REFERENCE MANUAL 83A1
DRINKING WATER

Contents

A. DRINKING WATER POLICY

NPS Unit Managers will reduce the risk of waterborne diseases and provide safe drinking water to employees, the visiting public, and park partners by assuring that drinking water systems are properly operated, maintained, monitored, and deficiencies promptly corrected. Drinking water systems will be regulated in accordance with 1) the Safe Drinking Water Act, as amended (42 U.S.C. 7401 et seq.), or 2) the Primacy Agency (e.g. the agency designated by Federal law as having oversight responsibility). Additional guidance for ***non-public*** or other ***unregulated*** drinking water systems is provided in RM83(A1).

A.1 All parks that operate public drinking water systems will have certified operators as required by the primacy agency. Parks that operate only non-public drinking water systems will have appropriately trained operators.

A.2 NPS Unit Managers will develop training plans and assure that operators receive any required and/or appropriate training.

A.3 NPS Unit Managers will assure that required records are maintained in permanent files for periodic review by the regional Public Health Consultant (PHC) or Primacy Agency representatives, and that reports are submitted on a timely basis as requested by the PHC and/or the Primacy Agency.

A.4 Bacteriological and chemical sampling will be performed in accordance with Federal, State and local laws/regulations and will comply with the requirements of RM83 (A1).

A.5 All water samples will be tested in laboratories certified by the Primacy Agency.

A.6 All surface water sources and any groundwater sources under the direct influence of (GWUDI) surface water, as determined by the Primacy Agency for public systems will be provided with approved filtration. Non-public surface water sources and groundwater sources under the direct influence of (GWUDI) surface water, as determined by the PHC, will be provided with approved filtration.

A.7 All public drinking water systems will be continuously disinfected. Acceptable disinfecting methods are those which provide a measurable disinfectant residual (minimum .2 mg/l free chlorine, optimum range is .5 to 1.0 mg/l free chlorine) in the distribution system. The PHC may specifically exempt ***non-public*** systems after a complete sanitary survey of the system is made.

A.8 For those park operated, public drinking water systems utilizing a chemical disinfectant, one (1) disinfectant residual sample will be measured and recorded per day from representative points. Parks operating ***non-public*** drinking water systems or receiving water from municipalities should contact the PHC for residual monitoring guidance.

A.9 Sanitary surveys for State regulated, public drinking water systems will be conducted in accordance with Primacy Agency requirements. The PHC may conduct sanitary surveys

of unregulated and/or non-public water systems.

A.10 All parks operating drinking water systems will have a documented cross connection control program on file for review by the Primacy Agency and/or the PHC (See RM83(A2)).

A.11 Water for all NPS water hauling operations, whether conducted by the park or a private contractor, will be obtained from an approved water source that meets the requirements of the Safe Drinking Water Act.

A.12 All parks will comply with the public notification requirements of the Safe Drinking Water Act.

A.13 When drinking water system modifications or new construction are proposed, parks will contact the Primacy Agency to determine if plans and specifications should be submitted for approval. A copy of the plans and specifications will be provided to the PHC upon request.

A.14 Potable water for backcountry operations must be 1) obtained from an approved public system, 2) boiled, or 3) filtered and disinfected.

A.15 Appropriate training requirements for non-certified operators will be described in park policy that is reviewed and approved by the Regional Public Health Consultant.

A.16 All parks operating drinking water systems will have an Operations and Maintenance Plan and an Emergency Management Plan.

B. WATER SYSTEM DEFINITIONS

B.1	Public Water System (**PWS**):	A system which provides water to the public for human consumption through pipes or "other constructed conveyances, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days per year".
B.2	**C**ommunity Water System (**CWS**):	A public water system that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.
B.3	**N**on-**T**ransient Non-Community Water System (**NTNC**):	A public water system that is not a [CWS] and that regularly serves at least 25 of the same persons over 6 months per year. Examples: Systems serving facilities such as schools or non-residential work sites where the same people use the water on

a regular basis.

B.4	Transient **N**on-**C**ommunity Water System (**TNC**):	Any public water system not described in 1 or 2 above that serves more than 25 persons per day at least sixty days out of the year. Examples: systems serving campgrounds or other non-residential areas not used by at least 25 of the same persons over 6 months a year.
B.5	**N**on-**P**ublic Water Systems (**NP**):	A water system that serves less than 15 service connections, or an average of less than 25 of the same persons per day. Examples could include systems serving ranger stations, individual residences and small campgrounds.

C. BACTERIOLOGICAL MONITORING

Definitions of the systems described below, as well as definitions of other terms used in this guideline are listed above and on pages 21-22.

C.1 Number and Frequency of Samples:

a. Community Water Systems [CWS]: Two samples per month, minimum, or as per Table 1 (Page 23). Samples must be taken at equally spaced intervals two times per month.

b. Non-Community Water Systems [NTNC & TNC]: Two samples per month, minimum, or as per Table 1 (Page 23). Samples must be taken at equally spaced intervals two times per month.

c. Non-Public Water Systems [NP]: One sample per month. The sampling frequency may be changed if authorized in writing by the PHC. *This authorization will only be given after a complete sanitary survey and review of the operational records indicates a reduced sampling frequency would not increase risk to end-users.*

C.2 Special Sampling Requirements:

a. Seasonal systems: Seasonal systems must obtain two consecutive, **negative** samples prior to utilization of the system. Samples may be collected on the same day, but not at the same time and must be collected at different sampling sites according to the site-sampling plan, if applicable.

b. Source water monitoring: Some Primacy Agencies require periodic source (raw) water monitoring. Sampling of source water must be in accordance with the Primacy Agency requirements.

c. Municipal supplies: National Park Service operated distribution systems serviced by municipal systems should be included in the municipality's bacteriological sampling programs whenever feasible. When the municipality does not monitor a distribution system, the PHC should be contacted to determine if and when the system requires sampling.

C.3 Site-sampling plan: Each system must have a written site-sampling plan available for review by the Primacy Agency, and/or the PHC. All bacteriological samples must be collected from identified sampling sites.

C.4 Positive samples: All positive total coliform samples require that the system operator obtain repeat samples in accordance with the Primacy Agency or at a minimum the following:

a. Public systems: Three repeat samples must be collected within 24 hours of laboratory notification of the positive result. One sample must be collected at the site of the positive sample, and one sample collected upstream and one downstream of the positive sample site, each within 5 service connections of positive sample site. In addition, a minimum of five samples must be collected the following month. **NOTE**: This includes public non-community systems.

b. Non-public systems: Two repeat samples must be collected and analyzed. One sample must be collected at the site of the positive sample.

C.5 Non-compliance - Public Systems: **If any repeat samples are positive,** the park must notify the Primacy Agency and the PHC by close of business of the day following receipt of notification of sample results. If the repeat test results indicate a fecal coliform or an *E.coli* contamination, public notification and corrective action must be taken immediately. The Park must contact the Primacy Agency for their concurrence on the content and method to be used in notifying the public. The Primacy Agency and the PHC must be contacted for assistance in determining the source of the contamination and in implementing corrective action.

Public notification is required if the requisite number of samples is not collected, or if more than one routine sample per month is positive for total coliform. Coordination with the Primacy Agency and/or the PHC is required.

C.6 Non-compliance - Non-Public Systems: The procedure described for public systems must be followed except that notification and involvement of the Primacy Agency is not required.

D. CHEMICAL MONITORING

The monitoring requirements in this section may be waived for non-public and/or unregulated systems if authorized, in writing, by the PHC. This authorization will only be given after a

complete sanitary survey of the system and review of the operational records indicates a reduced sampling frequency or waiver would not increase risk to end-users.

Systems connected to municipal supplies are not required to perform chemical monitoring if current analyses are available from the municipality. If current analyses are not available, the Park may be requested by the PHC to perform the analyses.

Monitoring requirements are as shown in **Table 5 (Page 41): National Park Service Water Systems Routine Monitoring Requirements**.

For a complete overview of the EPA National Primary Drinking Water Standards go to: http://www.epa.gov/safewater/standards.html

D.1 Primary, secondary, and general mineral: Primary inorganic, secondary inorganic and general mineral analyses must be conducted to meet regulatory requirements and/or to determine the most feasible treatment methodologies to provide water of satisfactory quality. Samples shall be collected from the source before treatment. NOTE – Nitrates are required annually for all sources.

For more information on inorganic chemicals, specific rule information, compliance dates, and regulatory updates, go to: http://www.epa.gov/safewater/mcl.html#inorganic

D.2 Organics:

a. Pesticides, Herbicides & PCB's: All public community and public non-transient non-community systems must be sampled annually unless a State or Primacy Agency waiver has been issued. All public non-community (transient users only) and non-public systems must be sampled one time. Additional sampling requirements are dependent upon the initial sampling results and source vulnerability. Samples should be collected after treatment and prior to entry to the distribution system.

b. **V**olatile **O**rganic **C**hemicals (**VOC**): There are fifty-five VOC's that have MCL's (regulated or unregulated) that must be analyzed. Samples should be collected after treatment and prior to entry to the distribution system.

i. Groundwater Supplies. Public community and public non-transient non-community systems served by groundwater supplies should have collected a sample from each entry point to the distribution system for an initial analysis by **December** 1990. A single routine sample must be collected at three-year intervals thereafter, unless the Primacy Agency has issued a waiver.

ii. Surface Water Systems. The initial sampling for public community and public non-transient non-community systems served by surface sources consists of four quarterly samples to be collected over a one-year period.

The first sample should have been collected by **December 1990**. Sampling must be repeated at three-year intervals thereafter, unless the Primacy Agency has issued a waiver.

iii. All Other Public Systems (ground or surface water). These systems should be sampled one time for baseline information. Contact the PHC for additional information and guidance.

iv. Non-public Systems. These systems should be sampled in special situations only. Contact the PHC for additional information and guidance.

For more information on organic chemicals, specific rule information, compliance dates, and regulatory updates, go to: http://www.epa.gov/safewater/mcl.html#organic

Note: If the primacy agency grants a waiver for organic chemical monitoring for a public system, the PHC may also grant a waiver for those non-public systems not regulated by the State but lie within the same aquifer.

D.3. Disinfectants/Disinfection Byproducts: This rule is intended to balance the use of disinfectants with the potential health effects from long term exposure to byproducts formed by the reaction of disinfectants with natural organic and inorganic matter in drinking water

a. This rule applies to all community and non-transient non-community water systems that add a chemical disinfectant to the water in any part of the treatment process. This includes surface water systems, groundwater systems under direct influence of surface water, and groundwater systems.

b. **Compliance dates:**

i. Surface Water and GWUDI of Surface Water Systems. For systems serving 10,000 or more people/day, the effective date is **January 2002**.

ii. Small Surface Water and GWUDI of Surface Water Systems. For systems serving less than 10,000 people/day, the effective date is **January 2004**.

c. **Byproducts to be monitored:**

i. Total trihalomethanes (TTHM): The sum of chloroform, bromoform, bromodichloromethane, and dibromochloromethane.

ii. Haloacetic acids (HAA5): The sum of monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid.

iii. Bromate: For those systems using ozone for disinfection.

iv. Chlorite: For those systems using chlorine dioxide for disinfection.

d. **Disinfectants to be monitored:**

i. Chlorine: for those systems using chlorine.[1]

ii. Chloramine: for those systems using chloramine.

iii. Chlorine dioxide: for those systems using chlorine dioxide.

e. **Monitoring requirements:**

i. Large surface water systems (>10,000 persons/day): monitor 4 samples/plant/quarter for TTHMs and HAA5s.

ii. Small surface water systems (<10,000 persons/day): monitor 1 sample/plant/year for TTHMs and HAA5s.

iii. Very small surface water systems - serving less than 500 people each day: monitor 1 sample/plant/year for TTHMs and HAA5s.

iv. Large ground water systems - serving more than 10,000 people each day: monitor 1 sample/plant/quarter for TTHMs and HAA5s.

v. Small ground water systems - serving less than 10,000 people each day: monitor 1 sample/plant/year for TTHMs and HAA5s.

vi. All Systems – monitoring per TCR for chlorine, chloramines and chlorine dioxide (which ever is used for disinfection).

[1]The MCL for chlorine under the stage 1 disinfection byproducts rule is 4.0 mg/L for systems serving fewer than 10,000 persons/day and is effective January 2004.

For specific rule information, compliance dates, and regulatory updates, go to: http://www.epa.gov/safewater/mdbp/dbpfr.pdf

E. LEAD AND COPPER

On June 7, 1991, final national primary drinking water regulations for lead and copper were adopted for public-community and public non-transient non-community water systems. The rule establishes maximum contaminant level goals (MCLG), and action levels for both lead and copper. It also sets forth treatment technique requirements and specifies monitoring requirements, analytical methods, public notification requirements, record keeping and reporting requirements, and compliance schedules. An EPA public education program is also required if

an action level is exceeded.

To comply with the rule and in order to assess for and reduce the health risks associated with lead and copper, parks should:

E.1 **Initial Surveillance for All NPS Water Systems:**

a. Have the water entering each system analyzed for lead and copper at a certified laboratory with a MDL of 0.001 mg/l for lead and 0.020 mg/l for copper. This will normally be done as part of the inorganic analysis.

If source water exceeds 0.015 mg/l of lead or 1.3 mg/l of copper, the levels must be reduced below those levels before the water enters the system. Systems with lead or copper contamination problems will have 24 months to install treatment specified by the Primacy Agency and 12 months after treatment installation to correct follow-up source samples.

After treatment, source water monitoring will be standardized to a three-year cycle established by the Primacy Agency.

b. Take first draw tap samples (one liter) at each Park Service owned residence and have them analyzed for lead and copper. If one or more first draw tap samples are elevated for lead or copper (>0.015 mg/l, >1.3 mg/l), contact your PHC for further recommendations.

c. Assure that lead solder or flux is no longer used in domestic water plumbing.

d. Replace drinking fountains listed by EPA under the Lead Contamination Control Act.

E.2 **Monitoring:**

a. Monitor community and non-transient non-community systems for lead and copper by collecting one set of samples every 6 months effective **July 1993**.

b. If the samples are not above the action levels in the 90th percentile, samples must be collected once a year for three years and then once every three years as long as the results are below the action level.

c. If the action level is exceeded in the 90th percentile at the consumer's tap, treatment methods approved by the Primary Agency must be installed.

* The Primacy Agency may allow reduced monitoring if certain conditions are met. Otherwise, base monitoring is required.

For specific rule information, compliance dates, and regulatory updates, go to:

http://www.epa.gov/safewater/lcrmr/implement.html

F. RADIONUCLIDES

F.1 In 2000, EPA revised the radionuclides regulation, which had been in effect since 1977. The revisions required new monitoring provisions to ensure that all customers of community water systems will receive water that meets the Maximum Contaminant Levels for radionuclides in drinking water. EPA also issued a standard for uranium, as required by the 1986 amendments to the Safe Drinking Water Act. The current standards are: combined radium 226/228 of 5 pCi/L; a gross alpha standard for all alphas of 15 pCi/L (not including radon and uranium); a combined standard of 4 mrem/year for beta emitters. The new MCL for uranium is 30 µg/L.

Community water systems (CWSs), which are water systems that serve at least 15 service connections or 25 residents regularly year round, are required to meet the final MCLs and to meet the requirements for monitoring and reporting.

Non-transient, non-community water systems (NTNCWSs) will not be regulated at this time. EPA will further consider this matter and may propose to regulate radionuclides at these systems in the future. NTNCWSs are public water systems that are not a CWS and serve at least 25 of the same people more than 6 months per year

For specific rule information, compliance dates, and regulatory updates, go to:

http://www.epa.gov/safewater/radionuclides/regulation.html#one

G. WATER TREATMENT

G.1 Filtration:

a. All surface water sources and any groundwater sources under the direct influence of surface water must be provided with approved filtration.

b. Compliance schedule for provision of filtration: For surface water supplies, filtration must have been in place and operational effective June 29, 1993. For groundwater supplies that are determined to be under the influence of surface water, filtration must be in place and operational 18 months after the Primacy Agency officially issues the determination

c. Parks with groundwater sources clearly under the direct influence of surface water should contact the PHC for assistance in developing a schedule to provide filtration or developing a new groundwater source.

d. In those cases where it is not certain if a groundwater source is under the influence of surface water, parks should be aware that the criteria for making such determinations have not been developed by all Primacy Agencies. When these

criteria are developed, parks should contact the PHC for assistance in developing and initiating a modification schedule.

For specific rule information, compliance dates, and regulatory updates, go to: http://www.epa.gov/safewater/mdbp/mdbp.html

e. On December 16, 1998 EPA finalized an Interim Enhanced Surface Water Treatment Rule (IESWT), which became effective **February 16, 1999**. This rule is intended to improve control of microbial pathogens, including specifically the protozoan *Cryptosporidium*, by enhancing physical removal efficiencies in drinking water, and addresses risk trade-offs with disinfection byproducts.

For specific rule information, compliance dates, and regulatory updates, go to: http://www.epa.gov/safewater/mdbp/ieswtr.html

f. In January 2004, the EPA Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) became effective. This rule follows the IESWTR and regulates systems of less than 10,000 people. This rule includes the compliance with Stage 1 Disinfectants/Disinfection Byproducts Rule. These new rules affect public and non-public surface water treatment plants including ground water systems under the influence of surface water.

For specific rule information, compliance dates, and regulatory updates, go to: http://www.epa.gov/safewater/mdbp/app_b_regulatory.pdf

g. In December 2005, the EPA Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and the Stage 2 Disinfection Byproduct Rule became effective. The Long Term 2 Enhanced Surface Water Treatment Rule and the Stage 2 Disinfection Byproducts Rule are the second phase of rules required by Congress. These rules strengthen protection against microbial contaminants, especially Cryptosporidium, and at the same time, reduce potential health risks of disinfection byproducts. The new regulations apply to public water systems that use surface water or ground water under the influence of surface water.

Under the LT2ESWTR, systems will monitor their water sources to determine treatment requirements. This monitoring includes an initial two years of monthly sampling for *Cryptosporidium*. To reduce monitoring costs, small filtered water systems will first monitor for *E. coli*—bacterium which is less expensive to analyze than *Cryptosporidium*—and will monitor for *Cryptosporidium* only if their *E. coli* results exceed specified concentration levels.

Monitoring starting dates are staggered by system size, with smaller systems beginning monitoring after larger systems. Systems must conduct a second round of monitoring six years after completing the initial round to determine if source water conditions have changed significantly. Systems may use (grandfather) previously collected data in lieu of conducting new monitoring, and systems are

not required to monitor if they provide the maximum level of treatment required under the rule.

Cryptosporidium treatment: Filtered water systems will be classified in one of four treatment categories (bins) based on their monitoring results. The majority of systems will be classified in the lowest treatment bin, which carries no additional treatment requirements. Systems classified in higher treatment bins must provide 90 to 99.7 percent (1.0 to 2.5-log) additional treatment for *Cryptosporidium*. Systems will select from a wide range of treatment and management strategies in the "microbial toolbox" to meet their additional treatment requirements. All unfiltered water systems must provide at least 99 or 99.9 percent (2 or 3-log) inactivation of *Cryptosporidium*, depending on the results of their monitoring. These *Cryptosporidium* treatment requirements reflect consensus recommendations of the Stage 2 Microbial and Disinfection Byproducts Federal Advisory Committee.

Other requirements: Systems that store treated water in open reservoirs must either cover the reservoir or treat the reservoir discharge to inactivate 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium*. These requirements are necessary to protect against the contamination of water that occurs in open reservoirs. In addition, systems must review their current level of microbial treatment before making a significant change in their disinfection practice. This review will assist systems in maintaining protection against microbial pathogens as they take steps to reduce the formation of disinfection byproducts under the Stage 2 Disinfection Byproducts Rule, which EPA is finalizing along with the LT2ESWTR.

The Stage 2 Disinfection Byproducts Rule strengthens public health protection for customers by tightening compliance monitoring requirements for two groups of DBPs, trihalomethanes (TTHM) and haloacetic acids (HAA5). The rule targets systems with the greatest risk and builds incrementally on existing rules. This regulation will reduce DBP exposure and related potential health risks and provide more equitable public health protection.

Under the Stage 2 DBPR, systems will conduct an evaluation of their distribution systems, known as an Initial Distribution System Evaluation (IDSE), to identify the locations with high disinfection byproduct concentrations. These locations will then be used by the systems as the sampling sites for Stage 2 DBPR compliance monitoring.

Compliance with the maximum contaminant levels for two groups of disinfection byproducts (TTHM and HAA5) will be calculated for each monitoring location in the distribution system. This approach, referred to as the locational running annual average (LRAA), differs from current requirements, which determine compliance by calculating the running annual average of samples from all monitoring locations across the system.

The Stage 2 DBPR also requires each system to determine if they have exceeded an operational evaluation level, which is identified using their compliance monitoring results. The operational evaluation level provides an early warning of possible future MCL violations, which allows the system to take proactive steps to remain in compliance. A system that exceeds an operational evaluation level is required to review their operational practices and submit a report to their state that identifies actions that may be taken to mitigate future high DBP levels, particularly those that may jeopardize their compliance with the DBP MCLs.

Entities potentially regulated by the Stage 2 DBPR are community and nontransient noncommunity water systems that produce and/or deliver water that is treated with a primary or residual disinfectant other than ultraviolet light.

A community water system (CWS) is a public water system that serves year-round residents of a community, subdivision, or mobile home park that has at least 15 service connections or an average of at least 25 residents.

A nontransient noncommunity water system (NTNCWS) is a water system that serves at least 25 of the same people more than six months of the year, but not as primary residence, such as schools, businesses, and day care facilities.

For specific rule information, compliance dates, and regulatory updates, go to:

http://www.epa.gov/safewater/disinfection/lt2/regulations.html

http://www.epa.gov/safewater/disinfection/stage2/regulations.html

h. The Environmental Protection Agency (EPA) is in the process of promulgating the final Ground Water Rule (GWR) to reduce the risk of exposure to fecal contamination that may be present in public water systems that use ground water sources. The rule establishes a risk-targeted strategy to identify ground water systems that are at high risk for fecal contamination. The GWR also specifies when corrective action (which may include disinfection) is required to protect consumers who receive water from ground water systems from bacteria and viruses.

   The rule addresses risks through a risk-targeting approach that relies on four major components:

   1. Periodic sanitary surveys of ground water systems that require the evaluation of eight critical elements and the identification of significant deficiencies (e.g., a well located near a leaking septic system). States must complete the initial survey by December 31, 2012 for most community water systems (CWSs) and by December 31, 2014 for CWSs with outstanding performance and for all non-community water systems.

   2. Source water monitoring to test for the presence of *E. coli*, enterococci, or coliphage in the sample. There are two monitoring provisions:

- *Triggered monitoring* for systems that do not already provide treatment that achieves at least 99.99 percent (4-log) inactivation or removal of viruses and that have a total coliform-positive routine sample under Total Coliform Rule sampling in the distribution system.

- *Assessment monitoring* - As a complement to triggered monitoring, a State has the option to require systems, at any time, to conduct source water assessment monitoring to help identify high risk systems.

3. Corrective actions required for any system with a significant deficiency or source water fecal contamination. The system must implement one or more of the following correction action options:

    - correct all significant deficiencies,

    - eliminate the source of contamination,

    - provide an alternate source of water, or

    - provide treatment which reliably achieves 99.99 percent (4-log) inactivation or removal of viruses.

4. Compliance monitoring to ensure that treatment technology installed to treat drinking water reliably achieves at least 99.99 percent (4-log) inactivation or removal of viruses.

For specific rule information, compliance dates, and regulatory updates, go to:

http://www.epa.gov/safewater/disinfection/gwr/regulation.html#therule

G.2 **Turbidity Monitoring:**

a. All water systems requiring filtration under the Surface Water Treatment Rule, Interim Enhanced Surface Water Treatment Rule, Long Term 1 Enhanced Surface Water Treatment Rule and Long Term 2 Enhanced Surface Water Treatment Rule (See G.1.) must be analyzed for turbidity. The unit of measure for turbidity is the Nephelometric Turbidity Unit (NTU). The MCL is 1.0 NTU for diatomaceous earth and slow sand filtration and 0.3 NTU for conventional and direct filtration. The MCL for "other technology" filtration such as bag filtration is 1.0 NTU unless a more stringent requirement is established by the Primacy Agency. The turbidity must never be greater than 1.0 NTU. Systems serving 500 or fewer persons per day must collect one grab sample per day. Effective **June 29, 1993**, systems serving more than 500 persons per day must collect one grab sample every four hours when water is served to the Public or continuous monitoring may be substituted for grab sampling.

The PHC must be informed of any violation. The issuance and content of public

notification must be determined in consultation with the Primacy Agency and/or the PHC.

For specific rule information, compliance dates, and regulatory updates, go to: http://www.epa.gov/safewater/mdbp/mdbp.html

G.3 **Disinfection:**

All public drinking water systems will be continuously disinfected. Acceptable disinfecting methods are those which provide a measurable disinfectant residual (minimum .2 mg/l free chlorine, optimum range is .5 to 1.0 mg/l free chlorine) in the distribution system. The PHC may specifically exempt ***non-public*** systems after a complete sanitary survey of the system is made.

Acceptable disinfection methods are those which provide a measurable disinfectant residual in the distribution system.

a. Distribution System Residual: A minimum free chlorine residual of 0.2 mg/l must be maintained at all points throughout the distribution system. If disinfectants other than chlorine are used, the PHC or Primacy Agency must be contacted for residual levels required to be maintained. The absence of a residual indicates either an equipment failure or the presence of contamination in the system. If an equipment failure is not the cause, the park must contact the PHC or the Primacy Agency for assistance in determining what action to take.

b. Routine Monitoring: All **chlorinated** distribution systems must be monitored for the presence of a **chlorine** residual. A minimum of one sample per day must be measured and recorded from representative points in the distribution system. Parks receiving water from municipalities should contact the PHC for residual monitoring requirements.

In addition to monitoring the distribution system itself, parks with surface water systems must monitor the entry point to the distribution system for the presence of a chlorine residual. The minimum chlorine residual is 0.2 mg/l or a higher level determined using CT calculations. If the residual drops below 0.2 mg/l (or the CT-Value, which ever is greater), it must be restored within four hours. Whenever the residual falls below the required value, the park must notify the Primacy Agency and the PHC as soon as possible but not later than the end of the next business day. For systems serving more than 3300 persons, the chlorine residual must be monitored on a continuous basis. Systems serving fewer than 3301 persons can take grab samples in lieu of continuous monitoring at the following frequencies:

System Population	Samples/day
< 500	1
501-1000	2
1001-2500	3

b. Redundancy of Disinfection Equipment: For surface water systems, replacement of disinfection equipment must be available and in service within four hours of problem identification.

c. Special Monitoring - Bacteriological Sampling: The chlorine residual must be measured at the bacteriological sample site each time a bacteriological sample is collected. The monitoring results must be recorded on the operators log and the laboratory form.

H. OPERATOR REQUIREMENTS

H.1 All parks that operate public drinking water systems will have certified operators as required by the primacy agency. Parks that operate only non-public drinking water systems will have appropriately trained operators.

H.2 The park must designate in writing, backup operators who have adequate training and skills to properly operate the system when the primary operator is not available.

Equivalent backup operator certification and training is recommended and may be required by some primacy agencies.

H.3 Appropriate training requirements for backup operators and for noncertified operators of nonpublic systems will be described by Park policy, reviewed and approved by the Regional Public Health Consultant.

H.4 NPS Unit Managers will develop training plans and assure that operators receive any required and/or appropriate training.

I. SANITARY SURVEYS

The 1986 amendments to the Safe Drinking Water Act require that the Primacy Agency conducts sanitary surveys or an entity approved by the Primacy Agency. For unregulated and/or non-public systems, contact the PHC.

J. CROSS CONNECTION CONTROL

Each park must have a documented cross connection control program on file for review by the Primacy Agency and/or the PHC. An example policy for cross-connection and backflow control is provided in RM83 (A2).

K. POTABLE WATER HAULING

In the absence of State or local standards, the following standards shall apply to NPS water hauling operations whether conducted by the Park or a private contractor:

K.1 Water shall be hauled from an approved source that meets the requirements of the Safe Drinking Water Act (SDWA).

K.2 Containers must be, (1) constructed of non-toxic materials, (2) be non-porous, (3) have never been used for storing anything but potable water, (4) used only for hauling potable water, and (5) be labeled "potable water only".

K.3 Before the container is filled, sufficient chlorine shall be added to achieve a free chlorine residual of 1.0 ppm, in the water hauled. A free chlorine residual sample shall be taken, and recorded.

K.4 The container must be flushed each time water is hauled if it has not been used for more than one day.

K.5 At no time during the water filling operation shall a potential for backflow exist.

K.6 Hoses used to fill and empty tanks shall be properly identified, and used only for potable water. The ends of the hoses shall be capped, when not in use, and the caps shall be attached to the hoses.

K.7 Hoses shall be stored in such a manner that they are not subject to contamination from surface run-off, birds, rodents, and other sources of contamination.

K.8 All valves and fire hydrants shall be flushed before the connection of any hoses.

K.9 No bacteriological testing will be required on water hauling tanks when source water systems and receiving water systems have a monitoring program in place.

L. REPORTS AND RECORDS RETENTION

The park has the responsibility for the maintenance of official records and to have them available in an organized manner for the review and inspection of various regulatory entities and for periodic review by the PHC. Records must be retained as follows or as required by the Primacy Agency:

RECORDS	RETENTION PERIOD
Chemical Analyses	Indefinitely
Bacteriological Analyses	Five years
Turbidity Measurements	Five years
Public Notices, Administrative Orders, Variances and Exemptions	Five years
Sanitary Surveys	Ten years
Operating Records--includes water usage, water production, chemical usage, chlorine residuals, etc.	Five years
System History - includes well logs test pump data, system	

modifications, as-builts, operator designations, significant events	Indefinitely
Lead and Copper Rule Records	Twelve years

M. WATER CONSERVATION

NPS Management Policies (Chapter 9.1.5.1) requires that the NPS design, construct, manage, and maintain water supply systems in a fashion that promotes conservation. Conservation measures which should be considered include: metering, leak detection and correction, automatic irrigation systems, low-use water fixtures, low flush toilets, and programs which discourage wasteful use of water.

N. PAYMENT OF FEES FOR SERVICE

Many Primacy Agencies charge fees for services. Fees are charged for plan review, construction and operating permits, and for sanitary surveys conducted by the Primacy Agency. The Safe Drinking Water Act placed federally owned and operated systems under the jurisdiction of Primacy Agencies. Parks may be required to pay subject fees. Payment of fees should be included in annual budget and contracting plans, as appropriate.

O. PUBLIC NOTIFICATION

The public notification requirements of the Safe Drinking Water Act require water systems to notify the persons they serve when:

O.1 Violation(s) of a National Primary Drinking Water Regulation or its monitoring requirements occur.

O.2 Variances or exemptions are in effect.

O.3 Systems do not comply with any schedule associated with a variance or exemption

The public notification requirements distinguish between serious violations, such as failure to meet a maximum contaminant level (MCL), and minor violations such as failure to use the proper analytical technique. This is accomplished by a two-tiered structure of public notification requirements. Tier I violations pose acute risk to human health and require rapid notification. Tier II violations do not pose an acute risk and more time is allowed for notification.

The Primacy Agent is responsible for approving the content distribution and timing of public notices. Therefore, whenever public notification is required, parks must contact the Primacy Agency for assistance in preparing such notices.

P. PLAN REVIEW AND APPROVAL

Whenever major water system modifications are proposed, parks must contact the Primacy Agency to determine whether or not plans and specifications must be submitted for approval.

The PHC may be contacted for technical review and guidance on public health related issues (e.g. treatment, backflow prevention, disinfection).

Q. POTABLE WATER FOR BACKCOUNTRY OPERATIONS

Water used for drinking and culinary purposes by backcountry concessionaires must be obtained from an approved public system or from a source known to be free of chemical contamination and treated by:

a. **Boiling**: Bringing to a rolling boil for 1 minute, or 3 minutes for elevation above 6500 feet.

OR

b. **Filtering and Disinfecting**: Filtering through an "Absolute" 1 micron filter, or one labeled as meeting American National Standards Institute (ANSI/NSF) (formerly the National Sanitation Foundation) International Standard #53 for "Cyst Removal" followed by disinfection. Add 8 drops of liquid chlorine bleach per gallon of water or another approved sanitizer and let stand for 30 minutes.

OR

c. Taking a supply of water from an approved public water system and properly storing in containers that are free from contamination and disinfected between every use. Due to the lack of labeling and manufacturing standards, there is no assurance that bottled water is safer than public drinking water and may require boiling also.

Water storage containers must be free of contamination when in use and must be washed and sanitized as necessary.

R. CONSUMER CONFIDENCE REPORTS

The Safe Drinking Water Amendments of 1996 require that Public Community Systems provide all consumers with a yearly Consumer Confidence Report which outlines all bacteriological, physical, and chemical monitoring results and Maximum Contaminant Levels for the preceding year.

S. DRINKING WATER SECURITY AND EMERGENCY PREPAREDNESS

Security and emergency response planning have always been a critical element of managing a drinking water system. Threat categories include physical destruction, bioterrorism/chemical contamination, cyber attacks, and personnel disruption. Potential threats can come from vandals, disgruntled employees, insider sabotage, activist groups, or state-sponsored terrorist groups.

The Park should determine if there are any state mandated requirements for providing drinking water security assessments.

If there no state requirements, the park can utilize the following list of actions that each park can do to protect the water supply from contamination and other harm:

1. Prepare or update an emergency response plan. Ensure all level of involvement and that all staff receive training on the plan.
2. Post updated emergency 24-hour numbers in highly visible areas (pumphouses, vehicles, offices) and give them to key personnel and local response officials.
3. Get to know the Park Ranger staff and/or the local law enforcement personnel. Ask them to add your facilities to their routine patrols. Practice emergency response procedures with the rangers, emergency response and public health staff.
4. Fence and lock your drinking water facilities and vulnerable areas (e.g. wellhead, hydrants, manholes, pumphouses, and storage tanks).
5. Lock all entry gates and doors and set any alarms to indicate illegal entry. Do not leave keys in equipment or vehicles at any time.
6. Install good lighting around your pumphouse, treatment facility and parking lot.
7. Identify existing and alternate water supplies and maximize use of backflow prevention devices and interconnections.
8. Use your Source Water Assessment information to lessen any threat posed by potential sources of contamination.
9. Lock monitoring wells to prevent vandals or terrorists from pouring contaminants directly into ground water near your source. Prevent pouring or siphoning contaminates through vent pipes by moving them inside the pumphouse or treatment plant. If that is not possible, fence or screen them.
10. In the event of an emergency, first call "911" then activate your emergency response plan.

A self-assessment vulnerability checklist is provided at: http://www.nps.gov/public_health/intra/. A more in-depth vulnerability profile assessment can be found in the Association of State Drinking Water Administrators, National Rural Water Association "Security Vulnerability Self-Assessment Guide for Small Drinking Water Systems" document.

These and other drinking water security references can be accessed at the following NPS website: http://www.nps.gov/public_health/intra/

T. GENERAL DEFINITIONS

Item	Definition
CT-value (Concentration X Time)	The product of "residual disinfection concentration" in mg/l determined before or at the first customer, and the corresponding "disinfection contact time" in minutes.
Cryptosporidium	Coccidian protozoan shed in the feces of man and animals in the form of oocysts, which can survive under adverse environmental conditions for long periods of time. Responsible for a severe gastrointestinal disease called cryptosporidiosis.
Escherichia coli (*E.coli*)	One of the species of bacteria in the fecal coliform

	group. It is found in large numbers in the gastrointestinal tract and feces of warm-blooded animals and man. Its presence is considered indicative of fresh fecal contamination, and it is used as an indicator organism for the presence of less easily detected pathogenic bacteria.
Fecal Coliforms	Aerobic and facultative, gram-negative, non-spore-forming rod-shaped bacteria capable of growth at 44.5 degrees C., and associated with fecal matter of warm-blooded animals.
Giardia lamblia	Flagellate protozoan shed in the feces of man and animals, usually in the cyst stage, and responsible for a severe gastrointestinal disease called giardiasis.
Ground water under the direct influence of surface water (**GWUDI**)	Water beneath the surface of the ground with (1) significant occurrence of insects or other macroorganisms, algae, or large-diameter pathogens such as *Giardia lamblia;* or (2) significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions.
Heterotrophic Plate Count (**HPC**)	Number of colonies of heterotrophic bacteria grown on selected solid media at a given temperature and incubation period, usually expressed in number of colony forming units per milliliter of sample (CFU/ml).
Heterotrophic microorganisms	Bacteria and other microorganisms that utilize organic matter synthesized by other organisms for energy and growth.
Inorganic Chemicals (**IOC**)	Chemical substances of mineral origin not having carbon in their molecular structure.
Maximum Contaminant Levels (**MCL**)	The highest permissible concentration of a substance allowed in drinking water, as established by EPA.
Maximum Contaminant Level Goals (**MCLG**)	The highest permissible concentration of a substance allowed in drinking water at which no known or anticipated health effects will occur. They are health goals and are not enforceable.
Minimum Detection Limit (**MDL**)	The lowest achievable concentration of a contaminant that can be measured under ideal laboratory conditions. A more technical definition is the minimum concentration of a substance that can be identified, measured, and reported with 99% confidence that the concentration of the substance being measured is greater than zero.
Potable Water Hauling:	The transportation of potable water as a primary, a supplemental, or an emergency source in containers greater than 50 gallons.
Primacy Agency	Generally a State agency authorized by the EPA to

	administer provisions of Safe Drinking Water Act. (Note: Not all States have requested this authorization. If authorization is not requested, EPA is the Primacy Agency).
Radionuclide	A material with an unstable atomic nucleus, which spontaneously decays or disintegrates, producing radiation.
Sanitary Survey	A detailed investigation of the features of a water system and conditions, which may impact the ability of the system to deliver safe drinking water.
Synthetic Organic Chemicals (**SOC**)	Man-made organic chemicals, many of which have been detected in drinking water. This group includes the VOCs.
Trihalomethanes (**THM**)	A group of volatile organic compounds formed when chlorine reacts with naturally occurring humic substances. Individual Compounds are not regulated under THM's.
Total Coliforms	A group of bacteria predominantly inhabiting the intestines of man or animals but occasionally found elsewhere. Presence in water is used as indication of possible pathogen contamination.
Total Trihalomethanes (**TTHM**)	A term used to designate the total concentration of chloroform, bromoform, dibromochloromethane, and bromodichloromethane in the National Primary Drinking Water Regulations. Combination of THM compounds is regulated.
Volatile Organic Compounds (**VOC**)	Lightweight, man-made organic compounds that vaporize, or evaporate, easily.
Waiver	The relinquishing of the requirements to perform certain monitoring and/or sampling procedures.

TABLE 1
NPS – TOTAL COLIFORM SAMPLE
REQUIREMENTS FOR PUBLIC SYSTEMS

Population Served Per Day	Minimum Number of Samples Per Month
25 to 2,500	2
2,501 to 3,300	3
3,301 to 4,100	4
4,101 to 4,900	5
4,901 to 5,800	6
5,801 to 6,700	7
6,701 to 7,600	8

7,601 to 8,500	9
8,501 to 12,900	10
12,901 to 17,200	15
17,201 to 21,500	20
21,501 to 25,000	25
25,001 to 33,000	30
33,001 to 41,000	40
41,001 to 50,000	50
50,001 to 59,000	60
59,001 to 70,000	70
70,001 to 83,000	80
83,001 to 96,000	90
96,001 to 130,000	100

The population served (**p**) is defined as the sum of the residents (**r**) and the average daily transient population (total number of transients (**t**) served per month divided by the number of days (**d**) of the month during which the transients were served), i.e., **p = r + t/d**. (If the transient population changes significantly from month to month, utilize information from previous years of operation to calculate the average daily transient population for the current month.)

Note: the local State or County jurisdiction may require an increased sampling protocol based on local regulations.

National Primary Drinking Water Regulations (NPDWRs or primary standards) are legally enforceable standards that apply to public water systems. Primary standards protect drinking water quality by limiting the levels of specific contaminants that can adversely affect public health and are known or anticipated to occur in public water systems. The table below divides these contaminants into Microorganisms, Disinfection Byproducts, Disinfectants, Inorganic Chemicals, Organic Chemicals, and Radionuclides.

TABLE 2
NATIONAL PRIMARY DRINKING WATER STANDARDS

Microorganisms

Contaminant	MCLG[1] [2] (mg/L)	MCL or TT[1] [2] (mg/L)	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Cryptosporidium (pdf file)	zero	TT [3]	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and fecal animal waste
Giardia lamblia	zero	TT[3]	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste
Heterotrophic plate count	n/a	TT[3]	HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is.	HPC measures a range of bacteria that are naturally present in the environment
Legionella	zero	TT[3]	Legionnaire's Disease, a type of pneumonia	Found naturally in water; multiplies in heating systems
Total Coliforms (including fecal coliform and *E. Coli*)	zero	5.0%[4]	Not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present[5]	Coliforms are naturally present in the environment; as well as feces; fecal coliforms and *E. coli* only come from

				human and animal fecal waste.
Turbidity	n/a	TT[3]	Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.	Soil runoff
Viruses (enteric)	zero	TT[3]	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste

Disinfection Byproducts

Contaminant	MCLG[1] (mg/L)[2]	MCL or TT[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Bromate	zero	0.010	Increased risk of cancer	Byproduct of drinking water disinfection
Chlorite	0.8	1.0	Anemia; infants & young children: nervous system effects	Byproduct of drinking water disinfection
Haloacetic acids (HAA5)	n/a[6]	0.060	Increased risk of cancer	Byproduct of drinking water disinfection
Total Trihalomethanes (TTHMs)	none[7] ---------- n/a[6]	0.10 --------- - 0.080	Liver, kidney or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection

Disinfectants

Contaminant	MRDLG[1] (mg/L)[2]	MRDL[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Chloramines (as Cl_2)	MRDLG=4[1]	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort, anemia	Water additive used to control microbes
Chlorine (as Cl_2)	MRDLG=4[1]	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort	Water additive used to control microbes
Chlorine dioxide (as ClO_2)	MRDLG=0.8[1]	MRDL=0.8[1]	Anemia; infants & young children: nervous system effects	Water additive used to control microbes

Inorganic Chemicals

Contaminant	MCLG[1] (mg/L)[2]	MCL or TT[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Antimony	0.006	0.006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder
Arsenic	0[7]	0.010 as of 01/23/06	Skin damage or problems with circulatory systems, and may have increased risk of getting cancer	Erosion of natural deposits; runoff from orchards, runoff from glass & electronicsproduction wastes
Asbestos (fiber >10 micrometers)	7 million fibers per liter	7 MFL	Increased risk of developing benign intestinal polyps	Decay of asbestos cement in water mains; erosion of natural deposits
Barium	2	2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion

				of natural deposits
Beryllium	0.004	0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries
Cadmium	0.005	0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints
Chromium (total)	0.1	0.1	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits
Copper	1.3	TT[8]; Action Level=1.3	Short term exposure: Gastrointestinal distress Long term exposure: Liver or kidney damage People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	Corrosion of household plumbing systems; erosion of natural deposits
Cyanide (as free cyanide)	0.2	0.2	Nerve damage or thyroid problems	Discharge from steel/metal factories; discharge from plastic and fertilizer factories
Fluoride	4.0	4.0	Bone disease (pain and tenderness of the bones); Children may get mottled	Water additive which promotes strong teeth; erosion of natural

			teeth	deposits; discharge from fertilizer and aluminum factories
Lead	zero	TT[8]; Action Level=0.015	Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits
Mercury (inorganic)	0.002	0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands
Nitrate (measured as Nitrogen)	10	10	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Nitrite (measured as Nitrogen)	1	1	Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Selenium	0.05	0.05	Hair or fingernail loss;	Discharge from

			numbness in fingers or toes; circulatory problems	petroleum refineries; erosion of natural deposits; discharge from mines
Thallium	0.0005	0.002	Hair loss; changes in blood; kidney, intestine, or liver problems	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories

Organic Chemicals

Contaminant	MCLG[1] (mg/L)[2]	MCL or TT[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Acrylamide	zero	TT[9]	Nervous system or blood problems; increased risk of cancer	Added to water during sewage/wastewater treatment
Alachlor	zero	0.002	Eye, liver, kidney or spleen problems; anemia; increased risk of cancer	Runoff from herbicide used on row crops
Atrazine	0.003	0.003	Cardiovascular system or reproductive problems	Runoff from herbicide used on row crops
Benzene	zero	0.005	Anemia; decrease in blood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills
Benzo(a)pyrene (PAHs)	zero	0.0002	Reproductive difficulties; increased risk of cancer	Leaching from linings of water storage tanks and distribution lines

Carbofuran	0.04	0.04	Problems with blood, nervous system, or reproductive system	Leaching of soil fumigant used on rice and alfalfa
Carbon tetrachloride	zero	0.005	Liver problems; increased risk of cancer	Discharge from chemical plants and other industrial activities
Chlordane	zero	0.002	Liver or nervous system problems; increased risk of cancer	Residue of banned termiticide
Chlorobenzene	0.1	0.1	Liver or kidney problems	Discharge from chemical and agricultural chemical factories
2,4-D	0.07	0.07	Kidney, liver, or adrenal gland problems	Runoff from herbicide used on row crops
Dalapon	0.2	0.2	Minor kidney changes	Runoff from herbicide used on rights of way
1,2-Dibromo-3-chloropropane (DBCP)	zero	0.0002	Reproductive difficulties; increased risk of cancer	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards
o-Dichlorobenzene	0.6	0.6	Liver, kidney, or circulatory system problems	Discharge from industrial chemical factories
p-Dichlorobenzene	0.075	0.075	Anemia; liver, kidney or spleen damage; changes in	Discharge from industrial chemical

			blood	factories
1,2-Dichloroethane	zero	0.005	Increased risk of cancer	Discharge from industrial chemical factories
1,1-Dichloroethylene	0.007	0.007	Liver problems	Discharge from industrial chemical factories
cis-1,2-Dichloroethylene	0.07	0.07	Liver problems	Discharge from industrial chemical factories
trans-1,2-Dichloroethylene	0.1	0.1	Liver problems	Discharge from industrial chemical factories
Dichloromethane	zero	0.005	Liver problems; increased risk of cancer	Discharge from drug and chemical factories
1,2-Dichloropropane	zero	0.005	Increased risk of cancer	Discharge from industrial chemical factories
Di(2-ethylhexyl) adipate	0.4	0.4	Weight loss, liver problems, or possible reproductive difficulties.	Discharge from chemical factories
Di(2-ethylhexyl) phthalate	zero	0.006	Reproductive difficulties; liver problems; increased risk of cancer	Discharge from rubber and chemical factories
Dinoseb	0.007	0.007	Reproductive difficulties	Runoff from herbicide used on soybeans and

				vegetables
Dioxin (2,3,7,8-TCDD)	zero	0.00000003	Reproductive difficulties; increased risk of cancer	Emissions from waste incineration and other combustion; discharge from chemical factories
Diquat	0.02	0.02	Cataracts	Runoff from herbicide use
Endothall	0.1	0.1	Stomach and intestinal problems	Runoff from herbicide use
Endrin	0.002	0.002	Liver problems	Residue of banned insecticide
Epichlorohydrin	zero	TT[9]	Increased cancer risk, and over a long period of time, stomach problems	Discharge from industrial chemical factories; an impurity of some water treatment chemicals
Ethylbenzene	0.7	0.7	Liver or kidneys problems	Discharge from petroleum refineries
Ethylene dibromide	zero	0.00005	Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer	Discharge from petroleum refineries
Glyphosate	0.7	0.7	Kidney problems; reproductive difficulties	Runoff from herbicide use
Heptachlor	zero	0.0004	Liver damage;	Residue of banned

			increased risk of cancer	termiticide
Heptachlor epoxide	zero	0.0002	Liver damage; increased risk of cancer	Breakdown of heptachlor
Hexachlorobenzene	zero	0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories
Hexachlorocyclopentadiene	0.05	0.05	Kidney or stomach problems	Discharge from chemical factories
Lindane	0.0002	0.0002	Liver or kidney problems	Runoff/leaching from insecticide used on cattle, lumber, gardens
Methoxychlor	0.04	0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock
Oxamyl (Vydate)	0.2	0.2	Slight nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes
Polychlorinated biphenyls (PCBs)	zero	0.0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased	Runoff from landfills; discharge of waste chemicals

			risk of cancer	
Pentachlorophenol	zero	0.001	Liver or kidney problems; increased cancer risk	Discharge from wood preserving factories
Picloram	0.5	0.5	Liver problems	Herbicide runoff
Simazine	0.004	0.004	Problems with blood	Herbicide runoff
Styrene	0.1	0.1	Liver, kidney, or circulatory system problems	Discharge from rubber and plastic factories; leaching from landfills
Tetrachloroethylene	zero	0.005	Liver problems; increased risk of cancer	Discharge from factories and dry cleaners
Toluene	1	1	Nervous system, kidney, or liver problems	Discharge from petroleum factories
Toxaphene	zero	0.003	Kidney, liver, or thyroid problems; increased risk of cancer	Runoff/leaching from insecticide used on cotton and cattle
2,4,5-TP (Silvex)	0.05	0.05	Liver problems	Residue of banned herbicide
1,2,4-Trichlorobenzene	0.07	0.07	Changes in adrenal glands	Discharge from textile finishing factories
1,1,1-Trichloroethane	0.20	0.2	Liver, nervous system, or circulatory problems	Discharge from metal degreasing sites and other factories

1,1,2-Trichloroethane	0.003	0.005	Liver, kidney, or immune system problems	Discharge from industrial chemical factories
Trichloroethylene	zero	0.005	Liver problems; increased risk of cancer	Discharge from metal degreasing sites and other factories
Vinyl chloride	zero	0.002	Increased risk of cancer	Leaching from PVC pipes; discharge from plastic factories
Xylenes (total)	10	10	Nervous system damage	Discharge from petroleum factories; discharge from chemical factories

Radionuclides

Contaminant	MCLG[1] (mg/L)[2]	MCL or TT[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Alpha particles	none[7] ---------- zero	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation
Beta particles and photon emitters	none[7] ---------- zero	4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta

				radiation
Radium 226 and Radium 228 (combined)	none[7] ---------- zero	5 pCi/L	Increased risk of cancer	Erosion of natural deposits
Uranium	zero	30 ug/L as of 12/08/03	Increased risk of cancer, kidney toxicity	Erosion of natural deposits

Notes

[1] Definitions:
Maximum Contaminant Level (MCL) - The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
Maximum Contaminant Level Goal (MCLG) - The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
Maximum Residual Disinfectant Level (MRDL) - The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
Maximum Residual Disinfectant Level Goal (MRDLG) - The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
Treatment Technique - A required process intended to reduce the level of a contaminant in drinking water.

[2] Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million.

[3] EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

- Cryptosporidium: (as of1/1/02 for systems serving >10,000 and 1/14/05 for systems serving <10,000) 99% removal.
- Giardia lamblia: 99.9% removal/inactivation
- Viruses: 99.99% removal/inactivation
- Legionella: No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated, *Legionella* will also be controlled.

- Turbidity: At no time can turbidity (cloudiness of water) go above 5 nephelolometric turbidity units (NTU); systems that filter must ensure that the turbidity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95% of the daily samples in any month. As of January 1, 2002, turbidity may never exceed 1 NTU, and must not exceed 0.3 NTU in 95% of daily samples in any month.

- HPC: No more than 500 bacterial colonies per milliliter.

- Long Term 1 Enhanced Surface Water Treatment (Effective Date: January 14, 2005); Surface water systems or (GWUDI) systems serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, Cryptosporidium removal requirements, updated watershed control requirements for unfiltered systems).

- Filter Backwash Recycling; The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

[4] more than 5.0% samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or E. coli if two consecutive TC-positive samples, and one is also positive for E.coli fecal coliforms, system has an acute MCL violation.

[5] Fecal coliform and E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Disease-causing microbes (pathogens) in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms. These pathogens may pose a special health risk for infants, young children, and people with severely compromised immune systems.

[6] Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:

- Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L). Chloroform is regulated with this group but has no MCLG.

- Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L). Monochloroacetic acid, bromoacetic acid, and dibromoacetic acid are regulated with this group but have no MCLGs.

[7] MCLGs were not established before the 1986 Amendments to the Safe Drinking Water Act. Therefore, there is no MCLG for this contaminant.

[8] Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level,

water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

[9] Each water system must certify, in writing, to the state (using third-party or manufacturer's certification) that when acrylamide and epichlorohydrin are used in drinking water systems, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows:

- Acrylamide = 0.05% dosed at 1 mg/L (or equivalent)
- Epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent)

National Secondary Drinking Water Regulations

National Secondary Drinking Water Regulations (NSDWRs or secondary standards) are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA

recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards.

- National Secondary Drinking Water Regulations - The complete regulations regarding these contaminants availible from the Code of Federal Regulations Web Site.
- For more information, read Secondary Drinking Water Regulations: Guidance for Nuisance Chemicals.

List of National Secondary Drinking Water Regulations

TABLE 3
NATIONAL SECONDARY DRINKING WATER STANDARDS

Contaminant	Secondary Standard
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L

TABLE 4
GENERAL MINERALS*

Contaminant	(mg/L)
Sodium	200 or less is preferred. 20 is considered the level for concern for people with the need to control intake.
Alkalinity	30-500
Calcium	75-200
Hardness	<200
Hydrogen Sulfide	Test at source only when necessary
Magnesium	50-150
Phosphate	<0.2
Potassium	For corrosion control
Specific Conductance	For corrosion control
Temperature (At Source)	For corrosion control

- Values listed are for information only. No limits are established.

TABLE 5
NATIONAL PARK SERVICE WATER SYSTEMS
ROUTINE MONITORING REQUIREMENTS

SYSTEM		BACTERIO-LOGICAL ANALYSIS	CHLORINE RESIDUAL ANALYSIS	TURBIDITY (SURFACE WATER ONLY)	CHEMICAL ANALYSIS					
					PRIMARY INORGANIC	SECONDARY INORGANIC/ GENERAL MINERAL	ORGANICS		RADIO-NUCLIDE	LEAD AND COPPER
							PESTICIDE/ HERBICIDE	VOLATILE		
COMMUNITY WATER SYSTEN (CWS)	GW	TWO/MONTH OR PER TABLE 1	ONE/DAY	POPULATION <500 ONE/DAY POPULATION >500 CONTINUOUS OR EVERY 4 HOURS	EVERY THREE YEARS Annual Nitrates	EVERY THREE YEARS	ANNUAL UNLESS STATE WAIVER ISSUED	EVERY THREE YEARS UNLESS STATE WAIVER ISSUED	Quarterly by end of 2007, then every 3, 6, or 9 years depending on results	**INITIAL** SAMPLE ALL WATER SOURCES AND HOUSING **MONITOR** (PC/PNT) EVERY SIX MONTHS. THERE - AFTER BASED ON RESULTS
NON-TRANSIENT NON-COMMUNITY (NTNC)	SW		SEE TABLE PAGE 16		ANNUALLY Annual Nitrates	ANNUALLY				
NON-COMMUNITY TRANSIENT (NCT)	GW		ONE/DAY		EVERY NINE YEARS Annual Nitrates	EVERY NINE YEARS	ONE TIME	ONE TIME BY 1994	ONE TIME	
	SW		SEE TABLE PAGE 16						NOT REQUIRED	
NON-PUBLIC (NP)	GW	ONE /MONTH	THREE/ WEEK	DETERMINE ON INDIVIDUAL BASIS	EVERY NINE YEARS Annual Nitrates	EVERY NINE YEARS	ONE TIME	SPECIAL SITUATIONS	NOT REQUIRED	
	SW									