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A summary of

Oregon

Drinking Water Regulations

including the 1986 amendments to the
Safe Drinking Water Act

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SUMMARY OF OREGON DRINKING WATER REGULATIONS INCLUDING REGULATIONS UNDER THE 1986 AMENDMENTS TO THE SAFE DRINKING WATER ACT

This summary provides a broad overview of the existing and upcoming regulations 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 regulation.

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 and for any contaminant in drinking water that may have an adverse effect upon the health of persons and which is known or anticipated to occur in public water systems. 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.

These regulations require that systems treat and control contaminants to the Maximum Contaminant Level. 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 OHD schedule for implementing the rules is presented in Figure 1.

The following is a summary of each of the federal and state rules. Each rule is implemented in Oregon on a schedule depending on system size.

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) 229-6307 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 3,446 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 981 community water systems serving 2.1 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 354 nontransient noncommunity water systems currently identified serving 70,000 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 1,470 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* is a public water system which 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 water systems. There are 641 state-regulated water systems currently identified serving 11,000 people in Oregon.

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 the following:

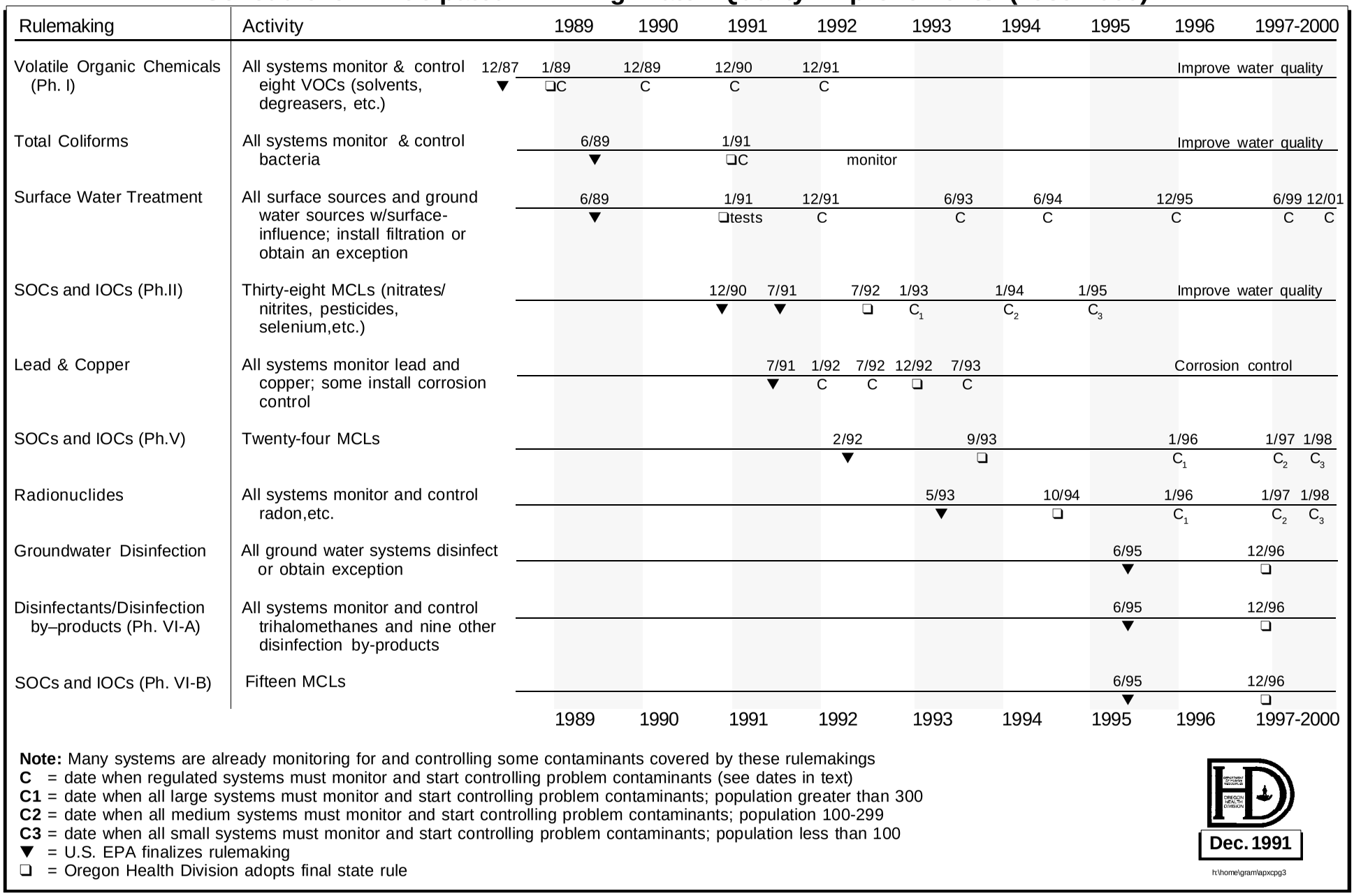
- A clear and understandable explanation of the violation;
- Information about potential adverse health effects, including specific mandatory language;
- Identification of the population at risk;
- An indication of the steps being taken to correct the problem;
- Preventive measures to be taken until

[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 (1989-2000)



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

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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 designer 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 customer's water bills;
- 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, page 4.

Purpose:

Set standards for eight VOCs.

Require monitoring for 51 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.

II. Total Coliform

Schedule:

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

Health Effects:

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. Disease symptoms may include diarrhea, cramps, nausea, and possibly jaundice, and any associated headaches and fatigue. These symptoms, however, are not just associated with disease-causing water, but also may be caused by a number of factors other than drinking water. EPA has set an enforceable drinking water standard for total coliform to reduce the risks of these adverse health effects.

Routine Monitoring Requirements:

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 E. coli.

Compliance:

All coliform results are reported as *coliforms present* (positive) or *coliforms absent* (negative).

Small- and medium-sized systems

Table 1: Volatile Organic Chemicals (VOCs) Regulation

Regulated contaminants:

Name	*MCLGs(mg/l)*	*MCLs(mg/l)*
Benzene	0	0.005
Vinyl Chloride	0	0.002
Carbon tetrachloride	0	0.005
1,2 Dichloroethane	0	0.005
Trichloroethylene	0	0.005
1,1 Dichloroetylene	0.007	0.007
1,1,1 Trichloroethane	0.200	0.200
para-Dichlorobenzene	0.075	0.075

Unregulated[+]:

Trihalomethanes:	Tetrachloroethylene	Bromomethane
Chloroform	Toluene	1,2,3,-Trichloropropane
Bromodichloromethane	p-Xylene	1,1,1,2-Tetrachloroethane
Chlorodibromomethane	o-Xylene	Chlorothane
Bromoform	m-Xylene	1,1,2,-Trichloroethane
trans-1,2-Dichloroethylene	1,1,-Dichloroethane	1,2,-Dichloropropane
Chlorobenzene	1,2,-Dichloropropane	o-Chlorotoluene
m-Dichlorobenzene	1,1,2,2,-Tetrachlorproethane	p-Chlorotoluene
Dichloromethane	Ethylbenzene	Bromobenzene
cis-1,2,-Dichloroethylene	1,3-Dichloropropane	1,3-Dichloropropene
o-Dichlorobenzene	Sytyrene	
1,1,-Dichloropropene	Chloromethane	

Special unregulated[+]:

Ethylene Dibromide (EDB)	n-Propylbenzene	Isopropyltoluene
1,2,-dibromo-3-chloropropane (DBCP)	n-Butylbenzene	Tert-Butylbenzene
1,2,4-Trimethylbenzene	Napthalene	Sec-Butylbenzene
1,2,4-Trichlorobenzene	Hexachlorobutadiene	Fluorotrichloromethane
1,2,3-Trichlorbenzene	1,3,5-Trimethylbenzene	Dichlorodifluoromethane
	p-Isopropyltoluene	Bromochloromethane

[+] Systems serving fewer than 150 connections may simply make themselves available to the Division for monitoring rather than actually testing for these VOCs. This must be done in writing.

Initial monitoring frequency:

Source	*Regulated VOC*	*Unregulated VOC*	*Special Unregulated VOC*
Surface	Quarterly for 1st year for each source	Quarterly for 1st year for each source	At state discretion
Ground (systems with population ≥ 3,300)	Quarterly for 1st year for each source	Once for 1st year for each source	At state discretion
Ground (systems with population < 3,300)	Once for 1st year for each source (additional sampling may be required at state discretion)	Once for 1st year for each source	At state discretion

Resampling 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[+++]

[++] 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.

[+++] "detected" means > 0.0005 mg/l (except trihalomethanes)

(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.

Application:

All public water systems using surface water sources.

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 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

Table 2: SOCs and IOCs (Phase II)

Contaminant	Health Effect(s)	Source(s)	BAT*	MCL
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	Gastrointestinal effects	Geological	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	Methemoglobinemia ("blue baby" syndrome)	Fertilizer,sewage, feedlots	5,7	10 mg/l
Nitrite	Same as nitrate	Same as nitrate	5,7	1 mg/l
Total nitrate/nitrite				10 mg/l
Selenium	Neurological effects	Mining, geological	1,2,5,6,7	0.01 mg/l
SOCs				
cis-1,2-Dichloroethylene	Nervous system, liver, kidney	Extraction solvent, dyes, perfumes, lacquers, pharmaceuticals	4,9	0.7 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
2,4-D	Liver, kidney, and nervous system	Algae control in reservoirs, weed killer	4	0.07 mg/l
Epichlorahydrin	Probable cancer	Polymers of this chemical are used in water treatment	10	Treatment technique
Ethylene dibromide	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 (PCB's)	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	0.0001 mg/l
Styrene	Probable cancer	Production of plastics	4,9	0.10 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 for airplanes	4,9	1 mg/l
Toxaphene	Probable cancer	Pesticide	4	0.003 mg/l
2,4,5-TP	Liver, kidney and nervous system damage	Herbicide	4	0.05 mg/l
Xylene	Liver, kidney and nervous system damage	Degreaser of metals, solvent for pesticides and the manufacture of gasoline	4,9	10 mg/l
Acrylamide	Probable cancer	Polymers used for water treatment	10	Treatment technique
Alachlor	Probable cancer	Pesticide	4	0.002 mg/l
Aldicarb	Nervous system damage	Pesticide	4	0.001 mg/l
Aldicarb sulfoxide	Nervous system damage	Pesticide	4	0.001 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	0.004 mg/l
Chlordane	Probable cancer	Pesticide	4	0.002 mg/l
Dibromochloropropane	Probable cancer	Pesticide	4	0.002 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

*** Key to best 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

6/94 State determines which community ground water sources are surface water influenced
12/95 Surface influenced community systems install filtration or alternative supply
6/99 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. Synthetic Organic and Inorganic Chemicals (Phase II)

Schedule:

Final federal rule published January 30 and July 1991. Final state rule to be adopted by July 30, 1992.

Purpose:

Set 27 new MCLs and treatment techniques and 11 revised MCLs as follows:

- 17 pesticide standards.
- 8 inorganic standards (delete 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 for two secondary contaminants, 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, page 5.

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 water source after treatment. Quarterly tests are required for first year. High cost expected for initial monitoring due to large number of analytical methods needed to test all contaminants and due to quarterly initial monitoring.

V. Lead and Copper Rule

Schedule:

Final federal rule adopted June 7, 1991. Final state rule to be 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; Wilson's disease (rarely).

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 services and conduct public education. Systems practicing corrosion control must monitor for water quality

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

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

Best available technology

The state may specify one of the following treatments of the source water (an alternative treatment may be used which is at least as effective):

1. Ion exchange
2. Reverse osmosis
3. Lime softening
4. Coagulation/filtration

parameters (pH, temperature, alkalinity, etc.). Systems meeting action levels or optimizing corrosion control may reduce monitoring.

VI. Synthetic Organic and Inorganic Chemicals (Phase V)

Schedule:

Proposed federal rule published July, 25, 1990. Final federal rule expected in February 1992. Final state rule to be adopted September 1993.

Purpose:

Set standards for six inorganic and 18 synthetic organic chemicals.

Health effects, sources, treatment:

Summarized in Table 4, page 8.

Application:

All community and nontransient noncommunity water systems.

VII. Radionuclides (Phase III)

Schedule:

Proposed federal rule published July 18, 1991. Final federal rule expected in May 1993. Final state rule to be adopted October 1994.

Purpose:

Set six standards including radon and uranium. Revise existing standards for other radionuclides.

Application:

All community and nontransient noncommunity water systems.

Sources, Treatment:

Radon gas can be present in groundwater from the natural decay of uranium. 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, page 7.

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.

VIII. Groundwater Disinfection Rule

Schedule:

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

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 ground water.

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.

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

Schedule:

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

Purpose:

Set standards for both disinfectant residuals and compounds which are by-products of the use of disinfectants (DBPs). MCLs are likely for about 10 DBPs (see Table 6).

Disinfectants are needed to control

Table 5: Radionuclides

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

*** Best available technology key**

1-Lime softening	2-Reverse osmosis	3-Ion exchange
4-Anion exchange	5-Cation exchange	6-Granular activated carbon

Table 4: SOCs and IOCs (Phase V)

Contaminant	Health Effect(s)	Source(s)	BAT*	MCL
IOCs				
Antimony	Alters blood cells of cholesterol and glucose	Geologically, used in ceramics, fireworks, glass, batteries, and explosives	2,7	0.01mg/l
Beryllium	Bone and lung damage, induction of cancer	Mining, processing plants, and improper waste disposal	1,2,5,6,7	0.001
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
Sulfate	Diarrhea, can cause dehydration in infants	Geologic	5,7	400
Thallium	Damage of kidney, liver, brain, and intestines	Geologic, used in manufacture of electronics, pharmaceuticals, glass and alloys	1,5	0.002
SOCs				
Benzo(a)pyrene (PAHs)	Cancer	Leaching from coal tar lining, and sealants in water storage tanks	4	0.0002
Dalapon	Kidney and liver damage	Herbicides	4	0.2
Dichloromethane	Cancer	Used as a solvent	11	0.005
Di(ethylhexyl)adipate	Liver and testes damage	Used as a plasticizer	4	0.5
Di(ethylhexyl)phthalate	Cancer	Used as a plasticizer	4	0.004
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	4	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	0.001
1,2,4-Trichlorobenzene	Cancer	Herbicide	4	0.009
1,1,2-Trichloroethane	Liver and kidney damage	Produced in the manufacture of 1,1,2-trichloromethane	4	0.005
2,3,7,8-TCDD (Dioxin)	Cancer	Production of some pesticides	4	$5x10^{-8}$

* Best 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

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.

Application:

All public water systems that add a disinfectant to the water.

Health Effects:

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

Treatment:

- Optimize removal of natural precursors from water prior to disinfection.
- Use alternate disinfectants (ozone, chloramines).
- Remove DBPs after formation.

Monitoring:

Initial monitoring begins in 1997, 1998, 1999 (1/3 of systems each year).

X. 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 about 15 inorganic and synthetic organic chemicals. See table 7 for listing of contaminants.

Application:

All community and nontransient noncommunity water systems.

XI. Health Advisories

Health Advisories are guidance documents issued by the U.S. Environ-

Table 6: Disinfectants and Disinfection By-products (Phase VI-A)

Chlorine	Chlorate	Bromoform (revised)
Chloramine	Trihalomethanes (revised)	Haloacetic Acids
Chlorine Dioxide	Chloroform (revised)	Dichloroacetic Acid
Cyanogen Chloride	Bromodichloromethane (revised)	Trichloroacetic Acid
Bromate	Dibromochloromethane (revised)	Chloropicrin
Iodate		Chloral hydrate
Chlorite		Aldehydes

mental Agency 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 October 1990 the list of EPA Health Advisories contained the contaminants in Table 10.

XII. 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 in1991 and the listed contaminants are shown in Table 9, page 10.

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)

Aluminum	2,4/2,6-dinitrotoluene	Metolachlor
Acrylonitrile	Ethylene thiourea (ETU)	Metribuzin
Bentazon	Hexachlorobutadiene	Molybdenum
Boron	Isophorone	Naphthalene
Bromacil	Lactofen/Acifluorfen	4-Nitrophenol
Bromomethane	Manganese	Prometon
Cyanazine	Methomyl	1,1,1,2-tetrachloroethane
Dacthal (DCPA)	Methyl ethyl ketone (MEK)	1,1,2,2-tetrachloroethane
Dicamba	Methyl isobutyl ketone (MIBK)	1,2,3-trichloropropane
1,1-dichloroethane	Methyl tertiary butyl ether (MTBE)	Trifluralin
Cis/trans-1,3-dichloropropene (Telone)		Vanadium
		Zinc

Table 8: Health Advisories

Aciflurofen
Acrylamide
Alachlor
Aldicarb
Ametryn
Ammonium sulfamate
Arsenic
Atrazine
Barium
Baygon
Bentazon
Benzene
Bis - (1-Chloroisopropyl) Ether
Boron
Bromacil
Brominated Trihalomethanes
Bromochloromethane
Bromoethane
Butylate
Cadmium
Carbaryl
Carbofuran
Carbon Tetrachloride
Carboxin
Chloramben
Chlordane
Chlorobenzene
Chloromethane
Chlorothalonil
Chromium
Cyanzine
Cyanide
Dacthal (DCPA)
Dalapon
Diazinon
1,2 Dibromo-3-Chloropropane (DBCP)
Dicamba
1,2 DichloROethane
1,1 Dichlorethylene
Cis 1,2 Dichloroethylene
Trans 1,2 Dichloroethylene
Dichloromethane
2,4 Dichlorophenoxyacetic Acid
1,2 Dichloropropane
1,3 Dichloropropene
Dieldrin
Diisopropyl Methyllphosphonate (DIMP)
Dimethrin
Dinoseb
Disulfoton
Diuron
Endothall
Endrin
Epichlorohydrin
Ethylbenzene
Ethylene Dibromide
Ethylene Glycol
Ethylene Thiourea
Fenamiphos
Fluometuron
Fonofos
Glyphosate
Heptachlor and Heptachlor Epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexahydri-1,3,5- Trinitro - 1,3,5 - Triazine
n-Hexane
Hexazinone
Lead
Legionella control in plumbing systems
Lindane
MCPA
Maleic hydrazinde
Mercury
Methomyl
Methoxychlor
Methyl Ethyl Ketone
Methyl parathion
Metolachlor
Metribuzin
Naphthalene
Nickel
Nitrate/Nitrite
Nitrocellnlose
O-Chlorotoluene
Octahydro-1,3,5,7-Tetranitro 1,3,5,7-Tetrazocine
Ortho-, Meta-, and Paradichlorobenzenes
Oxamyl
P-Chlorotoluene
Paraquat
Pentachlorophenol
Picloram
Polychlorinated Biphenyls (PCBs)
Prometon
Pronamide
Propachlor
Propazine
Propham
Simazine
Styrene
Tebuthiuron
Terbacil
Terbufos
2,3,7,8 Tetrachlordibenzo-p-Dioxin
1,1,1,2 Tetrachloroethane
Tetrachloroethylene (PCE)
Toluene
Toxaphene
1,2,4 Trichlorobenzene
1,3,5 Trichlorobenzene
1,1,1 Trichloroethane
1,1,2 Trichloroethane
Trichloroethylene (TCE)
Trichlorofluoromethane

Table 8: Health Advisories *(continued)*

2,4,5 Trichlorophenooxyacetic Acid (2,4,5 T)
2,4,5 Trichlorophenoxypropionic Acid (2,4,5 TP)
1,2,3 Trichloropropane
Trifluralin
Trinitroglycerol-2,4,6
Vinyl Chloride
Xylenes

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

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Please send requests for article topics or manuscripts of your articles to John Gram, editor (503 / 229-6302).

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