

## **SAFE DRINKING WATER ACT**

The federal Safe Drinking Water Act (PL93-523) was enacted in 1974 and went into effect in 1976. The purpose of the Act is to establish national enforceable standards for drinking water quality and to guarantee that water suppliers monitor water to ensure that it meets national standards. This Act established either the maximum concentration of pollutants allowed in, or the minimum treatment required for, water that is delivered to the customers. These substances are known to present adverse health effects to humans. Prior to the passage of PL93-523 standards were set by the individual state regulatory agencies. The limits and enforcement procedures varied from state to state and, in passing the law, Congress has attempted to assure uniformly safe drinking water for the general public. The SDWA has been amended several times over the last 30 years.

The enforcement of the SDWA is carried out by a primacy agency that is federally funded. These are usually a department of State government. In New Mexico the New Mexico Environment Department (NMED) is the primacy agency. In Arizona the primacy agency is the Arizona Department of Environmental Quality (ADEQ). The primacy agency for tribal water systems may be an internal tribal agency like the Navajo EPA. These agencies will adopt the SDWA as part of their state drinking water regulations.

### **PUBLIC WATER SYSTEMS**

The regulations established in PL93-523 apply only to public water systems. A *Public water system* or *PWS* means a system for the provision to the public of water for human consumption through pipes or other constructed conveyances, if such system has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least 60 days out of the year. A public water system is either a “community water system” or a “non-community water system.” *Non-community water system* means a public water system that is not a community water system. A non-community water system is either a “transient non-community water system (TWS)” or a “non-transient non-community water system (NTNCWS).” *Transient non-community water system* means a non-community water system that does not regularly serve at least 25 of the same persons over six months per year. *Non-transient non-community water system* means 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.

### **PRIMARY CONTAMINANTS**

Certain substances and organisms in drinking water have been determined to cause adverse health effects. They are referred to as primary contaminants. These substances can be grouped into four major categories:

- 1) INORGANIC CONTAMINANTS**
- 2) ORGANIC CONTAMINANTS**
- 3) RADIOLOGICAL CONTAMINANTS**
- 4) MICROBIOLOGICAL CONTAMINANTS**

## MAXIMUM CONTAMINANT LEVELS (MCL)

The maximum amount of any one of these substances that can be allowed in water, according to the regulations, is known as the maximum contaminant level (MCL). The MCLs for these chemicals and compounds are set at levels that are considered to be many times less than the concentrations that are known, or anticipated to cause adverse health effects.

### INORGANIC CONTAMINANTS

These contaminants are mostly heavy metals. They may enter the water supply naturally through groundwater formations or from mining runoff and industrial discharges. The MCL for each chemical is listed below.

<b>INORGANIC CONTAMINANT</b>	<b>MCL (mg/L)</b>
Antimony	0.006
Arsenic	0.010
Barium	2
Beryllium	0.004
Cadmium	0.005
Chromium	0.1
Cyanide	0.2
Mercury	0.002
Selenium	0.05
Thallium	0.002
Copper	1.3* Action level
Lead	0.015* Action level
Nitrate (as N)	10
Total Nitrate/Nitrite (as N)	10
Nitrite (as N)	1
Fluoride	2.0 Secondary MCL 4.0 Violation
Turbidity	0.3 NTU in 95% of samples 1 NTU maximum
Asbestos	7,000,000 Fibers/L

## **LEAD AND COPPER RULE**

A representative sampling survey must be conducted for lead and copper that may be present at the customer's tap. Most of the lead and copper found this way comes from the customer's plumbing. The system will be responsible for treating the water to stabilize the corrosive qualities that cause the leeching of lead and copper from the customer's plumbing. Sampling for lead and copper requires taking a "first draw" sample from the customer's tap, after water has been standing in the plumbing for at least 6 hours but no longer than 18 hours. If the 90th percentile results exceed the action levels for either metal, the system must take steps to stabilize the system water. This is accomplished by chemical addition of lime or another form of alkalinity, like calcium carbonate.

## **NITRATE AND NITRITE**

Nitrate and nitrite are the only chemical contaminants that represent an immediate health risk. Pregnant mothers and infants under 18 months can develop a condition known as "Blue Baby Syndrome". The presence of nitrate in the bloodstream reduces oxygen uptake that gives the skin a blue tint. The medical term for this illness is methahemoglobinemia.

## **FLUORIDE**

Fluoride is added to water to help prevent tooth decay. The optimum dosage for fluoride is 0.8-1.2 mg/L. However, at higher concentrations, fluoride can create stains on teeth and lead to brittle bones in older individuals. The average ambient air temperature for the system is used to determine the optimum dosage for fluoride.

## **TURBIDITY**

Turbidity is clay, silt or mud in the water. Although turbidity does not represent a health risk by itself, it can shield harmful bacteria from disinfection processes. Turbidity is measured in Nephelometric Turbidity Units (NTU). The device used to measure NTU's is called a nephelometer or turbidimeter.

## **ORGANIC CONTAMINANTS**

These contaminants include herbicides and insecticides that are primarily used in agriculture applications, organic solvents used in industrial applications, organic by-products of industrial processes, and chemical by-products from chlorination of drinking water. Runoff from agricultural spraying or improper application techniques can be a major source of these contaminants in a surface water supply. Industrial discharges, accidental spills and improper disposal of hazardous wastes can also become sources of contamination.

These compounds are grouped together, for sampling purposes, into Volatile Organic Compounds or VOCs and Semi Volatile Organic compounds, which include Synthetic Organic Compounds or SOCs, acid herbicides, carbamates, and others. A few of the organic contaminants are listed on the following page. They are all listed in Chapter 4.

<b>ORGANIC CONTAMINANT</b>	<b>MCL (mg/L)</b>
<b>Benzene</b>	<b>0.005</b>
<b>Vinyl Chloride</b>	<b>0.002</b>
<b>Carbon Tetrachloride</b>	<b>0.005</b>
<b>Styrene</b>	<b>0.1</b>
<b>Total Trihalomethanes (TTHM)</b>	<b>0.080</b>

### **RADIOACTIVE CONTAMINANTS**

Most radioactive substances occur naturally in ground water and in some surface supplies. Some man-made substances may also enter drinking water supplies from processing facilities, mining areas, and nuclear power plants.

<b>RADIOACTIVE CONTAMINANT</b>	<b>MCL</b>
<b>Radium 226 and 228</b>	<b>5 pCi/L</b>
<b>Gross Alpha Activity</b>	<b>15 pCi/L</b>
<b>Gross Beta Activity (man-made)</b>	<b>4 millirem/yr</b>
<b>Uranium</b>	<b>30 µg/L (ppb)</b>

### **MICROBIOLOGICAL CONTAMINANTS**

The coliform group of bacteria represents the indicator organisms used in determining bacteriological contamination. Their presence indicates the possibility that some pathogenic (disease causing) organisms may also be present. The MCL is exceeded when 2 (for systems required to collect 40 or fewer) or more than 5% of monthly routine compliance samples indicate the presence of Coliform bacteria (for systems required to collect more than 40). The presence of Total Coliform in any sample will require at least three repeat samples to be taken. These repeat samples must be taken within 24 hrs of notification of positive results.

The regulations call for a minimum of five samples for the month from any system that has positive sample results. Small systems that take only one sample per month have to take four (4) repeats when they get a total coliform positive test result. If any system has to take repeat samples, it must also take a minimum of five (5) routine samples the following month. Small systems that normally take less than 5 samples/month will have to increase the number to 5 samples. They can return to normal sampling schedules the following month if no repeats are required.

## **SECONDARY CONTAMINANTS**

There are certain substances in water that, although they do not present serious health hazards, can cause temporary physical discomfort and make the water unsuitable for use. Each state may determine which of these standards are included in their regulations. Chloride can make the water taste salty. This is also known as brackish water. Sulphate can cause minor gastro-intestinal problems. Iron and manganese can result in red or black water problems. The pH of the treated water can also create some digestive problems if it is very high or very low. Recommended levels for secondary contaminants are:

<b>SECONDARY CONTAMINANTS MCL (mg/L)</b>	
<b>Total Dissolved Solids</b>	<b>500</b>
<b>Chloride</b>	<b>250</b>
<b>Sulfate</b>	<b>250</b>
<b>Iron</b>	<b>0.3</b>
<b>Manganese</b>	<b>0.05</b>
<b>pH</b>	<b>6.5-8.5</b>

## **MONITORING AND REPORTING**

The public water systems are responsible for monitoring their water quality and reporting violations of the SDWA standards to the public. In New Mexico, the NMED-DWB is currently collecting and submitting chemical and radiochemical samples to the laboratories for all public water supplies. The program is funded through the “Water Conservation Fee” of 3 cents per 1000 gallons paid by each system. However, the systems will still be responsible for the results of testing and any public notification that may be required. No other primacy agency does this.

Systems must retain copies of most chemical and radiochemical analysis records for 10 years (except lead and copper) and bacteriological test and turbidity results for 5 years. Records for lead and copper must be kept for 12 years. The system is required to report to primacy agency within 48 hours if they fail to comply with any state or tribal Drinking Water Regulations.

## **SAMPLING SCHEDULES**

Samples used in testing for chemical and biological contaminants must be collected periodically. Samples for most inorganic chemical analyses must be submitted once a year for surface supplies and once every compliance period for ground water supplies. Nitrate and nitrite samples must be submitted yearly. Sampling for organic compounds is done quarterly for the initial set of samples. After that, samples are collected yearly for surface water and every three years for ground water as long as no VOC's or SOC's are detected. If they are found, the system must be sampled every quarter. Surface water systems (over 500) and large groundwater systems (over 10,000) must also collect TTHM/HAA5 samples quarterly.

Under the new Standardized Monitoring Rule, most chemical contaminants are monitored in a cycle of 3/6/9 years. Each three (3) year period is referred to as a compliance period. Microbiological sampling schedules are monthly. A minimum of one microbiological sample per month is normally required for the smallest systems. As the population served increases so does the number of samples required.

## **MICROBIOLOGICAL VIOLATIONS**

When a positive BAC-T sample is reported repeat samples are required. If the repeats come back negative there is no violation. If more than 5% of the monthly samples are positive for Total Coliform (TC), including repeats, there is a non-acute violation that requires public notification. This means that any system taking less than 40 samples per month can only have 1 total coliform positive sample per month. Systems that take 40-59 samples can have two positives (5%). Systems that take 60-79 samples can have three positive results, and so on.

If the MCL is exceeded and any of the test results were Fecal Coliform positive, a Tier 1 violation has occurred that requires notification through the electronic media. This sometimes triggers a "Boil Order" advisory. This type of violation used to be called an acute violation. If the MCL is exceeded and none of the positive results indicated a presence of Fecal Coliform, a Tier 2 violation has occurred. This level of violation used to be called a non-acute violation.

## **PUBLIC NOTIFICATION**

The water system will be required to notify the public any time maximum contaminant levels are exceeded. These violations of the standards fall into one of three Tiers. A Tier 1 notice is required for a violation that has a significant potential for immediate adverse health effect. Tier 1 violations require 24-hour public notice and must be reported to the primacy agency within 24 hours of violation notification. A Tier 2 notice is required for a violation that has potential for a serious, not immediate, adverse health effect and requires public notice within 30 days. A Tier 3 notice is required for violations not included in Tiers 1 or 2 and requires public notice within 12 months.

Tier 2 and 3 violations must be reported to the primacy agency within 10 days of notification. Systems must also submit a written certification of notification to the primacy agency within 10 days for all tiers. A copy of the notice that was distributed to the public must also be included.

### **ACTION PLANS FOR VIOLATIONS**

If a water supply exceeds the primary standards the water system must either cease using water from the contaminated source, provide adequate treatment to remove the contaminants, or locate a new source of supply that meets the standards. Blending may be done under certain conditions. The blended water must enter the system from a single point of entry.

### **VARIANCES, EXEMPTIONS AND WAIVERS**

A system that is found to exceed the MCL for a primary contaminant may not be able to correct the problem for financial or technical reasons. Depending on the circumstances, the system may be granted a variance or exemption. The fact that a variance or exemption has been granted does not mean that the system is no longer required to notify the public of the problem. Notification must continue on a yearly basis until the system is in compliance.

A variance may be granted to a water system when its supply is found to exceed maximum standards and no technology is available to economically remove these contaminants. Variances may be extended at the discretion of the state regulatory agency if no treatment methods are made available during the period the variance is granted. A variance is granted only if no unreasonable health risk exists. A variance will not be granted for total coliform.

When a system is in need of more time to provide total treatment required to reduce contaminant levels to acceptable limits due to financial issues, an exemption can be granted to the water system. Exemptions will only be granted in cases that do not pose an immediate health risk. Exemptions will not be granted for total coliform.

Waivers or exclusions are granted to systems when the primacy agency determines that certain sampling requirements can be relaxed. For example, small systems may receive a waiver for VOC testing if the initial samples indicate that organics are not present or there is no potential source of organic pollution in the area. Waivers are not granted for total coliform, nitrate, and nitrite. All requests for variances, waivers, and exemptions must be directed to and approved by the primacy agency.

## **SURFACE WATER TREATMENT RULES**

Any system that uses surface water must provide treatment of the supply. The original Surface Water Treatment Rule has been modified several times in the last 20 years. Springs and infiltration galleries are considered surface supplies if they are found to have groundwater that is under the direct influence of surface water (GWUDI). A speciation study of the organisms found in the suspected source of influence and the water that enters the system is used to determine whether a source is GWUDI.

The concerns about contamination by *Giardia* and *Cryptosporidium* have created the need for higher free chlorine residuals and longer disinfection contact times. The “CT” calculation is used to determine the necessary contact time at any given concentration. It is  $C \times T = A$ , where C is the chlorine concentration, T is the contact time in minutes, and A is a temperature-based constant. If the A value is 60 and a 1.0 mg/L free residual is present, the T value or contact time in minutes would be 60. If the free residual were raised to 2.0 mg/L, the contact time would only need to be 30 minutes.

Removal of *Cryptosporidium* is based on a 2-log reduction of the numbers found in raw water for LT1 systems. A 2-log removal or deactivation would mean that 1% of the bacteria may survive or 99% were removed. A 4- log removal or deactivation would mean that 0.01% of the organisms may survive or 99.99% were removed. Some larger LT2 systems may be required to provide a 5.5-log removal. Log removals credits are assigned to the various treatment processes.

## **DISINFECTANTS AND DISINFECTION BYPRODUCTS RULE**

Systems that use chlorine or chlorine dioxide may create chemicals like trihalomethanes (THMs), halo acetic acids (HAA5), chlorites, and perchlorates as by-products of the disinfection process. Trihalomethanes and halo acetic acids are formed when chlorine, bromine, or iodine combine with organic precursors that may be present in the source water. The four most common forms of trihalomethanes are chloroform, bromoform, dichlorobromomethane, and dibromochloromethane. Systems that use ozone as a disinfectant may also create bromates. All of these chemicals are carcinogens. Recent changes have set new MCLs for several disinfection by-products.

<b>NEW D-DBP RULE CONTAMINANTS</b>	
<b>CONTAMINANT</b>	<b>MCL (mg/L)</b>
<b>Total Trihalomethanes (TTHM)</b>	<b>0.080</b>
<b>Halo Acetic Acids (HAA5)</b>	<b>0.060</b>
<b>Bromate</b>	<b>0.010</b>
<b>Chlorite</b>	<b>1</b>
<b>Chlorine Dioxide</b>	<b>0.8</b>
<b>Chlorine</b>	<b>4</b>
<b>Chloramines</b>	<b>4</b>

A system that is in violation may be required to change to a different means of disinfection or incorporate a process like activated carbon adsorption. Sample results from D-DBP testing must be reported within 10 days of the end of the monitoring period. Chlorine residual reports must be submitted every quarter. Stage1 D-DBP set maximum contaminant levels based on a running annual average, or RAA, of samples taken in the system, rather than individual sample results. Stage 2 D-DBP has changed to use LRAA or location-based running annual average of each individual contaminant for the calculation.

## **GROUND WATER RULE**

The Ground Water Rule (GWR) was proposed to establish a strategy for identifying ground water systems that are at high risk for fecal contamination. Although disinfection is required for all surface water supplies, it is only required “as necessary” in ground water systems. Systems that are at risk must initiate corrective actions, which may include disinfection, and begin source water monitoring. The GWR is comprised of four major components:

- 1) Periodic sanitary surveys will be conducted on ground water system to identify and evaluate significant deficiencies such as defective casings or location too close to sources of surface pollution.
- 2) Monitoring of source water for the presence of *E. coli* and other enteric organisms will be required.
- 3) Corrective action must be taken by any system with significant deficiencies or source water contamination. This could include:
  - A. Correcting structural deficiencies
  - B. Eliminating the source of contamination
  - C. Finding an alternative source of water
  - D. Providing treatment to achieve a 4-log inactivation or removal of viruses
- 4) Compliance monitoring must be done to ensure that the treatment reliably achieves a 4-log reduction or inactivation of viruses.

## CONSUMER CONFIDENCE REPORTS (CCR)

The Consumer Confidence Report requires public water suppliers that serve the same people year round (community water systems) to provide consumer confidence reports (CCR) to their customers. These reports are also known as annual water quality reports or drinking water quality reports. The remaining public water systems in the U.S. are not required to provide CCRs. This is because these transient systems do not serve the same people on a day-to-day basis throughout the year. The CCR summarizes information regarding sources used (i.e., rivers, lakes, reservoirs, or aquifers), any detected contaminants, compliance and educational information. The reports are due to customers and the State by July 1<sup>st</sup> of each year. The primacy agency must receive written notification by October 1<sup>st</sup> that the CCR has been distributed.

### BASIC STUDY QUESTIONS

1. What is an MCL?
2. Why is turbidity a Primary Contaminant?
3. What is a nephelometer?
4. What is a repeat sample?

### ADVANCED STUDY QUESTIONS

1. What notification is required for a Tier 1 violation?
2. What are the action levels for lead and copper?
4. How often must nitrate samples be submitted?
4. What are the D-DPB regulated contaminants besides TTHMs?

### BASIC SAMPLE TEST QUESTIONS

1. A public water system serves a population greater than or equal to:
  - A. 25
  - B. 50
  - C. 100

2. What type of contaminant is iron?
  - A. Primary Inorganic
  - B. Primary Organic
  - C. Secondary

### ADVANCED SAMPLE TEST QUESTIONS

1. The MCL for Total Trihalomethanes is:
  - A. 0.010 mg/l
  - B. 0.080 mg/l
  - C. 0.200 mg/l
2. The SDWA Compliance Cycle for the Standardized Monitoring Rule consists of three:
  - A. Years
  - B. Compliance Periods
  - C. Quarters
  - D. Months
3. A 3-log removal is a \_\_\_\_\_ % reduction.
  - A. 90%
  - B. 99%
  - C. 99.9%