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

Vol. 9, Issue 3 • Summer 1994

Time to Plan Ahead! SDWA Implementation

By Dave Leland and Patrick Meyer

THE original 1974 Safe Drinking Water Act (SDWA) regulated 23 contaminants in public water systems. While all public water systems were affected to some degree, 105 Oregon community systems had to make major improvements at a total cost of at least $43 million. By 1993, virtually all community water systems in Oregon had met the standards.

The 1986 SDWA Amendments mandated regulation of 83 standards within three years. Although this extensive mandate has not been fully met by EPA, 76 contaminants have been regulated to date. State level rules have been adopted by the Health Division and approved by EPA, and initial monitoring by community water systems is either complete or in process. Contaminants remaining to be regulated include a lowered standard for arsenic, a new standard for sulfate, and new and revised standards for radionuclides including radon, radium and uranium. In 1991, we estimated the 1986 standards would cost Oregon communities $240 million during the 1990s. In addition, the SDWA mandates regulation of 25 additional contaminants every three years into the future.

While initial monitoring for all contaminants is not yet complete and regulations for additional contaminants are on the way, there is now enough information for communities to take a comprehensive look at their own systems and water quality and begin strategic planning to meet the new standards. An excellent article entitled "Strategic Planning for SDWA Compliance in Small Systems," by John Cromwell appeared in the May, 1994, Journal American Water Works Association. We have borrowed from this article here and strongly recommend that small community systems get, read and use it to assist in their planning. In this

Continued on page 2

David L. Leland, P.E., is manager of the Drinking Water Program; Patrick Meyer, MPH, is an Environmental Health Specialist and "Data Tsar" of the DWP.

Plan Review: OHD's Seal of Approval

By Dennis O. Nelson

Over 88 percent of Oregon public water systems (PWS) depend at least in part on groundwater sources. Demand for groundwater will likely increase because of dwindling surface water supplies and the increased costs associated with developing and maintaining surface water sources.

Groundwater sources, of course are not without problems. Contamination by bacteria and inorganic and organic chemicals is increasingly being found in the state. At minimum, such contamination results in increased monitoring and, in some cases, having to install expensive treatment systems or to abandon the source. With any contamination, the PWS is presented with a difficult public relations problem.

The Oregon Health Division (OHD) has developed a plan review process to reduce the risk of future contamination. The review is preventative in nature, combining common sense and appropriate standards, and requiring careful up-front consideration of the location and construction of a new well. This article addresses construction of the well, particularly the emplacement of the casing seal.

OHD requires that **prior** to drilling a well, a PWS must submit construction and installation plans to the division for review (OAR 333-61-060). The Water Resources Department (WRD) has rules that provide guidance to water wells in general (OAR 690, Divisions 205, 210, 215 and 220). They recognize, however, that additional

Continued on page 4

Dennis Nelson, PhD, R.G., is coordinator of the Drinking Water Program's groundwater studies; he splits his time between offices in Portland and Eugene.

Inside this issue:

Plan Ahead *(Continued from page 1)*

PIPELINE article, we briefly address the topic of strategic planning for compliance and outline the statewide results of SDWA implementation in Oregon so far.

Strategic Planning

To be better prepared for the future, many large utilities have embarked on strategic planning to assess their total SDWA compliance picture. This is critical because many of the new standards are closely interrelated and compliance solutions for different contaminants can actually interfere with each other. Small systems can use the same approach to improve planning and outcomes and avoid costly mistakes. The simple approach outlined in the JAWWA article can be used by small systems to better predict total costs before they begin making incremental investments in their systems. The potential benefits of such planning are greater today than ever before.

The JAWWA article offers the following checklist, modified somewhat for Oregon.You should be able to answer most of these questions by reviewing your own water quality records and correspondence files; formal directives or Orders; and sanitary surveys and other system reviews from the local health department and the Drinking Water Program.

SDWA Strategic Planning Checklist

1. Microbial contamination
   - Surface water systems
     - Will you have to filter?
     - Will your filter plant meet performance requirements?
   - Groundwater systems
     - Are you sure it's really groundwater?
     - Will you need to disinfect?
     - Is your current disinfection treatment adequate?
   - Distribution systems
     - Are you growing anything in the pipes?
     - Are potential problems hidden from view?
2. Corrosion by-products
   - What's the score on your first-draw lead/copper samples?
   - Do you have low pH or low alkalinity in your finished water?
   - Do you have lead service lines or "gooseneck" connections?
3. Industrial and commercial chemicals
   - Any detections in your initial monitoring? Have you followed up with additional tests?
   - What is your vulnerability to these chemicals based on use in the vicinity of the water source, construction of the well source, and presence or absence of geologic barriers?
4. Agricultural chemicals
   - Any pesticide detections in your initial monitoring? Have you followed up with more tests?
   - Are your nitrate levels significant? Have they been increasing over the years?
   - What is your vulnerability to pesticide use and nitrate in the vicinity of your water source?
5. Natural geologic contaminants
   - What are your historical arsenic levels?
   - Do you have the right geology for radon, radium, uranium or sulfate?
6. Disinfection by-products (DBP)
   - Do you have trihalomethane results from your Phase I volatile organic chemical (VOC) testing?
   - Does your source water have high total organic carbon (TOC) or bromide?
   - Is your treatment system suited for adaptations for DBP control?

ALL Oregon communities should be gathering the answers to these questions and using the results to take a comprehensive look at their current and future compliance with the new drinking water standards. Many communities will need to get professional help with self-assessment. In addition to consulting service firms, technical advice and direction is available from your local health department; the Oregon Association of Water Utilities (Dan DeMoss, Silverton, 873-8353); Oregon Rural Community Action Program (Pete Scott, LBCC, Albany, 967-8860); and the Pacific NW Section American Water Works Association, Small Systems Assistance Program (Noel Groshong, Umpqua Basin Water Association, Roseburg, 672-5559). Other useful information is available from the most recent sanitary survey of your water system conducted by the local health department or by Health Division staff.

What Have We Learned In Oregon?

Initial contaminant monitoring efforts and community water system compliance reviews are beginning to generate a statewide picture of SDWA compliance with new drinking water standards in Oregon. This emerging picture for community systems is presented here and we hope it will be helpful as you assess your own system.

As you read this, please remember implementation of the new SDWA requirements is a huge task for everyone and that it is occurring in an environment of very limited resources, both at the state and local levels. In spite of this, much has been accomplished by Oregon communities, although national deadlines have not always been completely met. Though much remains to be done, we recognize and value the obvious hard work and diligence of most Oregon communities.

First, there are 887 community water systems in Oregon, serving a combined population of 2.3 million people. About two-thirds of these systems serve fewer than 200 persons each, so small system compliance is a serious issue. It is interesting to note that the total number of community water systems in Oregon is in decline from nearly 1,000 several years ago. This is because small systems are choosing to consolidate with neighboring systems, mainly to improve operations and reduce costs.

The discussion below follows the order of the SDWA strategic planning checklist.

Microbial Contamination. Microbial quality of drinking water is now addressed by regulations for coliform bacteria and surface water treatment. Microbial quality of drinking water is currently the highest priority of the Drinking Water Program because of potential risks of waterborne disease outbreaks that can affect the large numbers of people served by public water systems. Additional regulations on surface water treatment and new regulations on disinfection of groundwater are under development, with implementation likely in the late 1990s.

Monthly coliform bacteria monitoring represents the majority of routine sampling by community systems. New, more stringent coliform standards were introduced in 1991, including more sensitive test methods and expanded resampling in response to coliform bacteria detections. From October 1993 to June 1994, Oregon community systems confirmed total coliform presence on 70 occasions and fecal coliform on 11. These episodes were quickly responded to and corrected. Most were due to treatment failures, main breaks or well source contamination. Several communities with large distribution systems found that although their groundwater sources were coliform-free, they could not meet the new standard without applying chlorine to maintain a consistent residual in the distribution system.

During this same time period, community systems submitted routine monthly test reports on schedule 97% of the time. However, routine monthly coliform samples and required resamples were not received (or received late) on 322 occasions and insufficient numbers of routine or resample results were received on 152 occasions. Program staff respond strongly to the fairly small number of systems that continually fail to report but we believe all communities need to pay closer attention to reporting to reduce the overall number of violations. These are the violations cited in the recent report by the Natural Resources Defense Council "Think Before You Drink: II," alleging failure of the national drinking water program to protect public health.

IN January, 156 Oregon communities using surface water sources began reporting monthly surface water treatment performance data. Through June, 218 failures to achieve adequate treatment were reported, mainly by 33 systems that are currently unfiltered but are working to install treatment or an alternate water source. However, 18 filtered systems are routinely unable to meet filtration and/or disinfection performance standards and therefore in need of significant upgrading. During the same period, 96% of the required monthly reports were submitted on time. However, reports were not filed or were incomplete on nearly 330 occasions, so again systems need to attend more carefully to monthly reporting requirements.

We have identified 107 communities with a total of 175 groundwater sources as potentially under the direct influence of nearby surface water bodies. About 40 of these have begun to submit required data. The remainder have not yet responded and need to get their monitoring and/or reporting underway.

Currently, about 20% of Oregon communities using groundwater sources have disinfection treatment, primarily chlorination. Future groundwater disinfection requirements in the late 1990s may have a substantial impact in Oregon. Each well will need to be assessed for susceptibility to contamination by viruses travelling through the aquifer. Treatment issues include not only installation of disinfection treatment equipment but also provision of disinfectant contact time to kill viruses prior to the first water use connection.

Corrosion by-products. 89 large- and medium-sized systems in Oregon have completed the required two rounds of initial lead and copper testing. 18 exceeded one or both action levels and must implement corrosion control treatment. 718 small systems, serving fewer than 3,300 persons, were to have completed initial monitoring in 1993. Through June, 1994, 498 reported round 1 results and 113 reported round 2 results; 84 exceeded lead and/or copper action levels. The remainder need to complete and/or report initial sampling as soon as possible. Systems exceeding an action level must conduct public education and submit a treatment recommendation to the Division.

Many Oregon surface waters are low in pH and alkalinity, so their corrosiveness to home plumbing materials is not surprising. The percentage of small systems exceeding action levels is lower, primarily because more use well water sources that tend to be less corrosive due to mineral content.

Use of lead-based solder was banned in Oregon in 1984. Relatively few Oregon communities installed lead pipes or services. The lead being found now appears to be associated both with old lead solder and lead-containing brass plumbing fixtures. In addition to lead and copper, one Oregon community found high levels of asbestos in its water due to corrosion of asbestos-cement water mains caused by a high natural level of carbon dioxide (CO2) in its primary well source.

Industrial, commercial and agricultural chemicals. These chemicals were regulated primarily under Phase I, II and V rules. Phase I regulated eight VOCs, primarily industrial chemicals. Monitoring was completed in 1992; 32 detections were confirmed with most attributed to groundwater contamination in urban areas. 13 systems exceeded maximum contaminant levels (MCL) and installed treatment, abandoned wells or found alternate water sources. This monitoring led to designation of both active and potential DEQ environmental cleanup sites that are currently being worked on or scheduled for future efforts as resources allow.

MANY more contaminants are addressed in the Phase II and V rules for which initial monitoring is underway now. So far, 1,299 test results have been received from 732 systems. Phase II initial monitoring is to be completed during 1995, Phase V by 1998. There have been 39 additional detections of VOCs, but at levels well below the MCL. About 100 systems found detections of PCBs (pohychlorinated biphenyls), but these are believed to be a result of deficiencies in the analytical method, rather than actually being present in the source water. Additional confirmation sampling is underway.

Phase II and V results so far have shown only five low-level detections of pesticides. Of more interest are 72 detections of nitrate in excess of 5 mg/L (50% of the MCL). 11 systems exceeded the MCL of 10 mg/L. The low number of pesticide detections so far is somewhat surprising considering that Oregon is highly agricultural with diverse crops, irrigation widely practiced and extensive vulnerable shallow water table aquifers in some agricultural areas.

To date, 80 systems have completed reviews of chemical uses in the vicinity of their water sources using a protocol developed by the Drinking Water Program to support requests for reduced monitoring. We recommend that all communities complete this assessment to learn more about local chemical uses and practices that could affect the quality of their water supply.

Natural geologic contaminants. Community systems have been monitoring for arsenic for many years. EPA is considering a substantially reduced MCLfor arsenic, from the current 0.050 mg/L to as low as 0.002 mg/L. Current data was developed with lab detection levels of generally about 0.010 to 0.020 mg/L, so it is not possible to estimate the impacts of a future MCL below these levels. However, 150 Oregon communities have reported arsenic levels above 0.010 mg/L. Oregon communities using wells, particularly in volcanic formations, should consider additional arsenic testing at new lower detection levels. Phase II/V monitoring has shown a small number of detections of nickel, antimony and thallium.

There is limited survey data on radon developed by the Division in the early 1980s. 65 deep wells serving community water systems were tested and 37 exceeded the proposed MCL of 200 pCi/L. Radon could therefore be a big problem in Oregon. Oregon labs are not currently certified for radon testing but we expect this service will be available soon.

Disinfection by-products. Current rules require only large systems (population >10,000) to monitor and only for total trihalomethanes (TTHMs). However, small communities that monitored for unregulated VOCs under Phase I have at least some idea of their potential for forming individual THMs, primarily chloroform. We recommend that small communities using surface water sources, or that disinfect their groundwater sources, have a lab test specifically for TTHMs to see if the future MCLs of 80 µg/L (stage 1) and 40 µg/L (stage 2) will be a problem. Total organic carbon and bromide testing is useful to determine if other DBPs may be a problem in the future. Although not yet certified, some labs may now be able to run tests for haloacetic acids (HAA5), the major new regulated contaminant in this rule.

Plan Review *(Continued from page 1)*

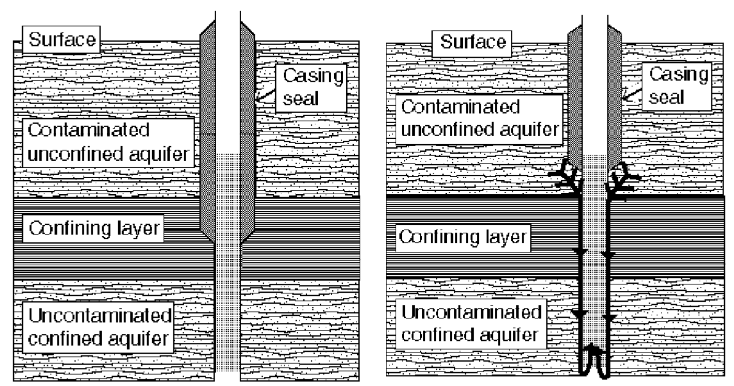
standards are required by OHD for water supply systems (OAR 690-210-020). Specific construction standards for wells are provided in OHD's rules (OAR 333-61-050); however, they are being revised to ensure that wells are constructed in a manner that not only meets minimum state standards but also affords a high level of protection of the resource.

The purpose of the well casing seal is to prevent surface or near surface waters from gaining access to the casing which would allow contaminated water to migrate down the casing to the groundwater source.

WRD's rules require that the well casing seal be emplaced by drilling an upper oversize drill hole, four inches greater than the nominal inside diameter of the casing to a minimum of 18 feet (see below). The annular space between the casing and the drill hole wall must be filled with approved materials: cement grout, concrete or dry granular western sodium bentonite (OAR 690-210-310 through 330).

WRD's rules state that **although the minimum casing seal depth is 18 feet, the actual depth should be based on the local subsurface geology**. For example, when sealing into an unconsolidated formation with significant clay beds, the casing seal must extend down at least five feet into a clay or otherwise impermeable layer (OAR 690-210-140). This means the seal must extend to whatever depth an impermeable layer greater than five feet in thickness occurs. If none is encountered before the water table is reached, the seal must extend a minimum of five feet below the water table (OAR 690-210-130 (1)).

OHD believes that if WRD's rules were strictly followed, there would be fewer problems associated with contaminants reaching the well bore. In figure 1a and b, we demonstrate the difference between a properly and an improperly constructed well. In both diagrams, a shallow contaminated aquifer is separated from a deeper uncontaminated aquifer by a low permeability confining layer. Note that for the properly constructed



Figures 1a and 1b: Properly (left) and improperly constructed wells

well, the seal extends through the contaminated aquifer and at least five feet into the clay layer. With this type construction, contaminants are prevented from migrating to the casing and down to the deeper aquifer.

Figure 1b represents the wrong way to construct the casing seal. Although the seal may extend to a depth of 18 feet or more, it ends within the contaminated aquifer. It is possible, therefore, for contaminated water to migrate down the casing and contaminate the deeper aquifer. Additionally, the well in figure 1b is illegal for a second reason. The well is open to two aquifers, allowing intermingling of waters. This is referred to as commingling and is prohibited under OAR 690-210-080. It is also a rule requirement in cases where contaminated water exists at shallow levels to construct a well such that the contaminated zone is sealed off (OAR 690-210-100).

If a report of the well in figure 1b was presented to OHD during plan review, the Division would not be able to approve its use because it does not meet current construction standards. It is likely that WRD would require that the well be reconstructed to meet standards or formally abandoned. Clearly it is important to communicate with OHD prior to constructing your water supply well. During that communication, the Division, in consultation with WRD if appropriate, can provide technical assistance with respect to construction, particularly in terms of the casing seal.

To further illustrate the benefit of following the plan review process, we present examples from our files where well construction has played a dominant role in the well's use. In each case, significant expenses either were, or could have been avoided through proper construction.

Example 1. Deep Basalt Wells.

We often hear individuals speak with confidence that their well is protected from contamination because it is deep. It should be clear from our discussion above that if the casing seal is not adequate, contaminants can gain access and cascade to a lower aquifer regardless of how deep the well is.

Figure 2 compares two basalt wells drilled within the boundaries of a confined animal feeding operation (CAFO). As indicated in the figure, both wells are deep, 560 and 675 feet, and located within 100 feet of each other. Well 1 is sealed to 26 feet. While this exceeds the state minimum, the seal terminates in a highly permeable sand and gravel layer that is contaminated with bacteria. Well 2 is sealed through the sand and gravel to a depth of 106 feet, well into dense basalt. Monitoring indicates that well 1 contains fecal coliforms while well 2, only 100 feet away, is currently free of bacterial contamination. Well 1, however, allows commingling of aquifers and may provide an avenue by which bacteria can move from the shallow aquifer to the deeper one. The cost of installation and maintenance of disinfection treatment on well 1 and/or its reconstruction to meet state standards would likely exceed the initial cost of emplacement of the deeper casing seal.

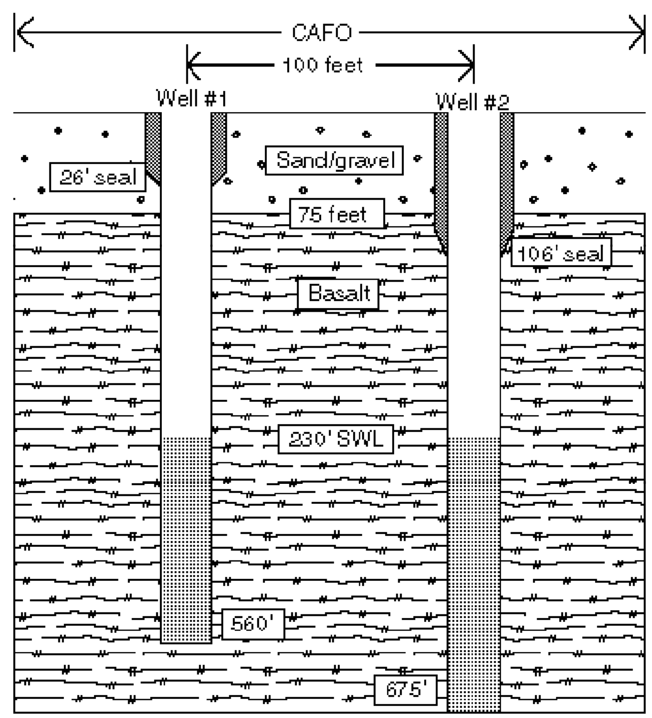


Figure 2: Properly and improperly sealed wells in a contaminated area

This example also illustrates the benefit of performing an initial site review to determine if any sources of contaminants are in the vicinity of the proposed well site. Clearly, common sense would indicate that locating a well in proximity to a contaminant source puts the drinking water source at risk. Performing a preliminary delineation of a wellhead protection area for the well is an excellent method of initiating a site review. A discussion of methods for delineation is beyond the scope of this article, however information regarding these methods and the wellhead protection program in general can be obtained from the Division.

Example 2. Geologic Complexities.

Determining the geology from a single bore hole may result in unforeseen problems arising at a later date. This is particularly true in cases where the geologic layers are not horizontal.

In figure 3, the well is sealed to a depth exceeding 18 feet and into dense basalt. Based on the information from the well log, the seal was initially judged as adequate.

Routine monitoring of this well soon detected the presence of fecal coliforms. Although a drain field was in the area, it was downhill from the well itself (Fig. 3) and over 150 feet away. OHD performed a geologic study of the site and found that the basalt flows were inclined to the surface. As indicated in the figure, the tilt of the lava flows provided access of the effluent from the drain field to the well. Contaminants migrated along the inclined permeable contacts between individual flows to the well bore.

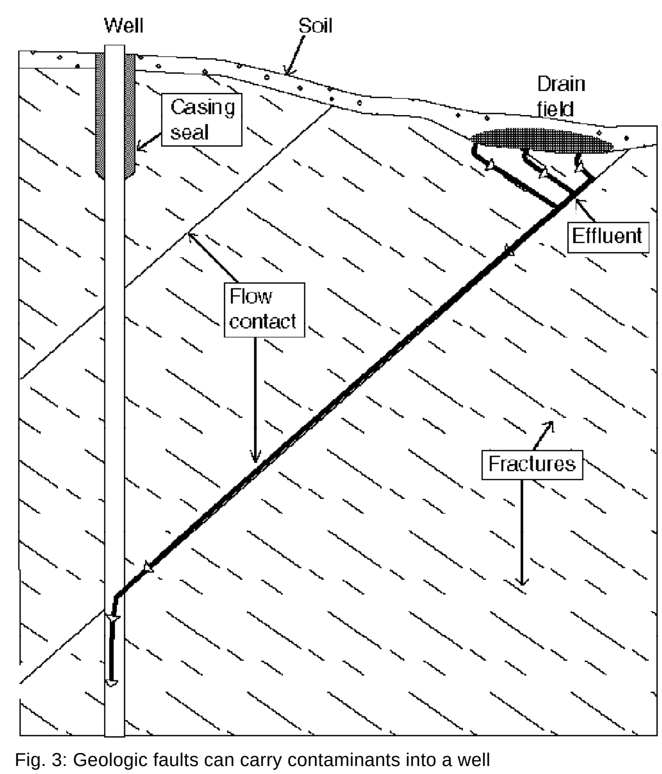


Fig. 3: Geologic faults can carry contaminants into a well

To remedy the problem, the well was reconstructed at a cost exceeding $6500. A new casing seal was emplaced to a depth of 160 feet. Fecal coliform contamination is no longer occurring.

During plan review, OHD will examine available geologic maps in order to determine whether geologic structures will need to be considered during well construction. Such information will likely also be relevant to the availability of water in the region. In some cases, it may be necessary for the PWS to retain the service of a professional geologist or hydrogeologist.

Example 3. Hydraulic Connection with Surface Water.

The Safe Drinking Water Act requires OHD to determine which groundwater sources are under the direct influence of surface water. Obviously wells that are in proximity to surface water are suspect. Systems may determine that their wells are not influenced based on hydrogeologic or water quality assessments. Included in the hydrogeologic assessment is whether a low permeability layer separates the aquifer from the surface water source and, if so, whether the well is sealed into that layer.

Figure 4 illustrates an example of a well that is located only 50 feet from a significant surface water source. A review of the well logs of the area indicated that the geology consisted of a shallow sand and gravel layer separated from a deeper sand and gravel layer by a thick clay-rich horizon. Both sand and gravel layers are saturated and will yield water to wells. The shallow aquifer is physically connected to the surface water source.

The well in question is actually sealed through the shallow aquifer and into the clay-rich zone, preventing the shallow surface water-influenced groundwater from entering the deeper zone. Water quality studies are consistent with this conclusion. Although the surface water source undergoes significant variations in temperature and conductivity, no such variations are recorded in the water being produced from the well.

The fact that this well is not under the direct influence of surface water means the system will not have to install filtration. The up-front expense of installing a casing seal to 55 feet is minor when compared to the cost of installing and maintaining filtration treatment.

Further, because of the construction, the water supply is less susceptible to contamination events (e.g. spills, agricultural runoff, etc.) that might impact the nearby surface water. A review of well reports of the area clearly revealed the presence of the low permeability

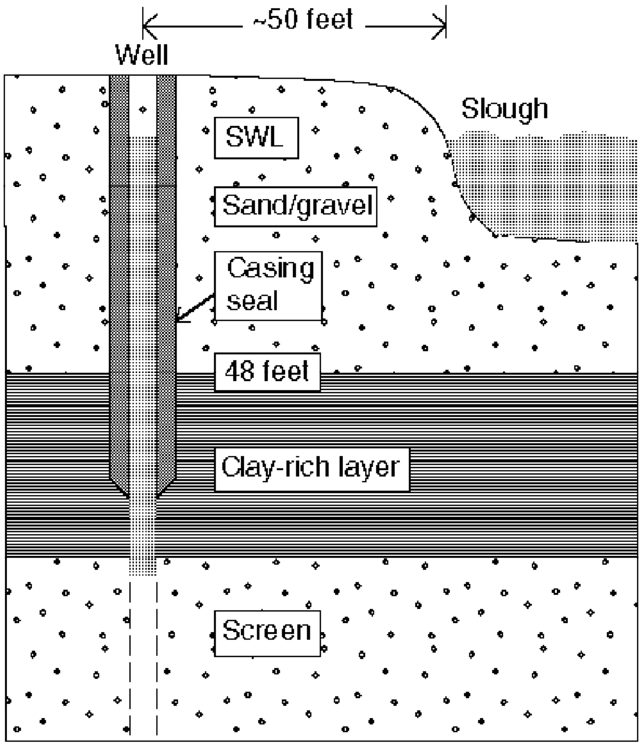


Fig. 4: Well sealed below shallow groundwater-influenced aquifer draws from deeper strata

zone. Knowledge of its presence prior to emplacement of the seal allowed for its proper construction.

Recommendations. In addition to the requirements already detailed in OHD's and WRD's rules above, we recommend that systems considering the development of a groundwater source:

1. Locate the proposed well site(s) on a U.S. Geological Survey topographic map.
2. Collect available well reports from the Water Resources Department for the section that contains the proposed site and surrounding sections.
3. Locate as many as possible of the well reports on the topographic map.
4. Use the reports to determine depth to groundwater in the area and the presence and persistence to low permeability layers at depth.
5. Perform a preliminary delineation of the wellhead protection area and conduct an inventory of potential contaminants within the area. Although more sophisticated delineation techniques are available and should be used by larger systems, we recommend as a minimum that the calculated fixed radius method be used. The method of calculation is described in Oregon's "Guidance Document for Wellhead Protection Area Delineation," available from the Division.

OHD will provide technical assistance to PWSs in the completion of the above steps. It is possible, however, that some PWSs will have to obtain the assistance of a professional hydrogeologist or geologist for items 4 and 5 above. In addition, the local well drilling community will be able to provide information regarding depth to groundwater and yield of the aquifers.

Public water systems should make every effort to comply with the current plan review requirements of OHD. These were designed to provide a process by which the system can objectively evaluate potential sites for new wells and design a construction plan that will protect the water supply in the future. The expense of proper planning is minuscule when compared to the cost and frustration of having to deal with a contaminated water supply.

Wellhead Protection Assistance Available

Funding from EPA is available to promote development and implementation of individual voluntary wellhead protection programs in Oregon.

Small grants (~$2,000 each) will be awarded for site-specific educational programs or implementation of the wellhead program. Deadline for submission of proposals is November 15; grants will be awarded in January 1995. Water systems interested in more information should write to Dennis Nelson at the Health Division, Box 14450, Portland, 97214-0450.

Nitrate Testing Required

Phase II requires that all public water systems test their sources for nitrates and report quarterly or annually.

Surface water sources (streams, lakes, some springs) must be tested quarterly. If four consecutive quarterly tests find levels less than 5 mg/l, you may request a reduction to annual testing.

Ground water sources (wells, springs) must be tested yearly.

High nitrate levels can pose a serious health risk for infants. If your results are above 10 mg/l, you must collect another sample within 24 hours and notify your county health department or Health Division.

Results should be sent to Health Division as soon as received.

Cross Connection Corner

Backflow Device Testers and Cross Connection Inspectors should think about signing up for updates. Certificates expire June 30, 1995, and if renewed after the following July 30 will require a reinstatement fee of **$50.00**! June is *not* the time to start looking for a Tester Update session to attend!

Your opinion counts: Health Division is gearing up for yet another round of rule revisions. Is there something you would like to see changed, added or removed? Now is your opportunity to suggest changes to the cross connection rules. Send your ideas in writing to: Drinking Water Program, Cross Connection, Box 14450, Portland 97214-0450. Deadline is December 15, 1994.

Piece of Your Mind II

In the spring issue**,** we asked about you; what you like or dislike about ***PIPELINE***; and whether you find the newsletter useful. We also asked for suggestions for articles. Responses have been pouring in--or perhaps dribbling is a better description.

It's not too late to make your voice heard. Clip or photocopy the questionnaire, fill it out and mail or fax it; or simply send your suggestions to Editor, ***PIPELINE***, Box 14450, Portland 97214-0450; FAX: 503 / 731-4077.

We'll give you a summary of the responses in a future issue.

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

American Water Works Association:

Sept. 26-27: Slow sand filtration workshop; Salem; Trudy Lay 303 / 347-6191

Oct. 3-6: Water certification review; Corvallis; Jim Moore/Robyn Price 503 / 754-7677

Oct 18-19: Cave-in protection; Albany; Amy Spencer 503 / 928-5055

Oct. 27-28: Coliform, Albany; Lisa or Julie 503 / 928-3620

Dec. 5: Oregon Water Utility Council symposium; Eugene; Judy Grycko 503 / 246-5845

Dec. 9: Teleconference: Preventing Waterborne Disease; Oregon City; Judy Grycko

Oregon Association of Water Utilities
503 / 364-8269

WD, WT certification review I, II
Oct. 11-13 Eugene

SDWA regulation update
Oct. 27 Bend
Nov. 17 Aurora
Dec. 15 Newport

Well head protection
Nov. 22 The Dalles

Cross connection
Dec. 8 Pendleton

Cla-valve class
Dec. 14 Wilsonville

Water system training courses
Drinking Water Program, OHD

Date	*Location*
Oct. 3	Eugene: Lane Co. courthouse (Harris Hall)
Oct. 5	Roseburg: Umpqua Community College
Oct.11	Klamath Falls: OSU Extension office

Contact Claudia Stiff, Portland, 503 / 731-4317

Oct. 19 Operator certification exam

Cross connection / backflow courses

Backflow Management Inc. (B) 800 / 824-4385

Clackamas Community College (C) 503 / 657-6958 x 2364

Pacific North West Section, AWWA (P) Stephen West (503 / 341-3726) or Charlie Harrison (503 / 526-2413)

BAVCO repair seminar (P) (Must register by Oct. 14)
Oct. 25 EWEB, 500 E. 4th, Eugene
Oct. 27 Portland Water Dept. office, 1900 N. Interstate, Portland

Backflow Device Tester course
Oct. 4-7 La Grande (B)
Dec. 12-15 Clackamas Community College (C)
Jan. 23-26 Clackamas Community College (C)

Backflow Device Tester update
Oct. 13-14 Eugene (C)
Oct. 21 Clackamas Community College (C)
Oct. 28 Salem (B)
Dec. 1-2 Clackamas Community College (C)
Dec. 9 Clackamas Community College (C)

Backflow device repair (B)
Oct. 26 Salem

Fire sprinkler systems for device testers (B)
Oct. 27 Salem

Cross connection control (B) (For systems required to have a program but not a certified inspector)
Nov. 8-9 Wilsonville
Dec. 6-7 Medford

Inspector course (C)
Nov. 14-17 Clackamas Community College

Inspector update (C)
Nov. 18 Clackamas Community College

PIPELINE is published quarterly free of charge by the staff of the Oregon Health Division, Drinking Water Program, 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. (45-94/191545)