Oregon Drinking Water News
PIPELINE
Drinking Water Program, Oregon Health Division

Vol.11, Issue 2 • Spring/Summer 1996

NRDC REPORT RELEASED - "JUST ADD WATER"

By Dave Leland

On May 9, 1996, the Environmental Working Group and the Natural Resources Defense Council released the latest in a series of reports about drinking water in the U.S. The report focused on violations of maximum contaminant levels and treatment techniques by individual public water systems across the country listed by state and by county. The report included coliform, fecal coliform, surface water treatment, and lead/copper action level violations and intended to avoid citing paperwork and monitoring violations. The violations were from the years 1994 and 1995.

In Oregon, the report was released by the Oregon State Public Interest Research Group (OSPIRG), and excerpts from their news release are printed below. It is clear that the environmental groups nationally are opposing efforts in Congress to amend the Safe Drinking Water Act, and are citing compliance statistics as support for their position.

We received very few press inquiries about the report, but our message to the media was:

1) Affected water users already know about the problem water systems because of the current public notification requirements.

2) The data is significant. Repeat violators are on Administrative Orders to make corrections. Unfiltered surface water systems either have filtration exceptions or are on orders to install filtration or alternate sources. Inadequately filtered systems have been identified and are on orders, however, the report did include some paperwork violations in this category. We are working with those systems with high lead and/or copper.

3) The data is correct. The sampling is conducted by water suppliers, who then report the results to our office, or have their laboratory do so on their behalf. In some cases, notably the surface water treatment requirements, water suppliers actually report their own violations. We enter it into the database which identifies violations and we report those to EPA. EWG/NRDC got the data direct from EPA.

Continued on page 3

CHEMICAL TESTING REQUIREMENTS FOR 1996-98

By Mary Alvey

This article gives up-to-date summaries of sampling requirements for chemical and radiological contaminants. Save for future reference! If you have questions, call us at 731-4317 or your county environmental health department.

Nitrates

All public water systems must do an annual nitrate test of each groundwater source or entry point. **Community and nontransient noncommunity** water systems with a surface water source must complete four consecutive quarterly tests. After that, monitoring can be reduced to one test annually.

Phase 2/5

January 1, 1996 began the second three year compliance period for chemical contaminant monitoring. **Only community and nontransient noncommunity** systems must test for the inorganic, volatile and synthetic organic contaminants. Testing is scheduled over the three year period based on population served.

Population	Year to Test
> 300	1996
100 - 299	1997
25 - 99	1998

Radiological

Only community water systems must continue to test for gross alpha every four years. EPA proposed a change to radiological contaminant standards and monitoring but it has not yet been adopted.

Please make arrangements with your lab to complete the testing and report the results to the Health Division. Be sure to identify the source or entry point, sample point (location) and sample type (raw or treated water) on the form you submit to the laboratory so that they can include this information on the report.

Mary Alvey, RS, is the manager, Monitoring & Compliance Unit, Drinking Water Program

Inside this issue:

Community Water System
Routine Chemical Monitoring*

For Jan. 1996 to Dec. 1998

Chemicals	Surface Water	Ground Water
Inorganics	Yearly	One
Nitrate	Quarterly[1]	Yearly
Asbestos AC Pipe	None[2]	
Source	None[2]	
Synthetic Organics	One	
Unregulated SOC	One	
Volatile Organic	One	
Unregulated VOC	One	
Trihalomethane	Quarterly	
Radiological	Every 4 years	

*This table describes the routine monitoring you must do. Waivers, reductions, wellhead protection programs, or detections will affect the sampling requirements. You will find details on number, location and timing of samples in the rule book.

Inorganics: testing may be reduced to one sample every 9 years if three rounds of sampling are completed and there are no MCL violations.

Nitrate: goes to quarterly sampling whenever a sample exceeds 5.0 mg/l.

SOC, VOC and unregulated SOC, VOC: testing may be reduced to one sample every 9 years if the system has a state approved wellhead protection program or a waiver.

Trihalomethanes: Trihalomethanes are monitored only by systems with a population of 10,000 or more.

Unregulated Chemicals: Systems with fewer than 150 connections are not required to test for unregulated synthetic or unregulated volatile organics if a waiver is requested in writing.

[1] **Nitrate:** testing for surface systems can be reduced to annually after 4 quarters of sampling and a reduction is requested in writing.
[2] **Asbestos:** routine monitoring is one sample every nine years. Monitoring will go to one sample every 3 years if the system exceeds Lead or Copper action levels.

Non Transient Water System
Routine Chemical Monitoring*

For Jan. 1996 to Dec. 1998

Chemicals	Surface Water	Ground Water
Inorganics	Yearly	One
Nitrate	Quarterly[1]	Yearly
Asbestos AC Pipe	None[2]	
Source	None[2]	
Synthetic Organics	One	
Unregulated SOC	One	
Volatile Organic	One	
Unregulated VOC	One	

*This table describes the routine monitoring you must do. Waivers, reductions, wellhead protection programs, or detections will affect the sampling requirements. You will find details on number, location and timing of samples in the rule book.

Inorganics: testing may be reduced to one sample every 9 years if three rounds of sampling are completed and there are no MCL violations.

Nitrate: goes to quarterly sampling whenever a sample exceeds 5.0 mg/l.

SOC, VOC and unregulated SOC, VOC: testing may be reduced to one sample every 9 years if the system has a state approved wellhead protection program or a waiver.

Unregulated Chemicals: Systems with fewer than 150 connections are not required to test for unregulated synthetic or unregulated volatile organics if a waiver is requested in writing.

[1] **Nitrate:** testing for surface systems can be reduced to annually after 4 quarters of sampling and a reduction is requested in writing.
[2] **Asbestos:** routine monitoring is one sample every nine years. Monitoring will go to one sample every 3 years if the system exceeds Lead or Copper action levels.

Noncommunity Water System

State Regulated Water System

Routine Chemical Monitoring*

Chemicals	Sample
Inorganics (Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cyanide, Fluoride, Lead, Mercury, Nickel, Nitrite, Selenium, Thallium)	Once
Nitrate	Yearly

* This table reflects base line monitoring . Waivers, reductions, or detections will affect sampling requirements.

Types of Water Systems:
Community Water System **-** provides water to 15 or more service connections or 25 or more year-round residents.
Nontransient Water System **-** does not serve a residential population but regularly serves at least 25 of the same people during at least six months per year.
Noncommunity Water System **-** serves a transient population of at least 25 people per day for at least 60 days per year.
State Regulated Water System **-** provides water to more than 3 but fewer than 15 service connections or more than 10 but fewer than 25 year-round residents.

TURBIDITY QUALITY ASSURANCE CHECK
By Kari Salis

The Health Division conducted the biennial Turbidity Quality Assurance Check beginning in February. 330 samples were sent to 283 systems relying on surface water or otherwise required to monitor and report turbidity (unfiltered surface systems received two). Sample bottles contained a polymer standard of known, but unmarked, turbidity. After proper calibration, the sample was to be measured in the system's turbidimeter. The value measured was recorded and sent to the Health Division, where it was compared with the actual value. Two-thirds of the systems (68%) responded. Results are summarized below:

Difference: measured from actual	Percent of responses in range
Target range: 0 to ±0.14	43
±0.15 to 0.34	42
±0.35 to 0.64	11
greater than ±0.65	4

Continued on page 4

NRDC Report (Continued from page 1)

4) The data is a bit old (1994-95) and many of these violations were addressed.

We noted one major error - the report stated that only two enforcement actions were taken by our office during this time period. Actually, we took (and reported to EPA) 471 actions!

Water suppliers should be aware that their reported data is readily available to anyone. In fact, the Environmental Working Group maintains a home page on the Internet with the full EPA database (http://www.ewg.org). This means that it is more important than ever for water suppliers to report accurately, and on time, and to know what they are reporting. Water suppliers must take the primary responsibility for their compliance data.

EXCERPTS FROM OSPIRG NEWS RELEASE:
One in Five Oregonians Drinks Water That Violates Health Standards
While Congress Weighs Safe Drinking Water Act Rollbacks

A report released today by the Oregon State Public Interest Research Group documents 18,542 violations of the Safe Drinking Water Act's health standards nationwide—including violations by 503 water systems in Oregon serving over 600,000 people.

"It is extremely troubling that so many of us here in Oregon are drinking potentially dangerous water. It is truly outrageous that, despite the number of health violations and the overwhelming public concern about the quality of our drinking water, the Congress is considering proposals to weaken public health protections in the Safe Drinking Water Act," said Randy Tucker, environmental advocate for OSPIRG.

"We are calling on Congress to strengthen the Safe Drinking Water Act by protecting source water from contamination, strengthening the enforcement authority of EPA and citizens, making polluters pay their fair share to clean up contaminated supplies, and expanding citizens right to know what is in their drinking water," Tucker stated.

Key findings from today's report include:

* 503 drinking water systems serving 624,636 people in Oregon violated EPA health standards or treatment techniques for drinking water.

* 47 schools, day care centers, and medical facilities in Oregon reported drinking water violations affecting 7,824 people, any of whom are particularly vulnerable to health threats in their drinking water.

Dave Leland, P.E., is manager of the Drinking Water Program

Turbidity (Continued from page 3)

The results show that 85% of all measurements were within 0.3 NTU (<0.35 NTU) of the actual value. While less than half were within our target range of 0.1 NTU, few systems have significantly inaccurate turbidimeters. It is also important to note that most measurements (88%) were *greater* than the actual value, so in most cases the error is on the conservative side.

Several factors can contribute to readings different from the actual value. The major reason is that the turbidimeter has not been properly calibrated. This should be done every three to six months, depending on the machine, using fresh standards. Agitation during mailing can also alter results, as can transferring the standard into another bottle. Also, it is possible that errors are introduced when primary polymer standards such as these are compared against a formazin calibration.

The main purpose of this program is to make operators aware that turbidimeters need to be calibrated routinely according to instructions specific to the type of machine. Often both a primary and secondary standard are necessary. Primary calibration standards do have a shelf life. Using expired standards will cause errors, so they should be replaced prior to expiration. The field staff of the Health Division will make site visits to water systems that did not get within the target range to assist the operators in proper use and calibration of turbidimeters.

Kari Salis is Engineering Assistant for Field Services Unit, Drinking Water Program

WELLFIELD DESIGNATION PROGRAM

By Kari Salis

Overview

The Health Division is beginning a program to review water systems with multiple wells for consideration as a "wellfield." Unless a common entry point (EP) exists, each well previously had to be monitored separately regardless of whether or not these wells are drawing water from the same aquifer. In an effort to focus future monitoring, the Drinking Water Program will consider requests for designation of multiple wells as a wellfield. This allows a system to sample only from the most vulnerable well, as determined by OHD, rather than from each well.

As part of this program, the appropriateness of all previous wellfield designations will also be reviewed. A more structured Wellfield Designation Program will ensure that terms used to describe a system's source or entry point are meaningful and accurate. The monitoring process is also streamlined by putting an emphasis on understanding exactly where the water is coming from, the hydraulics of the system, and proper sampling locations.

Defining a Wellfield

To be classified as a wellfield, the wells must 1) be within 1000 feet of each other, and 2) produce water from the same and no other aquifer. This determination will be made based on well reports, maps, and other hydrogeologic information available.

In the past, the term "wellfield" has been used somewhat loosely, with only a brief review taking place before declaring a set of wells a wellfield. In order to assure that former designations are appropriate, the system files will be reviewed using the criteria discussed here. For systems with a common entry point, however, other factors also have to be considered when determining which designation is appropriate and where the sample location should be. Table 1 contains a summary of all possible designations, which will be discussed throughout this article.

Importance of Proper Designations and Sample Points

Obtaining relevant and thorough water quality data by monitoring is very important to the water user, water systems, Health Division and other agencies. No one wants to waste time and money to take a sample that will produce ambiguous or meaningless results. The objective of routine monitoring is to find out what, if any, contaminants are in water entering the distribution system. Several wells may have a common entry point, but if they do not pump simultaneously, a single sample taken at the entry point will not achieve this goal. It can be very difficult to know when and where the sample should be taken. Operations are not always consistent or predictable, or some sources may only be used during periods of high demand.

Under existing rules, a water system with wells that enter the distribution piping at different locations must each be sampled in order to measure the overall water quality. Samples from the distribution are not allowed because the degree of mixing is unknown. However, if the wells are within 1000 feet of each other and draw water from the same exclusive aquifer, it is likely that the water produced from each well is the same and therefore only one would have to be sampled.

If a wellfield designation is appropriate, the sample location is determined by a vulnerability analysis. Even though the water drawn from these wells comes from the same aquifer, one well may be more likely than the other to become contaminated due to activities occurring on the surface or susceptibility of the aquifer. A poorly constructed well, i.e., one that does not properly seal off the shallow aquifer, is at greater risk from surface contamination. A well surrounded by industrial or agricultural chemical applications may be more vulnerable to contamination from these sources.

Since only one well is sampled, we choose the one that is the most likely to become contaminated. If, after evaluating both the construction and chemical usage information, it is apparent that both wells are highly susceptible and/or vulnerable, each well may need to be sampled individually even though they produce from the same aquifer.

Procedure for Wellfield Designation and Sample Site Selection

To be considered for a wellfield designation, a request must be submitted to the Health Division (attn.: Kari Salis). These will be evaluated as a first priority. Any correspondence or requests for information will be done in writing. Next the prior wellfield designations (about 170) will be reviewed for accuracy. Lastly, those entry points that are simply listed as "wells" will be investigated (about 120). Obviously, this is expected to be a long-term project.

When sending in a request to be considered, the following should be included: a) a schematic drawing showing all sources, entry points, and relevant sample taps, b) the distance between the wells, and c) a brief description of the pumping patterns for the wells (simultaneous or alternating, etc.). This information will be reviewed, along with well reports and other information from the water system file. Wells that are greater than 1000 feet apart in the same aquifer may be accepted on a case by case basis.

The first step is to decide if a wellfield designation is appropriate. The wells do not necessarily have to be the same depth, as there can be different water-bearing zones in the same aquifer. It may be necessary to acquire static water levels for the wells if this information is not in the well report. If the wells are determined to be drawing from the same aquifer, a vulnerability analysis will be initiated by OHD staff. If not, other factors will be considered such as common entry point and pumping patterns. The designation for the source or entry point will be dictated by the chart in Table 1.

In order to determine which well is most susceptible, a 3-year time of travel area for each well will be considered. This refers to the area on the surface above the zone that would contribute water over a 3-year period, which will be determined by OHD using the calculated fixed radius method. The water system will then conduct an inventory of potential contaminant sources within this area following procedures listed in the Wellhead Protection Guidance Manual available from the Division. Locations of any potential contaminant sources, such as pesticide application, septic tanks, or chemical storage tanks, will be plotted on a map and submitted to OHD. This information will be used along with well construction and other pertinent hydrogeologic information by OHD to determine which well should be sampled. For monitoring purposes, vulnerability of a particular well takes precedence over pumping patterns.

It is important to note here that this process may result in a reduction in the *number* of samples a system is required to take. Reductions in *frequency* can be granted if the system chooses to participate in either a Wellhead Protection Program or a Use and Susceptibility Waiver.

Kari Salis is Engineering Assistant for Field Services Unit, Drinking Water Program

Table 1: Designation and sample site determination

Conditions: **A:** Wells are within 1000 feet of each other
B: Wells are in the same and no other aquifer
C: Wells have a common entry point to the distribution system and pump simultaneously

A	B	C	DESIGNATION	SAMPLE LOCATION
Y	Y	Y	EP for Wellfield	Most vulnerable well
Y	Y	N	Wellfield	Most vulnerable well
N	Y	Y	EP for Wellfield	Entry Point
Y	N	Y	EP for Wells (not a wellfield)	Entry Point
N	N	Y	EP for Wells (not a wellfield)	Entry Point
Y	N	N	Separate (not a wellfield)	Each well sampled separately
N	Y	N	Separate (not a wellfield)	Each well sampled separately
N	N	N	Separate (not a wellfield)	Each well sampled separately

THE INFORMATION COLLECTION RULE (ICR) AN UPDATE

By Michael Whiteley

On May 14, 1996, the Environmental Protection Agency (EPA) published the final Information Collection Rule (ICR). The rule requires large water systems to provide EPA with specific monitoring data and other information characterizing their water systems. The information gathered in this rule will provide information necessary to promulgate the Enhanced Surface Water Treatment Rule (ESWTR), and the Disinfectants/Disinfection By-Products Rule (D/DBP).

The ICR requires large water systems (greater than 100,000 population) to monitor for viruses, *Giardia*, *Cryptosporidium*, total coliforms, and fecal coliform or *E. Coli* bacteria at the source. These systems would also be required to monitor disinfection by-products at specific locations within the treatment process. Surface water systems serving a population greater than 100,000 and groundwater systems serving more than 50,000 are required to conduct bench or pilot studies for the removal of disinfection precursors.

The final rule eliminated microbiological testing requirements for surface water systems with a population between 10,000 - 100,000 from the proposed rule. This leaves three water systems in Oregon (Portland Bureau of Water Works, Eugene Water & Electric Board, and the Salem Public Works) to monitor for the ICR microbiological contaminants. These three systems, as well as the Medford Water Commission, will be required to perform treatability studies for disinfection by-product precursor removal if applicable.

Monitoring is expected to begin in early 1997 and results will be made available to the public via the Internet.

Michael Whiteley, PE, is regional engineer for Field Services Unit, Drinking Water Program

WELL IDENTIFICATION PROGRAM

By Dennis Nelson

As a result of recent legislation, the Oregon Water Resources Department (WRD) has developed a program of well identification. The process is triggered by a property transfer. When ownership of property that contains one or more wells is transferred from one individual to another, a form describing the location of the well(s) must be submitted to WRD. The Department assigns a unique number to each well and sends an identification tag bearing that number to the owner to be permanently attached to the well by the owner. The ownership and the number are recorded with the property deeds.

This process provides for the unique identification of that well in the state and allows for the unambiguous assignment of a well log, chemical analyses, construction records, etc. to that particular well. The Health Division believes that water systems would benefit from having WRD assign identification numbers to their wells. This would reduce considerably any confusion that frequently develops regarding "...which well are we talking about?" whether we're involved in monitoring, plan review, wellhead protection, contaminant investigation, etc.

In order to facilitate this process, the Health Division is providing WRD with water system addresses. As WRD's resources allow, they will be sending the well identification packets to individual water systems asking for their voluntary compliance with the program. We urge you become part of the well identification program. We believe it will provide future benefits to both the water system and the agencies.

Dennis Nelson is the Groundwater Coordinator, Drinking Water Program

CROSS CONNECTION UPDATE

By Bonnie Waybright

The current list of approved backflow prevention assemblies is dated April 1996. Call (503)731-4899 to request a copy.

Backflow Assembly Tester Recertification

Backflow Assembly Testers need to know that the required Tester Recertification includes a hands-on proficiency demonstration of the new test procedures. The old procedures cannot be used for this proficiency demonstration. A one-day training course teaching the new procedures will be offered the day before the Tester Recertification.

1995 Annual Summary Report

The 1995 Annual Summary Report was sent to 884 Community Water Systems at the beginning of this year and were due in to the Health Division by the end of February. Statistics to date are: 380 reports (43%) were returned on time (kudos to those systems!); 504 systems (57%) were sent reminder letters; a total of 608 reports (69%) have been received (up from 57% for the 1994 report); and 310 systems (35%) have submitted copies of their ordinances (some in draft form). Time extensions for meeting program requirements have been granted to 62 systems, and more requests are being processed. Further action will be needed for the 276 systems that have failed to respond at all.

Written Program Plan

A frequently asked question is, "what is required in a written program plan?" There is no specific format for these documents, so the following guidelines have been developed. This requirement applies to community water systems serving 300 or more connections.

A master list of facilities and premises which are subject to inspection, and the hazard level for each. The Cross Connection Inspector has the responsibility of inspecting premises for actual or potential cross connections. The inspections must be prioritized so premises that are most likely to contain a high-hazard cross connection are inspected first. The master list is a prioritized list of premises that need to be inspected. Obviously, the actual degree of hazard will not be known until after the inspection, but the potential hazard level must be estimated in order to prioritize the inspections. The format or method of record keeping for this list is flexible. The objective of this requirement is for the Cross Connection Inspector to stay abreast of changes that may pose a threat to the water supply, and to prioritize the inspection workload.

Locating premises that need inspection can be accomplished in many ways. Information from the local building or plumbing inspectors can help locate new buildings or remodels. Many water systems are active in the plan review process, with a signature from the Cross Connection Inspector being required before construction can begin or before an occupancy permit can be issued. Meter readers can be a great help in locating premises that may need inspection, since they traverse the entire water system. Questionnaires may be sent to customers to gain some information, but this method may not be very comprehensive or reliable.

A current list of cross connection control staff and work responsibilities. This is a list of all staff who participate in the cross connection control program, including staff who are not certified Cross Connection Inspectors. The certified Cross Connection Inspector in charge of the program must be listed along with other staff who help with inspections, identification of premises needing inspections, testing assemblies, and the associated paperwork. The purpose of this requirement is to organize the responsibilities of the staff who contribute to the cross connection control program.

Provision and schedule for an initial inspection, the installation and annual testing of each required backflow assembly, and a periodic re-inspection of each required backflow assembly. The provision and schedule for an initial inspection is a companion to the master list. A schedule for inspections must be made after the premises have been identified and prioritized. A process must be in place for contacting the property owner to explain the need for inspection, and for scheduling the inspection. This process may be adequately described by the series of form letters most water systems use (i.e. the initial request for inspection, the follow-up if no response is received, etc. and the public education materials used) and a brief description of the criteria for sending each type of letter (i.e. if there is no response to the initial letter after a certain number of days, the second letter is sent, etc.) The process may also be described in the cross connection ordinance or enabling authority.

The installation and annual testing of each required backflow assembly must be tracked. Once a premise has been identified as posing a cross connection hazard (either high or low), a backflow assembly must be installed and tested. A process must be in place to ensure that the required assembly has been installed and tested, and that annual testing is performed.

The periodic re-inspection of each required backflow assembly is needed to ensure that the backflow assemblies that are in place continue to be commensurate with the degree of hazard, or that air gaps have not been defeated. If a cross connection has been isolated from the water system by a low-hazard backflow assembly, it needs to be checked periodically for changes that might require a high-hazard backflow assembly (i.e. if a video rental store with a double check valve assembly were to change to a medical clinic, which requires an RP). Airgaps are permitted for protection from high-hazard cross connections, but it is not uncommon for them to be modified by people who don't understand their importance in preventing backflow. Airgaps should be checked regularly for modifications. A question that frequently arises is "how often do backflow assemblies and airgaps need to be reinspected?" The Health Division does not require any specific interval. Every water system has its own unique combination of customer base, cross connection hazards, local cross connection requirements, and time and labor constraints to consider. It is the responsibility of the Cross Connection Inspector to evaluate his or her system and determine the re-inspection interval.

Bonnie Waybright, PE, is Cross Connection Program Coordinator, Drinking Water Program

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

SECOND CLASS
POSTAGE
PAID
PORTLAND OR

David E. Leland, Manager • 503/731-4010

TRAINING CALENDAR

Oregon Association of Water Utilities
Kevin Olson/(503)873-8353

Water System O&M
Oct. 29-30 Coos Bay

WT & WD Cert. Review I, II
Oct. 2-3 Salem
Oct. 8-9 Bend

Cross Connection/Backflow Courses
Backflow Management Inc. (B)
800-841-7689
Clackamas Community College (C)
(503) 657-6958 ext. 2364

Backflow Assembly Tester Course
Sept. 9-13 Oregon City (C)
Sept. 16-20 Portland (B)
Oct. 21-25 Portland (B)

Backflow Assembly Tester Retraining/ Recertification
Sept. 5-6 Portland (B)
Sept. 19-20 Oregon City (C)
Oct. 2 Portland (B)

Cross Connection Inspector Course
Sept. 24-27 Portland (B)

Cross Connection Inspector Update
Oct. 18 Portland (B)

Backflow Assembly Repair
Oct. 3-4 Portland (B)

Confined-Space Entry
Oct. 17 Portland (B)

Water System Training Courses
Oregon Health Division
Contact: Bernita Morgan/(503)731-4317
Aug.* Lincoln City
Sept.* Klamath Falls, Eastern Oregon
Oct.* Polk, Yamhill Counties
*- dates and locations to be announced

Management and Supervision for Working Professionals, I and II
Correspondence course up to 5 credits
Contact: Office of Independent Study
Indiana State University
1-800-234-1639
Internet: asrwiers@ruby.indstate.edu

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.

PIPELINE is published quarterly free of charge by the staff of the Oregon Health Division, Drinking Water Section, 800 NE Oregon St., Portland OR 97232. Second Class postage paid at Portland OR. POSTMASTER: Send address changes to PIPELINE, P.O. Box 14450, Portland OR 97214-0450.