Vol. 8, Special Issue

Oregon Drinking Water News

PIPELINE

Drinking Water Program, Oregon Health Division

July 1993

# Oregon Drinking Water Quality Standards

including the 1986 amendments to the
Safe Drinking Water Act

---

*Prepared by*

**Drinking Water Section**
Oregon Health Division
Department of Human Resources

This summary provides a broad overview of the existing and upcoming water quality standards that public drinking water systems must comply with over the next 10 years. This summary is not a substitute for the actual statutes, rules, codes or ordinances which govern drinking water supply.

Amendments to the 1986 Safe Drinking Water Act (SDWA) called for the Environmental Protection Agency (EPA) to set maximum contaminant level goals (MCLGs)[1], maximum contaminant levels (MCLs)[2], and monitoring requirements for 83 specific contaminants. As an alternative to setting MCLs and monitoring requirements, EPA can specify a required treatment technique for water systems. The amendments also required surface water systems to install filtration, and surface and groundwater systems to disinfect. In addition, the amendments require EPA to set 25 new MCLs every three years for additional contaminants in drinking water that may have an adverse effect on public health and which are known or anticipated to occur in public water systems.

These regulations require that systems treat and/or control contaminants to the maximum contaminant levels. Treatment and control is expensive and will increase the need for systems to make capital improvements.

The Oregon Health Division (OHD) is responsible for administering both state and federal drinking water laws under ORS Chapter 448, the Oregon Drinking Water Quality Act. The federal schedule for implementing the rules is presented on page 2.

The following is a summary of each of the federal rules. Each rule is implemented in Oregon on a schedule depending on system size. Federal rules that are described but not yet final are subject to change. Information presented on these is from the most current drafts.

A list of EPA's health advisories is also included. The health advisories are not enforceable standards but help owners and operators determine when there may be a potential health risk posed by a particular contaminant whether or not there is a regulatory standard that has been established for the chemical of concern.

For additional information call either the Oregon Health Division (503) 731-4381 or the EPA Drinking Water Hotline (800) 426-4791.

### Types of Public Water Systems

Oregon public water systems are regulated under OAR Chapter 333, Public Water Systems. A *public water system* provides piped water for human consumption to more than three service connections; or supplies water to a public or commercial establishment which operates a total of at least 60 days per year and which is used by 10 or more individuals per day; or is a facility licensed by the Health Division. There are about 3,500 public water systems currently identified in Oregon.

A *community water system* is a public water system which provides piped water to 15 or more service connections used by year-round residents or 25 or more year-round residents. Typical community water systems are cities, water districts, water associations, mobile home parks and rural subdivisions. There are 946 community water systems serving 2.25 million people in Oregon.

A *nontransient noncommunity water system* is a public water system which is not a residential water system but which regularly serves at least 25 of the same persons over six months per year. Typical nontransient noncommunity water systems are factories and schools. There are 309 nontransient noncommunity water systems currently identified serving 65,000 people in Oregon.

A *noncommunity water system* is a public water system that serves a transient population of at least 25 people per day for at least 60 days per year. This category includes parks, campgrounds, restaurants, motels, highway rest areas and stores. There are 1,514 noncommunity water systems currently identified in Oregon.

The Oregon statute regulates public water systems which are too small to fall under federal regulations. A *state-regulated water system* provides piped water to more than three but fewer than 15 service connections or more than 9 but fewer than 25 year-round residents. Small mobile home parks, subdivisions and rural residential systems are typical state-regulated systems. There are 780 state-regulated systems currently identified serving 13,000 people in Oregon. Monitoring requirements are the same as those for noncommunity systems.

### Public Notification

**Purpose:**

This rule requires owners/operators to notify their customers when a particular standard has been exceeded. This will inform consumers when there is a problem with the system that requires protective actions by users, construction of improvements or finding other solutions to the problem.

**Application:**

All public water systems.

**Schedule:**

Final rule published in *Federal Register* on October 28, 1987. State rule became effective November 13, 1989.

**Each Public Notice must contain:**

- A clear and understandable explanation of the violation;
- Information about potential adverse health effects, including specific mandatory language;
- Identification of the population at risk;
- A description of the steps being taken to correct the problem;
- Preventive measures to be taken until the violation is corrected.

**Each Public Notice must:**

- Be clear and conspicuous;
- Not contain unduly technical language;
- Not contain unduly small print;
- Include the phone number of the owner, operator or designee of the public water system; and
- Be multilingual, where appropriate.

**Ways to Issue a Public Notice:**

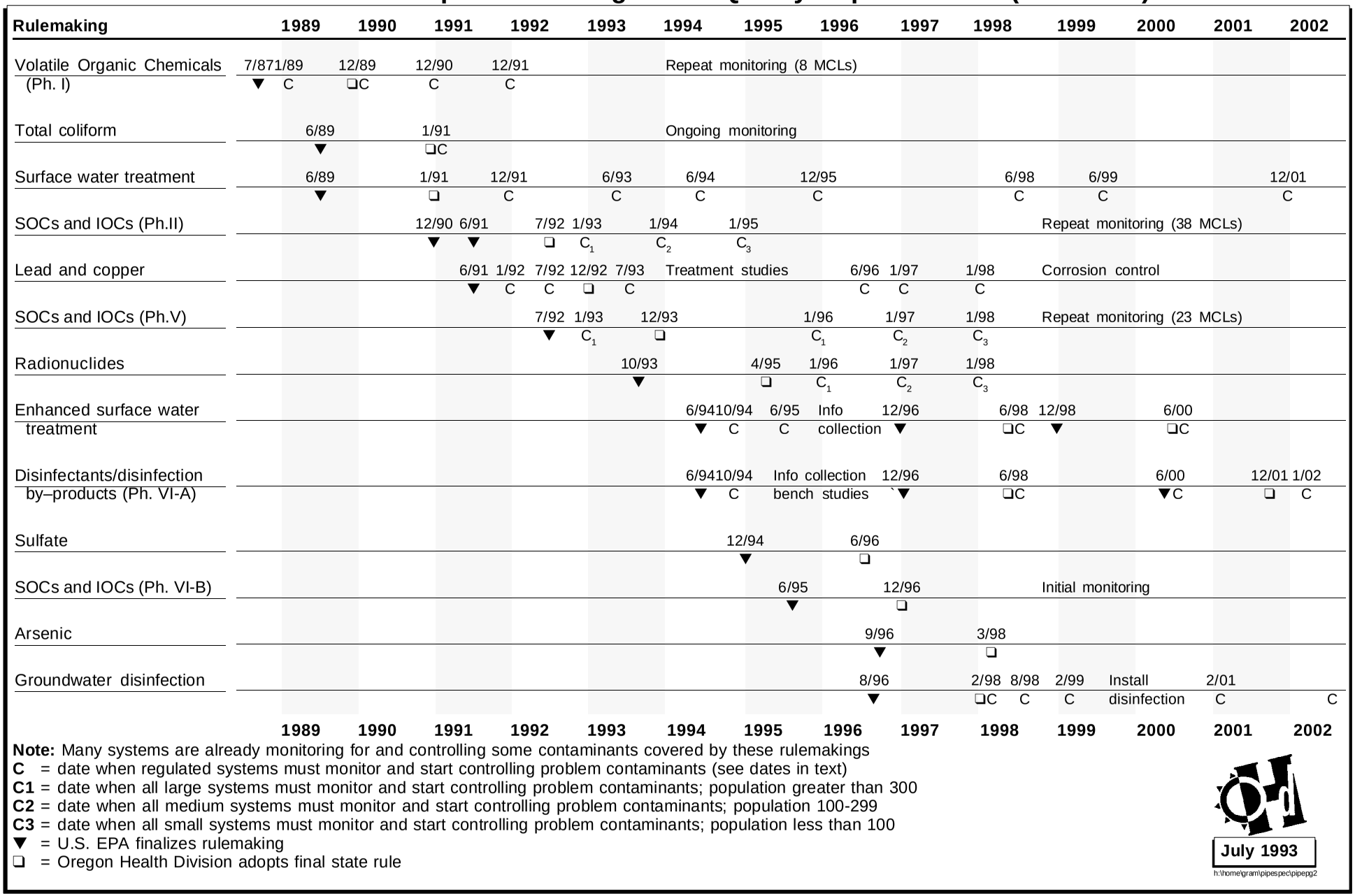
- Through the local electronic media;
- In the local daily newspaper;
- By direct mail;
- In customers' water bills;

[1]MCLGs: Non-enforceable health-based goals. MCLGs must be set at a level at which no known or anticipated adverse effect on human health occurs and allows for an adequate margin of safety, regardless of cost.

[2]MCLs: Enforceable standards which must be set as close to the MCLGs as feasible, with the use of best available technology and other means that are available, taking cost and feasibility into consideration.

## State of Oregon

# Schedule of Anticipated Drinking Water Quality Improvements (1989-2002)




**Note:** Many systems are already monitoring for and controlling some contaminants covered by these rulemakings

**C** = date when regulated systems must monitor and start controlling problem contaminants (see dates in text)

**C1** = date when all large systems must monitor and start controlling problem contaminants; population greater than 300

**C2** = date when all medium systems must monitor and start controlling problem contaminants; population 100-299

**C3** = date when all small systems must monitor and start controlling problem contaminants; population less than 100

▼ = U.S. EPA finalizes rulemaking

❑ = Oregon Health Division adopts final state rule

**July 1993**

h:\home\gram\pipespec\pipepg2

- By hand delivery; or
- By continuous posting in a conspicuous place.

Systems serving areas that do not have a daily or weekly newspaper must provide notice by hand delivery or posting.

Public water systems must provide copies of the public notification to the state.

The owner/operator of the public water system is legally responsible for ensuring that all public notice requirements are met.

**Classification of Violations:**

*Acute violations* for contaminants which pose an immediate threat to human health such as nitrate require immediate public notice.

*Tier 1 violations* are directly related to potential adverse health effects and include:

- Failure to comply with an MCL;
- Failure to comply with a treatment technique that has been established in lieu of an MCL; and
- Failure to comply with a schedule prescribed by the Division.

*Tier 2 violations* do not pose a direct threat to public health; however, they are significant enough to warrant public notice. They include:

- Failure to comply with monitoring requirements;
- Failure to use or comply with specified test procedures;
- Issuance of variance or an exemption.

**Timing and Frequency of Public Notice:**

*Within 72 hour*s (Acute violations):

- Notice by all community systems via the electronic media;
- Notices by noncommunity systems via hand delivery or posting.

*Within 14 days:*

- Newspaper notices by all systems for all Tier 1 violations; or
- Notices by noncommunity systems by posting or hand delivery.

*Within 45 days:*

Notices by all community water systems by direct mail, in water bills, or by hand delivery for all Tier 1 violations.

*Within 3 months:*

- Newspaper notices for all Tier 2 violations; or
- Notices by noncommunity systems by posting or hand delivery for Tier 2 violations.

*Repeated every 3 months:*

All notices given by all systems by direct mail or hand delivery for both Tier 1 and Tier 2 violations.

*Continuous Notice:*

All notices given by posting, for as long as the violation exists.

## I. Volatile Organic Chemicals (Phase I)

**Schedule:**

Final federal rule published July 8, 1987. Final state rule effective November 13, 1989. See Table 1.

**Purpose:**

Set standards for eight VOCs.

Require monitoring for unregulated VOC contaminants.

**Application:**

All community and nontransient noncommunity systems.

**Sources:**

Solvents; gasoline; no natural sources.

**Health effects:**

Cancer and non-cancer effects.

**Treatment:**

Packed tower aeration. Granular activated carbon.

**Monitoring:**

Samples collected from each source after treatment. Initial monitoring during 1988, 1989, 1990 and 1991. Resampling frequency from quarterly to every five years depending on sample results and vulnerability of water source. Resampling test dates have been adjusted to fit sampling requirements for Phase II (See Section V).

## II. Total Coliform

**Schedule:**

Final rule published in *Federal Register* on June 29, 1989. State rule effective January 1, 1991.

**Application:**

All public water systems.

**Purpose:**

Control coliform bacteria. Coliforms are common in the environment, are generally not harmful themselves and are used as *indicators* of water quality. The presence of these bacteria in the drinking water, however, generally is a result of a problem with water treatment or the pipes which distribute the water, and indicates that the water may be contaminated with organisms that can cause disease.

**Monitoring:**

| Population served | Samples per month |
|---|---|
| up to 1,000 | 1 sample |
| 1,001 to 2,500 | 2 samples |
| 2,501 to 83,000 | 1 per 800 pop. |
| 83,001 to 111,000 | 1 per 900 pop. |
| 111,001 to 160,000 | 1 per 1000 pop. |
| 160,001 to 250,000 | 1 per 1,200 pop. |
| 250,001 to 410,000 | 1 per 1,500 pop. |
| over 410,000 | 1 per 2,000 pop. |

A set of repeat samples must be collected in response to each positive routine sample.

All positive total coliform samples must be further tested for fecal coliform or *Escherichia coli*.

**Compliance:**

All coliform results are reported as

**Table 1: VOCs (Phase I)**

**Regulated contaminants:**

| *Name* | *MCL(mg/l)* |
|---|---|
| Benzene | 0.005 |
| Vinyl chloride | 0.002 |
| Carbon tetrachloride | 0.005 |
| 1,2 Dichloroethane | 0.005 |
| Trichloroethylene | 0.005 |
| 1,1 Dichloroethylene | 0.007 |
| 1,1,1 Trichloroethane | 0.200 |
| para-Dichlorobenzene | 0.075 |

**Monitoring frequency:**

| *Source* | *VOCs*[++] *detected* | *Source vulnerable* | *No. of connections* | *Resampling frequency* |
|---|---|---|---|---|
| Surface | No | No | NA | State discretion |
| | No | Yes | >500 | 3 yrs |
| | No | Yes | ≤500 | 3 yrs |
| | Yes | NA | NA | Quarterly[+++] |
| Ground | No | No | NA | 5 yrs |
| | No | Yes | >500 | 3 yrs |
| | No | Yes | ≤500 | 5 yrs |
| | Yes | NA | NA | Quarterly[+++] |

[++] "Detected" means >0.0005 mg/l

[+++] Ground or surface water systems detecting VOCs at levels consistently less than the MCL for three consecutive years may be allowed to reduce repeat monitoring to once a year at the Division's discretion.

*coliforms present* (positive) or *coliforms absent* (negative).

Small- and medium-sized systems (fewer than 40 samples/mo.) are allowed one positive sample per reporting period including routine and repeat samples. Large systems are allowed up to five percent positive samples.

Confirmed presence of fecal coliform or *E. coli* constitutes an acute health risk violation and requires immediate public notice.

**Treatment:**

Best available treatment includes disinfection, proper well construction, wellhead protection, cross connection control and distribution pressure maintenance.

## III. Surface Water Treatment

**Purpose:**

Control *Giardia lamblia*, viruses, heterotrophic plate count bacteria (HPC) and *Legionella*; control turbidity.

**Application:**

All public water systems using surface water sources (about 400).

**Schedule:**

Final rule published in the *Federal Register*, June 29, 1989. State rule adopted on January 1, 1991.

**Compliance:**

- All public water systems which use either surface water or ground water under the direct influence of surface water will be required to filter or meet stringent criteria to remain unfiltered.
- Removal and/or inactivation of *Giardia lamblia* and enteric viruses at 99.9%,and 99.99% respectively. Must be achieved by disinfection alone or by a combination of filtration and disinfection.
- All systems must be operated by qualified operators as determined by the state.

**Compliance dates:**

**1/91** Unfiltered supplies begin testing

**12/91** Unfiltered surface water supplies must meet requirements to remain unfiltered

**6/93** Filtration or alternate source must be in place. Filtered systems must meet filtration requirements**.** Community systems with groundwater sources that may be under direct influence of surface water begin testing to determine degree of influence.

**6/94** State determines which community ground water sources are surface water influenced

**12/95** Surface influenced community systems install filtration or alternative supply

**6/98** Noncommunity systems with groundwater sources that may be under direct influence of surface water begin testing to determine degree of influence.

**6/99** State determines which noncommunity ground water sources are surface influenced

**12/2001** Surface influenced noncommunity systems install filtration or alternate source

**Requirements to remain unfiltered:**

- Fecal coliform limit prior to disinfection must be less than or equal to 20/100 ml in at least 90 percent of the samples taken or the total coliform concentration must be less than or equal to 100/100 ml in at least 90 percent of the samples. Samples must be collected from raw water on a weekly basis.
- Turbidity level prior to disinfection must not exceed 5 nephelometric turbidity units.
- A system must achieve at least 99.9% and 99.99% inactivation of *Giardia* cysts and viruses respectively. Daily measurements of pH, temperature, and chlorine residual at the first customer site are required to compute the CT values. The disinfection system must also have either redundant components, or an automatic shut-off of water to the distribution system whenever there is less than 0.2 mg/l of residual disinfectant concentration in the water.
- System must develop a watershed control program including written agreements with landowners.
- No occurrence of outbreaks of waterborne disease with the current source and treatment methods.
- System must be in compliance with the total coliform rule as well as the total trihalomethane (TTHM) standards.

**Filtration requirements:**

Water systems must install one of the following technologies:

- Conventional rapid sand;
- Direct filtration (with coagulation);
- Slow sand filtration;
- Diatomaceous earth filtration;
- Alternate technology (cartridge or membrane filters).

Water systems must meet specific turbidity performance standards particular to above technologies.

## IV. Enhanced Surface Water Treatment Rule

**Purpose:**

The Enhanced Surface Water Treatment Rule (ESWTR) will require water systems to monitor raw water for *Giardia*, *Cryptosporidium*, total coliforms, fecal coliforms or *E. Coli* and enteroviruses and must provide levels of treatment based on the raw water quality measurements. These may exceed 99.9% (3-log) removal for *Giardia* and 99.99% virus removal as needed.

**Schedule:**

Large systems will be required to collect the above described data prior to adoption of the ESWTR. This data will be used to design the rule.

The ESWTR will have two stages: interim and final. The final rule will be developed using experience gained under the interim. The interim would be established in June 1996 with the state rule due December 1997. The final ESWTR is due June 2000, with state rule due December 2001.

**Monitoring:**

**6/94** Final information collection rule

**10/94-12/95** Community water systems with surface sources serving more than 100,000 persons monitor source and filtered water for *Giardia*, *Cryptosporidium*, total coliforms, fecal coliforms/*E. coli*, viruses.

**6/95-6/96** Community water systems with surface sources serving 10,000-100,000 persons monitor bimonthly for *Giardia*, *Cryptosporidium*, total coliforms, fecal coliforms/*E. coli*, viruses.

**12/96** Interim Enhanced Surface Water Treatment rule

**6/98** Systems serving more than 10,000 persons meet interim ESWTR.

**Table 2: SOCs and IOCs (Phase II)**

| Contaminant | Health Effect(s) | Source(s) | Treatment* | MCL |
|---|---|---|---|---|
| **Inorganics (IOCs)** | | | | |
| Asbestos | Benign tumors | Geological, asbestos-cement pipe, fire retardant | 2,3,8 | 7 million fibers/liter |
| Barium | Circulatory system | Geological | 5,6,7 | 2 mg/l |
| Cadmium | Kidney | Geological, mining, and smelting | 2,5,6,7 | 0.005 mg/l |
| Chromium | Liver, kidney effects | Geological, metal plating | 2,5,6,7 | 0.1 mg/l |
| Mercury | Kidney | Used to make paint, paper, vinyl chloride, geological | 2,4,6,7 | 0.002 mg/l |
| Nitrate (as N) | Methemoglobinemia ("blue baby" syndrome) | Fertilizer, sewage, animal waste | 5,7 | 10 mg/l |
| Nitrite (as N) | Same as nitrate | Same as nitrate | 5,7 | 1 mg/l |
| Total nitrate/nitrite (as N) | | | | 10 mg/l |
| Selenium | Neurological effects | Mining, geological | 1,2,5,6,7 | 0.05 mg/l |
| **VOCs** | | | | |
| cis-1,2-Dichloroethylene | Nervous system, liver, kidney | Extraction solvent, dyes, perfumes, lacquers, pharmaceuticals | 4,9 | 0.07 mg/l |
| 1,2-Dichloropropane | Liver toxin, lung and kidney effects | Pesticide, solvent | 4,9 | 0.005 mg/l |
| Ethylbenzene | Liver, kidney effects | Manufacture of styrene | 4,9 | 0.7 mg/l |
| Monochlorobenzene | Respiratory, nervous system, liver, kidney | Solvent, pesticide | 4,9 | 0.1 mg/l |
| *trans*-1,2-Dichloroethylene | Liver, nervous and circulatory systems | Solvent, chemical production | 4,9 | 0.1 mg/l |
| Styrene | Probable cancer | Production of plastics | 4,9 | 0.1 mg/l |
| Tetrachloroethylene | Probable cancer | General and dry cleaning solvent | 4,9 | 0.005 mg/l |
| Toluene | Liver, kidney, nervous and circulatory damage | Solvent and in the manufacture of gasoline | 4,9 | 1 mg/l |
| Xylenes | Liver, kidney and nervous system damage | Degreaser of metals; solvent for pesticides and in the manufacture of gasoline | 4,9 | 10 mg/l |
| *o*-Dichlorobenzene | Liver, kidney and blood cell damage | Solvent used in the production of pesticides and dyes | 4,9 | 0.6 mg/l |
| **Pesticides/herbicides/PCBs (SOCs)** | | | | |
| 2,4-D | Liver, kidney and nervous system | Herbicide | 4 | 0.07 mg/l |
| Ethylene dibromide (EDB) | Probable cancer | Pesticide | 4,9 | 0.00005 mg/l |
| Heptachlor | Probable cancer | Pesticide | 4 | 0.0004 mg/l |
| Heptachlor epoxide | Probable cancer | Pesticide | 4 | 0.0002 mg/l |
| Lindane | Liver, kidney and nervous system damage | Pesticide | 4 | 0.0002 mg/l |
| Methoxychlor | Liver, kidney and nervous system damage | Pesticide | 4 | 0.04 mg/l |
| Polychlorinated biphenyls (PCBs) | Probable cancer | Used in electrical tranformers and other industrial equipment | 4 | 0.0005 mg/l |
| Pentachlorophenol | Liver, kidney and reproductive damage | Used as a wood preservative, herbicide, disinfectant and defoliant | 4 | 0.001 mg/l |
| Toxaphene | Probable cancer | Pesticide | 4 | 0.003 mg/l |
| 2,4,5-TP (Silvex) | Liver, kidney and nervous system damage | Herbicide | 4 | 0.05 mg/l |
| Alachlor | Probable cancer | Pesticide | 4 | 0.002 mg/l |
| Aldicarb | Nervous system damage | Pesticide | 4 | **(0.003 mg/l) |
| Aldicarb sulfoxide | Nervous system damage | Pesticide | 4 | **(0.004 mg/l) |
| Aldicarb sulfone | Nervous system damage | Pesticide | 4 | **(0.002 mg/l) |
| Altrazine | Liver and kidney damage | Herbicide | 4 | 0.003 mg/l |
| Carbofuran | Nervous and reproductive system damage | Pesticide | 4 | 0.04 mg/l |
| Chlordane | Probable cancer | Pesticide | 4 | 0.002 mg/l |
| Dibromochloropropane (DBCP) | Probable cancer | Pesticide | 4,9 | 0.0002 mg/l |
| **Water treatment chemicals** | | | | |
| Acrylamide | Probable cancer | Polymers used for water treatment | 10 | Treatment technique |
| Epichlorohydrin | Probable cancer | Polymers used for water treatment | 10 | Treatment technique |

*** Key to available technology for removing contaminants**

1. Activated alumina
2. Coagulation/Filtration
3. Direct and Diatomite filtration
4. Granular activated carbon
5. Ion exchange
6. Lime softening
7. Reverse osmosis
8. Corrosion control
9. Packed tower aeration
10. Polymer addition practices

** Final MCLs for these contaminants have not been set.

**12/98** Final Enhanced Surface Water Treatment rule.
**6/2000** Water systems meet final ESWTR.

### V. Synthetic Organic and Inorganic Chemicals (Phase II)

**Schedule:**
Final federal rule published January 30, 1991 and July 1, 1991. Final state rule was adopted December 7, 1992.

**Purpose:**
Set 27 new MCLs and treatment techniques and 11 revised MCLs as follows:
- 17 pesticide standards.
- 8 inorganic standards (deleted existing MCL for silver).
- 10 new volatile organic standards.
- 2 treatment requirements for water treatment chemicals (polymers).
- 1 standard for PCBs.

Also set monitoring requirements for 30 unregulated contaminants to be regulated later under Phase V and secondary contaminant levels for silver and aluminum.

**Application:**
All standards apply to community and nontransient noncommunity systems. Nitrate/nitrite standards also apply to transient noncommunity systems.

**Sources, health effects and best available technology:**
Summarized in Table 2.

**Monitoring:**
Systems must complete initial monitoring during 1993, 1994 or 1995 (1/3 of systems each year). Repeat monitoring based on initial results and vulnerability assessment of water source. Samples are collected from each source after treatment. Quarterly testing is required for the first year; however, for systems serving 3,300 or fewer persons which test by Oct. 1, 1993, that will be the only test required. Systems serving more than 3,300 persons may request a waiver which, if granted, will reduce monitoring requirements. High costs for initial monitoring are due to the large number of analytical methods needed to test all contaminants and the quarterly initial monitoring.

### VI. Lead and Copper Rule

**Schedule:**
Final federal rule adopted June 7, 1991. Final state rule was adopted December 7, 1992. See Table 3.

**Purpose:**
Set treatment technique requirements for lead and copper including:
- Corrosion control treatment.
- Source water treatment.
- Public education.
- Lead service line replacement.

No MCLs set for lead or copper. Action levels set at 0.015 mg/l for lead and 1.3 mg/l for copper.

**Application:**
All community and nontransient noncommunity water systems.

**Health effects:**
Lead:
- In children, altered physical and mental development; interference with growth; deficits in IQ, attention span and hearing; interference with red blood cell production.
- In women, shorter gestation period; in men and women, increased blood pressure.

Copper: stomach and intestinal distress.

**Sources:**
Lead: corrosion of lead solder, brass plumbing fixtures and lead piping in customer plumbing.
Copper: primarily corrosion of copper piping used in plumbing systems.

**Monitoring:**
All systems must conduct customer tap sampling (see Table 3). One liter samples of water standing in the tap for six hours are collected from high risk homes with lead solder, lead pipes or lead service lines.

Large systems (greater than 50,000 population) must optimize corrosion regardless of lead/copper levels. Other systems must install corrosion treatment only if action levels are exceeded by the 90th percentile value. Systems exceeding action levels must monitor source water for lead and copper, identify and remove lead service lines and conduct public education. Systems practicing corrosion control must monitor for water quality parameters (pH, temperature, alkalinity, etc.). Systems meeting action levels or optimizing corrosion control may reduce monitoring.

### VII. Synthetic Organic and Inorganic Chemicals (Phase V)

**Schedule:**
Final federal rule adopted in July 17, 1992. Final state rule to be adopted January 1994.

**Purpose:**
Set standards for five inorganic and 18 synthetic organic chemicals.

**Health effects, sources, treatment:**
Summarized in Table 4.

**Application:**
All community and nontransient noncommunity water systems.

**Monitoring:**
Systems serving more than 150 service connections must begin initial monitoring between January 1 and December 31, 1993. Systems with fewer than 150 service connections must monitor between January 1, 1996, and December 31, 1998.

### VIII. Radionuclides (Phase III)

**Schedule:**
Proposed federal rule published July 18, 1991. Final federal rule expected in October 1993. Final state rule to be adopted April 1995.

**Purpose:**
Set six standards including radon and uranium. Revised existing standards for other radionuclides.

**Application:**
All community and nontransient noncommunity water systems.

**Table 3: Lead and Copper Monitoring**

| Population served | Sample sites initial | Sample sites reduced |
|---|---|---|
| >100,000 | 100 | 50 |
| 10,001-100,000 | 60 | 30 |
| 3,301-10,000 | 40 | 20 |
| 501-3,300 | 20 | 10 |
| 101-500 | 10 | 5 |
| <100 | 5 | 5 |

**Starting dates for sampling**

| | |
|---|---|
| January 1992 | Large systems (>50,000) |
| July 1992 | Medium systems (3,301-50,000) |
| July 1993 | Small systems (<3,300) |

**Corrosion control installation dates**

6/96 Large systems (>50,000)
1/97 Medium systems (3,301-50,000)
1/98 Small systems (<3,300)

**Sources, Treatment:**

Radon gas can be present in groundwater from the natural decay of radium. Most other radioactive contaminants are present naturally in the environment. Most beta and photon emitters are man-made contaminants. Treatment methods are shown in Table 5.

**Health Effects:**

Primarily cancer (see Table 5). Inhaling radon gas increases the risk of lung cancer.

**Monitoring:**

Systems begin initial monitoring in 1996, 1997 and 1998 ($^1/_3$ of systems each year. Repeat monitoring every 3, 6 or 9 years, depending on initial results and water source vulnerability.

## IX. Groundwater Disinfection Rule

**Schedule:**

Proposed federal rule expected August 1994. Final federal rule expected in August 1996. Final state rule to be adopted February 1998;. Coordinated with the Disinfection Byproducts rule (Section X).

**Purpose:**

Require public water systems using groundwater sources to disinfect the water to control viruses unless the source is deemed *not vulnerable* to viral contamination.

**Application:**

All public water systems using groundwater sources (not influenced by surface water).

**Health Effects:**

Viruses can cause disease outbreaks and can be transported in groundwater.

**Sources:**

Source of viruses is human fecal material or sewage (subsurface sewage disposal, lagoons, etc.)

**Treatment:**

Apply disinfectant to achieve virus reduction. Use of ultraviolet light is under consideration if distribution system is small and in good condition.

**2/98** Systems already treating, monitor for disinfectant residuals.

**8/98** Systems demonstrate to the Division their vulnerability to virus contamination to avoid disinfection

**2/99** Systems already disinfecting

**Table 4: SOCs and IOCs (Phase V)**

| Contaminant | Health Effect(s) | Source(s) | Treatment* | MCL (mg/l) |
|---|---|---|---|---|
| **IOCs** | | | | |
| Antimony | Alters blood cells of cholesterol and glucose | Geologically, used in ceramics, fireworks, glass, batteries, and explosives | 2,7 | 0.006 |
| Beryllium | Bone and lung damage, induction of cancer | Mining, processing plants, and improper waste disposal | 2,5,6,7 | 0.004 |
| Cyanide | Damage of the spleen, brain, and liver | Used in electroplating, steel processing, plastics, fertilizer | 5,7,9 | 0.2 |
| Nickel | Heart and liver damage | Used in electroplating, stainless steel and alloy products | 5,6,7 | 0.1 |
| Thallium | Damage of kidney, liver, brain, and intestines | Geologic, used in manufacture of electronics, pharmaceuticals, glass and alloys | 5 | 0.002 |
| **Pesticides/herbicides/PCBs/VOCs** | | | | |
| Benzo(a)pyrene | Cancer | Leaching from coal tar lining, and coatings in water storage tanks and pipes | 4 | 0.0002 |
| Dalapon | Kidney and liver damage | Herbicides | 4 | 0.2 |
| Dichloromethane | Cancer | Used as a solvent | 11 | 0.005 |
| Di(2-ethylhexyl)adipate | Liver and testes damage | Used as a plasticizer | 4 | 0.5 |
| Di(2-ethylhexyl)phthalate | Cancer | Used as a plasticizer | 4 | 0.006 |
| Dinoseb | Thyroid and reproductive damage | Pesticide | 4 | 0.007 |
| Diquat | Liver, kidney, and gastrointestinal tract | Herbicide | 4 | 0.02 |
| Endothall | Liver, kidney, gastrointestinal and reproductive damage | Herbicide | 4 | 0.1 |
| Endrin | Liver, kidney, and heart | Pesticide (no longer in use) | 4 | 0.002 |
| Glyphosate | Liver, and kidney | Herbicide | 12 | 0.7 |
| Hexachlorobenzene | Cancer | Produced in the manufacture of some solvents and pesticides | 4 | 0.001 |
| Hexachlorocyclopentadiene | Kidney and stomach damage | Produced in the manufacture of flame retardents and pesticides | 4,11 | 0.05 |
| Oxamyl | Kidney damage | Pesticide | 4 | 0.2 |
| Picloram | Kidney and liver damage | Pesticide | 4 | 0.5 |
| Simazine | Cancer | Herbicide | 4 | 0.004 |
| 1,2,4-Trichlorobenzene | Cancer | Herbicide | 4,11 | 0.07 |
| 1,1,2-Trichloroethane | Liver and kidney damage | Produced in the manufacture of 1,1,2-trichloromethane | 4,11 | 0.005 |
| 2,3,7,8-TCDD (Dioxin) | Cancer | Production of some pesticides | 4 | $5x10^{-8}$ |

*** Available technology key**

1. Activated carbon
2. Coagulation/filtration
3. Direct and diatomite filtration
4. Granular activated carbon
5. Ion exchange
6. Lime softening
7. Reverse osmosis
8. Corrosion control
9. Chlorine oxidation
10. Ultraviolet Light
11. Packed tower aeration
12. Oxidation

demonstrate they meet treatment performance levels

**2/01** Community systems install disinfection

**2002-3** Noncommunity systems install disinfection

### X. Disinfectants and Disinfection By-products (Phase VI-A)

**Schedule:**

Large systems will be required to monitor for water quality parameters in raw and distribution system water and for disinfection byproducts in the distribution system. Data generated will be used to finalize a stage one federal rule by June 1996. A stage two federal rule, based on experience with stage one, will be adopted by June 2000.

**Purpose:**

Set standards for both disinfectant residuals and compounds which are by-products of the use of disinfectants (DBPs). This rule is being closely coordinated with rules for ground water disinfection and enhanced surface water treatment.

Disinfectants are needed to control waterborne disease but all disinfectants react with naturally occurring compounds in water (called *precursors*) to produce DBPs which may have health risks. Some disinfectants may need to have dosages limited to prevent health effects. Rule must *balance* risks to assure control of waterborne disease while limiting exposure to disinfection by-products and disinfectant residuals.

Because of the lack of adequate scientific information on disinfectant by-products and their health effects, the rule will be implemented in two stages and will use the regulatory-negotiation process. The stages will establish MCLs for total trihalomethanes (TTHM) and total haloacetic acids (THAA). See Table 6. The current standard for TTHM is 100 µg/l. Maximum residual disinfectant level goals for three types of residuals will be set. In addition, treatment technique limits for total organic carbon (TOC) are set to control as yet unidentified disinfection by-products. Surface water systems with conventional filtration treatment would be required to optimize coagulation prior to disinfection if TOC levels are greater than 2 mg/l. Stage two will establish additional MCLs in the future based on stage one data generated by water systems.

**Application:**

All community and nontransient noncommunity water systems that use a chemical disinfectant.

**Treatment:**

All systems using chemical disinfection and conventional filtration meet MCLs for TTHM and THAA and enhance coagulation if TOC is 2 mg/l or higher. Enhanced coagulation means removing specified levels of TOC by coagulation and sedimentation prior to disinfection.

Other water systems must meet MCLs for TTHM and THAA. These include systems with slow sand filtration, cartridge filters and groundwater systems that disinfect.

Systems using ozone must meet bromate MCL. Systems using chlorine dioxide must meet chlorite MCL.

**Health Effects:**

Trihalomethanes are associated with increased cancer risk. Other DBPs now under study are possible cancer risks. Additional DBPs and health effects may be identified.

**Monitoring:**

**6/94** Final information collection rule.

**10/94-12/95** All surface water systems that serve more than 100,000 persons monitor sources and filtered water monthly for pH, alkalinity, turbidity, temperature, calcium, hardness, total organic carbon, $UV_{254}$, bromide and ammonia. Also monitor the distribution system quarterly at four locations for TTHM, THAA, haloacetonitriles (HAN), chloropicrin, haloketones, chloral hydrate and total organic halide (TOX). Bench studies to investigate DBP precursor removal.

**12/96** Final stage one DBP rule

**6/98** Surface water systems serving more than 10,000 persons meet stage one DBP MCLs. Initiate regulatory negotiation for stage two DBP requirements

**6/2000** Surface water systems serving fewer than 10,000 persons meet stage one DBP MCLs. Final stage two federal rule.

**1/2002** Groundwater systems serving fewer than 10,000 persons meet stage one DBP MCLs.

**2004** All water systems meet stage two DBP MCLs.

### XI. Synthetic and Inorganic Chemicals (Phase VI-B)

**Schedule:**

Proposed federal rule expected 1993. Final federal rule expected June 1995. Final state rule to be adopted December 1996.

**Purpose:**

Set standards for at least 13 inorganic and synthetic organic chemicals. See Table 7 for listing of contaminants. Number of contaminants depends on number of MCLs set in DBP rule.

**Application:**

All community and nontransient noncommunity water systems.

**Monitoring:**

To be determined.

### XII: Sulfate

**Schedule:**

Proposed federal rule due October 1993. Final federal rule due December 1994, with state adoption by June 1996.

**Purpose:**

Set MCL for sulfate. Sulfate originally proposed as part of Phase V rule but was deferred to consider alternative regulations due to high cost and low risk.

**Application:**

All public water systems

**Table 5: Radionuclides**

| Contaminant | Health Effect(s) | Treatment* | MCL |
|---|---|---|---|
| Radium 226 | Bone cancer | 1,2,5 | 20 pCi/l |
| Radium 228 | Bone cancer | 1,2,5 | 20 pCi/l |
| Uranium | Kidney damage, bone cancer | 1,4,7 | 20 µg/l |
| Radon | Probable lung cancer | 6 | 300 pCi/l |
| Gross alpha | Cancers | 2,3,7 | 15 pCi/l |
| Beta and Photon | Cancers | 2,3,7 | 4 mrem/yr |

*** Available technology key**

1-Lime softening
2-Reverse osmosis
3-Ion exchange
4-Anion exchange
5-Cation exchange
6-Aeration
7-Coagulation/flocculation

**Table 6: Disinfectants and disinfection by-products**

| Disinfectants (max. levels) | Stage one | Stage two |
|---|---|---|
| Chlorine (free) | 4 mg/l | 4 mg/l |
| Chloramines (total chlorine) | 4 mg/l | 4 mg/l |
| Chlorine dioxide | 0.8 mg/l | 0.8 mg/l |
| **Disinfection by-products (MCLs)** | | |
| Total trihalomethanes (TTHM) | 80 µg/l | 40 µg/l |
| Total haloacetic acids (THAA) | 60 µg/l | 30 µg/l |
| Chlorite (systems with chlorine dioxide disinfection) | 0. 8 µg/l | 0. 8 µg/l |
| Bromate (systems with ozone disinfection) | 10 µg/l | 10 µg/l |

**Health Effects:**

Sulfate levels above 400-500 mg/l can have a laxative effect on infants and unacclimated adults. Adults acclimate to high sulfate levels fairly rapidly. An MCL of 400-500 mg/l would affect a large number of small water systems.

**Monitoring:**

To be determined.

## XII. Arsenic

**Schedule:**

Proposed federal rule expected in September 1994 with the final rule in September 1996. State rule adoption by March 1998.

**Purpose:**

Set revised MCL for arsenic. Current MCL is 0.050 mg/l. Likely to be reduced to 0.002 to 0.005 mg/l based on cancer risk. A low MCL would affect a large number of water systems.

**Application:**

Community and nontransient noncommunity water systems.

**Health Effects:**

Non cancerous effects mainly thickening of skin. Possible skin cancer and some evidence of internal organ cancer risk.

**Treatment:**

Reverse osmosis, activated alumina, and electrodialysis. Treatment to below 0.002 mg/l may not be currently possible.

**Monitoring:**

To be determined.

## XIII. Health Advisories

Health Advisories are guidance documents issued by the EPA to assist federal, state, and local officials in responding to drinking water contamination. The Health Advisories contain information on health risks and treatment technologies, and specify levels of chemical concentrations in water that are acceptable for drinking. In preparing Health Advisories, EPA reviews available human data and experimental animal studies in evaluating potential human health effects. The Health Advisories are updated as new information becomes available. As of June 1993 the list of EPA Health Advisories contained the contaminants in Table 8.

## XIV. Drinking Water Priority List

EPA is required to publish a priority list of contaminants in drinking water every three years. These contaminants are candidates for future regulation. The Safe Drinking Water Act requires EPA to set 25 new MCLs every three years.

The drinking water priority list was revised in 1991 and the listed contaminants are shown in Table 9. A new list is due in January 1994.

## XV. Unregulated Contaminants

**Purpose:**

Develop occurrence data to assist in selecting new contaminants for setting drinking water standards. Unregulated contaminants have no established MCLs.

**Application:**

Community and nontransient noncommunity water systems.

**Schedule:**

The list of current unregulated contaminants is shown in Table 10. This list will change as new federal regulations become effective. New contaminants will be added, existing contaminants will become regulated with established MCLs and monitoring frequencies, or will drop from the list.

**Monitoring:**

Monitoring is by source every five years. Systems which serve fewer than 150 connections may simply notify the Division in writing that they are available for sampling.

## XVI Secondary Contaminants

**Purpose:**

No MCLs are set for secondary contaminants, however, guideline levels are listed that are associated with aesthetic effects such as staining of plumbing fixtures or tastes and odors.

**Application:**

All public water systems.

**Schedule:**

Secondary standards can be set within any regulation. A current listing of secondary standards is given in Table 11.

**Monitoring:**

No monitoring is required in the rules. Secondary contaminants and levels are offered for guidance only.

***Note:*** *This document was prepared by Drinking Water Section staff from currently available EPA documents and materials. It will be revised and republished as new regulatory developments occur.* John Gram, editor.

**Table 7: SOCS and IOCS (Phase VI-B)**

| Contaminant | Possible MCL goals |
|---|---|
| Acifluorfen | 0 |
| Acrylonitrile | 0 |
| Boron | 1 mg/l |
| Bromomenthane | 1 mg/l |
| Cyanazine | 0.001 mg/l |
| 2,4/2,6-Dinitrotoluene | 0 |
| Ethylenethiourea | 0 |
| Hexachlorobutadiene | 0.001 mg/l |
| Manganese | 0.2 mg/l |
| Molybdenum | 0.04 mg/l |
| 1,3 Dichloropropane | 0 |
| 1,2,3 Tetrachloroethylene | 0 |
| Zinc | 2 mg/l |

**Table 8: Health Advisories**

**Organics**

Aciflurofen
Acrylamide
Alachlor
Aldicarb
Aldicarb sulfone
Aldicarb sulfoxide
Ametryn
Ammonium sulfamate
Atrazine
Baygon
Bentazon
Benzene
bis - (1-Chloroisopropyl) ether
Bromacil
Bromochloromethane
Bromoethane
Butylate
Carbaryl
Carbofuran
Carbon tetrachloride
Carboxin
Chloramben
Chlordane
Chloromethane
Chlorothalonil
Chlorotoluene o-
Chlorotoluene p-
Cyanazine
2,4-D
DCPA (Dacthal)
Dalapon
Diazinon
Dibromochloropropane (DBCP)
Dicamba
Dichlorobenzene o-
Dichlorobenzene m-
Dichlorobenzene p-
Dichlorodifluoromethane
Dichloroethane (1,2-)
Dichlorethylene (1,1-)
Dichloroethylene (cis-1,2-)
Dichloroethylene (trans-1,2-)
Dichloromethane
Dichloropropane (1,2-)
Dichloropropene (1,3-)
Dieldrin
Diisopropyl methylphosphonate
Dimethrin
Dimethyl methylphosphonate
1,3-Dinitrobenzene
Dinitrotoluene (2,4-)
Dinitrotoluene (2,6-)
Dinoseb
Dioxane p-
Diphenamid
Diphenylamine
Disulfoton
Dithiane (1,4-)
Diuron
Endothall
Endrin
Epichlorohydrin
Ethylbenzene
Ethylene dibromide (EDB)
Ethylene glycol
ETU
Fenamiphos
Fluometuron
Fluorotrichloromethane
Fonofos
Glyphosate
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexachloroethane
Hexane (n-)
Hexazinone
HMX
Isophorone
Lindane
Maleic hydrazinde
MCPA
Methomyl
Methoxychlor
Methyl parathion
Metolachlor
Metribuzin
Monochlorobenzene
Naphthalene
Nitrocellulose (non-toxic)
Nitroguanidine
Oxamyl (Vydate)
Paraquat
Pentachlorophenol
Picloram
Prometon
Pronamide
Propachlor
Propazine
Propham
RDX
Simazine
Styrene
2,4,5-T
2,3,7,8 TCDD (Dioxin)
Tebuthiuron
Terbacil
Terbufos
Tetrachloroethane (1,1,1,2-)
Tetrachloroethylene
Toluene
Toxaphene
2,4,5-TP
Trichlorobenzene (1,2,4 -)
Trichlorobenzene (1,3,5-)
Trichloroethane (1,1,1-)
Trichloroethane (1,1,2-)
Trichloroethylene
Trichloropropane (1,2,3-)
Trifluralin
Trinitroglycerol
Trinitrotoluene
Vinyl chloride
Xylenes

**Inorganics**

Anitmony
Barium
Cadmium
Chromium (total)
Cyanide
Mercury (inorganic)
Molybdemun
Nickel
Nitrate (as N)
Nitrite (as N)
Nitrate + Nitrite (both as N)
Thallium
White phosphorous
Zinc
Zinc chloride (measured as Zinc)

**Table 9: Drinking Water Priority List**

**Inorganics (total = 14)**

Aluminum
Boron
Chloramines
Chlorate
Chlorine
Chlorine dioxide
Chlorite
Cyanogen chloride
Hypochlorite ion
Manganese
Molybdenum
Strontium
Vanadium
Zinc

**Pesticides (total = 19)**

Asulam
Bentazon
Bromacil
Cyanazine
Cyromazine
DCPA (and its acid metabolites)
Dicamba
Ethylenethiourea
Fomesafen
Lactofen / Acifluorfen
Metalaxyl
Methomyl
Metolachlor
Metribuzin
Parathion degradation product (4-Nitrophenol)
Prometon
2,4,5-T
Thiodicarb
Trifluralin

**Synthetic organic chemicals (total = 43)**

Acrylonitrite
Bromobenzene
Bromochloroacetonitrile
Bromodichloromethane
Bromoform
Bromomethane
Chlorination / Chloramination by-products (Misc.), e.g., Haloacetic acids, Haloketones, Chloral hydrate, MX-2 [3-chloro-4-(dichloromethyl)-5-hydroxy-2-(5H)-furanone], N-Organochloramines
Chloroethane
Chloroform
Chloromethane
Chloropicrin
o-Chlorotoluene
p-Chlorotoluene
Dibromoacetonitrile
Dibromoacetomethane
Dibromomethane
Dichloroacetonitrile
1,1-Dichloroethane
2,2-Dichloropropane
1,3-Dichloropropane
1,1-Dichloropropene
1,3-Dichloropropene
2,4-Dinotrophenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
1,2-Diphenylhydrazine
Fluorotrichloromethane
Hexachlorobutadiene
Hexachloroethane
Isophorone
Methyl ethyl ketone
Methyl isobutyl ketone
Methyl-t-butyl ether
Naphthalene
Nitrobenzene
Ozone by-products, e.g., aldehydes, epoxides, peroxides, nitrosamines, bromate, Iodate
1,1,1,2-Tetrachloroethane
1,1,2,2,-Tetrachloroethane
Tetrahydrofuran
Trichloroacetonitrile
1,2,3-Trichloropropane

**Microorganisms (total = 1)**

Cryptosporidium

**Table 10: Unregulated Contaminants**

3-Hydroxycarbofuran
Aldicarb
Aldicarb Sulfoxide
Aldicarb Sulfone
Aldrin
Butachlor
Carbaryl
Dicamba
Dieldrin
Methomyl
Metolachlor
Metribuzin
Propachlor
1,1-Dichloroethane
1,1-Dichloropropene
1,1,1,2-Tetrachloroethane
1,1,2,2,-Tetrachloroethane
1,2,3,-Trichloropropane
1,3-Dichloropropane
1,3-Dichloropropene
2,2-Dichloropropane
Bromobenzene
Bromodichloromethane
Bromoform
Bromomethane
Chloroethane
Chloroform
Chloromethane
Dibromochloromethane
Dibromomethane
M-Dichlorobenzene
*o*-Chlorotoluene
*p*-Chlorotoluene

**Table 11: Secondary Standards**

| | |
|---|---|
| Aluminum | .05-0.2 mg/l |
| Chloride | 250 mg/l |
| Color | 15 color units |
| Copper | 1.0 mg/l |
| Corrosivity | Non-corrosive |
| Fluoride | 2.0 mg/l |
| Foaming agents | 0.5 mg/l |
| Hardness | 250 mg/l |
| Iron | 0.3 mg/l |
| Manganese | 0.05mg/l |
| Odor | 3 threshold odor numbers |
| pH | 6.5-8.5 |
| Silver | .1 mg/l |
| Sulfate | 250 mg/l |
| Total dissolved solids (TDS) | 500 mg/l |
| Zinc | 5 mg/l |

Drinking Water Section, Oregon Health Division
Department of Human Resources
P.O. Box 14450
Portland OR 97214-0450

Application to Mail at
Second-Class
Postage Rates
is Pending
at Portland OR

***PIPELINE*** is published monthly free of charge by the staff of the Oregon Health Division, Drinking Water Section, 800 NE Oregon St., Portland OR 97232. Application to mail at second-class postage rates is pending at Portland OR. POSTMASTER: Send address changes to PIPELINE, P.O. Box 14450, Portland OR 97214-0450.

***PIPELINE*** is intended to provide useful information on technology, training, and regulatory and policy issues to those involved with the state's public water systems to improve the quality of drinking water in Oregon. ***PIPELINE*** may be copied or reproduced without permission provided credit is given.

This special edition was prepared by Drinking Water Section staff from currently available EPA documents and materials. It will be revised and republished as new regulatory developments occur.

Please send requests for article topics or manuscripts of your articles to John Gram, editor.

**David E. Leland, Manager, Drinking Water Section 503 / 731-4010**