passing water through a precoat of diatomaceous earth deposited on 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 Filtration – Water treatment including chemical coagulation, possibly flocculation, and filtration, but not sedimentation.

Directorate of Technical Works – An agency within the Town Planning Authority. The directorate is the responsible (competent) authority for permitting of groundwater supply wells.

Disinfectant – Any oxidant (including, but not limited to, chlorine, chlorine dioxide, chloramines, and ozone) intended to kill or inactivate pathogenic microorganisms in water.

DoD-Produced Water – Any water used for drinking water where the raw water is extracted by DoD. If DoD blends raw water with purchased water, the drinking water is considered DoD-produced water. Any drinking water that does not meet the definition of purchased water must be considered DoD-produced water.

DoD Water System – A public water system or non-public water system.

Emergency Assessment – An evaluation of the susceptibility of the water source, treatment, storage, and distribution system(s) to disruption of service from natural disasters, accidents, and sabotage.

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.

Groundwater Under the Direct Influence of Surface Water (GWUDISW) – 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.

Lead-Free – A maximum lead content of 0.2% for solder and flux, and 8.0% for pipes and fittings.

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.

Local Health Authority – The local public health and sanitation authority in the Prefectures.

Local National – An employee hired under Greek employment conditions.

Maximum Contaminant Level (MCL) – The maximum permissible level of a contaminant in water that is delivered to the free-flowing outlet of the ultimate user of a public water system 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.

Non-Public Water System (NPWS) – A system that does not meet the definition of a public water system (for example, a well serving a building with less than 25 people).

Non-Transient, Non-Community (NTNC) Water System – A public water system that is not a community water system and that regularly serves at least 25 of the same persons over 6 months per year. A NTNC system could be a school or factory with its own water supply where the same people drink the water throughout the year, but not 24-hours a day.

Point-of-Entry (POE) Treatment Device – A treatment device applied to the drinking water entering a facility to reduce contaminants in drinking water throughout the facility.

Point-of-Use (POU) Treatment Device – A treatment device applied to a tap to reduce contaminants in drinking water at that tap.

Potable Water – Water that has been examined and treated to meet the standards in this chapter, and has been approved as potable by the appropriate DoD medical authority.

Public Water System (PWS) – A system for providing piped water to the public for human consumption, if such system has at least 15 service connections or regularly serves at least 25 year round residents. This term includes both "community water systems" which serve year-round residents and "non-community systems" along with any collection, treatment, storage, and distribution facilities under control of the operator of such systems, and any collection or pretreatment storage facilities not under such control that are used primarily in connection with such systems. A non-community system is used by intermittent users or travelers and is sub-classified into a non-transient, non-community or NTNC system and a transient, non-community or TNC system.

Purchased Water – Any drinking water acquired from an entity authorized by the competent local authorities to produce and distribute drinking water. Note: All facilities (including leased facilities) should ensure that their water supplier is authorized by the competent local authorities.

Sanitary Survey – An on-site review of the water source, facilities, equipment, operation, and maintenance of a public water system to evaluate the adequacy of such elements for producing and distributing potable water.

Slow Sand Filtration – Water treatment process where raw water passes through a bed of sand at a low velocity (1.2 ft/hr), resulting in particulate removal by physical and biological mechanisms.

Transient Non-Community (TNC) Water System – A non-community water system that does not regularly serve at least 25 of the same persons over 6 months per year. A TNC system example is a motel with its own well.

Total Trihalomethanes – The sum of the concentration in mg/L of chloroform, bromoform, dibromochloromethane, and bromodichloromethane.

Underground Injection – A subsurface emplacement through a bored, drilled, driven, or dug well where the depth is greater than the largest surface dimension, whenever a principle function of the well is the emplacement of any fluid.

Vulnerability Assessment – An evaluation by DoD which shows that contaminants of concern either have not been used in a watershed area or the source of water for the system is not susceptible to contamination. Susceptibility is based on prior occurrence, vulnerability assessment results, environmental persistence and transport of the contaminants, and any wellhead protection program results.

CRITERIA

C3.1 REQUIREMENTS

DoD installations that intend to withdraw and distribute DoD-produced drinking water from on-base water supply wells must submit a permit request to the Greek Representative, who may transmit the permit request to the regional Directorate of Technical Works (see Chapter 1 for the process).

DoD water systems, regardless of whether they produce or purchase water, will:

C3.1.1 Maintain a map/drawing of the complete potable water system.

C3.1.2 Update the potable water system master plan at least every 5 years.

C3.1.3 Protect all water supply aquifers (groundwater) and surface water sources from contamination by suitable placement and construction of wells, by suitable placing of the new intake (heading) to all water treatment facilities, by siting and maintenance of septic systems and on-site treatment units, and by appropriate land use management on DoD installations.

C3.1.4 Conduct sanitary surveys of the water system at least every 3 years for systems using surface water, and every 5 years for systems using groundwater, or as warranted, including review of required water quality analyses. Off-installation surveys will be coordinated with Greek authorities.

C3.1.5 Provide proper treatment for all water sources. Surface water supplies, including GWUDISW, must conform to the surface water treatment requirements set forth in Table 3.1. All surface water must be filtered and disinfected, at a minimum, before distribution. Groundwater supplies, at a minimum, must be disinfected.

C3.1.6 Maintain a continuous positive pressure of at least 20 psi in the water distribution system.

C3.1.7 Perform water distribution system operation and maintenance practices consisting of:

C3.1.7.1 Maintenance of a disinfectant residual throughout the water distribution system with a minimum concentration of 0.2 mg/L at the most remote point in the distribution system (except where determined unnecessary by the appropriate DoD medical authority)

C3.1.7.2 Proper procedures for repair and replacement of mains (including disinfection and bacteriological testing)

C3.1.7.3 An effective annual water main flushing program

C3.1.7.4 Proper operation and maintenance of storage tanks and reservoirs

C3.1.7.5 Maintenance of distribution system appurtenances (including hydrants and valves)

C3.1.8 Establish an effective cross connection control and backflow prevention program.

C3.1.9 Underground injection is rigorously controlled in Greece and requires a permit. DoD installations that intend to conduct underground injection must contact the Environmental Executive Agent (via the Component chain of command) for the Greek permitting procedure and minimum compliance requirements.

C3.1.10 Develop and update as necessary an emergency contingency plan to ensure the provision of potable water despite interruptions from natural disasters and service interruptions. At a minimum, the plan will include:

- Identification of key personnel
- Procedures to restore service
- Procedures to isolate damaged lines
- Identification of alternative water supplies
- Installation public notification procedures
- Emergency assessment

C3.1.11 Use only lead-free pipe, solder, flux, and fittings in the installation or repair of water systems and plumbing systems for drinking water. Provide installation public notification 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, and remedial actions which may be taken.

C3.1.12 Maintain records showing monthly operating reports for at least 3 years, and records of bacteriological results for not less than 5 years, and chemical results for not less than 10 years. The records should include an operational logbook with the following information:

- Location, date, and time of sampling
- Analytical results
- Observations about the system operation
- Potential health hazards and the corrective measures taken to address the hazard

C3.1.13 Document corrective actions taken to correct breaches of criteria and maintain such records for at least 3 years. Cross connection and backflow prevention testing and repair records should be kept for at least 10 years.

C3.1.14 Conduct vulnerability assessments.

C3.2 TESTING REQUIREMENTS

DoD water systems, regardless of whether they produce or purchase water, will, by independent testing or by validated supplier testing, ensure conformance with the following criteria. The testing methods utilized must be in conformance with DoD-approved test methods (Tables 3.26 to 3.28). Alternatively, the appropriate DoD medical authority may approve the use of Greek test methods (Table 3.25) or methods approved by the Local Health Authority. The method detection limit of the method utilized must be lower than the MCL.

C3.2.1 TOTAL COLIFORM BACTERIA REQUIREMENTS

C3.2.1.1 An installation responsible for a PWS will conduct a bacteriological monitoring program to ensure the safety of water provided for human consumption and allow evaluation with the total coliform-related MCL. The MCL is based only on the presence or absence of total coliforms. The MCL is no more than 5% positive samples per month for a system examining 40 or more samples a month, and no more than one positive sample per month when a system analyzes less than 40 samples per month. Further, the MCL is exceeded whenever a routine sample is positive for fecal coliforms or E. Coli or any repeat sample is positive for total coliforms.

C3.2.1.2 Each system must develop a written, site-specific monitoring plan and collect routine samples according to Table 3.2 (Total Coliform Monitoring Frequency).

C3.2.1.3 Systems with initial samples testing positive for total coliforms will collect repeat samples as soon as possible, preferably the same day. Repeat sample locations are required at the same tap as the original sample plus an upstream and a downstream sample, each within five service connections of the original tap. Any additional repeat sampling that may be required will be performed according to the appropriate DoD medical authority. Monitoring will continue until total coliforms are no longer detected.

C3.2.1.4 When any routine or repeat sample tests positive for total coliforms, it will be tested for fecal coliform or E. Coli. Fecal-type testing can be foregone on a total coliform positive sample if fecal or E. Coli is assumed to be present.

C3.2.1.5 If a system has exceeded the MCL for total coliforms, the installation will complete the notification in C3.3 to:

- 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.

- The installation public as soon as possible, but not later than 72 hours after the system is notified of the test result that an acute risk to public health may exist.

C3.2.2 INORGANIC CHEMICAL REQUIREMENTS

C3.2.2.1 For purchased water: An installation responsible for a PWS will ensure that the water distributed does not exceed applicable limitations set out in Table 3.3-a (Inorganic Chemical MCLs for Purchased Water). For DoD-produced water: An installation responsible for any potable water supply system will ensure that the water distributed does not exceed applicable limitations set out in Table 3.3-b (Inorganic Chemical MCLs for DoD-Produced Water).

For purchased or DoD-produced water: Except for nitrate, nitrite, and total nitrate/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. For systems monitored annually or less frequently, a system is out of compliance if a single sample exceeds the MCL. For nitrate, nitrite, and total nitrate/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.

C3.2.2.2 Systems will be monitored for inorganic chemicals at the frequency set in Table 3.4-a (Inorganics Monitoring Requirements) unless a more frequent requirement is set by the Local Health Authority in a permit for a DoD-controlled drinking water production well or set by an appropriate DoD medical authority.

In addition to the requirements for purchased water in C3.2.2.1 and C3.2.2.2 (above paragraph), if the purchased water is re-treated, the MCL and testing frequencies for DoD-produced water must be met for any parameters that may be affected by the treatment, as determined by an appropriate DoD medical authority.

C3.2.2.3 If a system is out of compliance, the installation will complete the notification in C3.3 as soon as possible. If the nitrate, nitrite, or total nitrate/nitrite MCLs are exceeded, then this is considered an acute health risk and the installation will complete the notification to:

- 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.
- The installation public as soon as possible, but not later than 72 hours after the system 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 will immediately increase monitoring in accordance with Table 3.4 (Inorganics

Monitoring Requirements) until authorities determine the system is reliable and consistent and remedial actions completed.

C3.2.3 FLUORIDE REQUIREMENTS

C3.2.3.1 An installation commander responsible for a PWS will ensure that the fluoride content of drinking water does not exceed the MCL of 1.2 mg/L stated in Tables 3.3-a and 3.3-b (Inorganic Chemical MCLs).

C3.2.3.2 Systems will be monitored for fluoride by collecting one treated water sample at the entry point to the distribution system annually for surface water systems and one every 3 years for groundwater systems. Daily monitoring is recommended for systems practicing fluoridation using the criteria in Table 3.5 (Recommended Fluoride Concentrations at Different Temperatures).

C3.2.3.3 If any sample exceeds the MCL, the installation will complete the notification in C3.3 as soon as possible, but in no case later than 14 days after the violation.

C3.2.4 LEAD & COPPER REQUIREMENTS

C3.2.4.1 DoD CWS and NTNC water systems will comply with action levels (distinguished from the MCL) of 0.015 mg/L for lead and 1.3 mg/L for copper to determine if corrosion control treatment, public education, and removal of lead service lines (if appropriate) are required. Actions are triggered if the respective lead and copper levels are exceeded in more than 10% of all sampled taps.

C3.2.4.2 Affected DoD systems will conduct monitoring in accordance with Table 3.6 (Monitoring Requirements for Lead and Copper Water Quality Parameters). High risk sampling sites will be targeted by conducting a materials evaluation of the distribution system. Sampling sites will be selected as stated in Table 3.6.

C3.2.4.3 If an action level is exceeded, the installation will collect the additional water quality samples specified in Table 3.6. Optimal corrosion control treatment will be pursued. If action levels are exceeded after implementation of applicable corrosion control and source water treatment, lead service lines will be replaced if the lead service lines cause the lead action level to be exceeded. The installation commander will implement an education program for installation personnel (including U.S. and Local National) within 60 days and will complete the notification in C3.3 as soon as possible, but in no case later than 14 days after the violation.

C3.2.5 SYNTHETIC ORGANIC REQUIREMENTS

C3.2.5.1 An installation responsible for CWS and NTNC will ensure that synthetic organic chemicals in water distributed do not exceed the limitations delineated in Table 3.7-a

(Synthetic Organic Chemical MCLs for Purchased Water) or Table 3.7-b (Synthetic Organic Chemical MCLs for DoD-Produced Water). For systems monitored quarterly or more frequently, a system is out of compliance if the annual running average concentration of an organic chemical exceeds the MCL. For systems monitored annually or less frequently, a system is out of compliance if a single sample exceeds the MCL.

C3.2.5.2 Systems will be monitored for synthetic organic chemicals according to the schedule stated in Table 3.8-a (Synthetic Organic Chemical Monitoring Requirements) unless a more frequent requirement is set by the Local Health Authority in an permit for a DoD-controlled drinking water production well or set by an appropriate DoD medical authority.

In addition to the requirements for purchased water in C3.2.5.1 and C3.2.5.2 (above paragraph), if the purchased water is treated, the MCL and testing frequencies for DoD-produced water must be met for any parameters that may be affected by the treatment, as determined by an appropriate DoD medical authority.

C3.2.5.3 If a system is out of compliance, complete the notification in C3.3 as soon as possible, but in no case later than 14 days after the violation. The installation immediately will begin quarterly monitoring and will increase quarterly monitoring if the level of any contaminant is at its detection limit but less than its MCL as noted in Table 3.8, and will continue until the installation commander determines the system is back in compliance and any necessary remedial measures are implemented.

C3.2.6 TOTAL TRIHALOMETHANES REQUIREMENTS

C3.2.6.1 An installation responsible for a CWS or NTNC system that adds a disinfectant (oxidant, such as chlorine, chlorine dioxide, chloramines, or ozone) to any part of its treatment process (to include the addition of disinfectant by a local water supplier) will ensure that the MCL of 0.10 mg/L for total trihalomethanes is met in drinking water.

C3.2.6.2 Such systems that add a disinfectant will monitor total trihalomethanes in accordance with Table 3.9 (Total Trihalomethane Monitoring Requirements).

C3.2.6.3 If a system is out of compliance, the installation will complete the notification in C3.3 as soon as possible, but in no case later than 14 days after the violation, and undertake remedial measures.

C3.2.7 RADIONUCLIDE REQUIREMENTS

C3.2.7.1 An installation responsible for CWS and NTNC systems will test the system for conformance with the applicable radionuclide limits contained in Table 3.10 (Radionuclide MCLs & Monitoring Requirements).

C3.2.7.2 Systems will perform radionuclide monitoring as stated in Table 3.10.

C3.2.7.3 If the average annual MCL for gross alpha activity, total radium (or gross beta in systems serving over 100,000) is exceeded, the installation will complete the notification according to the procedures in C3.3 within 14 days. Monitoring will continue until remedial actions are completed and the average annual concentration no longer exceeds the respective MCL. Continued monitoring for gross alpha-related contamination will occur quarterly, while gross beta-related monitoring will be monthly. If any gross beta MCL is exceeded, the major radioactive components will be identified.

C3.2.8 SURFACE WATER TREATMENT REQUIREMENTS

DoD water systems employing surface water sources or GWUDISW will meet the surface water treatment requirements delineated in Table 3.1.

C3.2.9 TURBIDITY REQUIREMENTS

For purchased water: DoD PWS filtered waters will be tested at least once every 4 hours. If the turbidity readings in Table 3.1-a are exceeded, the installation will complete the notification in C3.3 as soon as possible, but in no case later than 14 days after the violation and undertake remedial action.

For DoD-produced water: DoD PWS filtered waters will be tested at least once every 4 hours. If the turbidity readings in Table 3.1-a are exceeded, the installation will complete the notification in C3.3 as soon as possible, but in no case later than 14 days after the violation and undertake remedial action. DoD NPWS will be tested in accordance with the Normal Monitoring routine (see Table 3.4-b).

C3.2.10 NON-PUBLIC WATER SYSTEMS

For purchased water: DoD NPWSs will be monitored at a minimum for total coliforms and disinfectant residuals periodically.

For DoD-produced water: DoD NPWSs will comply with the same requirements as PWS, except when explicitly excluded in the above criteria.

C3.2.11 ALTERNATIVE WATER SYSTEMS

DoD installations will, if necessary, only utilize alternative water sources including POE/POU treatment devices and bottled water supplies that are approved by the installation commander.

C3.3 NOTIFICATION REQUIREMENTS

When a DoD water system is out of compliance as set forth in the preceding criteria, the appropriate DoD medical authority and installation personnel (U.S. and Greek) will be notified immediately. The notice will provide a clear and readily understandable explanation of the violation, any potential adverse health effects, the population at risk, the steps that the system is taking to correct the violation, the necessity for seeking alternative water supply (if any), and any preventive measures the consumer should take until the violation is corrected. The appropriate DoD medical authority will coordinate notification of Greek authorities in cases where off-installation populations are at risk.

C3.4 SYSTEM OPERATOR REQUIREMENTS

DoD installations will ensure that personnel are appropriately trained to operate DoD water systems.

ADMINISTRATIVE ITEMS

1. DoD installations that intend to withdraw and distribute DoD-produced drinking water from on-base water supply wells must submit a permit request to the Greek Representative, who may transmit the permit request to the regional Directorate of Technical Works (see Chapter 1 for the process).

Table 3.1 – Surface Water Treatment Requirements

1. Unfiltered Systems
   a. Systems which use unfiltered groundwater sources under the direct influence of surface water will analyze the raw water for total coliforms or fecal coliforms at least weekly and for turbidity at least daily for a minimum of 1 year. If the total coliforms and/or fecal coliforms exceed 100/100 mL and 20/100 mL, respectively, appropriate filtration must be applied. Appropriate filtration must also be applied if turbidity exceeds 1 Nephelometric Turbidity Unit (NTU).
   b. Disinfection must achieve at least 99.9% (3-log) inactivation of *Giardia lamblia* cysts and 99.99% (4-log) inactivation of viruses by meeting applicable CT values, as shown in Tables 3.11 through 3.24.
   c. Disinfection systems must have redundant components to ensure uninterrupted disinfection during operational periods.
   d. Disinfectant residual monitoring immediately after disinfection is required once every 4 hours that the system is in operation. Disinfectant residual measurements in the distribution system will be made weekly.
   e. Disinfectant residual of water at the most remote point of the distribution network must be maintained at a minimum of 0.2 mg/L.
   f. 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.
   g. If disinfectant residuals in the distribution system are undetected in more than 5% of monthly samples for two consecutive months, appropriate filtration must be implemented.
2. Filtered Systems
   a. Filtered water systems will provide a combination of disinfection and filtration that achieves a total of 99.9% (3-log) removal of *Giardia lamblia* cysts and 99.99% (4-log) removal of viruses.
   b. The turbidity of filtered water will be monitored at least once every 4 hours. The turbidity of filtered water will not exceed 0.5 NTU (1 NTU for slow sand and diatomaceous earth filters) in 95% of the analyses in a month, with a maximum of 5 NTU.
   c. Disinfection must provide the remaining log-removal of *Giardia lamblia* cysts and viruses not obtained by the filtration technology applied.*
   d. Disinfection residual maintenance and monitoring requirements are the same as those for unfiltered systems.

*Proper conventional treatment typically removes 2.5 log Giardia/ 2.0 log viruses. Proper direct filtration and diatomaceous earth filtration remove 2.0 log Giardia/ 1.0 log viruses. Slow sand filtration removes typically removes 2.0 log Giardia/ 2.0 log viruses. Less log-removal may be assumed if treatment is not properly applied.

Table 3.2 – Total Coliform Monitoring Frequency

Population Served	Number of Samples [1]	Population Served	Number of Samples [1]
25 to 1,000 [2]	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	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

Notes:

1. Minimum number of Routine Samples per month
2. A non-community water system using groundwater and serving 1,000 or less people 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 is free of sanitary defects.

Note: Systems serving < 4,900 people that use groundwater 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.

Table 3.3-a – Inorganic Chemical MCLs for Purchased Water

Parameter	MCL	Units
Arsenic (CWS only)	0.05	mg/L
Antimony [1]	0.006	mg/L
Asbestos [1]	7 million	fibers/L (longer than 10 um)
Barium	2.0	mg/L
Beryllium [1]	0.004	mg/L
Cadmium [1]	0.005	mg/L
Chromium [1]	0.1	mg/L
Cyanide [1]	0.2	mg/L (as free cyanide)
Fluoride [2]	1.2	mg/L
Mercury [1]	0.002	mg/L
Nickel [1]	0.1	mg/L
Nitrate [3]	10	mg/L (as N)
Nitrite [3]	1	mg/L (as N)
Total Nitrite and Nitrate [3]	10	mg/L (as N)
Selenium [1]	0.05	mg/L
Sodium [4]	---	---
Thallium	0.002	mg/L

Notes:

1. MCLs apply to CWS and NTNC systems.
2. Fluoride also has a secondary MCL at 2.0 mg/L. MCL applies only to CWS.
3. MCLs apply to CWS, NTNC, and TNC systems.
4. No MCL established. Monitoring is required so concentration levels can be made available on request. Sodium levels shall be reported to the DoD medical authority upon receipt of analysis.

Table 3.3-b – Inorganic Chemical MCLs for DoD-Produced Water

Parameter	MCL	Units
Organoleptic Parameters		
Color	20	mg/L Pt/Co
Odor	2 at 12°C 3 at 25°C	mg/L
Taste	2 at 12°C 3 at 25°C	mg/L
Physical-Chemical Parameters		
Alkalinity	Water must not be aggressive	
Aluminum	0.2	mg/L (as Al)
Ammonium	0.5	mg/L (as NH_4)
Asbestos [1]	7 million	fibers/L (longer than 10 um)
Barium	2.0	mg/L (as Ba)
Beryllium [1]	0.004	mg/L (as Be)
Chlorides	200	mg/L (as Cl)
Dry residues	1,500	mg/L (at 180°C)
Fluoride	1.2	mg/L (as F)
Free carbon dioxide	Water must not be aggressive	
Hydrogen ion concentration	6.0 – 9.5	(as pH)
Hydrogen sulfide	Undetectable organoleptically	(as H_2S)
Iron	0.2	mg/L (as Fe)
Magnesium	50	mg/L (as Mg)
Manganese	0.05	mg/L (Mn)
Nitrate	10	mg/L (as N)
Nitrite	0.1	mg/L (as N)
Total Nitrite and Nitrate	10	mg/L (as N)
Kjeldahl nitrogen	1.0	mg/L (excluded N of NO_2 and NO_3)
Oxidizability	5	mg/L (as O_2)
Phosphorus	5	mg/L (as P_2O_5)
Potassium	12	mg/L (as K)
Silver	0.01	mg/L (as Ag)
Sodium	150	mg/L (as Na)
Sulfates	250	mg/L (as SO_4)
Surfactants	0.2	mg/L
Temperature	25°C	°C
Total hardness	60	mg/L (minimum for softened water) (as Ca)
Toxic Substances		
Antimony	0.006	mg/L (as Sb)
Arsenic	0.05	mg/L (as As)
Cadmium	0.005	mg/L (as Cd)
Chromium	0.05	mg/L (as Cr)
Cyanide	0.05	mg/L (as total Cn)
Mercury	0.001	mg/L (as Hg)
Nickel	0.05	mg/L (as Ni)
Selenium	0.01	mg/L (as Se)
Thallium	0.002	mg/L (as Tl)

Notes:

1. MCLs apply to CWS and NTNC systems.

Table 3.4-a – Inorganics Monitoring Requirements

Parameter	Monitoring for Purchased Water				Monitoring for DoD-Produced Water
	Groundwater	Surface Water	Trigger That Increases Monitoring[1]	Reduced Monitoring	
Organoleptic Parameters					
Color	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Odor	No requirement	No requirement	NA		Minimum [9]
Taste	No requirement	No requirement	NA		Minimum [9]
Physico-Chemical Parameters					
Alkalinity	Once	Once	NA	NA	Periodic / Occasional [4]
Aluminum (Al)	No requirement	No requirement	NA	NA	Occasional [4]
Ammonium (NH_4)	No requirement	No requirement	NA	NA	Normal [9]
Asbestos	1 sample / 9 yrs	1 sample / 9 yrs	>MCL	Yes [2]	Same as purchased water
Barium (Ba)	1 sample / 3 yrs	Annual	> MCL	- - -	Same as purchased water [10]
Beryllium (Be)	1 sample / 3 yrs	Annual	> MCL	- - -	Same as purchased water
Boron (B) [11]	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Calcium (Ca) [11]	Once [3]	Once [3]	NA	NA	Periodic / Occasional [4]
Chlorides	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Conductivity [11]	No requirement	No requirement	NA	NA	Minimum [9]
Dissolved oxygen [11]	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Dry residues	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Fluoride	1 sample / 3 yrs	Annual	>MCL	- - -	Same as purchased water [10]
Free carbon dioxide	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Hydrogen ion concentration	Once [3]	Once [3]	NA	NA	Normal [9]
Hydrogen sulfide	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Iron (Fe)	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Magnesium (Mg)	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Manganese (Mn)	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Nitrates (as N)	Annual [5]	Quarterly [5]	>50% of MCL [6]	Yes [7]	Normal [9]
Nitrites (as N)	Annual [5]	Quarterly [5]	>50% of MCL [6]	Yes [8]	Normal [9]
Total Nitrite and Nitrate (as N)	Annual	Quarterly	> 50% of Nitrite MCL	- - -	Same as purchased water
Kjeldahl Nitrogen (not NO_2 + NO_3)	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Oxidizability	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Phosphorus (P_20_3)	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Potassium (K)	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Residual chlorine	No requirement	No requirement	NA	NA	Minimum [9]
Silver (Ag)	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Sodium (Na)	1 sample / 3 yrs	Annual	- - -	- - -	Same as purchased water [10]
Substances extractable with chloroform [11]	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Sulfates	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Surfactants	No requirement	No requirement	NA	NA	Periodic / Occasional [4]

Parameter	Monitoring for Purchased Water				Monitoring for DoD-Produced Water
	Groundwater	Surface Water	Trigger That Increases Monitoring[1]	Reduced Monitoring	
Temperature	Once [3]	Once [3]	NA	NA	Normal [9]
Total hardness	No requirement	No requirement	NA	NA	Periodic / Occasional [4]
Toxic Substances					
Antimony (Sb)	1 sample / 3 yrs	Annual	>MCL	- - -	Same as purchased water [10]
Arsenic (As)	1 sample / 3 yrs	Annual	>MCL	- - -	Same as purchased water [10]
Cadmium (Cd)	1 sample / 3 yrs	Annual	> MCL	- - -	Same as purchased water [10]
Chromium (Cr)	1 sample / 3 yrs	Annual	> MCL	- - -	Same as purchased water [10]
Cyanides (Cn)	1 sample / 3 yrs	Annual	> MCL	- - -	Same as purchased water [10]
Mercury (Hg)	1 sample / 3 yrs	Annual	> MCL	- - -	Same as purchased water [10]
Nickel (Ni)	1 sample / 3 yrs	Annual	> MCL	- - -	Same as purchased water [10]
Selenium (Se)	1 sample / 3 yrs	Annual	> MCL	- - -	Same as purchased water [10]
Thallium	1 sample / 3 yrs	Annual	> MCL	- - -	Same as purchased water

Notes:

1. Increased quarterly monitoring requires a minimum of 2 samples/quarter for groundwater systems and at least 4 samples/quarter for surface water systems.
2. Necessity for analysis is predicated upon a vulnerability assessment by the PWS.
3. PWSs shall be analyzed within 1 year of the effective date of this FGS to determine the corrosivity entering the distribution system. Two samples (one mid-winter and one mid-summer) will be collected at the entry point of the distribution system for systems using surface water and GWUDISW. One sample will be collected for systems using only groundwater. Corrosivity characteristics of the water shall include measurements of pH, calcium, hardness, alkalinity, temperature, total dissolved solids, and calculation of the Langelier Index.
4. The Local Health Authority will evaluate the site-specific conditions and will determine whether the parameter should be included in either the periodic or occasional sampling frequency.
5. Any sampling point with an analytical value greater than or equal to 0.5 mg/L as N (50% of the nitrite MCL) must begin sampling for nitrate and nitrite separately. Since nitrite easily converts to nitrate, a system can conclude that if the total nitrate/nitrite value of a sample is less than half of the nitrite MCL, then the value of nitrite in the sample would also be below half of its MCL.
6. Increased quarterly monitoring shall be undertaken for nitrate and nitrite if a sample is >50% of the MCL.
7. The DoD medical authority may reduce the repeat sampling frequency for surface water systems to annually if after 1 year the results are <50% of the MCL.
8. The DoD medical authority may reduce the repeat sampling frequency to 1 annual sample if the results are 50% of the MCL.
9. Monitoring frequency is based on population served. See Table 3.4-b for # samples/year, based on population. If there is no specified monitoring frequency shown in Table 3.4-b and a frequency has not been established in a required permit or by an appropriate DoD medical authority, the frequency shall be the same as for purchased water. If monitoring frequencies have been established in a required permit, then the more frequent monitoring requirement must be met. In no case will the monitoring frequency for DoD-produced water be less than that for purchased water.
10. More frequent monitoring may be set in a required permit (for DoD-produced water) or by the appropriate DoD medical authority.
11. The parameter does not have an established MCL. The parameter has a Greek Guide Value, which is a goal and is not enforceable.

Table 3.4-b – Monitoring Frequency Based on Population Served

Volume of Water Produced or Distributed (m^3/day)	Population Served (Consuming 200 L/day/person)	Minimum Monitoring	Normal Monitoring	Periodic Monitoring	Occasional Monitoring
		Frequencies shown as # samples/year			
100	1 – 500	[1]	[1]	[1]	Frequency to be determined by the Local Health Authority
1,000	501– 5,000	[1]	[1]	[1]	
2,000	5,001 – 10,000	12	3	[1]	
10,000	10,001 – 50,000	60	6	1	
20,000	50,001 – 100,000	120	12	2	
30,000	100,001 – 150,000	180	18	3	
60,000	150,001 – 300,000	360 [2]	36	6	
100,000	300,001 – 500,000	360 [2]	60	10	
200,000	500,001 – 1,000,000	360 [2]	120 [2]	20 [2]	
1,000,000	1,000,001 – 5,000,000	360 [2]	120 [2]	20 [2]	

Notes:

1. The Local Health Authority will determine the frequency. However, water intended for food-manufacturing industries must be monitored at least once each year.
2. The Local Health Authority should endeavor to increase the frequency, if possible.
3. If the water must be disinfected, the microbiological analysis frequency should be doubled.
4. Where analyses are very frequent, the samples should be collected at regular intervals
5. When the sampling results from the preceding years are constant and significantly better than the MCLs, and when there is no factor likely to cause water quality deterioration, the minimum analysis frequencies may be reduced as follows:
   - For surface water, by a factor of 2 with the exception of the frequencies for microbiological analyses
   - For groundwater, by a factor of 4, but without prejudice to the provisions of A. above.

If a frequency has not been established in a permit or by an appropriate DoD medical authority, the frequency shall be the same as for purchased water.

Table 3.5 – Recommended Fluoride Concentrations at Different Temperatures

Annual Average of Maximum Daily Air Temperatures (°F)	Control Limits (mg/L)		
	Lower	Optimum	Upper
50.0 - 53.7	0.9	1.2	1.2
53.8 - 58.3	0.8	1.1	1.2
58.4 - 63.8	0.8	1.0	1.2
63.9 - 70.6	0.7	0.9	1.2
70.7 - 79.2	0.7	0.8	1.0
79.3 - 90.5	0.6	0.7	0.8

Table 3.6 – Monitoring Requirements for Lead and Copper Water Quality Parameters

Population Served	# of Sites for Standard Monitoring [1, 2]	# of Sites for Reduced Monitoring [3]	# of Sites for Water Quality Parameters [4]
>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

Notes:

1. Every 6 months for lead and copper.
2. Sampling sites shall be based on a hierarchical approach. For a CWS, priority will be given to single-family residences which contain copper pipe with lead solder installed after 1982, contain lead pipes, or are served by lead service lines; then, structures, including multifamily residences, with the foregoing characteristics; and finally, residences and structures with copper pipe with lead solder installed before 1983. For NTNC systems, sampling sites will consist of structures that contain copper pipe with lead solder installed after 1982, contain lead pipes, and/or are served by lead service lines. First draw samples will be collected from a cold water kitchen or bathroom tap; non-residential samples will be taken at an interior tap from which water is typically drawn for consumption.
3. 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 (<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 will be conducted during the 4 warmest months of the year.
4. This monitoring must be conducted by all large systems (>50,000). Small and medium sized systems must monitor water quality parameters when action levels are exceeded. Samples will be representative of water quality throughout the distribution system and include a sample from the entry to the distribution system. Samples will 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.

Table 3.7-a – Synthetic Organic Chemical MCLs for Purchased Water

Parameter [2]	MCL (mg/L)	Detection Limit (mg/L)
Pesticides/PCBs		
Alachlor	0.002	0.0002
Aldicarb	0.003	0.0005
Aldicarb sulfone	0.003	0.0008
Aldicarb sulfoxide	0.004	0.0005
Atrazine	0.003	0.0001
Benzo[a]pyrene	0.0002	
Carbofuran	0.04	0.0009
Chlordane	0.002	0.0002
Dalapon	0.2	
2,4-D	0.07	0.0001
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	0.00002
Di (2-ethylhexyl) adipate	0.4	
Di (2-ethylhexyl) phthalate	0.006	
Dinoseb	0.007	
Diquat	0.02	
Endrin	0.002	0.00002
Endothall	0.1	
Ethylene dibromide (EDB)	0.00005	0.00001
Glyphosphate	0.7	
Heptachlor	0.0004	0.00004
Heptachlorepoxide	0.0002	0.00002
Hexachlorobenzene	0.001	
Hexachlorocyclopentadiene	0.05	
Lindane	0.0002	0.00002
Methoxychlor	0.04	0.0001
Oxamyl (Vydate)	0.2	
PCBs (as decachlorobiphenyls)	0.0005	0.0001
Pentachlorophenol	0.001	0.00004
Picloram	0.5	
Simazine	0.004	
2,3,7,8-TCDD (Dioxin)	0.00000003	
Toxaphene	0.003	0.001
2,4,5-TP (Silvex)	0.05	0.0002
Volatile Organic Chemicals		
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	
1,1,2-Trichloroethane	0.005	
1,2,4-Trichloro-benzene	0.07	
1,2-Dichloropropane	0.005	0.0005
Ethylbenzene	0.7	0.0005
Monochlorobenzene	0.1	0.0005

Parameter [2]	MCL (mg/L)	Detection Limit (mg/L)
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	0.05% dosed at 1 ppm [1]	
Epihydrochlorin	Treatment technique 0.01% dosed at 20 ppm [1]	

Notes:

1. Only applies when adding these polymer flocculants to the treatment process. No sampling is required; the system certifies that dosing is within specified limits.
2. There may be synthetic organic compounds that are included in this table but were never used previously or currently in Greece. Therefore, each Component should evaluate whether to exclude from the list the pesticides that are not used in Greece to minimize the number of unnecessary analyses. Some pesticides may no longer be used in Greece but were used in the past and, therefore, should be included in the analysis.

Table 3.7-b – Synthetic Organic Chemical MCLs for DoD-Produced Water

Parameter[3]	MCL (mg/L)	Detection Limit (mg/L)
Pesticides/PCBs		
Alachlor	0.0001 [2]	0.0002
Aldicarb	0.0001 [2]	0.0005
Aldicarb sulfone	0.0001 [2]	0.0008
Aldicarb sulfoxide	0.0001 [2]	0.0005
Atrazine	0.0001	0.0001
Benzo[a]pyrene	0.0002	0.00002
Carbofuran	0.0001 [2]	0.0009
Chlordane	0.0001 [2]	0.0002
Dalapon	0.0001 [2]	0.001
2,4-D	0.0001	0.0001
1,2-Dibromo-3-chloropropane (DBCP)	0.0001	0.00002
Di (2-ethylhexyl) adipate	0.4	0.0006
Di (2-ethylhexyl) phthalate	0.006	0.0006
Dinoseb	0.0001 [2]	0.0002
Diquat	0.0001 [2]	0.0004
Endrin	0.0001	0.00002
Endothall	0.0001 [2]	0.009
Ethylene dibromide (EDB) (1,2-Dibromoethane)	0.00005	0.00001
Glyphosphate	0.0001 [2]	0.006
Heptachlor	0.0001	0.00004
Heptachlorepoxide	0.0001	0.00002
Hexachlorobenzene	0.001	0.0001
Hexachlorocyclopentadiene	0.05	0.0001
Lindane	0.0001	0.00002
Methoxychlor	0.0001	0.0001
Oxamyl (Vydate)	0.0001 [2]	0.002
PCBs (as decachlorobiphenyls)	0.0001	0.0001
Pentachlorophenol	0.0001	0.00004
Picloram	0.0001	0.0001
Polycyclic Aromatic Hydrocarbons	0.0002	
Simazine	0.0001	0.00007
2,3,7,8-TCDD (Dioxin)	0.00000003	0.000000005
Toxaphene	0.0001	0.0001
2,4,5-TP (Silvex)	0.0001 [2]	0.0002
Total Pesticides	0.0005	
Volatile Organic Chemicals		
Benzene	0.005	0.0005
Carbon tetrachloride (Tetrachloromethane)	0.005	0.0005
o-Dichlorobenzene (1,2-Dichlorobenzene)	0.6	0.0005
cis-1,2-Dichloroethylene (cis-1,2-Dichloroethene)	0.07	0.0005
trans-1,2-Dichloroethylene (trans-1,2-Dichloroethene)	0.1	0.0005
1,1-Dichloroethylene (1,1-Dichloroethene)	0.007	0.0005
1,1,1-Trichloroethane	0.2	0.0005
1,2-Dichloroethane	0.005	0.0005
Dichloromethane	0.005	
1,1,2-Trichloroethane	0.005	
1,2,4-Trichloro-benzene	0.07	
1,2-Dichloropropane	0.005	0.0005

Parameter[3]	MCL (mg/L)	Detection Limit (mg/L)
Ethylbenzene	0.7	0.0005
Hydrocarbons (dissolved or emulsified; after extraction); mineral oil	0.01	
Monochlorobenzene (Chlorobenzene)	0.1	0.0005
para-Dichlorobenzene (1,4-Dichlorobenzene)	0.075	0.0005
Styrene	0.1	0.0005
Tetrachloroethylene (Tetrachloroethene)	0.005	0.0005
Trichloroethylene (Trichloroethene)	0.005	0.0005
Toluene	1.0	0.0005
Vinyl chloride	0.002	0.0005
Xylene (total)	10	0.0005
Other Organics		
Acrylamide	0.05% dosed at 1 ppm[1]	
Epihydrochlorin	Treatment technique 0.01% dosed at 20 ppm[1]	
Phenols (as C_6H_5OH)	0.0005 [2]	

Notes:

1. Only applies when adding these polymer flocculants to the treatment process. No sampling is required; the system certifies that dosing is within specified limits.
2. The Greek MCL is lower than the method detection limit of the currently available analytical methods. Systems will be considered in compliance for phenols if the results of approved test methods indicate no detection of phenols.
3. There may be synthetic organic compounds currently or previously used in Greece that are not included in this table, since they are not used in the US. In addition, there may be some synthetic organic compounds that are included in this table but were never used previously or currently used in Greece. Therefore, each Component should evaluate whether to exclude from the list the pesticides that are not used in Greece, and to include the Greek pesticides, to minimize the number of unnecessary analyses. Some pesticides may no longer be used in Greece but were used in the past and, therefore, should be included in the analysis.

Table 3.8-a – Synthetic Organic Chemical Monitoring Requirements

Parameter[3]	Monitoring for Purchased Water	Monitoring for DoD-Produced Water
Pesticides/PCBs		
Alachlor	See Table 3.8-b	Same as purchased water[1]
Aldicarb	See Table 3.8-b	Same as purchased water[1]
Aldicarb sulfone	See Table 3.8-b	Same as purchased water[1]
Aldicarb sulfoxide	See Table 3.8-b	Same as purchased water[1]
Atrazine	See Table 3.8-b	Same as purchased water[1]
Benzo[a]pyrene	See Table 3.8-b	Same as purchased water[1]
Carbofuran	See Table 3.8-b	Same as purchased water[1]
Chlordane	See Table 3.8-b	Same as purchased water[1]
Dalapon	See Table 3.8-b	Same as purchased water
2,4-D	See Table 3.8-b	Same as purchased water[1]
1,2-Dibromo-3-chloropropane (DBCP)	See Table 3.8-b	Same as purchased water[1]
Di (2-ethylhexyl) adipate	See Table 3.8-b	Same as purchased water
Di (2-ethylhexyl) phthalate	See Table 3.8-b	Same as purchased water
Dinoseb	See Table 3.8-b	Same as purchased water
Diquat	See Table 3.8-b	Same as purchased water
Endrin	See Table 3.8-b	Same as purchased water[1]
Endothall	See Table 3.8-b	Same as purchased water
Ethylene dibromide (EDB) (1,2-Dibromoethane)	See Table 3.8-b	Same as purchased water[1]
Glyphosphate	See Table 3.8-b	Same as purchased water
Heptachlor	See Table 3.8-b	Same as purchased water[1]
Heptachlorepoxide	See Table 3.8-b	Same as purchased water[1]
Hexachlorobenzene	See Table 3.8-b	Same as purchased water
Hexachlorocyclopentadiene	See Table 3.8-b	Same as purchased water
Lindane	See Table 3.8-b	Same as purchased water[1]
Methoxychlor	See Table 3.8-b	Same as purchased water[1]
Oxamyl (Vydate)	See Table 3.8-b	Same as purchased water
PCBs (as decachlorobiphenyls)	See Table 3.8-b	Same as purchased water[1]
Pentachlorophenol	See Table 3.8-b	Same as purchased water[1]
Picloram	See Table 3.8-b	Same as purchased water
Polycyclic Aromatic Hydrocarbons: benzo[b]fluoranthene benzo[k]fluoranthene benzo[a]pirene benzo[ghi]perylene fluoranthene ideno[1,2,3-cd]pyrene	No requirement	(2)
Simazine	See Table 3.8-b	Same as purchased water[1]
2,3,7,8-TCDD (Dioxin)	See Table 3.8-b	Same as purchased water
Toxaphene	See Table 3.8-b	Same as purchased water[1]
2,4,5-TP (Silvex)	See Table 3.8-b	Same as purchased water[1]
Total pesticides	No requirement	(2)
Volatile Organic Chemicals		
Benzene	See Table 3.8-b	Same as purchased water
Carbon tetrachloride (Tetrachloromethane)	See Table 3.8-b	Same as purchased water[1]
o-Dichlorobenzene (1,2-Dichlorobenzene)	See Table 3.8-b	Same as purchased water[1]
cis-1,2-Dichloroethylene (cis-1,2-Dichloroethene)	See Table 3.8-b	Same as purchased water[1]
trans-1,2-Dichloroethylene (trans-1,2-Dichloroethene)	See Table 3.8-b	Same as purchased water[1]

Parameter[3]	Monitoring for Purchased Water	Monitoring for DoD-Produced Water
1,1-Dichloroethylene (1,1-Dichloroethene)	See Table 3.8-b	Same as purchased water[1]
1,1,1-Trichloroethane	See Table 3.8-b	Same as purchased water[1]
1,2-Dichloroethane	See Table 3.8-b	Same as purchased water[1]
Dichloromethane	See Table 3.8-b	Same as purchased water
1,1,2-Trichloroethane	See Table 3.8-b	Same as purchased water
1,2,4-Trichloro-benzene	See Table 3.8-b	Same as purchased water
1,2-Dichloropropane	See Table 3.8-b	Same as purchased water[1]
Ethylbenzene	See Table 3.8-b	Same as purchased water
Hydrocarbons (dissolved or emulsified; after extraction); mineral oil	No requirement	(2)
Monochlorobenzene (Chlorobenzene)	See Table 3.8-b	Same as purchased water[1]
para-Dichlorobenzene (1,4-Dichlorobenzene)	See Table 3.8-b	Same as purchased water[1]
Styrene	See Table 3.8-b	Same as purchased water
Tetrachloroethylene (Tetrachloroethene)	See Table 3.8-b	Same as purchased water[1]
Trichloroethylene (Trichloroethene)	See Table 3.8-b	Same as purchased water[1]
Toluene	See Table 3.8-b	Same as purchased water
Vinyl chloride	See Table 3.8-b	Same as purchased water
Xylene (total)	See Table 3.8-b	Same as purchased water
Other Organics		
Acrylamide	See Table 3.8-b	Same as purchased water
Epihydrochlorin	See Table 3.8-b	Same as purchased water
Phenols	No requirement	(2)

Notes:

1. More frequent monitoring may be established in the required permit (for DoD-produced water) or by the appropriate DoD medical authority.
2. Monitoring frequency only required when established in the required permit for a DoD-controlled drinking water production well or by an appropriate DoD medical authority. If monitoring frequencies have been established in the required authorization, then the more frequent monitoring requirement must be met. In no case will the monitoring frequency for DoD-produced water be less than that for purchased water.

Table 3.8-b – Synthetic Organic Chemical Minimum Monitoring Requirements

Parameter	Base Requirement [1]		Trigger for Increased Monitoring [2]	Reduced Monitoring
	Groundwater	Surface Water		
VOCs	Quarterly	Quarterly	> 0.0005 mg/L	Yes [3, 4]
Pesticides/PCBs	4 quarters of sampling over a 3-year period (during most likely period for their presence)		> Detection limit [6]	Yes [4, 5]

Notes:

1. Groundwater systems shall take a minimum of one sample at every entry point which is representative of each well after treatment; surface water systems will take a minimum of one sample at every entry point to the distribution system at a point which is representative of each source after treatment. For CWS, monitoring compliance is to be met within 1 year of publication of the FGS; for NTNC, compliance is to be met within 2 years of publication of the FGS.
2. Increased monitoring requires a minimum of 2 samples per quarter for groundwater systems and at least 4 samples per quarter for surface water systems.
3. Repeat sampling frequency may be reduced to annually after 1 year of no detection and every 3 years after three rounds of no detection.
4. Monitoring frequency may be reduced if warranted based on a vulnerability assessment by the PWS.
5. Repeat sampling frequency may be reduced to the following if after one round of no detection; systems greater than 3,300 reduce to 2 samples/year every 3 years, or systems less than 3,300 reduce to 1 sample every 3 years.
6. Detection limits listed in Tables 3.7-a and 3.7-b, or as determined by the best available testing methodology.

Compliance is based on an annual running average for each sample point for systems monitoring quarterly or more frequently; for systems monitoring annually or less frequently, compliance is based on a single sample, unless the appropriate DoD medical authority requests a confirmation sample. A system is out of compliance if any contaminant exceeds the MCL.

If more frequent monitoring requirements are established in permits for DoD-controlled drinking water production wells, those more frequent monitoring requirements must be followed.

Table 3.9 – Total Trihalomethane Monitoring Requirements

Population Served by System	# of Samples Per Distribution System	Frequency of Samples	Type of Sample
10,000 or more	4	Quarterly	Treated
Less than 10,000	1	Annually	Treated

Notes:

1. One of the samples must be taken at a location in the distribution system reflecting the maximum residence time of water in the system. The remaining samples shall be taken at representative points in the distribution system. Systems using groundwater sources that add a disinfectant should have one sample analyzed for maximum total trihalomethane potential. Systems employing surface water sources (in whole or in part) that add a disinfectant should have one sample analyzed for total trihalomethanes.
2. Compliance is based upon a running yearly average of quarterly samples for systems serving more than 10,000 people. Noncompliance exists if the average exceeds the MCL (0.10 mg/L). For systems serving less than 10,000 that have a maximum total trihalomethane potential sample exceeding the MCL, a sample for total trihalomethanes shall be analyzed. If the total trihalomethane sample exceeds the MCL, noncompliance results.

Table 3.10 – Radionuclide MCLs and Monitoring Requirements

Parameter	MCL (pCi/L)
Gross Alpha [1]	15
Combined Radium-226 and -228	5
Gross Beta [2]	50

Notes:

1. Gross alpha activity includes radium-226, but excludes radon and uranium.
2. Monitoring for gross beta is only required for surface water systems over 100,000. Gross beta activity refers to the sum of beta particle and photon activity from manmade radionuclides. If gross beta exceeds the MCL (i.e., equivalence to a dose of 4 millirem/year), the individual components must be determined (Strontium-90 and Tritium). See 40 CFR 141.26(b) (reference (f)) for additional information.

Monitoring Requirements

For gross alpha activity and radium-226 and radium-228, systems will be tested once every 4 years. Testing will 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.

Gross alpha only may be analyzed if activity is ≤5 pCi/L. Where radium-228 may be present, radium-226 and/or -228 analyses should be performed when activity is >2 pCi/L. If the average annual concentration is less than half the maximum contaminant level, analysis of a single sample may be substituted for the quarterly sampling procedure. A system with two or more sources having different concentrations of radioactivity shall monitor source water in addition to water from a free-flowing tap. If the installation introduces a new water source, these contaminants will be monitored within the first year after introduction.

Table 3.11 – CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 0.5°C or Lower*

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
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

*$CT_{99.9}$ =CT for 3 log inactivation.

Table 3.12 – CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 5.0°C*

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
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

*$CT_{99.9}$ =CT for 3 log inactivation.

Table 3.13 – CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 10°C*

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

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

*$CT_{99.9}$ =CT for 3 log inactivation.

Table 3.14 – CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 15°C*

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

*$CT_{99.9}$ =CT for 3 log inactivation.

Table 3.15 – CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 20°C*

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	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 (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	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

*$CT_{99.9}$ =CT for 3 log inactivation.

Table 3.16 – CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 25°C*

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

*$CT_{99.9}$ =CT for 3 log inactivation.

Table 3.17 – CT Values for Inactivation of Viruses by Free Chlorine

Temperature (°C)	Log Inactivation 2.0 pH		Log Inactivation 3.0 pH		Log Inactivation 3.0 pH	
	6-9	10	6-9	10	6-9	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	1	11	2	15

Table 3.18 – CT Values for Inactivation of Giardia Cysts by Chlorine Dioxide

Inactivation	Temperature (°C)					
	£1	5	10	15	20	25
0.5-log	10	4.3	4	3.2	2.5	2
1-log	21	8.7	7.7	6.3	5	3.7
1.5-log	32	13	12	10	7.5	5.5
2-log	42	17	15	13	10	7.3
2.5-log	52	22	19	16	13	9
3-log	63	26	23	19	15	11

Table 3.19 – CT Values for Inactivation of Viruses by Free Chlorine Dioxide pH 6-9

Removal	Temperature (°C)					
	£1	5	10	15	20	25
2-log	8.4	5.6	4.2	2.8	2.1	1.4
3-log	25.6	17.1	12.8	8.6	6.4	4.3
4-log	50.1	33.4	25.1	16.7	12.5	8.4

Table 3.20 – CT Values for Inactivation of Giardia Cysts by Ozone

Inactivation	Temperature (°C)					
	£1	5	10	15	20	25
0.5-log	0.48	0.32	0.23	0.16	0.12	0.08
1-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-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-log	2.9	1.9	1.43	0.95	0.72	0.48

Table 3.21 – CT Values for Inactivation of Viruses by Free Ozone

Inactivation	Temperature (°C)					
	£1	5	10	15	20	25
2-log	0.9	0.6	0.5	0.3	0.25	0.15
3-log	1.4	0.9	0.8	0.5	0.4	0.25
4-log	1.8	1.2	1.0	0.6	0.5	0.3

Table 3.22 – CT Values for Inactivation of Giardia Cysts by Chloramine pH 6-9

Inactivation	Temperature (°C)					
	£1	5	10	15	20	25
0.5-log	635	365	310	250	185	125
1-log	1,270	735	615	500	370	250
1.5-log	1,900	1,100	930	750	550	375
2-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-log	3,800	2,200	1,850	1,500	1,100	750

Table 3.23 – CT Values for Inactivation of Viruses by Chloramine

Inactivation	Temperature (°C)					
	£1	5	10	15	20	25
2-log	1,243	857	643	428	321	214
3-log	2,063	1,423	1,067	712	534	356
4-log	2,883	1,988	1,491	994	746	497

Table 3.24 – CT Values for Inactivation of Viruses by UV

Log Inactivation	
2.0	3.0
21	36

Table 3.25 – Greek Analytical Methods

Parameter	Methodology
Organoleptic Parameters	
Color	Photometric method calibrated on the Pt/Co scale
Odor	Successive dilutions, tested at 12°C or 25°C
Taste	Successive dilutions, tested at 12°C or 25°C
Turbidity	Silica method – Formazine method – Secchi's method
Physico-Chemical Parameters	
Alkalinity	Acidimetry with Methyl orange
Aluminum	Atomic absorption – absorption spectrophotometry
Calcium	Atomic absorption – complexometry
Chlorides	Titrimetry – Mohr's method
Conductivity	Electrometry
Dissolved oxygen	Winkler's method – Specific electrode method
Dry residue	Dessication at 180°C and weighing
Free carbon dioxide	Acidimetry
Hydrogen ion concentration	Electrometry
Magnesium	Atomic absorption
Potassium	Atomic absorption
Silica	Absorbtion spectrophotometry
Sodium	Atomic absorption
Sulfates	Gravimetry – complexometry – spectrophotometry
Temperature	Thermometry
Total hardness	Complexometry
Undesirable Substances	
Ammonium	Absorption spectrophotometry
Barium	Atomic absorption
Boron	Atomic absorption - Absorption spectrophotometry
Cobalt	Atomic absorption spectrometry
Copper	Atomic absorption - Absorption spectrophotometry
Fluoride	Absorption spectrophotometry – Specifice electrode method
Hydrocarbons (dissolved or in emulsion) Mineral oils	Infra-red absorption spectrophotometry
Hydrogen sulfide	Absorption spectrophotometry
Iron	Atomic absorption - Absorption spectrophotometry
Kjeldahl Nitrogen	Oxidation with titrimetry or Absorption spectrophotometry
Manganese	Atomic absorption - Absorption spectrophotometry
Nitrates	Absorption spectrophotometry – Specific electrode method
Nitrites	Absorption spectrophotometry
Other organo-chlorine compounds	
Oxidizability	Boiling for 10 minutes with KMnO4 in acid medium
Phenols (phenol index)	Absorption spectrophotometry – Paranitroaniline method and 4-aminoantipyrine method
Phosphorus	Absorption spectrophotometry
Residual chlorine	Titrimetry - Absorption spectrophotometry
Substances extractable in chloroform	Liquid/liquid extraction using purified chloroform at neutral PH, weighing the residue
Surfactants (reacting with methylene blue)	Absorption spectrophotometry with methylene blue
Suspended solids	Method of filtration on to µ0.45 porous membrane or centrifuging for at least 15 minutes with an average acceleration of 2800 to 3200 g dried at 105°C and weighed
Total organic carbon (TOC)	Instrumental method
Zinc	Atomic absorption - Absorption spectrophotometry
Toxic Substances	
Antimony	Absorption spectrophotometry

Parameter	Methodology
Arsenic	Atomic absorption - Absorption spectrophotometry
Beryllium	- - -
Cadmium	Atomic absorption
Chromium	Atomic absorption - Absorption spectrophotometry
Cyanides	Absorption spectrophotometry
Lead	Atomic absorption
Mercury	Atomic absorption
Nickel	Atomic absorption
Pesticides and related products	Gas or liquid chromatography upon extraction through solvents and purification, or identification of the mixture components and qualitative determination
Polycyclic aromatic hydrocarbons (PAHs)	Measurement of intensity of ultraviolet fluorescence after extraction using hexane-gas-phase-chromatography or measurement in ultraviolet after thin layer chromatography, or Comparative measurements against a mixture of six standard substances of the same concentration
Selenium	Atomic absorption
Silver	Atomic absorption
Microbiological Parameters	
Total coliforms	Fermentation in multiple tubs. Subculturing of the positive tubes on a confirmation medium. Count according to most probable number (MPN), or Membrane filtration and culture on an appropriate medium such as Tergitol lactose agar, endo, agar, 0.4% Teepol broth, subculturing and identification of the suspect colonies – Incubation temperature for total coliforms: 37°C, Incubation temperature for fecal coliforms: 44°C
Fecal coliforms	Same as total coliforms
Fecal streptococci	Sodium azide method (Litsky). Count according to MPN
Sulfite-reducing Clostridia	A spore count, after heating the sample to 80 °C by: • Seeding in a medium with glucose, sulfite and iron, counting the black-halo colonies • Membrane filtration, deposition of the inverted filter on a medium with glucose, sulfite and iron covered with agar, count of black colonies • Distribution in tubes of differential reinforced clostridial medium (DRCM), subculturing of the black tubes in a medium of litmus-treated milk, count according to MPN
61/62 Total counts	Inoculation by placing in nutritive agar
Additional Tests	
Animalcules (worms - larvae)	Concentration by filtration on a membrane. Microscopic examination. Test for pathogenicity
Enteroviruses	Concentration by filtration, flocculation or centrifuging and identification
Faecal bacteriophages	Guelin's process
Pathogenic staphylococci	Membrane filtration and culture on a specific medium (e.g. Chapman's hypersaline medium). Test for pathogenic characteristics
Protozoa	Concentration by filtration on a membrane, microscopic examination, test for pathogenicity
Salmonella	Concentration by membrane filtration. Inoculation on a pre - enriched medium. Enrichment, subculturing on isolation agar. Identification.

Table 3.26 – DoD-Approved Inorganic Chemical Analytical Test Methods

Parameter	Methodology [13]	EPA	ASTM [3]	SM [4]	Other
Alkalinity	Titrimetric Electrometric titration		D1067-92B	2320 B	I-1030-85 [5]
Aluminum		200.7 [2] 200.8 [2] 200.9 [2]	3120 B 3113 B 3111 D		
Antimony	ICP-Mass Spectrometry Hydride-Atomic Absorption Atomic Absorption (Platform) Atomic Absorption (Furnace)	200.8 [2] 200.9 [2]	 D-3697-92	 3113 B	
Arsenic [14]	Inductively Coupled Plasma ICP-Mass Spectrometry Atomic Absorption (Platform) Atomic Absorption (Furnace) Hydride Atomic Absorption	200.7 [2] 200.8 [2] 200.9 [2]	 D-2972-93C D-2972-93B	3120 B 3113 B 3114 B	
Asbestos	Transmission Electron Microscopy Transmission Electron Microscopy	100.1 [9] 100.2 [10]			
Barium	Inductively Coupled Plasma ICP-Mass Spectrometry Atomic Absorption (Direct) Atomic Absorption (Furnace)	200.7 [2] 200.8 [2]		3120 B 3111 D 3113 B	
Beryllium	Inductively Coupled Plasma ICP-Mass Spectrometry Atomic Absorption (Platform) Atomic Absorption (Furnace)	200.7 [2] 200.8 [2] 200.9 [2]	 D3645-93B	3120 B 3113 B	
Cadmium	Inductively Coupled Plasma ICP-Mass Spectrometry Atomic Absorption (Platform) Atomic Absorption (Furnace)	200.7 [2] 200.8 [2] 200.9 [2]		 3113 B	
Calcium	EDTA Titrimetric Atomic Absorption (Direct Aspiration) Inductively-Coupled Plasma	 200.7 [2]	D511-93A D511-93B	3500-Ca D 3111 B 3120 B	
Chloride		300.0 [6]	D4327-91 4500-Cl-D D512-89B	4110 B 4500-Cl-B	
Chromium	Inductively Coupled Plasma ICP-Mass Spectrometry Atomic Absorption (Platform) Atomic Absorption (Furnace)	200.7 [2] 200.8 [2] 200.9 [2]		3120 B 3113 B	
Color				2120 B	
Copper	Atomic Absorption (Furnace) Atomic Absorption (Direct Aspiration) ICP ICP - Mass Spectrometry Atomic Absorption (Platform)	 200.7 [2] 200.8 [2] 200.9 [2]	D1688-95C D1688-95A	3113 B 3111 B 3120 B	
Conductivity Conductance			D1125-95A	2510 B	

Parameter	Methodology [13]	EPA	ASTM [3]	SM [4]	Other
Cyanide	Manual Distillation followed by: Spectrophotometric (Amenable) Spectrophotometric Manual Semi-automated Selective Electrode	 335.4 [6]	 D2036-91A D2036-91B D2036-91A	 4500-CN-C 4500-CN-G 4500-CN-E 4500-CN-F	 I-3300-85 [5]
Foaming Agents				5540C	
Fluoride	Ion Chromatography Manual Distill (Color SPADNS) Manual Electrode Automated Electrode Automated Alizarin	300.0 [6]	D4327-91 D1179-93B	4110 B 4500-F-B, D 4500-F-C 4500-F-E	 380-75WE [11] 129-71W [11]
Iron		200.7 [2] 200.9 [2]		3120 B 3111 B 3113 B	
Lead	Atomic Absorption (Furnace) ICP-Mass Spectrometry Atomic Absorption (Platform) Differential Pulse Anodic Stripping Voltammetry	 200.8 [2] 200.9 [2]	D3559-95D	3113 B	 1001 [15]
Magnesium	Atomic Absorption ICP Complexation Titrimetric Methods	 200.7 [2]	D 511-93 B D 511-93 A	3111 B 3120 B 3500-Mg E	
Manganese		200.7 [2] 200.8 [2] 200.9 [2]		3120 B 3111 B 3113 B	
Mercury	Manual (Cold Vapor) Automated (Cold Vapor) ICP-Mass Spectrometry	245.1 [2] 245.2 [1] 200.8 [2]	D3223-91	3112 B	
Nickel	Inductively Coupled Plasma ICP-Mass Spectrometry Atomic Absorption (Platform) Atomic Absorption (Direct) Atomic Absorption (Furnace)	200.7 [2] 200.8 [2] 200.9 [2]		3120 B 3111 B 3113 B	
Nitrate	Ion Chromatography Automated Cadmium Reduction Ion Selective Electrode Manual Cadmium Reduction	300.0 [6] 353.2 [6]	D4327-91 D3867-90A D3867-90B	4110 B 4500-NO3- F 4500-NO3-D 4500-NO3- E	B-1011 [8] 601 [7]
Nitrite	Ion Chromatography Automated Cadmium Reduction Manual Cadmium Reduction Spectrophotometric	300.0 [6] 353.2 [6]	D4327-91 D3867-90A D3867-90B	4110 B 4500-NO3-F 4500-NO3- E 4500-NO2-B	B-1011 [8]
Odor				2150 B	
Ortho-phosphate [12]	Colorimetric (Automated, Ascorbic Acid) Colorimetric (Ascorbic Acid, Single Reagent) Colorimetric (Phosphomolybdate) Automated-Segmented Flow Automated Discrete Ion Chromatography	365.1 [6] 300.0 [6]	 D515-88A D4327-91	4500-P F 4500-P E 4110 B	 I-1602-85 [5] I-2601-90 [5] I-2598-85 [5]

Parameter	Methodology [13]	EPA	ASTM [3]	SM [4]	Other
pH	Electrometric	150.1 [1] 150.2 [1]	D1293-95	4500-H+ B	
Selenium	Hydride-Atomic Absorption ICP-Mass Spectrometry Atomic Absorption (Platform) Atomic Absorption (Furnace)	 200.8 [2] 200.9 [2]	D3859-93A D3859-93B	3114 B 3113 B	
Silica	Colorimetric, Molybdate Blue Automated-Segmented Flow Colorimetric Molybdosilicate		 D859-95	 4500-Si D	I-1700-85 [5] I-2700-85 [5]
Silver		200.7 [2] 200.8 [2] 200.9 [2]		3120 B 3111 B 3113 B	I-3720-85 [16]
Sodium	Inductively-Coupled Plasma Atomic Absorption (Direct Aspiration)	200.7 [2]		 3111 B	
Sulfate		300.0 [16] 375.2 [16]	D4327-91 D516-90	4110 B 4500-SO42-F 4500-SO42-C, D 4500-SO42-E	
Temperature	Thermometric			2550	
Thallium	ICP-Mass Spectrometry Atomic Absorption (Platform)	200.8 [2] 200.9 [2]			
Zinc		200.7 [2] 200.8 [2]		3120 B 3111 B	

Notes:

The procedures shall be done in accordance with the documents listed below. Copies of the documents may be obtained from the sources listed below. Information regarding obtaining these documents can be obtained from the Safe Drinking Water Hotline at 800-426-4791. Documents may be inspected at EPA's Drinking Water Docket, 401 M Street, SW., Washington, DC 20460 (Telephone: 202-260-3027); or at the Office of Federal Register, 800 North Capitol Street, NW., Suite 700, Washington, DC.

1. "Methods for Chemical Analysis of Water and Wastes'', EPA/600/4-79/020, March 1983. Available at NTIS, PB84- 128677.
2. "Methods for the Determination of Metals in Environmental Samples--Supplement I'', EPA/600/R-94/111, May 1994. Available at NTIS, PB95-125472.
3. Annual Book of ASTM Standards, 1994 and 1996, Vols. 11.01 and 11.02, American Society for Testing and Materials. The previous versions of D1688-95A, D1688-95C (copper), D3559-95D (lead), D1293-95 (pH), D1125-91A (conductivity) and D859-94 (silica) are also approved. These previous versions D1688-90A, C; D3559-90D, D1293- 84, D1125-91A and D859-88, respectively are located in the Annual Book of ASTM Standards, 1994, Vols. 11.01. Copies may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428.
4. 18th and 19th editions of Standard Methods for the Examination of Water and Wastewater, 1992 and 1995, respectively, American Public Health Association; either edition may be used. Copies may be obtained from the American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005.
5. Method I-2601-90, Methods for Analysis by the U.S. Geological Survey National Water Quality Laboratory--Determination of Inorganic and Organic Constituents in Water and Fluvial Sediments, Open File Report 93-125, 1993; For Methods I-1030-85; I-1601-85; I-1700-85; I-2598-85; I-2700-85; and I-3300-85 See Techniques of Water Resources Investigation of the U.S. Geological Survey, Book 5, Chapter A-1, 3rd ed., 1989; Available from Information Services, U.S. Geological Survey, Federal Center, Box 25286, Denver, CO 80225-0425.
6. "Methods for the Determination of Inorganic Substances in Environmental Samples'', EPA/600/R-93/100, August 1993. Available at NTIS, PB94-120821.

7. The procedure shall be done in accordance with the Technical Bulletin 601 “Standard Method of Test for Nitrate in Drinking Water’’, July 1994, PN 221890-001, Analytical Technology, Inc. Copies may be obtained from ATI Orion, 529 Main Street, Boston, MA 02129.
8. Method B-1011, “Waters Test Method for Determination of Nitrite/Nitrate in Water Using Single Column Ion Chromatography,’’ August 1987. Copies may be obtained from Waters Corporation, Technical Services Division, 34 Maple Street, Milford, MA 01757.
9. Method 100.1, “Analytical Method For Determination of Asbestos Fibers in Water’’, EPA/600/4-83/043, EPA, September 1983. Available at NTIS, PB83-260471.
10. 10 Method 100.2, “Determination of Asbestos Structure Over 10-µm In Length In Drinking Water’’, EPA/600/R-94/134, June 1994. Available at NTIS, PB94-201902.
11. Industrial Method No. 129-71W, “Fluoride in Water and Wastewater’’, December 1972, and Method No. 380-75WE, “Fluoride in Water and Wastewater’’, February 1976, Technicon Industrial Systems. Copies may be obtained from Bran & Luebbe, 1025 Busch Parkway, Buffalo Grove, IL 60089.
12. Unfiltered, no digestion or hydrolysis.
13. Because MDLs reported in EPA Methods 200.7 and 200.9 were determined using a 2X preconcentration step during sample digestion, MDLs determined when samples are analyzed by direct analysis (i.e., no sample digestion) will be higher. For direct analysis of cadmium and arsenic by Method 200.7, and arsenic by Method 3120 B sample preconcentration using pneumatic nebulization may be required to achieve lower detection limits. Preconcentration may also be required for direct analysis of antimony, lead, and thallium by Method 200.9; antimony and lead by Method 3113 B; and lead by Method D3559-90D unless multiple in-furnace depositions are made.
14. If ultrasonic nebulization is used in the determination of arsenic by Methods 200.7, 200.8, or SM 3120 B, the arsenic must be in the pentavalent state to provide uniform signal response. For methods 200.7 and 3120 B, both samples and standards must be diluted in the same mixed acid matrix concentration of nitric and hydrochloric acid with the addition of 100 µL of 30% hydrogen peroxide per 100ml of solution. For direct analysis of arsenic with method 200.8 using ultrasonic nebulization, samples and standards must contain one mg/L of sodium hypochlorite.
15. The description for Method Number 1001 for lead is available from Palintest, LTD, 21 Kenton Lands Road, P.O.
16. Method I-3720-85, Techniques of Water Resources Investigation of the U.S. Geological Survey, Book 5, Chapter A-1, 3rd ed., 1989; Available from Information Services, U.S. Geological Survey, Federal Center, Box 25286, Denver, CO 80225-0425.

Table 3.27 – DoD-Approved Organic Chemicals Analytical Test Methods

Parameter	Method
Alachlor [1]	507, 525.2, 508.1, 505, 551.1
Atrazine [1]	507, 525.2, 508.1, 505, 551.1
Benzene	502.2, 524.2
Benzo(a)pyrene	525.2, 550, 550.1
Carbofuran	531.1, 6610
Carbon tetrachloride (Tetrachloromethane)	502.2, 524.2, 551.1
Chlordane	508, 525.2, 508.1, 505
Monochlorobenzene (Chlorobenzene)	502.2, 524.2
2,4-D4 (as acid, salts and esters)	515.2, 555, 515.1, 515.3, D5317-93
Dalapon	552.1, 515.1, 552.2, 515.3
Dibromochloropropane (DBCP)	504.1, 551.1
o-Dichlorobenzene (1,2-Dichlorobenzene)	502.2, 524.2
p-Dichlorobenzene (1,4-Dichlorobenzene)	502.2, 524.2
1,2-Dichloroethane	502.2, 524.2
1,1-Dichloroethylene (1,1-Dichloroethene)	502.2, 524.2
cis-Dichloroethylene (cis-1,2-Dichloroethene)	502.2, 524.2
trans-Dichloroethylene (trans-1,2-Dichloroethene)	502.2, 524.2
Dichloromethane	502.2, 524.2
1,2-Dichloropropane	502.2, 524.2
Di(2-ethylhexyl)adipate	506, 525.2
Di(2-ethylhexyl)phthalate	506, 525.2
Dinoseb [3]	515.2, 555, 515.1, 515.3
Dioxin (2,3,7,8-TCDD)	1613
Diquat	549.2
Endothall	548.1
Endrin	508, 525.2, 508.1, 505, 551.1
Ethylbenzene	502.2, 524.2
Ethylene dibromide (EDB) (1,2-Dibromoethane)	504.1, 551.1
Glyphosate	547, 6651
Heptachlor	508, 525.2, 508.1, 505, 551.1
Heptachlor Epoxide	508, 525.2, 508.1, 505, 551.1
Hexachlorobenzene	508, 525.2, 508.1, 505, 551.1
Hexachlorocyclopentadiene	508, 525.2, 508.1, 505, 551.1
Lindane	508, 525.2, 508.1, 505, 551.1
Methoxychlor	508, 525.2, 508.1, 505, 551.1
Oxamyl	531.1, 6610
PCBs [2] (as decachlorobiphenyl) (as Aroclors)	508A 508.1, 508, 525.2, 505
Pentachlorophenol	515.2, 525.2, 555, 515.1, 515.3, D5317-93
Picloram [3]	515.2, 555, 515.1, 515.3, D5317-93
Silvex (2,4,5-TP [3])	515.2, 555, 515.1, 515.3, D5317-93
Simazine [1]	507, 525.2, 508.1, 505, 551.1
Styrene	502.2, 524.2
Tetrachloroethylene (Tetrachloroethene)	502.2, 524.2, 551.1
Toluene	502.2, 524.2
Total Trihalomethanes	502.2, 524.2, 551.1
Toxaphene	508, 508.1, 525.2, 505
1,2,4-Trichlorobenzene	502.2, 524.2
1,1,1-Trichloroethane	502.2, 524.2, 551.1
1,1,2-Trichloroethane	502.2, 524.2, 551.1

Parameter	Method
Trichloroethylene (Trichloroethene)	502.2, 524.2, 551.1
Vinyl chloride	502.2, 524.2
Xylenes (total)	502.2, 524.2

Notes:

1. Substitution of the detector specified in Method 505, 507, 508 or 508.1 for the purpose of achieving lower detection limits is allowed as follows. Either an electron capture or nitrogen phosphorous detector may be used provided all regulatory requirements and quality control criteria are met.
2. PCBs are qualitatively identified as Aroclors and measured for compliance purposes as decachlorobiphenyl. Users of Method 505 may have more difficulty in achieving the required detection limits than users of Methods 508.1, 525.2 or 508.
3. Accurate determination of the chlorinated esters requires hydrolysis of the sample as described in EPA Methods 515.1, 515.2, 515.3 and 555, and ASTM Method D 5317-93.

Method 508A and 515.1 are in Methods for the Determination of Organic Compounds in Drinking Water, EPA/600/4-88-039, December 1988, Revised, July 1991.

Methods 547, 550 and 550.1 are in Methods for the Determination of Organic Compounds in Drinking Water--Supplement I, EPA/600-4-90-020, July 1990. Methods 548.1, 549.1, 552.1 and 555 are in Methods for the Determination of Organic Compounds in Drinking Water--Supplement II, EPA/600/R-92-129, August 1992.

Methods 502.2, 504.1, 505, 506, 507, 508, 508.1, 515.2, 524.2 525.2, 531.1, 551.1 and 552.2 are in Methods for the Determination of Organic Compounds in Drinking Water--Supplement III, EPA/600/R-95-131, August 1995. Method 1613 is titled “Tetra-through Octa-Chlorinated Dioxins and Furans by Isotope-Dilution HRGC/HRMS’’, EPA/821-B-94-005, October 1994.

These documents are available from the National Technical Information Service, NTIS PB91- 231480, PB91-146027, PB92-207703, PB95-261616 and PB95-104774, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161. The toll-free number is 800-553-6847.

Method 6651 shall be followed in accordance with Standard Methods for the Examination of Water and Wastewater, 18th edition, 1992 and 19th edition, 1995, American Public Health Association (APHA); either edition may be used.

Method 6610 shall be followed in accordance with the Supplement to the 18th edition of Standard Methods for the Examination of Water and Wastewater, 1994 or with the 19th edition of Standard Methods for the Examination of Water and Wastewater, 1995, APHA; either publication may be used. The APHA documents are available from APHA, 1015 Fifteenth Street NW., Washington, D.C. 20005. Other required analytical test procedures germane to the conduct of these analyses are contained in Technical Notes on Drinking Water Methods, EPA/600/R-94-173, October 1994, NTIS PB95-104766. EPA Methods 515.3 and 549.2 are available from U.S. Environmental Protection Agency, National Exposure Research Laboratory (NERL)-Cincinnati, 26 West Martin Luther King Drive, Cincinnati, OH 45268. ASTM Method D 5317-93 is available in the Annual Book of ASTM Standards, 1996, Vol. 11.02, American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428, or in any edition published after 1993.

Table 3.28 – DoD-Approved Coliform and Turbidity Analytical Test Methods

Parameter	Methodology	Citation [1]
Total Coliform [2]	Total Coliform Fermentation Technique [3, 4, 5] Total Coliform Membrane Filter Technique [6] ONPG-MUG Test [7]	9221 A, B, C 9222 A, B, C 9223
Fecal Coliforms [2]	Fecal Coliform Procedure [8] Fecal Coliform Filter Procedure	9221 E 9222 D
Heterotrophic bacteria [2]	Pour Plate Method	9215 B
Turbidity	Nephelometric Method Nephelometric Method Great Lakes Instruments	2130 B 180.1 [9] Method 2 [10]

Notes:

The procedures shall be done in accordance with the documents listed below. Copies of the documents may be obtained from the sources listed below. Information regarding obtaining these documents can be obtained from the Safe Drinking Water Hotline at 800-426-4791. Documents may be inspected at EPA's Drinking Water Docket, 401 M Street, SW, Washington, D.C. 20460 (Telephone: 202-260-3027); or at the Office of the Federal Register, 800 North Capitol Street, NW, Suite 700, Washington, D.C. 20408.

1. Except where noted, all methods refer to Standard Methods for the Examination of Water and Wastewater, 18th edition, 1992 and 19th edition, 1995, American Public Health Association, 1015 Fifteenth Street NW, Washington, D.C. 20005; either edition may be used.
2. The time from sample collection to initiation of analysis may not exceed 8 hours. Systems must hold samples below 10 °C during transit.
3. Lactose broth, as commercially available, may be used in lieu of lauryl tryptose broth, if the system conducts at least 25 parallel tests between this medium and lauryl tryptose broth using the water normally tested, and this comparison demonstrates that the false-positive rate and false-negative rate for total coliform, using lactose broth, is less than 10 percent.
4. Media should cover inverted tubes at least one-half to two-thirds after the sample is added.
5. No requirement exists to run the completed phase on 10 percent of all total coliform-positive confirmed tubes.
6. MI agar also may be used. Preparation and use of MI agar is set forth in the article, "New medium for the simultaneous detection of total coliform and Escherichia coli in water'' by Brenner, K.P., et al., 1993, Appl. Environ. Microbiol. 59:3534-3544. Also available from the Office of Water Resource Center (RC-4100), 401 M Street SW, Washington, D.C. 20460, EPA 600/J-99/225.
7. The ONPG-MUG Test is also known as the Autoanalysis Colilert System.
8. A-1 Broth may be held up to three months in a tightly closed screw cap tube at 4 °C.
9. "Methods for the Determination of Inorganic Substances in Environmental Samples'', EPA/600/R-93/100, August 1993. Available at NTIS, PB94-121811.
10. GLI Method 2, "Turbidity'', November 2, 1992, Great Lakes Instruments, Inc., 8855 North 55th Street, Milwaukee, Wisconsin 53223.