A report from the Minnesota Department of Health

Protecting Public Health:

Securing the Safety of Minnesota's Drinking Water

Drinking Water Protection

A summary of

Drinking Water Protection Activities

in Minnesota for 2002

Issued April 2003
Minnesota Department of Health
Division of Environmental Health

MINNESOTA MDH DEPARTMENT OF HEALTH

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Securing the Safety of Minnesota's Drinking Water

A Summary of Drinking Water Protection Activities in Minnesota for 2002

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This report is available on the World Wide Web at

http://www.health.state.mn.us/divs/eh/water/com/dwar/report02.html

Reports from previous years (through 1995) are also available at this site

Minnesota Department of Health

Drinking Water Protection Section Web Page:

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Introduction

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, radiological, 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.

The section on Emerging Issues, beginning on page 12, contains information on the security of water systems, an issue that is receiving more attention as a result of the September 2001 terrorist attacks, as well as an update on drinking water standards that are being reviewed and revised. Standards set for drinking water are done with a strong margin of safety built in and are constantly being reviewed, a process that sometimes results in the revisions of certain standards. This section also contains news on the educational initiative MDH has been involved in to get curriculum on drinking water into Minnesota classrooms through the establishment of Drinking Water Institutes for teachers.

We hope this information will provide the people of Minnesota with a clearer picture of what is 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 both the safety and the quality of their drinking water.

Executive Summary

The Minnesota Department of Health is responsible for enforcing the federal Safe Drinking Water Act and safeguarding the quality of drinking water in our state. This includes the responsibility of regulating approximately 8,300 public water supply systems statewide. This figure includes 958 *community* systems, which provide drinking water to people in their places of residence. The community systems include 714 *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, 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 community water system may be tested regularly for more than 100 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 such as 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 water 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.

  Standard procedures are followed whenever potential bacterial contamination is detected. Systems are disinfected, flushed, and retested to ensure that any contamination problems are eliminated. All of the residents served by the system are informed of the situation. In some cases, boil water notices are issued, advising residents to boil their water before using it for drinking or cooking.

- **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 problem.

- **Inorganic Chemicals and Radioactive Elements.** Each system is typically tested once every nine years—although, in some cases, it could be as often as once a year—for 13 additional inorganic chemicals. Systems are normally tested every three years for 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.

- **Disinfection By-products.** Disinfection rids drinking water of microbiological organisms, such as bacteria, viruses, and protozoa, that can cause and spread disease. The most common method of disinfection is through the addition of chlorine to drinking water supplies. However, chlorine can combine with organic materials in the raw water to create contaminants called trihalomethanes (THMs) and haloacetic acids (HAAs). Repeated exposure to elevated levels of THMs over a long period of time could increase a person's risk of cancer. By 2003, all community water systems that add a disinfectant to the water must regularly test their treated water to determine if THMs and HAAs are present. If the THMs or HAAs 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.

- **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 water system must do additional testing and take steps to reduce levels. Systems that exceed the action level for lead must also perform an ongoing program of public education.

Note: Any time a drinking water standard is violated, the affected water system must take corrective actions that include notifying its residents of the violation. In addition to this notification, all community water systems issue an annual **Water Quality Report** (sometimes referred to as a **Consumer Confidence Report**) that lists the source of the system's drinking water as well as a list of all regulated contaminants that were detected, even in trace amounts well below the legal standard, during the previous calendar year.

A Current Profile of

Minnesota's Drinking Water Protection Program

Since 1974, the U.S. EPA 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 to 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 25 or more people, or have 15 or more service connections.

Minnesota currently has 8,300 public water supply systems, more than all but six other states. Of those systems, 958 are community systems, which provide 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, 23 of these systems, including the municipal systems that serve the state's largest cities, use surface water, drawn from lakes or rivers.

Of the state's 958 community water systems, 714 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 noncommunity systems provide water to an ever-changing "transient" population at places such as restaurants, resorts, and highway rest stops. Other noncommunity systems may provide water to relatively stable population groups in nonresidential locations such as schools, 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 such as 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 require routine disinfection as a safeguard against 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 compliance 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 for analysis. 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 for taking steps to eliminate potential health hazards.

  Under the provisions of the SDWA, the individual public water supply system is responsible for taking water samples and submitting them to certified laboratories for analysis. To lessen the burden on water supply operators, most of the required samples are collected by field staff from MDH. Minnesota's public 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 more than 100 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,*** beginning on page 7). 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 EPA has developed legal standards known as maximum contaminant levels (MCLs) for 60 of the more than 100 pesticides and industrial contaminants. Advisory standards have been developed for the other pesticides and industrial contaminants, and those are used in the same way as the MCLs in assessing test results.

Any time a community water system exceeds the MCL for one of these contaminants, the water supply operator, with the assistance of MDH, must immediately take steps to notify the people who use the water. 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 one or more times per month 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 an indication that the system is adequately protected against contamination from 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. Standard procedures are followed whenever potential bacterial contamination is detected. Systems are disinfected, flushed, and retested to ensure that any contamination problems are eliminated. All of the residents served by the system are informed of the situation. In some cases, boil water notices are issued, advising residents to boil their water before using it for drinking or cooking.

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 which 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 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 of age. 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 tested for 13 other inorganic chemicals in addition to nitrate. The testing is usually done once every nine years, but it may be done as often as once a year. 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 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, are 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.

Disinfection By-products. Disinfection rids drinking water of microbiological organisms, such as bacteria, viruses, and protozoa, that can cause and spread diseases. 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.

However, even though 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 contaminants called trihalomethanes (THMs) and haloacetic acids (HAAs). Repeated exposure to elevated levels of THMs over a long period of time could increase a person's risk of cancer.

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 and HAAs.

By 2004, all community water systems that add a disinfectant to the water must regularly test their treated water to determine if THMs and HAAs are present. If the THMs or HAAs exceed the limits set by the U. S. EPA, the water system must take action to correct the problem. The corrective actions include notifying all residents served by the water system.

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 water 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 (ppb) for lead or 1,300 ppb for copper. If a system exceeded the action level for lead or copper in more than 10 percent of the locations tested, it 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 of 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 contamination 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 public 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 2002

Pesticides and Industrial Contaminants

During 2002, MDH conducted 21,576 tests for pesticides and industrial contaminants in community water systems. No systems exceeded drinking water standards for these contaminants.

Bacterial Contamination

Twenty-eight community systems—including 19 municipal systems—tested positive for bacterial contamination in 2002. All but four of the affected systems serves fewer than 1,000 people.

The municipal systems that had confirmed coliform bacteria contamination in 2002 were Browns Valley (population 640, Traverse); Chokio (pop. 443, Stevens County); Cold Spring (pop. 2,975, Stearns County); Cuyuna (pop. 120, Crow Wing County); DeGraff (pop.133, Swift County); Dumont (pop. 115, Traverse County); Eitzen (pop. 229, Houston County); Geneva (pop. 449, Freeborn County); Good Thunder (pop. 589, Blue Earth County); Hampton (pop. 434, Dakota County); Hibbing (pop. 22,000, St. Louis County); Holloway (pop. 142, Swift County); Lake City (pop. 4,950, Wabasha County); McIntosh (pop. 638, Polk County); Minnesota Lake (pop. 681, Blue Earth County); Richmond (pop. 1,213, Stearns County); Taylors Falls (pop. 951, Chisago); Verndale (pop. 575, Wadena County); and Waverly (pop. 732 Wright County).

Standard procedures were followed in all of these cases. Systems were disinfected, flushed, and retested to ensure that any contamination problems had been eliminated. All of the residents served by the affected systems were informed of the situation.

Nitrate/Nitrite

One municipal system continued to exceed the nitrate standard in 2002. The affected system is Edgerton (pop. 1,123, Pipestone County), which has constructed a new treatment plant and is now meeting the standard.

Radioactive Elements

Gross Alpha Emitters

Thirteen community water systems—including eight municipal systems—were exceeding the standard for gross alpha emitters on the distribution system in 2002. The affected municipal systems are Green Isle (pop. 357, Sibley County); Hamburg (pop. 538, Carver County); Hinckley (pop. 4,000, Pine County); Medina (pop. 2,623, Hennepin County); Medford (pop. 1,000, Steele County); Norwood (pop. 1,543, Carver County); Red Wing (pop. 15,770, Goodhue County); and Watson (pop. 211, Chippewa County). No restrictions were placed on water consumption, although residents were notified of the situation. Residents were told that this is not an emergency situation and were advised to consult with their doctors if they have any special concerns.

Radium 226 & 228

Fifteen community water systems—including 11 municipal systems—were exceeding the standard for radium 226 & 228 on the distribution system in 2002. The affected municipal systems are Arlington (pop. 2,048, Sibley County); Goodview (pop. 3,000, Winona County); Green Isle (pop. 357, Sibley County); Hamburg (pop. 538, Carver County); Hinckley (pop. 4,000, Pine County); LaCrescent (pop. 4,923, Houston County); Lucan (pop. 226, Redwood County); Medina (pop. 2,623, Hennepin County); Medford (pop. 1,000, Steele County); Norwood (pop. 1,543, Carver County); and Red Wing (pop. 15,770, Goodhue County). No restrictions were placed on water consumption although residents were notified of the situation. Residents were told that this is not an emergency situation and were advised to consult with their doctors if they have any special concerns. Each of these systems has either started to make infrastructure changes or is studying alternatives to meet the MCL.

It is anticipated that many more systems will exceed the MCL once the revised radionuclides rule—which requires samples to be taken from each entry point to the distribution system rather than from a representative point on the distribution—takes effect in 2004.

Other Inorganic Chemicals

No community water systems exceeded the standards for inorganic chemicals in 2002.

Disinfection By-products

No community water systems exceeded the standards for disinfection by-products in 2002.

Lead and Copper

Minnesota's community water supplies are continuing with efforts, begun during the early part of the 1990s, to reduce lead and copper levels in their drinking water.

The systems started their lead/copper testing program in 1992 and 1993. The testing is done by taking first-draw water samples from a number of consumers' taps in the system. If more than 10 percent of the samples exceeded the federal action level of 15 ppb for lead or 1,300 ppb for copper, the entire system was considered to be "in exceedance." Communities that exceeded the action level(s) were required to do additional testing and take steps to reduce the absorption of lead/copper into the water from the water distribution system and/or household plumbing.

When these systems were first tested in the early 1990s, 70 exceeded the action level for lead, 125 exceeded the action level for copper, and 17 exceeded both the lead and copper action levels. Over the decade, approximately 230 systems exceeded the lead and/or copper action level(s) at one time or another. More than 150 of these systems installed corrosion control treatment to minimize the lead/copper levels in their consumers' taps, and 125 of them have since been deemed by the Minnesota Department of Health to have optimized their corrosion control treatment. An additional 47 systems were also deemed to have optimal corrosion control treatment without having installed chemical-treatment process. Only 3 of the initial 87 systems still exceed the lead action level, although overall lead levels in these communities have been significantly reduced through the course of corrosion-control treatment.

Due to the unique characteristics of Minnesota's groundwater, with its tendency to absorb copper, results received from systems that had installed treatment for copper control are less impressive as it compared with treatment for lead. In general, treatments brought a reduction in copper levels at consumers' taps between 50 and 70 percent, with about 60 percent of the systems meeting the copper action level after the treatment. Only three of the initial 142 systems still have a 90th percentile copper level of (the value obtained after disregarding 10 percent of the samples taken that had the highest levels) greater than 2,000 ppb.

About five new systems come onto the list of systems required to install corrosion control treatment each year. The Minnesota Department of Health continues to work with these systems to bring them compliance through treatment optimization.

Emerging Issues

Water System Security

In 2002 the United States Congress passed the Public Health Security and Bioterrorism Preparedness and Response Act of 2002, which includes a section on Drinking Water Security and Safety in the form of an amendment to the federal Safe Drinking Water Act, which requires all community water systems serving a population greater than 3,300 to "conduct a vulnerability assessment of its system to a terrorist attack or other intentional acts intended to substantially disrupt the ability of the system to provide a safe and reliable supply of drinking water."

Assessments by water systems serving more than 100,000 people had to be submitted to the U. S. Environmental Protection Agency (EPA) by March 31, 2003. Minnesota has two systems, Minneapolis and St. Paul, in this category. In July of 2002, each city received an $115,000 grant from EPA for use by the cities for vulnerability assessments and security planning.

Systems serving a population of 50,000 or more but fewer than 100,000 must complete their assessments by December 31, 2003. Systems serving a population of greater than 3,300 but fewer than 50,000 must have their assessments in by June 30, 2004. Minnesota has 12 systems between 50,000 and 99,999 and 136 between 3,301 and 49,999.

The Minnesota Department of Health (MDH) has be conducting workshops around the state on vulnerability assessments for systems that are required to complete and submit them as well as for water systems serving 3,300 or fewer people. Even though these systems are not required to conduct vulnerability assessments, all systems, regardless of size, are encouraged to do them and will be offered help by the state.

MDH district engineers have been highlighting security as part of their normal inspections of water systems. The Health Department has also developed a module on water system security that can be used at training for water operators around the state, in conjunction with a panel discussion, with water utility superintendents and local law enforcement personnel serving as panelists.

In addition, the American Water Works Association has conducted workshops for utilities on vulnerability assessments and counterterrorism and is issuing an Emergency Planning Manual to its members.

Among the things water providers are doing to protect their systems and the water they serve to the public are making sure that all facilities are locked and secure; installing motion sensors and video cameras to monitor, detect, and record events; getting local law enforcement officials to become familiar with their facilities; establishing a procedure with local law enforcement for reporting and responding to threats; and setting up a system for detection, response, and notification issues with local public health officials.

What are the chances of water being intentionally contaminated?
The U.S. Environmental Protection Agency believes the threat of contamination through terrorist activities is small.

For a contaminant to be effective, it must be tasteless, odorless, and colorless. While it may be easy to contaminate a glass of water and camouflage the taste, it is much more difficult to contaminate an entire system due to the sheer size. A contaminant would have to be used in large quantities since it would quickly dilute in the water. In addition, treatment processes already in place at most water utilities will deactivate many contaminants.

Although the likelihood of such an event is small, even a small contamination situation as a result of terrorism will undermine public confidence in the safety of public water systems. This confidence is critical and is one more reason that the superintendents and operators of public water systems must remain on guard at all times.

From well before September 11, water providers have been protecting our drinking water against a variety of threats, including from those who would try to contaminate our water or destroy facilities needed to continue to deliver safe drinking water to people.

Standard Review and Revisions
In the next few years, Minnesota water supplies will have to comply with a change in standard for arsenic and radionuclides, as well as an anticipated rule for radon.

Arsenic
A revision to the Arsenic Rule was finalized in January 2001 with the federal standard of 50 ppb being lowered to 10 ppb. Approximately 40 community water supplies in Minnesota will be affected by the revised rule.

The reduction in the MCL has been anticipated for several years. Water supplies in Minnesota that have measurable levels of arsenic in their water have been studying alternatives and preparing for the possibility of having to add treatment processes or replace existing wells to comply with the new, more stringent standard.

Arsenic occurs naturally in the environment and, as a component of underground rock and soil, can work its way into groundwater, and is found in west central Minnesota.

All public water systems must comply with the new standard by January 2006. Exposure to elevated levels of arsenic will not cause any immediate health effects, although long-term exposure could bring about an increased risk of bladder and skin cancer, as well as problems associated with the circulatory system and the nervous system.

Radionuclides
A revision to the Radionuclides Rule was finalized in December 2000 with a federal standard of 5 picoCuries per liter (pCi/L) for combined radium 226 and radium 228, 15 pCi/L for gross alpha emitters, and 20 pCi/L for uranium. The most significant revision affected the sampling point used for compliance. The former rule required samples to be taken from a representative point on the distribution system, while the revised rule requires samples to be taken from each entry point to the distribution system. It is anticipated that many supplies will be unable to meet the standard at these sampling points when the new rule takes effect in 2006.

Several public water systems currently exceed the existing standard and, while anticipating the revised rule, have been working to meet the standard. These systems have been studying alternatives, including the addition of treatment or the replacement of existing wells, to comply with the revised standard.

Radionuclides are naturally occurring contaminants that are found in groundwater throughout central and southern Minnesota. Long-term exposure to elevated levels of these contaminants may result in an increased risk of cancer. Residents of community water systems can find out the radionuclide levels, if any, in their drinking water by reading the Water Quality Report (sometimes referred to as the Consumer Confidence Report) that is issued each year by their water utility.

Radon
The Radon Rule was proposed in November 1999 with a federal standard of 300 pCi/L and an alternative standard of 4,000 pCi/L. It is anticipated that the rule will be finalized in 2003. For those states that adopt a multi-media mitigation program—which compels citizens, homeowners, schools, and communities to reduce radon exposure from indoor air—a standard of 4,000 pCi/L would apply. For those states that do not adopt the multi-media mitigation program, the 300 pCi/L standard would apply.

In anticipation of this rule, MDH has surveyed water systems and determined that approximately one-third of the community water systems may exceed the standard of 300 pCi/L, while approximately one percent may exceed the standard of 4,000 pCi/L. Routine radon monitoring at community water systems began in 2001.

Radon occurs naturally in both indoor air and groundwater, as a decay product of uranium in the soil. Exposure to radon may occur from soil gases that enter the home or with the use of groundwater that releases radon into the air (showering, washing dishes, cooking, etc.) as well as ingestion of water containing radon. Exposure to radon in air is the second-leading cause of lung cancer in the United States.

Disinfection By-products
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. However, chlorine and other disinfectants have the potential to form by-products that are known to produce harmful health effects. They can combine with organic materials in the raw water to create a group of contaminants called total trihalomethanes as well as haloacetic acids, chlorite, and bromate.

Standards already in place for disinfection by-products are being revised and expanded in the Stage 1 Disinfectants/Disinfection By-products Rule (Stage 1 DBPR), a component of the Microbial-Disinfectants/Disinfection By-products (M-DBP) regulatory package, which was published in December 1998. The rule, expected to reduce the risks associated with exposure to disinfectants and disinfection by-products, includes a more stringent federal standard for total trihalomethanes of 80 ppb and new standards for a group of five haloacetic acids, chlorite, and bromate of 60 ppb, 1.0 ppm, and 10 ppb, respectively. The Stage 1 DBPR also establishes federal standards for the disinfectants chlorine, chloramines, and chlorine dioxide of 4.0 ppm, 4.0 ppm, and 0.8 ppm, respectively.

Systems that use surface water or groundwater under the direct influence of surface water as a source, serving 10,000 or more people, were required to comply with the requirements of the Stage 1 DBPR beginning January 1, 2002. All such systems have conducted two years of preliminary monitoring, and it is expected that none of the systems will have difficulty meeting the Stage 1 DBPR requirements. In an effort to prepare for this rule's effect on the remainder of the state's water systems after January 1, 2004, MDH has conducted an investigative study of total trihalomethane and haloacetic acid levels at 10 groundwater systems serving fewer than 10,000 people. Nine of the 10 systems had by-product concentrations that were low enough to qualify them to reduce their monitoring frequency to once every three years. The peak average for total trihalomethane and haloacetic acid concentrations at the 10 systems were 12 ppb and 5 ppb, respectively.

Disinfection by-products form in source water and distribution systems when a chemical disinfectant is added to water containing inorganic or organic matter. Adverse health effects associated with long-term exposure to elevated levels include increased risk of bladder cancer as well as damage to blood and kidneys. Several disinfection by-products have been shown to cause cancer and adverse reproductive and developmental effects in laboratory animals. A weak association has been suggested between certain cancers or reproductive and developmental effects and exposure to chlorinated surface water.

Source Water Protection

Source water protection is a method of preventing contamination of the wells, rivers, and lakes that supply public water systems by effectively managing potential contaminant sources in the area. Minnesota's public water systems have been active in source water protection efforts over the last 10 years, and 2003 will be an important year for source water protection in Minnesota, as source water assessments will be produced for all of the state's public water systems this year.

Key Elements in source water protection include:

- **Source Water Assessments**

A source water assessment is a document produced by the Minnesota Department of Health that provides basic information to public water systems and the general public about their drinking water. Specifically, source water assessments include the following:

  - A description of the drinking water source for the public water system—such as a well, river, or lake—and the area that supplies water to that source.
  - A description of the susceptibility of the water source to contamination. This describes how likely it is that water source may become contaminated.
  - Contaminants of concern to anyone using the drinking water source.

All public water systems in Minnesota will receive a completed source water assessment by May 30, 2003, as required by the federal Safe Drinking Water Act. In addition, source water assessments will be made available to the public on the MDH Drinking Water Protection web site. Providing this information to the public is important as it helps communities understand potential threats and identify priority needs to safeguard water supplies.

- **Wellhead Protection**

  All public water systems using groundwater (that is, wells) must participate in source water protection by carrying out wellhead protection efforts. The information provided in the source water assessment, as described above, can help water systems implement wellhead protection. Wellhead protection activities include:

  - Delineating a protection area. The area supplying water to the well is defined and mapped.
  - Identifying potential sources of contamination. An inventory will be conducted in the wellhead protection area to identify possible contaminant sources.
  - Managing and monitoring potential sources of contamination. Communities and public water systems work together to reduce the possibility of their water supplies becoming contaminated. Tools to protect water sources may include isolation distances, which keep contaminant sources at a safe distance from the well, local land-use ordinances, zoning, conservation easements, and land purchases.
  - Establishing a contingency plan. A contingency plan will help a public water system and a community prepare for emergency situations and ensure a safe water supply in the future.
  - Developing wellhead protection plans. A wellhead protection plan is a public water system's comprehensive approach to protection of their water source(s) and includes the elements discussed above.

- **Protection of Surface Water Intakes**
  Protection of surface water intakes is not required, but many of the Minnesota water systems that use surface water have expressed an interest in developing source water protection plans. MDH staff has been working with these water systems to create source water assessments and assist in the development of their source water protection plans.

Conclusion

Monitoring test results for 2002 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 even more rare. 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 for 2002

The following is a summary of drinking water monitoring test results for all public water supply systems in Minnesota for calendar year 2002. 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 8,300 such systems in Minnesota, including:

- *958* **community** *systems, which provide water to consumers in their places of residence, including 714* **municipal** *systems.*

- *approximately 7,300* **noncommunity** *systems, which provide drinking water in settings like factories, schools, restaurants, and highway rest stops.*

Minnesota issued the following violations in calendar year 2002; in some cases, the violations were issued to water systems that were already in exceedance of the particular standard:

- 12 noncommunity systems with a violation of the maximum contaminant level (MCL) for nitrate.
- 0 community systems with a violation of the MCL for nitrite.
- 28 community systems with a violation of the MCL for total coliform.
- 245 noncommunity systems with a violation of the MCL for total coliform.
- 2 community systems with a violation of the MCL for combined radium.
- 2 community systems with a violation of the MCL for gross alpha emitters.
- 31 noncommunity systems with a treatment technique violation for the Surface Water Treatment Rule.
- 2 community systems with a treatment technique violation for the Surface Water Treatment Rule.
- 14 community systems with a violation of the Consumer Confidence Rule.
- 2 community systems with a treatment technique violation of the Lead and Copper Rule

A report which lists all violations of the Safe Drinking Water Act in Minnesota for calendar year 2002 is available from the Drinking Water Protection Section, Minnesota Department of Health, Box 64975, St. Paul, MN 55164-0975. This is also available on the world wide web through a link in the Appendix at http://www.health.state.mn.us/divs/eh/water/cinfo/dwar/report02.html or at:

http://www.health.state.mn.us/divs/eh/water/cinfo/dwar/summary2002.pdf
http://www.health.state.mn.us/divs/eh/water/cinfo/dwar/pwsid2002.pdf
http://www.health.state.mn.us/divs/eh/water/cinfo/dwar/contaminant2002.pdf

Note: *Although a public water supply may be out of compliance with more than one contaminant or violation type, when calculating totals, it's counted no more than once within the population being totaled; as a result, the sum of number of public water systems in violation over the various violation types or contaminants may not add up to the total.*

Individual water systems produce an annual report listing contaminants that were detected, even in trace amounts, during the previous calendar year. Please contact the individual water system if you would like a copy of this report.

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