



**Texas Water
Resources
Institute**

**Summer 1990
Volume 16
No. 2**

The HIGH CO\$T of Drinking Water

New Federal Regulations will make drinking water safer, but at a steep price

by Ric Jensen

Information Specialist

Few of life's pleasures seem as simple, enjoyable, and inexpensive as drinking a cool, clean glass of water on a hot Texas summer day.

However, all of that may be about to change.

The water you drink will still be refreshing. However, because of new federal regulations the water will be purer than ever. There's one catch - improving the quality will probably cause dramatic increases in the price most Texans pay for drinking water.

The issues involve questions about human health and safety, environmental regulations, and how much the public is willing to pay.

In 1986, Congress passed a sweeping series of Amendments to the Safe Drinking Water Act (SDWA). As a result, the Environmental Protection Agency (EPA) has proposed far-reaching regulations that will require many areas to improve the quality of both ground and surface waters that are used for drinking water.

The regulations require increased levels of treatment to guard against bacteria, lead and copper, radioactive substances, manmade chemicals, and other types of contaminants.

While the concepts sound fine and good - no one wants to oppose *safe* drinking water - the regulations require a delicate balancing act between improving human health and making drinking water much more expensive.

Although developing cost/benefit analyses for building a new freeway is fairly straightforward, such comparisons become sensitive when dealing with human health.

How do you calculate the monetary value of saving or extending a human life or preventing a case of cancer? Should something we suspect is dangerous to human health be regulated or do we need definite proof before acting?

The SDWA Amendments and the forthcoming EPA regulations have their critics. Some utilities charge they are too tough and expensive. Contaminants and cancer-causing chemicals introduced through drinking water make up only a small portion of the total amount of such substances humans are exposed to in a lifetime, they argue. If that's the case, how much good will it do to provide marginally better drinking water?

Others say that epidemiology studies (which measure links between certain population groups and numbers of diseases) used by the EPA to develop the new standards don't always show cause and effect relationships. If many people become ill after drinking water that contains a particular pollutant, does that prove the contaminant caused the disease or could it have originated from other factors?

Studies which suggest that large doses of toxic substances cause diseases in bacteria and laboratory animals have been criticized because some say that lower doses in real world conditions may not produce human health problems.

What is the status of drinking water quality? It's hard to say. Studies by some watchdog groups suggest that there are more than 2,000 chemicals (including nearly 200 that may cause cancer) that are now unregulated in U.S. drinking water supplies.

Data on drinking water quality in Texas are sketchy. There have been few instances of contamination by man-made pollutants, although groundwater contamination by uranium has been noted in McCullough, San Saba and Concho counties.

Implementing the SDWA Amendments will not be easy. The draft regulations to limit lead concentrations require that utilities test the water at homeowners' taps early in the morning, because lead accumulates at night when little water is running through the pipes. Few people are expected to welcome this daily intrusion over a period of a months. Homebuyers and sellers maybe upset by a draft provision that limits federal financing for new homes that have pipes and fittings with more than 8% lead and solder with more than 0.2% lead.

The lead regulations also make utilities responsible for water quality *after* it leaves the water treatment plant and enters customers' homes. Utilities say that a number of factors they can't control (leaching from household pipes and fixtures) may produce unacceptable lead levels even when the water was properly treated at the plant. Many utilities now have lead levels at customers' taps that are greater than the draft limits, according to a new survey, and pH control and other treatments won't significantly reduce lead concentrations.

Some legal experts suggest the SDWA Amendments may open up lawsuits which could charge that utilities are not fully protecting human health. Maximum Contaminant Level

Goals (MCLG) are unenforceable levels at which no ill health effects are anticipated. Maximum Contaminant L levels (MCLs) are enforceable standards set as close as possible to the MCLG, but incorporate data on feasibility. The dilemma may come when utilities treat water only to MCL levels despite knowing that meeting MCLGs would better protect health.

Although the health questions and the task of implementing the new rules are controversial, the explosive issue will be the huge price tag associated with the SDWA Amendments. The program is expected to cost \$13 billion for new construction and \$117 million annually for monitoring, and will boost water rates nationally by \$800 million per year.

Many small rural water systems will be most affected (84% of all water systems in the U.S. serve less than 10,000 persons). In Texas, 94% of all water systems serve less than 2,500 customers. There are roughly 900 public water supply corporations and more than 4,500 private water suppliers. More than 400,000 Texas households are served by private wells and will not be affected by the SDWA Amendments.

Some economists warn that "rate shock" and "consumer revolt" will set in once customers look at their more expensive rates. Some estimates project that monthly water bills may rise by \$70 per household in areas served by small water utilities.

Many small water suppliers are now financially burdened and the SDWA Amendments may only increase the stress. Many rural water suppliers now can't produce water as high in quality as cities because they don't have the latest technology. Small systems also don't have a large customer base to spread out the increased costs. Spending \$5 million to improve water treatment will send only a slight ripple in ratepayers' bills in Dallas, but in Iola (population 500) it could make rates go through the roof. Although loans may be available from the Texas Water Development Board (TWDB) or the Farmers Home Administration for small utilities and non-profit water supply corporations, only more expensive and hard to get commercial financing may be available to investor owned water suppliers that serve subdivisions and trailer parks.

The SDWA Amendments do not include provisions to provide federal financial assistance for small communities, although bills are now pending in Congress that could provide some relief.

Even though the regulations are being attacked from the water industry and ratepayers, two factors must be considered. First, EPA didn't develop the regulations on its own. Congress, whom we elect, passed the legislation that spurred the EPA to develop the standards. Secondly, Congress reacted to wide support from individual citizens. One opinion poll showed that 40% of Americans feared that substances in the water could lead to cancer or death sometime during their lifetime and more than 50% said they would *pay slightly more to* improve drinking water quality.

BACKGROUND OF THE SAFE DRINKING WATER ACT AMENDMENTS

The Safe Drinking Water Act was passed in 1974 shortly after carcinogenic chemicals including trihalomethanes (THMs) were found in the drinking water supply in New Orleans. Ironically, THMs were caused by disinfecting the water with chlorine to make it safer. The Act required EPA to develop MCLs for THMs, organic and inorganic chemicals, and microbes.

In 1986, the SDWA Amendments were passed because Congress perceived that EPA was not aggressively enforcing the original act. A study by the Government Accounting Office (1982) examined 10 EPA regions to determine if utilities were complying with the act. EPA reported that 43% of the water systems in the U.S. were not complying with regulations to monitor bacteria levels and other provisions. Despite this, EPA enforcement actions were either minimal or non-existent, the study reported. As a result, Congress enacted the tough SDWA Amendments.

The SDWA Amendments may be a "child of technology", passed not because of widespread dissatisfaction over drinking water quality but because new analytical techniques make it possible to measure contaminants in smaller and smaller amounts. For example, the regulatory limit for some chemicals is now in the parts per billion and parts per trillion range - levels that only a decade ago were undetectable. A part per billion is so minuscule it's the equivalent of one second in 32 years or a single penny in a stack of \$10 million.

The SDWA Amendments are extremely comprehensive and cannot be covered in detail here. However, sources of additional information are cited in the *References* section. A summary of some of the major provisions of the SDWA Amendments and a timetable for implementation is shown in Figure 1. Some highlights of the SDWA Amendments include the following:

- EPA is required to set standards (MCLs and MCLGs) for 83 contaminants. So far, final standards have been developed and implemented for only eight volatile organic chemicals (VOCs) although more standards are expected shortly. EPA has tested many of Texas' water systems for VOCs and found no violations. In the future, EPA will have to develop standards for 25 additional contaminants every three years.
- Disinfection is required for all public water suppliers.
- All public water systems that use surface waters or "groundwater under the influence of surface water" will be required to use disinfection and may be required to use filtration to control turbidity, viruses, and organisms that cause Legionnaire's disease and other illnesses. This provision could have a relatively minor impact in Texas because surface waters are already filtered and disinfected. Exemptions may be allowed if the source water was of high quality or if site-specific requirements were met.

- Use of lead in pipes, fixtures and distribution systems will be limited and measures to control corrosion are required. Nationally, corrosion control requirements could reduce damages to pipes and water distribution systems by \$525 million per year. Education programs will have to be conducted, whether a system is in violation of the standard or not. Many lead-lined drinking water fountains in schools and public buildings will have to be replaced.
- Groundwater and wellhead protection programs will be developed and approved by the EPA.
- Variances and exemptions to some of the SDWA Amendments can be granted if best available technologies are used to control contaminants, if risks to human health will not develop as a result, if compelling economic factors are shown, and if no alternative drinking water sources are available. Exemptions can require point of use treatment devices or supplying bottled water.
- Increased monitoring will be required for many substances. The amount of monitoring that needs to be performed will depend on pollution vulnerability studies.
- Regulations for 30 synthetic organic chemicals and eight inorganic chemicals have also been proposed. Standards are also being developed for radioactive substances including radon-222, radium-226, radium-228, uranium, and others. The radon regulations could affect parts of South Texas, the Hill Country, the High Plains, and the greater Houston area where high levels have been reported.
- Tests for coliform bacteria will be conducted and systems which report the presence of coliform in more than 5% of monthly samples will violate the regulations. The amount of sampling will vary depending on the size of the system and may be reduced if only groundwater is utilized and if the water is sanitary.
- EPA now can fine violators as much as \$25,000 per day per violation.

HEALTH ISSUES

The Safe Drinking Water Act Amendments embrace a wide range of health issues and EPA predicts they will improve human health by reducing the number of cases of cancer and chronic and acute diseases (EPA, 1990).

The SDWA Amendments are expected to result in 178 less cancer cases per year (EPA, 1990). Most of the improvements will come from preventing cancer caused by vinyl chloride, ethylene dibromide, and radon. Nearly 80% of the improvements are expected in water systems serving less than 25,000 people.

The number of chronic illnesses caused by drinking contaminated water are also expected to drop significantly. Cases of kidney diseases caused by exposure to cadmium, impacts of high lead levels on children such as delayed neurological and physical development, impaired learning abilities and kidney damage, and skeletal defects caused by high levels of fluoride are all expected to diminish.

Nationally, water systems that serve less than 10,000 people will expose nearly 5 million fewer people per year to dangerous lead levels. More than 138 million people should be exposed to lower lead concentrations and 226,000 fewer people will be exposed to reduced cadmium levels because of the SDWA Amendments.

Acute effects include outbreaks caused by microorganisms and chemicals such as "travelers' diarrhea" and other maladies. The SDWA Amendments are expected to reduce the number of disease outbreaks caused by microorganisms by more than 360,000 cases per year.

EPA (1990) has tried to put the health benefits in economic terms by projecting the cost of implementing requirements of the SDWA Amendments and comparing that to the number of cases diseases that could be avoided. For systems serving 3,300 to 10,000 customers, for example, the cost to prevent each case of cancer caused by radioactive substances other than radon is

\$55 million. The cost to prevent cancer from other substances is dramatically less: radon is \$800,000/case, VOCs are \$1.8 million/case, SOCs are \$600,000/case, and arsenic is \$1.4 million/case. The cost per case is usually much less for urbanized areas than for smaller rural water systems.

The expected accomplishments of the SDWA Amendments in improving human health sound impressive. However, some question just how far the government can go, and the public can afford to pay, to improve human health by bettering drinking water quality.

A basic issue is whether regulations should be imposed only on chemicals which are proven health threats or on those we merely suspect are dangerous? The SDWA Amendments now allow EPA to regulate substances that may (not *will*) pose a health risk. Texas Senator Phil Gramm introduced a bill in 1980 which would have required proof that a substance was a threat to human health before it could be regulated. Others contend that waiting for scientific proof before acting is taking a chance with human health. In many cases, waiting for positive proof may lead to needless diseases and deaths.

Although the public seems to want improved environmental quality, some experts wonder if we are creating a generation of "nosophobics" - people who fear they be will sick in the future because of pollutants lurking in the water, air, and environment (Whelan, 1989). One study (Bord, et al, 1989) confirmed that many people severely overestimate the risks from living near sites that may be polluted. The challenge is to be able to objectively evaluate the risks associated with different chemicals, including those in drinking water, so that intelligent choices can be made.

Other experts (Ames, 1986) criticize what they feel are generally held misconceptions that lead to strict regulations like the SDWA Amendments. These include beliefs that cancer rates are soaring, that man-made chemicals are causing significant amounts of cancer, that pollution causes cancer and birth defects, that regulations can be developed

before we understand how carcinogens work, and that technology is making the world more dangerous.

Although cause and effect relationships are often difficult to establish, some studies have shown cases where residents suffered health ailments while they were drinking contaminated water but several acute symptoms were relieved shortly after clean water was supplied (Gabler, 1988).

Just how safe is Texas' drinking water? Not many cases have been documented where drinking water has been contaminated by man-made pollutants. Naturally occurring contaminants are a potential problem in many areas: high levels of fluoride and selenium have been reported in the Ogallala Aquifer and in north central Texas. Numerous studies by the Texas Water Development Board and the Texas Department of Agriculture (TDA) have found that nitrate levels in shallow wells in Knox, Haskell, and Comanche counties and arsenic concentrations in some private wells in Martin and Howard counties were 10 times greater than EPA limits. Results from TDA's 1988 water sampling program study suggest that atrazine levels exceeded EPA health advisory limits in two wells and that 101 of 182 wells violated the EPA drinking water standard for nitrate.

TWO TROUBLE SPOTS -- LEAD AND RADON

Two of the most prominent disease causing elements in drinking water are lead and radon.

Lead is harmful to humans if it is inhaled or ingested from polluted water, air, soil, and food. Lead can cause a number of adverse health effects including heart disease in adult men, and fertility problems in women. Most of the attention on lead has been focused on its effects on children. Nationally, more than 2.4 million children are at risk nationally from potentially high lead levels, nearly 250,000 children are exposed to lead levels high enough to impair their intellectual development, and as many as 70,000 children below age 5 have high lead levels in their blood.

Lead usually makes its way into water supplies by corrosion of parts of the plumbing system such as lead pipes, solder, and fixtures. Both very old and very new homes pose the greatest lead threats. Many old homes were built with lead fixtures, while some new homes have not yet developed mineral coatings inside pipes that prevent lead contamination. Hot water is likely to contain higher lead levels. As a result, many experts advise flushing the system for a few minutes or using cold water when preparing baby formula.

The SDWA Amendments contain a number of provisions to reduce the risks of lead contamination, including bans on the use of lead pipes, solder and flux in private plumbing, replacing lead-lined water coolers in schools and public institutions, controlling corrosion and public education (Lin, 1989). Even though replacement of lead lined fountains is taking place in many Texas schools, that step may not eliminate an

area's lead problem. Officials in Round Rock reported lead levels in their drinking water at concentrations near EPA limits even after coolers were replaced.

Radon is a naturally occurring element that is dissolved in groundwater and released when the water is agitated and heated from running water. The radon can then be inhaled and can lead to lung cancer. EPA estimates that roughly 20,000 lung cancer deaths result from radon exposure nationally each year. In Texas, high levels have been reported near Houston and in the extreme northern Panhandle (Cech, et al., 1988). In McCullough, Concho and San Saba counties, 14 water suppliers are now working to lower excessive radionuclide levels and to find alternative water sources.

ECONOMICS OF THE ACT: COSTS WILL SOAR

It's difficult to predict how the SDWA Amendments will affect individual water rates. First, all the regulations to implement the SDWA Amendments have not yet been developed so the cost will probably go up. Second, responses to the SDWA Amendments will be site-specific. Some communities' rates may be dramatically impacted while others may remain relatively stable.

Nationally, EPA (1990) estimated that capital costs to comply with the Amendments could be more than \$10 billion, with \$6 billion of that figure for systems serving less than 10,000 persons.

Annual treatment, operations, and waste disposal costs could total more than \$2.5 billion nationally per year, but monitoring may only cost \$200 million annually, according to EPA projections. Measures to control microbiological contaminants and coliform levels including surface water treatment, disinfection could add up to \$1.1 billion or 44% of annual operating costs. Treating for radionuclides represents \$790 million or 32% of annual operating costs while implementing the lead program constitutes 14% of annual operating costs (see Figure 2). Most of the capital demands and annual compliance costs will increase dramatically after 1994).

One study (Mann and Beecher, 1989) examined the cost of various treatment methods that may be needed to comply with some of the SDWA Amendments. Results for a typical town serving 5,000 customers showed that using packed aeration columns could cost \$89 per million gallon, but that reverse osmosis could cost nearly \$3,000 per million gallons. Rates could rise by 600% for very small systems but would increase by only 160% for larger utilities, the report stated. Other studies say adding filtration and disinfection could boost individual water bills by \$275 per year.

Regional EPA officials say that costs in Texas could be somewhat less than the national averages because surface water supplies are already filtered and disinfected. Also, areas which are not judged to be vulnerable to contamination may be able to avoid some of the most expensive monitoring requirements. Still, the economic impacts are expected to be significant.

BIG PROBLEMS FOR SMALL SYSTEMS

Rural water systems had the most trouble meeting the water quality provisions of the Safe Drinking Water Act and may have an even tougher time complying with the SDWA Amendments. EPA sponsored the National Statistical Assessment of Rural Water Conditions in 1984 and found that 29% of those surveyed violated bacterial standards, 16% exceeded lead guidelines, and 24% could not meet mercury limits.

Meeting the SDWA Amendments will be difficult. EPA estimated that as many as 45,000 of the 60,000 small water systems throughout the U.S. will not be able to meet the new SDWA Amendments without improving facilities and equipment. Systems serving less than 10,000 people may have to pay more than 70% of projected national costs (roughly \$2.5 billion annually) to comply with the new regulations because they don't have the personnel and equipment to meet the new guidelines (EPA, 1990). Costs for radionuclides and microbiological contaminants are expected to make up the brunt of the costs.

For example, a small water system supplying 2,000 people could see its rates increase by 300% to 500% if filtration has to be installed (Seagraves, et al., 1988). Other provisions of the SDWA Amendments could result in equally high increases.

There is disagreement about which of the provisions will have the greatest impact on small and rural water suppliers. One study (Miller, et al., 1988) suggested that the most significant costs would be associated with monitoring pollutant levels and guarding against microbial contamination, but other reports suggest that monitoring will be only a small portion of annual treatment and disposal costs (EPA, 1990).

Small systems may be able to cope with the SDWA Amendments by protecting sources of water to reduce potential contamination by bacteria and viruses, switching to a higher quality source of water, merging to form regional systems, or eliminating treatment operations and supplying customers with treated water purchased from neighboring cities and private water companies (Long and Stukenberg, 1988).

Small systems serving fewer than 1,500 people may be able to qualify for exemptions to the SDWA Amendments if they can demonstrate that they are making progress in complying with the regulations and if no undue health threat is present.

SUMMARY

When it comes to human health, there are no easy choices. It's difficult to endorse anything that provides less than optimal levels of protection against contaminants.

In the case of drinking water, factors need to be addressed including the cost to both utilities and their customers, feasibility of implementing regulations, and especially difficult impacts on small communities.

Fundamentally, we have to answer the underlying question of whether improving drinking quality to such high levels is really going to significantly better human health? Some experts are saying that federal funds and regulations could be directed to other environmental hazards that might make a bigger difference in improving human health.

Ultimately, the public is going to have to decide how much it wants to pay for clean wafer end how pure it wants that water to be. The responsibility rests with the public to become involved in the process and let their feelings be known on this key issue.

REFERENCES

Ames, Bruce, "Six Common Errors Relating to Environmental Pollution," *NAWC Water*, Washington, DC, Winter, 1986.

Aurelius, Lea, *Testing for Pesticide Residues in Texas Well Water*, Texas Department of Agriculture, Austin, TX, 1990.

Bord, Richard, Donald Epp, Robert O'Connor, *Achieving Greater Consistency Between Subjective and Objective Risks*, Environmental Resources Research Institute, Penn State University, University Park, PA, 1989.

Buehrner, Judi, "States Confront Financial Impact of New Regulations," *Mainstream*, American Water Works Association, Denver, CO, March, 1990.

Cech, Irina, Charles Kreitler, Howard Pritchard, Alfonso Holguin, and Mengistu Lumma, "Radon Distribution in Domestic Waters of Texas," *Ground Water*, Urbana, IL, September, 1988.

Drinking Water: A Community Action Guide, Concern, Washington, DC, 1988.

Dyksen, John, David Hildebrand, and Robert Razcko, "SDWA Amendments: Effects on the Water Industry," *American Water Works Association Journal*, Denver, CO, Jan. 1988.

Estimates of the Total Benefits and Total Costs Associated with Implementation of the 1986 Amendments to the Safe Drinking Water Act, EPA Office of Drinking Water, Washington, DC, March, 1990.

Gabler, Raymond, *Is Your Water Safe to Drink?*, Consumer Reports Books, Mt. Vernon, NY, 1988.

Groundwater Quality of Texas, Texas Water Commission, Austin, TX, 1989.

Is Your Drinking Water Safe?, EPA Office of Water, Washington, DC, 1989.

Lead and Your Drinking Water, EPA Office of Water, 1989.

Lin, Shun Dar, "Proposed Lead Rules Add Chores, Costs to Utility Burden," *Water Engineering and Management*, Des Plaines, IL, February, 1989.

Long, Bruce, and John Stukenberg, "SDWA Amendments: Small Community Compliance," *American Water Works Association Journal*, Denver, CO, Aug., 1988.

Mann, Patrick, and Janice Beecher, *Cost Impact of Safe Drinking Water Act Compliance for Commission-Regulated Water Utilities*, National Regulatory Research Institute, Columbus, OH, 1989.

Miller, G. Wade, John Cromwell, and Frederick Marrocco, "The Role of States in Solving the Small System Dilemma," *American Water Works Association Journal*, Denver, CO, August, 1988.

Norling, Nancy, Thomas Stephens, and Vivian Davis, "Safer Water at a Higher Price: Anticipating the Impact of the Safe Drinking Water Act," *Public Utilities Fortnightly*, Washington, DC, Dec. 22, 1988.

Ponlius, Frederick, "Complying with the New Drinking Water Quality Regulations," *American Water Works Association Journal*, Denver, CO, February, 1990.

Removal of Radon from Household Water, EPA, Washington, DC, August, 1985.

Seagraves, Barry, John Peterson, and Paul Williams, "Financing Strategies for Small Systems," *American Water Works Association Journal*, Denver, CO, August 1988.

States' Compliance Lacking in Meeting Safe Drinking Water Regulations, Government Accounting Office, Gaithersberg, MD, 1982.

Whelan, Elizabeth, "What Kind of Data Does the Public Need?" *EPA Journal*, Washington, DC, May/June, 1989.