Safeguarding a Precious Resource

Drinking Water Protection in Minnesota—1998

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Foreword

Ensuring the safety of our drinking water is one of the most fundamental—and most critical—responsibilities of modern public health. In fact, safe drinking water has been a key ingredient in some of the greatest public health achievements of the last half-century—including the dramatic reductions in disease and improvements in longevity that we now tend to take for granted. Along with other basic public health measures like immunization, drinking water protection has played a crucial role in building a safer and healthier society.

We need to remain vigilant if we are to protect those past gains. The Minnesota Department of Health (MDH) is strongly committed to safeguarding the quality of our drinking water, and as part of that commitment, we routinely monitor all of our state's public water supply systems for a broad range of chemical and biological contaminants.

MDH believes that educating the public about water quality issues is an important element of drinking water protection. Since 1995, we have been releasing annual summary reports like this one to help us achieve that goal. Like previous reports in the series, this year's report covers test results and actions taken during the preceding calendar year.

The main body of the report provides information about Minnesota's community water supply systems— that is, systems that provide people with drinking water in their places of residence. More detailed information about community systems in the state, as well as noncommunity systems, is included in the appendix.

We hope this information will provide the people of Minnesota with a clearer picture of what's being done to protect the quality of their drinking water, and what our monitoring efforts have revealed about the success of those efforts. We believe that the picture is a positive one, and we hope this report will build Minnesotans' confidence in the both the safety and the quality of their drinking water.

Executive Summary

The Minnesota Department of Health (MDH) is responsible for enforcing the federal Safe Drinking Water Act—and safeguarding the quality of drinking water—in our state. That includes responsibility for regulating 8,900 *public water supply systems* statewide. That figure includes 958 *community* systems, which provide drinking water to people in their places of residence. Those community systems include 708 *municipal* systems, serving towns or cities.

The Major Elements of Drinking Water Protection

Minnesota's drinking water protection strategy includes three major elements:

- ***Prevention*** measures are used to protect the quality of drinking water at the source—by controlling potential sources of pollution, regulating land use, and reviewing plans and providing advice on construction of water treatment and distribution facilities, and inspecting these facilities on a regular basis.

- ***Treatment*** measures—including routine disinfection—are used to make the water palatable and safe to drink.

- ***Monitoring*** of water supplies for potentially harmful contaminants—on a routine basis—is the critical element of the state's enforcement responsibilities under the Safe Drinking Water Act.

The Monitoring Process

Minnesota's community water supply systems are monitored for the following types of *contaminants:*

- **Pesticides and industrial contaminants.** Each system may be tested regularly for up to 118 pesticides and industrial contaminants—including both synthetic organic chemicals (SOCs) and volatile organic chemicals (VOCs). The list of chemicals to be tested for—and the testing schedule—may vary from one system to another. Testing requirements depend on factors like whether a particular chemical is likely to be present in the local environment—and how vulnerable the system is to contamination. If a system exceeds the applicable federal or state drinking water standard for a particular chemical, it must notify the people who use the water and take appropriate steps to correct the problem.

- **Bacterial contamination.** Larger community systems are tested monthly—and smaller systems are tested quarterly—for contamination by *coliform bacteria.* The coliform test is used as a general indicator of water quality in the system, in terms of potential microbial contamination. Whenever bacterial contamination is detected, people served by the system are advised to boil the water before using it for drinking or cooking.

  The system must be disinfected, flushed, and found to be free of contamination before the boil order can be lifted.

- **Nitrate.** Each system must be tested annually for nitrate. Nitrate occurs naturally in the environment, but elevated nitrate levels in drinking water are usually associated with the use of fertilizer, or the breakdown of human and animal waste. It is a health concern primarily for infants under the age of six months. If the federal standard for nitrate is exceeded, an advisory is issued regarding consumption of the water by infants. The advisory remains in effect until steps can be taken to correct the nitrate problem.

- **Inorganic Chemicals and Radioactive Elements.** Each system is typically tested once every three years—or as often as once a year, in some cases—for a list of 13 additional inorganic chemicals, and a number of radioactive elements. Both inorganic chemicals and radioactive elements may be naturally present in the water. If the water exceeds health standards for either type of contaminant, people who use the water are informed, and steps are taken to correct the problem.

- **Lead and Copper.** For the last several years, community water supply systems have participated in efforts to reduce lead and copper contamination in drinking water. Lead and copper are not typically present in the water when it leaves the treatment plant. Lead and copper differ from other contaminants in that they are rarely present in source waters. Rather, they enter the water through contact with plumbing components, usually in individual homes. If more than 10 percent of the homes in a community exceed the federal "action level" for lead or copper based on the results of community-wide monitoring—the local water supply system must do additional testing and take steps to reduce levels. Systems that exceed the action level for lead must also perform a regular program of public education.

A Current Profile of

Minnesota's Drinking Water Protection Program

Since 1974, the U.S. Environmental Protection Agency has been responsible for regulating the nation's public water supply systems, under the provisions of the federal Safe Drinking Water Act. However, almost all states—including Minnesota—have now assumed responsibility for enforcing the act within their own borders. Minnesota became one of the first states to achieve *primacy*—and begin regulating public water supply systems at the state level—in 1977.

The definition of "public water supply system," for purposes of the Safe Drinking Water Act, is a broad one. To be considered "public," a water supply system must have its own water source and provide water to more than 25 people or have more than 15 service connections.

Minnesota currently has 8,900 public water supply systems—more than all but six other states. Of those systems, 958 are *community* systems—that is, systems which provided water to people in their homes or places of residence. Most of these community systems use *groundwater* from underground sources, tapped by water wells, as their source of water. However, 24 of these systems—including the municipal systems that serve the state's largest cities—use *surface water,* drawn from lakes or rivers.

Only 708 of the state's community systems are municipal systems, serving towns or cities. The rest of the community systems provide water to people in a variety of residential locations, including manufactured home parks, apartment buildings, housing subdivisions, colleges, hospitals and correctional facilities.

The remainder of the state's public water supply systems are *noncommunity* systems. Some of these non-community systems provide water to an ever-changing "transient" population, often at restaurants, resorts, or highway rest stops. Other noncommunity systems may provide water to relatively stable population groups, but in non-residential locations—like schools, factories and other places of employment, and day care facilities.

The Major Elements of Drinking Water Protection

Three basic strategies are used to safeguard the quality of our drinking water:

- **Prevention.** Preventing contamination of the source water used by public water supply systems—lakes, rivers and water wells—is an important component of drinking water protection. This aspect of drinking water protection includes measures like regulating land use, regulating the construction of water treatment facilities, and controlling potential sources of pollution.

- **Treatment.** Most community water supply systems use some form of treatment, so the water will be palatable and safe to drink. Many systems—but not all—require routine disinfection, to address potential problems with bacterial contamination. Groundwater systems are less likely to require disinfection, because contaminants tend to be filtered out of the water as it moves downward through the earth, from the surface to the underground sources tapped by water wells.

- **Monitoring.** Monitoring is the critical element of enforcement activities under the Safe Drinking Water Act (SDWA). Under provisions of the act, public water supply systems are required to sample treated—or "finished"—water on a regular basis, and submit the samples to MDH. The samples are tested for a broad range of potential contaminants. If unacceptable levels of contaminants are found, the water supply owner or operator is legally responsible for informing the people who use the water, and taking steps to eliminate potential health hazards.

  Under the provisions of the SDWA, the individual water supply system is responsible for taking water samples and submitting them to MDH for testing. To lessen the burden on water supply operators, some of the required samples are collected by field staff from MDH. Minnesota's water supply operators have one of the best records in the nation regarding compliance with these sampling and testing requirements.

Note: *The monitoring requirements and test results described in this report apply primarily to community water supply systems.*

Monitoring: What We Test For—and Why

Minnesota's community water supplies are tested for a number of different types of contaminants. The reasons for testing—and how often the testing is done—depends on the type of contaminant and other factors. The type of contaminant also determines what actions will be taken, if unacceptable levels are found in the water.

The major types of contaminants we test for include:

Pesticides and Industrial Contaminants. Minnesota's community water supply systems are routinely tested for up to 118 different pesticides and industrial contaminants—including synthetic organic compounds (SOCs) and volatile organic compounds (VOCs). Systems may be tested anywhere from four times a year to once every six years, depending on the specific chemical and the vulnerability of the system to contamination (see ***Assessing Vulnerability to Contamination,*** below). Some systems may not need to do any testing for a particular contaminant. A formal *use waiver* is sometimes granted, specifically exempting a water supply system from testing for a particular contaminant, if that chemical or pesticide is not commonly used in the immediate area.

The U.S. Environmental Protection Agency (EPA) has developed legal standards known as *maximum contaminant levels (or MCLs)* for 60 of the118 chemicals on the list. *Advisory* standards have been developed for the other 58 chemicals on the list, and those are used in the same way as the MCLs in assessing test results.

Any time a community water supply exceeds the applicable standard for one of these contaminants, the water supply operator must immediately take steps to notify the people who use the water—with the assistance of MDH. Appropriate steps are then taken to reduce the contamination to acceptable levels.

In some cases, the MCL or advisory standard is calculated to prevent immediate or short term health effects. More often, however, these standards are designed to reduce the long-term risk of developing cancer or other chronic health conditions. They are calculated very conservatively. If the concern is long-term health effects, the standards are calculated to keep the risk of illness at levels most people would regard as negligible—even if they drink the water every day, over an entire 70-year lifetime.

Bacterial Contamination. Community water supply systems serving more than 1,000 people are tested monthly for *coliform bacteria.* Smaller systems are tested four times a year. The coliform test is used as a general indicator of water quality in the system, in terms of potential microbial contamination. If the coliform test is negative, it is assumed that the system has also been adequately protected against contamination with other types of disease-causing organisms. However, if any detectable amount of coliform is found in the water, it is assumed that the system may be compromised, and steps are taken to protect the people who use the water. Typically, they are advised to boil their tap water before using it for drinking or cooking—or switch to using bottled water for those purposes. The water supply system is responsible for notifying its customers about the advisory, with the assistance of MDH.

The boil order remains in effect until the system has been disinfected and flushed, and retested to make sure no contamination is present. That process typically takes about a week. After the advisory is lifted, the system is temporarily placed on an accelerated testing schedule for bacterial contamination.

Bacterial contamination problems are most commonly found in smaller water supply systems. Most of these smaller systems use groundwater, and many do not routinely disinfect the water as part of the treatment process.

Nitrate/Nitrite. Community water supply systems in Minnesota are tested once a year for *nitrate*—a chemical which may occur naturally in the environment, but can also enter the water from sources like fertilizer run-off, decaying plant and animal wastes, or sewage. Nitrate is a health *concern primarily for infants under the age of six months.* The infant's digestive system can convert the nitrate to *nitrite,* which can interfere with the ability of the infant's blood to carry oxygen. The result is a serious illness know as *methemoglobinemia,* or "blue baby syndrome." Methemoglobinemia can be fatal if nitrate levels in the water are high enough, and the illness isn't treated properly.

The current standard (MCL) for nitrate in drinking water is 10 parts per million (ppm). If a water supply system exceeds the standard, the people who use the water are notified and advised not to use the water for mixing infant formula, or other uses that might result in consumption of the water by infants under six months. The advisory is kept in place until steps can be taken to reduce nitrate levels in the water. Possible remedial measures include treating the water to remove the nitrate, or drilling a new water well.

Older children and adults are generally not at risk from drinking nitrate-contaminated water. In fact, the average adult consumes about 20-25 milligrams per day in food—primarily from vegetables. Because of changes that occur after six months of age, the digestive tract no longer converts nitrate into nitrite. However, some adults—including people with low stomach acidity and people with certain blood disorders—may still be at risk for nitrate induced methemoglobinemia.

Inorganic Chemicals. Community water systems in Minnesota are also tested for a list of 13 *other inorganic chemicals,* in addition to nitrate. The testing is usually done once every three years, but may be done as often as once a year or as seldom as once every nine years. The list includes *antimony, arsenic, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium, sulfate,* and *thallium.* In some cases, these chemicals may be naturally present in the groundwater. If a water supply system were to exceed the federal MCL for one of these chemicals, the people who use the water would be notified, and appropriate steps would be taken to reduce levels of these chemicals in the water.

Radioactive Elements. Community water systems in Minnesota are also usually tested once every three years—or as often as once a year, in some cases—for a list of *radioactive elements.* These radioactive elements—*or radiochemicals*—may be present in the water from natural sources. If a system were to exceed the federal MCL for one of these radioactive elements, the people who use the water would be notified, and steps would be taken to correct the problem.

Lead and Copper. Some public water supply systems in Minnesota are required to test their water, on a regular basis, for lead and copper. All public systems in the state took part in an initial round of lead and copper testing that ended in 1994. The water was tested in a number of homes within each system, to determine if they exceeded the federal "action level" of 15 parts per billion for lead or 1,300 parts per billion for copper. If a system exceeded the action level for lead or copper—in more than 10 percent of the locations tested—the system was required to take corrective action and do further testing. Current testing requirements are based partly on the results of that initial round of testing, and the success of subsequent efforts to reduce risk of lead contamination in systems that have previously exceeded the action level.

Lead in drinking water is not an environmental contamination problem in the conventional sense. Water is almost never contaminated with lead at the source, or when it first enters the distribution system. However, water can absorb lead from plumbing components used in individual homes. Possible sources of lead in the system include lead pipe, lead plumbing solder and brass fixtures. Lead exposure is a potentially serious health concern, especially for young children. However, the water must usually be in contact with lead plumbing components for an extended period of time—usually by standing in the system overnight—before it can absorb potentially hazardous levels of lead. Consumers can usually protect themselves simply by turning on the faucet and letting the water run for 30 seconds—or until it runs cold—before using it for drinking or cooking.

While most people are subject to lead exposure from a number of possible sources—and drinking water typically accounts for a relatively small proportion of a person's total lead exposure—it is also one of the easiest sources of lead exposure to control and eliminate. Some Minnesota water supply systems are addressing the lead issue by treating their water, so it will be less likely to absorb lead from plumbing.

Assessing Vulnerability to Contamination

Monitoring requirements for individual water supply systems depend partly on how vulnerable the system is to contamination. MDH does vulnerability assessments of water supply systems, taking into account a number of factors. If the system uses groundwater, the way in which the wells are constructed can serve to increase or decrease the risk of contamination. In some systems, natural geologic barriers may serve to protect the source water from contamination. Systems with a past history of contamination problems may be at higher risk.

Compared to surface water systems, groundwater systems tend to be less vulnerable to certain types of contamination. Water tends to be naturally filtered as it moves downward through the earth, making its way from the surface to the underground aquifers tapped by water wells. That process tends to remove certain kinds of contaminants, including bacteria and parasites like *Cryptosporidium*. For that reason, many groundwater systems do not routinely include disinfection as part of their normal water treatment procedures.

Monitoring Test Results

for calendar year 1998

Pesticides and Industrial Contaminants

During 1998, MDH conducted 26,784 tests for these contaminants in community water systems. None of the tests exceeded the drinking water standards for any of these contaminants.

Bacterial Contamination

Thirty systems—including 19 municipal systems—tested positive for bacterial contamination in 1998. All but four of the affected systems served fewer than 1,000 people. The largest served a population of slightly more than 4,500.

The municipal systems that reported positive bacterial tests in 1998 were Amboy (population 557), Audubon (pop. 146), Big Lake (3,000), Center City (pop. 557), Dawson (pop. 1,676), Deer River (pop. 907), Elgin (pop. 667), Green Isle (pop. 357), Kasota (pop. 655), Lake City (pop. 4,550), Lake Park (pop. 696), Millville (pop. 166), Remer (pop. 396), Rockville (pop. 644), Rush City (pop. 1,614), Ruthton (pop. 328), South Haven (pop. 201), Warba (pop. 80), and Zumbro Falls (pop. 208).

Standard procedures were followed in all of these cases. Residents served by the affected systems were informed of the test results, and advised to boil their water before using it for drinking or cooking. All of the systems were disinfected, flushed, and retested to ensure that any contamination problems had been eliminated. The boil order was then lifted, and the systems were able to resume normal operations.

Boil orders for the affected systems were in place for time periods ranging from 2 to 64 days. All but eight of the affected systems were able to resume normal operation in two weeks or less.

Nitrate

One municipal system exceeded the nitrate standard in 1998. The system is exploring options for reducing nitrate levels in its water. Residents have been advised not to let infants consume the water until the problem can be corrected. The affected system is Lewiston (pop. 1,404).

Nitrite

One municipal system exceeded the nitrite standard in 1998. The system is exploring options for reducing nitrite levels in its water. Residents have been advised not to let infants consume the water until the problem can be corrected. The affected system is Clara City (pop. 1,307).

Lead and Copper

Minnesota's community water supply systems are continuing with efforts, begun during the early part of this decade, to reduce lead and copper levels in their drinking water.

Minnesota's community water supply systems were originally tested for lead and copper during the early 1990s. The testing is done by taking water samples from a number of points in the system. If more than ten percent of the samples exceed the federal action level of 15 parts per billion (ppb) for lead or 1,300 ppb for copper, the entire system is considered to be "in exceedance." Communities that exceed the action level are required to do additional testing, and take steps to reduce the absorption of lead into the water from the distribution system or household plumbing.

When these systems were first tested several years ago, 87 exceeded the action level for lead. Seventy-one of those systems have since completed follow-up monitoring retested; the other 16 are scheduled for follow-up monitoring in 1999. Of the 71 that already have retested, 11 are still in exceedance of the action level for lead.

Results of recent testing reveal the following picture:

- **Large Systems (serving 50,000 or more people).** There are five of these larger systems in Minnesota. Initial testing revealed unacceptable lead levels in two systems. Both of the affected systems have instituted corrosion control measures—which reduce the ability of water to absorb lead and copper from plumbing. Both have retested; one of the two still exceeds the action level.

- **Medium-Sized Systems (serving 3,000 to 50,000 people).** When the state's 128 medium-sized systems were initially tested in 1992, 21 were found to exceed the action level for lead. Fifteen of these systems have retested and were found to be in compliance. The Minnesota Department of Health hopes to bring the remaining six systems into compliance in 1999.

  Of 29 systems that exceeded the action level for copper, 15 have successfully retested. The Minnesota Department of Health is working with the 14 systems that still exceed the action level for copper in optimizing corrosion-control treatment to further lower the copper levels.

- **Smaller Systems (serving fewer than 3,300 people).** Sixty-four of the state's 818 smaller systems exceeded the action level for lead when they were initially tested in 1993. Forty-four of the affected systems have successfully retested; another 16 are scheduled to complete follow-up testing in 1999.

  Of 113 systems that initially exceeded the action level for copper, about half have completed follow-up monitoring; the other half are scheduled to complete this monitoring in 1999.

Other Inorganic Chemicals and Radioactive Elements

No community water systems exceeded the standards for inorganic chemicals or radioactive elements in 1998.

Emerging Issues

Information on Tap:
First Consumer Confidence Reports to be Delivered in 1999

Since 1995, the state of Minnesota has provided citizens with an annual report on the overall quality of drinking water from public suppliers in the state. We felt this was important in terms of creating greater awareness regarding our planet's most precious resource.

Therefore, the Minnesota Department of Health applauded one of the key provisions of the 1996 amendments to the federal Safe Drinking Water Act—a requirement that all community water systems in the country begin issuing annual reports. These "Consumer Confidence Reports" will provide information on the system's source of water as well as the results of monitoring over the previous calendar year. Not only will the results note violations, if any, of drinking water standards, they will include a list of all compounds detected in the finished water—even in trace amounts too small to pose any threats to health.

The first reports—which will cover the 1998 calendar year—will be due by October 19, 1999. Subsequent reports will be due by July 1 of each year. In Minnesota, all 975 community water systems—including municipalities as well as other systems that serve water to people in their homes—will be issuing a report. Distribution of the report will vary depending on the size of the system. Those serving populations of 10,000 or more will have to mail or individually distribute the report to all their customers, making an effort to ensure that the report reaches not just billing customers but all consumers (including apartment tenants who don't receive individual bills and employees at businesses that are connected to the public water supply). Systems that serve 10,000 or fewer people have the option of individual distribution or publishing the report in one or more local newspapers that serve their area. Systems serving fewer than 500 people may satisfy the distribution requirement by publicizing the availability of the report and letting their customers know how to obtain a copy.

The Minnesota Department of Health is taking an active role in assisting the state's community water suppliers with the information necessary to produce their reports. MDH will be sending the results of monitoring from the previous year to each system along with the other information that will be required in each report. MDH will encourage systems to go beyond the minimum requirements of the rule and include additional information—such as a description of their treatment and distribution processes—that will enhance their customers' awareness of what is involved in the delivery of safe drinking water and the importance of protecting water resources.

The reports are a tool to encourage dialogue between consumers and utilities, get consumers more involved in decisions, and provide a starting point for consumers to obtain more information.

Drinking Water Disinfection—Benefits and Challenges

The disinfection of drinking water, which kills or renders harmless microbiological organisms that cause disease, is an important component in the treatment process and one of the public-health miracles of the 20th century.

For centuries, people were largely unaware of the need to treat the water we drink. Many thought that the taste of the water determined its purity, not knowing that even the best tasting water could contain disease-causing organisms. Even the fact that disease could be spread through drinking water was not commonly known until the latter part of the 1800s.

With this knowledge came an awareness of the need to treat our water. Great Britain began disinfecting its drinking water early in the 20th century and saw a sharp decline in typhoid deaths. Shortly after, disinfection was introduced into the United States—with dramatic results, bringing about a virtual elimination of waterborne diseases such as cholera, typhoid, dysentery, and hepatitis A.

The most common method of disinfection is through the addition of chlorine to drinking water supplies. Not only is chlorine effective against waterborne bacteria and viruses in the source water, it also provides residual protection to inhibit microbial growth after the treated water enters the distribution system. This means it continues working to keep the water safe as it travels from the treatment plant to the consumer's tap. Approximately 75 percent of municipal water systems in Minnesota, serving more than 90 percent of the state's population, add chlorine to the water as a means of disinfection.

However, although chlorine has been a literal lifesaver with regard to drinking water, it also has the potential to form by-products that are known to produce harmful health effects. Chlorine can combine with organic materials in the raw water to create a group of contaminants called trihalomethanes (THMs). Repeated exposure to elevated levels of THMs over a long period of time could increase a person's risk of cancer.

Since the mid-1970s, when the threat posed by disinfection by-products became known, water utilities have been reviewing their operations to minimize THM formation without compromising public health protection. This has involved adjustment to the type and amount of chlorine used as well as where it is applied. In addition, the treatment process has been expanded to remove the naturally occurring organic matter that reacts with chlorine to produce THMs.

Other means of disinfection besides chlorine are available. However, these methods may also produce harmful by-products. In addition, alternative disinfectants cannot provide the residual protection (that is, continue to disinfect in the city-wide distribution system) of chlorine-based disinfectants, so they must be used in combination with chlorine.

Although the risks associated with chlorination have been known—and dealt with—for more than two decades, the subject of disinfection by-products has received increased attention recently because of a pair of studies released over the past two years.

One, conducted by the University of Minnesota over a period of more than 10 years and released in the summer of 1997, showed a possible link between women who drink chlorinated water and higher incidents of cancers of the colon. The study dealt with more than 40,000 middle-aged Iowa women and an analysis of the sources of their drinking water and its chlorination-related contaminants. The authors of the study made it clear that while there may be a correlation between chlorinated water and cancers of the colon, there is not necessarily a clear cause-and-effect with these parameters. The authors did not recommend that people stop drinking chlorinated water and, in fact, reaffirmed the benefits with the opening statement of their study: "Chlorine disinfection of drinking water has been one of the most successful interventions this century in the prevention of waterborne illness."

The other study, conducted in California and released in early 1998, dealt with pregnant women who drink large quantities of water with elevated levels of THMs and indicated a possible link with higher risks for early-term miscarriages. This study was one part of a large-scale effort by the U. S. Environmental Protection Agency (EPA) to balance the need for protection against microbial contaminants—those that cause dysentery and cholera—with the need the keep the dangers of disinfection itself to a minimum. EPA, which partly paid for the California study, is planning to fund another comparable study in another part of the country to see if the California results are replicated.

The formation of disinfection by-products is a greater concern for water systems that use surface water, such as rivers, lakes, and streams, as their source. Surface water sources are more likely to contain the organic materials that combine with chlorine to form THMs.

Surface water systems serving a population greater than 10,000 must regularly test their treated water to determine if THMs are present. If the THMs exceed the limits set by the U. S. Environmental Protection Agency (EPA), the water system must take action to correct the problem. The corrective actions include notifying all residents served by the water system. By 2003, all public water systems that provide disinfection will be required to test for THMs and meet the limits set by EPA.

The Maximum Contaminant Level (MCL) for THMs is currently 100 ppb. However, the standard is being lowered to 80 ppb. EPA is taking other action with regard to THMs and other disinfection by-products through some pending rules, such as the Enhanced Surface Water Treatment Rule and the Microbial/Disinfection By-products Rules Cluster.

Testing of Minnesota water supplies does not indicate problems with potential adverse health effects from drinking water by-products. Results from 1998 monitoring show that THM levels are well below the current maximum contaminant level of 100 ppb. The levels are also well below the pending limit of 80 parts per billion and below the threshold limits of 75 ppb that were used in the aforementioned California study.

Minnesota suppliers will continue to be vigilant in guarding against disinfection by-products while continuing to provide protection against microbes and other disease-causing organisms.

Drinking water treatment operations must often meet competing objectives—adequate microbial protection and reduced levels of disinfection by-products—to comply with EPA regulations. The key to treatment is to provide a balance between the health benefits of disinfected drinking water and the creation of by-products from the disinfectants.

It is not an easy task and is one that requires close and continuous attention. It is an ongoing process, and EPA is continuing to revise its regulations to provide the balance to prevent by-products with long-term health effects while keeping the microbiological quality of drinking water as the top priority.

Other Potential Standard Revisions:

The standard for trihalomethanes is not the only one under review by the U. S. Environmental Protection Agency. In the next few years, it is likely that Minnesota water suppliers will have to deal with an anticipated change in standard for arsenic as well as an anticipated change that may not be made in radium.

Arsenic

Arsenic occurs naturally in the environment and, as a component of underground rock and soil, can work its way into groundwater. Adverse health effects associated with long-term exposure to elevated levels of arsenic include problems to the skin, the circulatory system, and the nervous system. Even though there are measurable amounts of arsenic in groundwater in some parts of Minnesota, all public water suppliers in the state are well within the current federal standard of 50 parts per billion (ppb) for arsenic.

However, recent studies have indicated a cancer risk from arsenic in drinking water along the lines of cancer risks from indoor radon and tobacco smoke. In addition, new technology has allowed for the detection of even very small amounts of arsenic. As a result, Congress set deadlines in the 1996 amendments to the federal Safe Drinking Water Act that requires the U. S. Environmental Protection

Agency (EPA) to propose a revised arsenic rule by January 1, 2000 and to finalize the rule by January 1, 2001.

It is unclear exactly what the new maximum contaminant level will be, but it likely will be reduced to somewhere between 2 and 20 ppb. Monitoring from past years indicates that as many as ten percent of Minnesota community water systems could have trouble meeting the new standard if it is set as low as 5 ppb.

The Minnesota Department of Health has been regularly communicating updated information on the issue to the state's water systems that could be affected by a change in the federal standard. Many cities are addressing the subject in comprehensive water studies done on their water systems. Different options are available for reducing arsenic in the finished water supply, although until the new standard is known, it is impossible to identify the exact type of treatment that may be needed.

A process involving aeration and chemical addition can convert arsenic into a state in which it can be removed through filtration. The city of Hector, Minnesota, has been using this method since 1992 and has been able to reduce the level of arsenic—ranging from 24 to 83 ppb in its raw water—to as low as 3 ppb in the finished water.

However, more expensive membrane filtration, involving a reverse-osmosis process, may be required for some systems if the new standard is set below 10 ppb. A utility in western Minnesota recently installed such a system, not for a problem with arsenic but to deal with other compounds in the water. The cost of this system was approximately $1.5 million. Money from the state's drinking water revolving fund, which provides below-market-rate loans to systems to make capital improvements necessary to remain in compliance with the Safe Drinking Water Act, may help with some of the financing, although the investment needed will be considerable if the new standard requires the construction of numerous reverse-osmosis plants in Minnesota. In addition to the cost, a major drawback of reverse-osmosis is the amount of water that is rejected, or wasted, in the treatment. The amount wasted may range from 25 to 35 percent of the water being fed into the reverse-osmosis treatment system.

The Minnesota Department of Health is continuing to regulate arsenic at the current standard of 50 ppb while working with water systems in anticipation of a lower standard in the near future.

Radium

Recent actions (as well as the possibility of inaction) by the EPA concerning the revisions to the radionuclide rule could have a major impact on Minnesota community water systems. On July 18, 1991, EPA had proposed revisions to the radionuclide rule, the most significant being a change in maximum contaminant levels (MCLs) for radium 226 and radium 228. Prior to the proposed rule revision, the MCL for the total of radium 226 and radium 228 was 5 picoCuries/liter (pCi/l). The 1991 rule revision proposed to change the MCL to 20 pCi/l for radium 226 and 20 pCi/l for radium 228.

Radium 226 and 228 are naturally occurring minerals that are commonly found in Minnesota groundwater that is drawn from deeper bedrock aquifers. EPA indicated to MDH that during the time frame between when the rule was proposed in July of 1991 and when it became final (a period that is usually no more than two years), MDH should not require any corrective actions from Minnesota water systems that complied with the proposed MCLs of 20 pCi/l for radium 226 and 20 pCi/l for radium 228. This was good news since none of the Minnesota systems exceeded the proposed MCLs.

However, in December 1997, EPA announced that the radium MCLs will probably *not* be changed to the 20/20 as proposed in 1991 but would remain at a combined radium level of 5 pCi/l. At the time of the last monitoring, approximately 50 community water systems had at least one radium sample in exceedance of of 5 pCi/l. The primary treatment method available to reduce radium is softening, which can be very expensive, especially for those cities with multiple wells or treatment plants.

In June of 1998 MDH convened a meeting affected community water systems to explain the situation and encourage them to contact the EPA and request that the rule be reproposed so that full consideration can be given to health risk considerations and also the magnitude of the costs associated with having to meet a combined radium MCL of 5pCi/l. MDH is still hopeful that EPA will reopen the radionuclide rule and tive more consideration to the health risk of radium versus the costs of treatment. Otherwise, as with the systems that may have to install additional treatment to reduce arsenic levels, many water systems in Minnesota may have to install costly additions to their treatment processes.

Conclusion

Monitoring test results for 1998 tend to reinforce the conclusions of previous years: The quality of Minnesota's drinking water is very high. Even as our monitoring activities have expanded, we have rarely found any detectable contamination. Contaminant levels that exceed applicable health standards have been rarer still. Although we need to remain vigilant, Minnesotans can continue to have confidence in their drinking water.

MDH remains committed to protecting the high quality of our drinking water. The safety of our drinking water should never be taken for granted—but Minnesotans can be assured that their local water supply system is making every effort to ensure that their water is safe. And they can also be assured that the Minnesota Department of Health—and the broader public health community—are working to ensure that their confidence is well placed.

Appendix

Summary of Safe Drinking Water Monitoring Results for Minnesota

Includes Results for Both Community and Non-Community Public Water Supply Systems in Minnesota—1998

The following is a summary of drinking water monitoring test results for **all public water supply systems** *in Minnesota for calendar year 1998. Public water supply systems include all systems that serve 25 or more people on a regular basis, or that have 15 or more service connections. There are approximately 8,900 such systems in Minnesota, including:*

- *approximately 950* **community** *systems, which provide water to consumers in their places of residence. These 950 community systems include approximately 700* **municipal** *systems.*

- *approximately 8,000* **non-community** *systems which provide drinking water in settings like factories, schools, restaurants, and highway rest stops.*

During calendar year 1998, Minnesota had:

- 1 community system and 25 non-community systems that exceeded the MCL of 10 ppm for nitrate

- 1 community system that exceeded the MCL of one ppm for nitrite

- 11 community systems that were in violation of monitoring requirements for nitrate

- 30 community systems and 292 non-community systems that had detectable levels of bacterial contamination when tested for total coliform, and were placed under boil orders

- 39 community systems and 50 non-community systems that were in violation of monitoring requirements for total coliform

- 1 community system and 8 non-community systems that were in violation of treatment technique requirements under the surface water treatment rule

- 15 community systems and 1 noncommunity system that were in violation of monitoring requirements for lead and copper

A full report of monitoring activities for calendar year 1998 is available from the Drinking Water Protection Section, Minnesota Department of Health, Box 64975, St. Paul, MN 55164-0975.