EPA United States Environmental Protection Agency

# Providing Timely Drinking Water and Source Water Quality Information to Your Community

## Des Moines Water Works' Project

EMPACT

Environmental Monitoring for Public Access & Community Tracking

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# Providing Timely Drinking Water and Source Water Quality Information to Your Community

## Des Moines Water Works' Project

**National Risk Management Research Laboratory**

**Office of Research and Development**

**U. S. Environmental Protection Agency**
**Cincinnati, Ohio 45268**

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# Contents

# Foreword

The Technology Transfer and Support Division of the EPA Office of Research and Development's (ORD's) National Risk Management Research Laboratory initiated the development of this handbook to help interested communities, particularly those with medium and large public water systems, learn more about the Des Moines Water Works (DMWW) EMPACT project. DMWW's EMPACT project provides Des Moines metropolitan community residents with timely information about the factors that affect their drinking water supply. ORD, working with DMWW, produced this handbook to transfer the lessons learned from the project and reduce the resources needed to implement similar projects in other communities.

You can order copies of this handbook (both print and CD-ROM versions) online at ORD's Technology Transfer Web site at *http://www.epa.gov/ttbnrmrl*. You can also download a PDF version of the handbook from this site. In addition, you can order print and CD-ROM versions of the handbook by contacting either ORD Publications or the Office of Water Resource Center at:

EPA ORD Publications
26 W. Martin Luther King Dr.
Cincinnati, OH 45268-0001
EPA NSCEP Toll free: 800-490-9198
EPA NSCEP Local: 513-489-8190

EPA Office of Water Resource Center (RC 4100)
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
Phone: 202-260-7786
E-mail: center.water-resource@epa.gov

Please make sure you include the title of the handbook and the EPA document number in your request

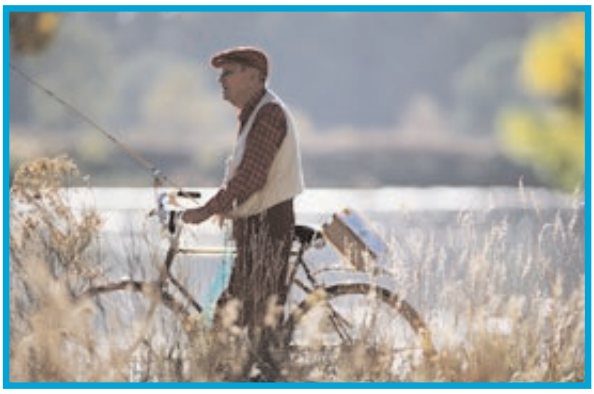
.

We hope that you find this handbook worthwhile, informative, and easy to use.

# 1 Introduction

Would residents in your community have trouble answering these types of questions:

- How safe is your drinking water today?
- How healthy are the watersheds in and around your community?
- Could simple changes in your lifestyle help improve water quality in your area?
- How would you measure these improvements, and what would they mean to you and your family?



If so, your water utility and the community residents it serves would benefit from a project that uses new and innovative methods and technologies to deliver timely, accurate, and understandable information about the quality of drinking water and source water in your area.

This handbook has been designed with this goal in mind:

> **To show you how one water utility—the Des Moines Water Works (DMWW)—is implementing a project to provide timely drinking water and source water quality information to the Des Moines metropolitan community.**

The handbook provides a detailed case study of DMWW's project to encourage medium and large water utilities (or communities responsible for supplying drinking water) to consider adopting strategies for delivering timely data to the public. Although small water systems and communities not subject to federal drinking water regulations are not likely to have the resources to implement such a project, these entities may also find some portions of this handbook valuable.

## ABOUT THE EMPACT PROGRAM

This handbook was developed by the U.S. Environmental Protection Agency's (EPA's) EMPACT program. EPA created EMPACT (Environmental Monitoring for Public Access and Community Tracking) in 1997. The program is now administered by EPA's Office of Environmental Information.

The EMPACT program promotes new and innovative approaches to collecting, managing, and communicating environmental information to the public. Working with communities in 156 of the largest metropolitan areas across the country, the program takes advantage of new technologies to provide community members with timely, accurate, and understandable environmental information they can use to make informed, day-to-day decisions about their lives. EMPACT projects cover a wide range of environmental issues, including water quality, ground water contamination, smog, ultraviolet radiation, and overall ecosystem quality. To learn more, visit EPA's EMPACT Web site at *http://www.epa.gov/empact.*

## 1.1 What Do Water Utilities Do?

Water utilities are responsible for producing drinking water of consistently high quality for their consumers. EPA and the states develop and enforce standards to protect the quality of drinking water, and water utilities must meet these standards. Producing high quality drinking water ideally follows an approach with multiple barriers to prevent contaminants from reaching consumers. The earliest possible barrier (i.e., the most ideal barrier) is watershed and wellhead protection, which ensures that contaminants do not enter source water. Therefore, strong environmental stewardship is an essential element of drinking water supply.

### DRINKING WATER VS. SOURCE WATER

When considering the responsibilities of water utilities, it is very important to distinguish between drinking water and source water:

**Drinking water** is water that is conveyed to residences and businesses from a public water system. Typically, this water is treated by a water utility to make it potable. Drinking water is sometimes referred to as finished water.

**Source water** (i.e., raw water) is ambient water that is accessed by water utilities to treat for distribution as drinking water. Source water can originate in either a surface source (such as a lake, river, or reservoir) or a subsurface source (such as a well).

Water utilities collect and analyze drinking water and source water quality data to facilitate the following:

- Produce and deliver high quality water.
- Assure consumers and regulators that drinking water is of high quality.
- Continue to improve the quality of drinking water through research.

Water utilities are challenged every day. The regulatory environment is changing. Science is also changing, as is our knowledge of water quality and how it impacts consumers and the environment is changing. Water utilities continually strive to improve the performance of their treatment and distribution systems, make improvements to meet new challenges, and communicate with consumers in an honest and timely manner.

### THE WATER DATA AND TOOLS PROJECTS

DMWW's EMPACT project is one of four *Time-Critical Water Data* and *Tools Projects*. These projects were formed through a partnership between the EMPACT program and EPA's Office of Water. Through case studies of these four unique projects, the Water Data and Tools initiative is designed to demonstrate local capability to collect and communicate water quality data that are meaningful, defensible, and easily accessible, and build a framework to encourage other communities to do the same through technology transfer and outreach.

## WATER DATA AND TOOLS PROJECTS

| Project | Locations | Web site | Data and Tools |
|---|---|---|---|
| Chesapeake Bay | Baltimore, MD<br>Washington, DC | *http://mddnr.chesapeakebay.net/empact* | Water quality in support of Pfiesteria surveil lance |
| Jefferson Parish | New Orleans, LA | *http://www.jeffparish.net* | Freshwater diversions and algal blooms |
| Ohio River | Cincinnati, OH<br>Louiseville, KY<br>Pittsburgh, PA | *http://www.orsanco.org/empact* | Swimming and fishing conditions |
| Des Moines | Des Moines, IA | *http://www.dmww.com/empact* | Drinking water and source water quality |

*Visit http://www.epa.gov/surf2/empact/tools.html for more information on the EMPACT Water Data and Tools Projects.*

## 1.2 Why is it Important to Communicate Timely Drinking Water and Source Water Quality Information to the Public?

All members of a community have a right to know about the current quality of their drinking water because drinking water quality affects public health. The need to provide timely drinking water quality data is most urgent when these data indicate an acute result that can have immediate effects on a utility's customer population. Your efforts to provide your customers with timely information on the quality of their drinking water will build public confidence in your utility's ability to provide safe, healthy, reliable drinking water. Businesses relying on consistently high-quality water to support a production process can use timely water quality information to determine whether to maintain or modify their processes. By disseminating these timely data on a Web site, you may reduce the number of phone calls to your utility from consumers or manufacturers seeking specific water quality test results.

From a human health perspective, the urgency for timely source water quality information is typically less than that for drinking water quality information. However, the timeliness of source water quality information may be critical when spills or other environmental emergencies occur in the watershed. The presentation of timely source water quality data and trends on a Web site can inform and influence the behavior of residents in your watershed. This heightened public awareness would not only enable local residents and public officials to make informed decisions about land use management and water conservation measures, but would also encourage affected groups to take a larger and more proactive role in instituting practices to restore and preserve the quality of source waters.

## 1.3 Des Moines Water Works' EMPACT Project

DMWW is the largest water utility in the state of Iowa. Serving over 350,000 people, DMWW operates two major water treatment plants and pumps an average of 43 million gallons of water per day.

In 1998, EPA's EMPACT program funded DMWW's EMPACT project, which provides Des Moines metropolitan community residents with timely information about the factors that affect their drinking water supply. DMWW's EMPACT project is broken into three phases:

- Phase I is the development of a data management protocol, tools, and electronic links required to identify, manage, and deliver **drinking water quality** information to the project Web site.
- Phase II is the periodic collection, Web posting, and updating of **source water quality** information collected from selected monitoring sites within the Racoon River and Des Moines River watersheds.
- Phase III is the adaptation of the methods and tools developed for Phases I and II to existing **urban runoff studies** conducted by DMWW.

DMWW's EMPACT project strives to encourage Des Moines residents, as well as the entire watershed community, to assume a larger role in restoring and preserving the quality of source waters in the community. Project partners include EPA's Office of Groundwater and Drinking Water (OGWDW), EPA Region VII, the Iowa Department of Natural Resources, and the United States Geological Survey (USGS). You can visit DMWW's EMPACT project Web site at *http://www.dmww.com/empact.*

### 1.3.1 Project Costs

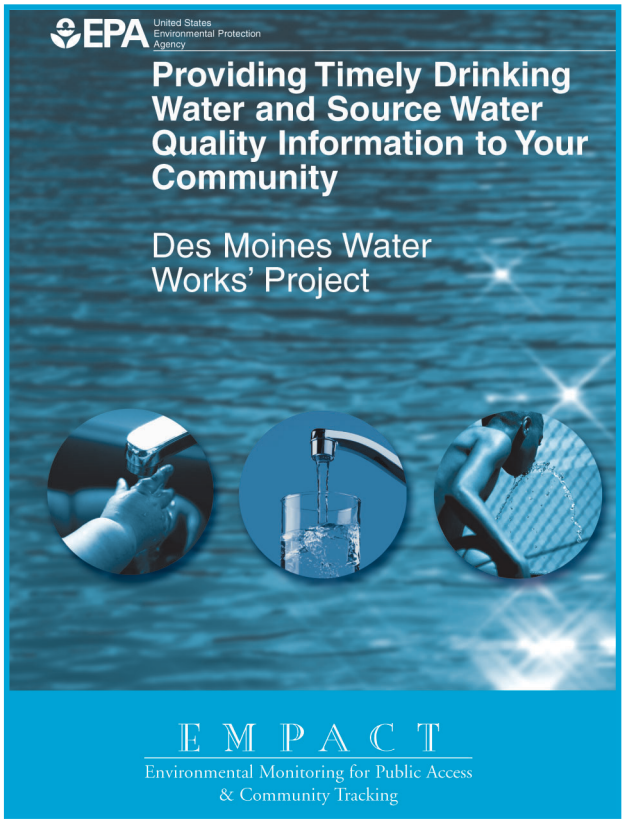
To plan, design, develop, install, and implement the three phases of its EMPACT project, DMWW incurred a total cost of approximately $245,000. This cost should give you an idea of how much a comparable project might cost your utility. However, every project that communicates timely information about drinking water and source water quality is unique to its community. Therefore, the cost of your project will also be unique.

# 2 How To Use This Handbook

This handbook has been designed to show you how DMWW is implementing a project to provide timely drinking water and source water quality information to the Des Moines metropolitan community. The handbook intends to encourage medium and large water utilities (or communities responsible for supplying drinking water) to consider adopting strategies for delivering timely data to the public. Although small water systems and communities not subject to federal drinking water regulations are not likely to have the resources to implement such a project, these entities may also find some portions of this handbook valuable.

The handbook is organized into the following chapters:

- **Chapter 3** presents an overview of water quality monitoring. Specifically, the chapter discusses the federal and state regulations and guidelines applicable to drinking water and source water. It also discusses typical methods used by water systems to collect and disseminate information about drinking water and source water quality. Chapter 3 is targeted toward readers who are not familiar with federal and state drinking water and source water regulations and guidelines. Therefore, water utility personnel are likely already familiar with the material presented in this chapter.
- **Chapter 4** presents an overview of DMWW operations and discusses the key programs and systems that support these operations. Specifically, the chapter discusses DMWW's sample collection/analysis program, data management system, and communications/outreach program. It also discusses the integrated collection of software and hardware components that further supports DMWW's operations. This chapter is targeted toward all readers.
- **Chapter 5** presents a detailed case study of DMWW's EMPACT project. The chapter describes the three project phases in detail and discusses the EMPACT project area on DMWW's Web site. This chapter is targeted toward all readers.
- **Chapter 6** focuses on communications and outreach. The chapter discusses many of DMWW's communication/outreach efforts. Chapter 6 is targeted toward personnel tasked with implementing an outreach plan.
- **Appendix A** contains brochures and pamphlets related to DMWW's communication/outreach plan, including a Consumer Confidence Report. These materials are discussed in Chapter 6.
- **Appendix B** presents a glossary of terms used in the handbook. This glossary is targeted toward all readers.



- **Appendix C** presents a brief case study of the EMPACT Water Quality Project implemented at the Water Quality Division of Tucson Water in Tucson, Arizona. This appendix is targeted toward all readers.
- **Appendix D** presents general guidance on creating a comprehensive outreach plan and provides a list of resources for presenting water quality information to the public. This appendix is targeted toward personnel tasked with implementing an outreach plan.

Throughout this handbook, you will find lessons learned and success stories related to DMWW's EMPACT project. You will also find references to supplementary information sources, such as Web sites, guidance documents, and other written materials that will provide you with a greater level of detail.

# 3 Water Quality Monitoring—An Overview

All water–even from the healthiest rivers and lakes–contains naturally occurring substances from the soil, surrounding vegetation and wildlife, and biological, physical, and chemical processes. Some water sources may be contaminated by man-made chemicals or the by-products of industrial processes. The purpose of water quality monitoring is to measure the presence and quantity of these constituents or parameters in water. This chapter introduces the concept and measurement of water quality from the perspective of drinking water utilities and discusses some of the regulations and guidelines that public water systems must follow to protect water quality.

Section 3.1 provides a general introduction to the concept of drinking water and source water quality monitoring related to drinking water utilities. Sections 3.2 and 3.3 discuss the federal and state regulations and guidelines that public water systems must follow to protect the quality of drinking water and source water, respectively. These sections also introduce the water quality monitoring and communication requirements associated with these regulations and guidelines.

## TO LEARN MORE

To learn more about water quality, consult the following references and Web sites:

- EPA's Water Projects and Programs page at: *http://www.epa.gov/epahome/waterpgram.htm*.
- EPA's Office of Ground Water and Drinking Water (OGWDW) site at: *http://www.epa.gov/safewater/*.
- Drinking Water: Past, Present, and Future. USEPA/OW, February 2000, EPA 816-F-00-002.
- National Library of Medicine drinking water page at: *http://www.nlm.nih.gov/medlineplus/drinkingwater.html.*
- The National Agricultural Library Water Quality Information Center site at: *http://www.nal.usda.gov/wqic*.
- For questions about drinking water requirements under the Safe Drinking Water Act (SDWA), contact the Safe Drinking Water Hotline at (800) 426-4791 or via e-mail at *hotline-sdwa@epa.gov.*
- See Appendix D for additional references.

## 3.1 Introduction to Water Quality Monitoring

The quality of water affects how we are able to use it; conversely, the way we use our water can affect its overall quality. The federal government, states, and localities are all involved in the regulation, monitoring, and control of our nation's waters to protect the quality of water for its intended use. Therefore, it is important to distinguish between the quality of drinking water and the quality of source water.

### PUBLIC WATER SYSTEMS

There are approximately 170,000 public water systems in the United States. EPA classifies these water systems according to the number of people they serve, the source of their water, and whether they serve the same people year-round or on an occasional basis. Public water systems, which may be either publicly or privately owned, provide water for human consumption through pipes or other constructed conveyances to at least 15 service connections or serve an average of at least 25 people for at least 60 days per year. EPA has defined three types of public water systems:

**Community Water System**: A public water system that supplies water to the same population year-round. For example, the water system operated by DMWW (a water utility) is considered a community water system. There are approximately 54,000 community water systems operated in the United States.

**Non-Transient Non-Community Water System**: A public water system that regularly supplies water to at least 25 of the same people for at least six months per year, but not year-round. Some examples are water systems at schools, factories, office buildings, and hospitals. There are approximately 20,000 non-transient non-community water systems operated in the United States.

**Transient Non-Community Water System:** A public water system that provides water to at least 25 people per day in a place such as a gas station or campground where people do not remain for long periods of time. There are approximately 93,000 transient non-community water systems operated in the United States.

The federal and state regulations and guidelines designed to protect the quality of these waters are discussed in the following sections.

## 3.2 Regulation of Drinking Water

Federal regulation of drinking water quality began in 1914, when the U.S. Public Health Service set standards for certain disease-causing microbes. Today, water quality is protected by a variety of different regulations and guidelines.

Through the **Safe Drinking Water Act** (SDWA) established in 1974 and revised in 1986 and 1996, Congress authorized EPA to set enforceable health standards and required public notification of water utility violations and annual customer reports on contaminants found in drinking water. Under the authority of the SDWA, EPA sets standards for approximately 90 contaminants in drinking water. Currently, standards are set for the following:

- **Microorganisms**, including (but not limited to) *Cryptosporidium, Giardia lamblia, Legionella,* total coliforms (including fecal coliform and *E. coli*), and viruses. Although some of these contaminants occur naturally in the environment, most

originate in human and animal fecal waste. Many of these contaminants can cause gastrointestinal illness if ingested. *Legionella* can cause Legionnaire's disease.

- **Disinfectants and disinfection byproducts**, including (but not limited to) bromate, chloramines, chlorine, chlorine dioxide, chlorite, haloacetic acids, and total trihalomethanes. These contaminants are either water additives used to control microbes or byproducts of the disinfection process. Potential health effects vary with each contaminant; they range from eye/nose irritation, stomach discomfort, and anemia to liver, kidney, and nervous system effects and the increased risk of cancer.
- **Inorganic chemicals,** including antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, copper, cyanide, fluoride, lead, mercury, nitrate, nitrite, selenium, and thallium. These contaminants originate from a variety of different sources, including (but not limited to) discharges from industrial processes, erosion of natural deposits, corrosion of pipes, and runoff. Potential health effects are specific to each contaminant; they can include circulatory system problems, skin damage, intestinal polyps and lesions, increased blood pressure, kidney damage, nerve damage, thyroid problems, bone disease, and the increased risk of cancer.
- Various **organic chemicals**. As with the inorganic chemicals, these contaminants originate from a variety of different sources, including (but not limited to) discharges from industrial processes, agricultural and municipal runoff, and leaching from pipes. Potential health effects are specific to each contaminant; they can include kidney, liver, immune system, nervous system, circulatory system, and gastrointestinal problems, reproductive difficulties, anemia, and the increased risk of cancer.
- **Radionuclides**, including alpha particles, beta particles and photon emitters, Radium 226 and Radium 228, and uranium. These contaminants may originate through the erosion and decay of natural and man-made deposits. If ingested, they may potentially increase the risks of cancer. Uranium may also cause kidney toxicity.

For each of these contaminants, EPA sets a legal limit, called a maximum contaminant level (MCL), or requires a certain type of treatment. Water utilities may not distribute drinking water that doesn't meet these standards. Most states have been delegated the authority to enforce the federal standards; state standards must be at least as strict as the federal standards.

**National Primary Drinking Water Regulations** are legally enforceable standards that apply to public water systems. Primary standards protect public health by limiting the levels of drinking water contaminants, including microorganisms, disinfectants and disinfection byproducts, inorganic chemicals, organic chemicals, and radionuclides. You can visit *http://www.epa.gov/safewater/mcl.html* for detailed information on the contaminants regulated by national primary drinking water regulations.

**National Secondary Drinking Water Regulations** are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. Examples of these contaminants include metals, pH, total dissolved solids, odor, and color. You can visit *http://www.epa.gov/safewater/mcl.html* for detailed information on the contaminants regulated by national secondary drinking water regulations. Although EPA recommends

secondary standards to public water systems, the Agency does not require that these systems comply. States may, however, choose to adopt secondary standards as enforceable standards.

### HEALTH EFFECTS

The health-related contaminants regulated by primary and secondary drinking water regulations fall into two groups according to the health effects they may cause:

**Acute effects** occur within hours or days of the time that a person consumes a contaminant. People can suffer acute health effects from almost any contaminant if they are exposed to extraordinarily high levels (as in the case of a spill). In drinking water, microbes such as bacteria and viruses are contaminants with the greatest chance of reaching levels high enough to cause acute health effects. Most people's bodies can fight off these microbial contaminants; acute contaminants typically don't have permanent effects. Nonetheless, when high levels occur, acute contaminants can make people ill and may be dangerous or deadly for the very young, the very old, or people with immune systems weakened by HIV/AIDS, chemotherapy, steroid use, or other reasons.

**Chronic effects** occur after people consume a contaminant at levels over EPA's safety standards for many years. The drinking water contaminants that can have chronic effects are chemicals (such as disinfection by-products, solvents, and pesticides), radionuclides (such as radium), and minerals (such as arsenic). Examples of the chronic effects of drinking water contaminants can include cancer, liver or kidney problems, or reproductive difficulties.

## 3.2.1 Monitoring Drinking Water Quality

Water utilities perform a wide range of water quality monitoring to meet several purposes. First, water utilities routinely monitor and test public water systems to ensure compliance with the more than 90 contaminants for which EPA has set national primary drinking water regulations. Second, water utilities must also meet more stringent and additional monitoring requirements set by the individual states. Finally, water utilities conduct other routine monitoring as part of their day-to-day operations to ensure treatment effectiveness and to ensure that finished water quality meets both health and aesthetic objectives. This testing includes routine sampling as well as check sampling to confirm the results of any problems discovered during routine sampling. Monitoring locations and frequency are based on the parameters being monitored and are specific to each water utility based on its source water type, size, treatment process, and distribution system. Some drinking water parameters are monitored constantly while others are monitored only every few years.

The table on the following page shows the major groups of contaminants and the minimum testing frequency to comply with the monitoring requirements under EPA's national primary drinking water regulations. If a problem is detected, there are immediate retesting requirements that go into effect and strict instructions for how the public is informed. The retesting is continued until the water system can reliably demonstrate that it is free of problems.

| CONTAMINANT | MINIMUM MONITORING FREQUENCY |
|---|---|
| **Acute Contaminants** | |
| **Bacteria** | For community water systems, samples are collected throughout each monthly monitoring period, ranging from 1 sample per month to 480 samples per month depending on the system size. For non-community water systems, sampling is conducted once per quarter. |
| **Protozoa and Viruses** | Continuous monitoring for turbidity and monthly monitoring for total coliforms, as indicators. |
| **Nitrate/Nitrite** | Quarterly sampling for surface water systems and annual sampling for groundwater systems. |
| **Chronic Contaminants** | |
| **Volatile Organics (e.g., benzene)** | Quarterly sampling at each entry point into the water system, reduced to annual (or less frequent) sampling if no detects. |
| **Synthetic Organics (e.g., pesticides)** | Quarterly sampling at each entry point into the water system, reduced to annual (or less frequent) sampling if no detects. |
| **Inorganics/Metals** | For groundwater systems, sampling is conducted once every 3 years. For surface water systems, sampling is conducted annually. |
| **Lead and Copper** | Annual sampling is required, with the number of sites ranging from 5 to 100, based on the size of the system. |
| **Radionuclides** | Four consecutive quarters of sampling during initial annual compliance period; subsequent monitoring frequency is reduced if levels are below the detection limit. |

*Sample Compliance Monitoring Schedule Required Under EPA Regulations.*

### 3.2.2 Public Notification of Drinking Water Violations

Federal regulations require that water utilities notify the people they serve when any violation of a drinking water contaminant standard has occurred or any other situation has occurred that may pose a short-term risk to health. As utilities test their water, they may discover that levels of certain contaminants are higher than federal or state standards. These conditions may occur due to a change in local water conditions, heavy rainstorms, or an accidental spill of a hazardous substance. Water utilities may also fail to collect one or a series of their required samples at the scheduled interval. Any time a water utility fails to meet any EPA or state standards for drinking water (including missing required samples or collecting them late), the utility must inform the people who drink the water.

Depending on the severity of the situation, water utilities have from 24 hours to 1 year to notify the people they serve of a violation. EPA specifies three categories, or tiers, of public notification. For each tier, water utilities have different amounts of time to distribute the notice and different ways to deliver the notice:

**Immediate notice (Tier 1)**: Any time a situation creates the potential for immediate human health impacts, water utilities have 24 hours to take whatever steps are necessary to notify people who may drink the water. In these situations, water utilities must use mass media outlets such as television and radio, post their notice in public places, or personally deliver a notice to the people they serve.

**Notice as soon as possible (Tier 2):** Any time a water utility distributes water that hasn't been treated properly or contains contaminants at levels that exceed EPA or state standards, the utility must notify the people it serves as soon as possible, within 30 days of the violation as long as the situation does not pose an immediate risk to human health. The water utility must provide notice through the mail or via hand delivery to residences and through posting in conspicuous places for other persons served by the water system.

**Annual Notice (Tier 3):** When a water utility violates a drinking water standard but the violation does not have a direct impact on human health (for example, failing to take a required sample on time), the utility has up to 1 year to provide a notice of this situation to the people it serves. This extra time gives water utilities the opportunity to consolidate these notices and send them with annual water quality reports (Consumer Confidence Reports, described below).

Regardless of their tier classifications, all notices must include the following:

- A description of the violation that occurred, including the potential health effects.
- The population at risk and whether alternate water supplies should be used.
- What the water utility is doing to correct the problem.
- Actions consumers can take.
- When the violation occurred and when the water utility expects it to be resolved.
- How to contact the water utility for more information.
- Language encouraging broader distribution of the notice.

In addition to Tier 1 and Tier 2 notices, EPA requires that water utilities place annual drinking water quality reports into the hands of the people they serve. These reports, called Consumer Confidence Reports (CCRs), enable consumers to make practical, knowledgeable decisions about their health and their environment. Water utilities may enhance their reports as they wish; however, each report must provide consumers with fundamental information about their drinking water.

The first of these reports came out in 1999; water utilities now publish reports by July 1 every year. CCRs are the centerpiece of the "right-to-know" provisions in the 1996 Amendments to the SDWA. The Amendments contain several other provisions aimed at improving public access to information about drinking water, including the annual public water system compliance report and improved public notification in cases where drinking water is not meeting a contaminant standard. You can read more about these reports at *http://www.epa.gov/safewater/ccrl.html.* In addition, examples of CCRs from DMWW are included in Appendix A.

## WHAT DETERMINES THE PUBLIC NOTIFICATION TIER?

The following violations, situations, or conditions require Tier 1, Tier 2, or Tier 3 notifications. For more information on the Public Notification Rule, visit *http://www.epa.gov/safewater/pn.html*.

### Tier 1

- Fecal coliform violations; failure to test for fecal coliform after an initial total coliform sample tests positive.
- Nitrate, nitrite, or total nitrate/nitrite maximum contaminant level (MCL) violation; failure to collect a confirmation sample.
- Chlorine dioxide maximum residual disinfectant level (MRDL) violation in the distribution system; failure to collect required samples in the distribution system.
- Exceedence of the maximum allowable turbidity level (if elevated to Tier 1 by the primacy agency).
- Special notice for non-community water systems with nitrate exceedences between 10 mg/L and 20 mg/L, where the system is allowed to exceed 10 mg/L by the primacy agency.
- An outbreak of a waterborne disease or other waterborne emergency.
- Other violations or situations determined by the primacy agency.

### Tier 2

- All MCL, MRDL, and treatment technique violations, except where a Tier 1 notice is required.
- Monitoring violations, if elevated to Tier 2 by the primacy agency.
- Failure to comply with variance and exemption conditions.
- Turbidity consultation: When public water systems have a treatment technique violation resulting from a single exceedence of the maximum allowable turbidity limit or an MCL violation resulting from an exceedence of the 2-day turbidity limit, they must consult their primacy agency within 24 hours. The primacy agency will then determine whether a Tier 1 notice is necessary. If consultation does not occur within 24 hours, the violation is automatically elevated to Tier 1.

### Tier 3

- Monitoring and testing procedure violations, unless the primacy agency elevates the violation to Tier 2.
- Operation under a variance and exemption.
- Special public notices such as a fluoride secondary maximum contaminant level (SMCL) exceedence or the availability of unregulated contaminant monitoring results.

### WHAT'S IN A CONSUMER CONFIDENCE REPORT?

CCRs must provide consumers with the following fundamental information about their drinking water:

- Identification of the lake, river, aquifer, or other drinking water source.
- A brief summary of the susceptibility of the drinking water source to contamination based on the source water assessments that states are currently completing.
- Directions on how to get a copy of the water system's complete source water assessment.
- The level (or a range of levels) of any contaminant found in local drinking water along with EPA's legal limit (MCL) for comparison.
- The likely source of that contaminant in the local drinking water supply.
- The potential health effects of any contaminant detected in violation of an EPA health standard and a description of the utility's actions to restore safe drinking water.
- The compliance of the water system with other drinking water-related rules.
- An educational statement for vulnerable populations about avoiding *Cryptosporidium*.
- Educational information on nitrate, arsenic, or lead in areas where these contaminants are detected at levels greater than 50% of EPA's standard.
- Phone numbers for additional sources of information, including the water utility and EPA's Safe Drinking Water Hotline (800-426-4791).

## 3.3 Source Water

In contrast with drinking water, federal regulation of source water quality has been less detailed and has allowed for more flexibility in the monitoring and reporting of source water quality. While many states, water utilities, and localities have watershed and wellhead protection/management programs, the 1996 SDWA Amendments placed a new focus on source water quality. The 1996 Amendments require states to implement Source Water Assessment Programs (SWAPs) to assess areas serving as drinking water sources and identify potential threats to these sources. You can read more about source water assessments at *http://www.epa.gov/safewater/protect/assessment.html*.

By 2003, states are required to complete a source water assessment for every public water system. Each SWAP will be uniquely tailored to state water resources and drinking water priorities. However, each assessment must include four major elements:

- A delineation (or map) of the source water assessment area.
- The potential sources of contamination in the delineated area.
- The susceptibility of the water supply to those contamination sources.
- Public release of the assessment results.

State SWAPs have been reviewed and approved by EPA; states and localities are currently in the process of developing source water assessments. These assessment reports will be provided to the public in a variety of ways. Some states plan to convene public workshops, while others will have copies available at public libraries, local government offices, or water sup-

pliers. Many states also plan to post the assessment summaries on the Internet. In addition, the results of the assessments will be included in the annual water quality reports that community water systems are required to prepare for the people they serve. You can find links to each state's drinking water and source water protection pages at *http://www.epa.gov/safewater/dwinfo.html.*

In addition to the source water assessment requirements of the SDWA Amendments, all surface source waters are federally regulated by the Clean Water Act (CWA) and the rules and regulations that have been developed under that authority. The CWA impacts those sources (both point sources and nonpoint sources) that contribute pollutants to the nation's surface waters. Point sources are stationary locations or fixed facilities from which pollutants are discharged. Nonpoint sources are diffuse sources of pollutants associated with land use or groundwater flow. Examples include runoff from agriculture, forestry, or urban activities. You can learn more about the CWA and all associated programs and requirements at *http://www.epa.gov/ow.*

### 3.3.1 Monitoring Source Water Quality

Typically, source water quality monitoring is conducted by water utilities to determine the quality of water feeding the water treatment system and adjust the treatment process based on raw water characteristics. In addition, many localities and water utilities conduct source water monitoring as part of their watershed and wellhead protection/management programs.

Water utilities are not required by the regulations under the Safe Drinking Water Act to provide source water quality monitoring results to either EPA or the public, but they may choose to do so through program-specific outreach products, such as Web sites.

## CLEAN WATER ACT PROGRAMS THAT IMPACT SURFACE SOURCE WATER QUALITY

**The Water Quality Criteria and Standards Program.** This program includes a compilation of national recommended water quality criteria for the protection of aquatic life and human health for approximately 150 pollutants. These criteria have been published pursuant to Section 304(a) of the CWA and provide guidance for states and tribes to use in adopting water quality standards. These water quality criteria cover the following types: aquatic life, biological, drinking water, human health, and nutrient. You can find out more about this program at *http://www.epa.gov/waterscience/standards.*

**The National Pollutant Discharge Elimination System (NPDES) Permitting Program.** This program requires that all point sources discharging pollutants into waters of the United States obtain an NPDES permit. These permits implement water quality standards and effluent limitations guidelines that have been developed for specific industrial categories. You can find out more about this program at *http://www.epa.gov/owm/npdes.html.*

**Nonpoint source programs such as the Total Maximum Daily Load (TMDL) Program.** Under Section 303(d) of the CWA, states, territories, and authorized tribes are required to develop lists of impaired waters. These impaired waters do not meet water quality standards that states, territories, and authorized tribes have set for them, even after point sources have installed minimum required levels of pollution control technology. The TMDL rule requires that these jurisdictions establish priority rankings for waters on the list and develop TMDLs for these waters. A TMDL not only specifies the maximum amount of a pollutant (its loading) that a water body can receive and still meet water quality standards but also allocates pollutant loadings among point and nonpoint sources. While TMDLs have been required by the CWA since 1972, until recently states, territories, tribes, and EPA have not developed many. Several years ago, citizens' organizations began bringing legal actions against EPA seeking the listing of waters and the development of TMDLs. To date, there have been about 40 legal actions in 38 states, and EPA is under court order or consent decrees in many states to ensure that TMDLs are established, either by the state or by EPA. Currently, EPA is working to develop changes to the TMDL regulations. Until then, the current TMDL rule remains in effect. You can find out more about this program at *http://www.epa.gov/owow/tmdl* and at *http://www.epa.gov/owow/nps.*

**EPA's Clean Lakes Program.** The Clean Lakes Program was established in 1972 as Section 314 of the Federal Water Pollution Control Act to provide financial and technical assistance to states in restoring publicly owned lakes. The early focus of the program was on research and development of lake restoration techniques and evaluation of lake conditions. The Clean Lakes Program regulations promulgated in 1980 redirected the program activities to diagnose the current conditions of individual lakes and their watersheds, determine the extent and sources of pollution, develop feasible lake restoration and protection plans, and implement these plans. The CWA Amendments of 1987 expanded the program to include state-wide assessments of lake conditions. EPA has encouraged states to use these assessment funds to develop the institutional and administrative capabilities needed to carry out their lake programs. You can find out more about this program at *http://www.epa.gov/owow/lakes.*

# 4 Des Moines Water Works

DMWW is the largest municipal water utility in the state of Iowa. Serving over 350,000 people, DMWW operates two water treatment plants and pumps an average of 43 million gallons of water per day. This chapter briefly discusses many of the day-to-day operations conducted at DMWW and introduces some of the key programs and systems that support DMWW's operations.

## 4.1 Overview of DMWW Operations

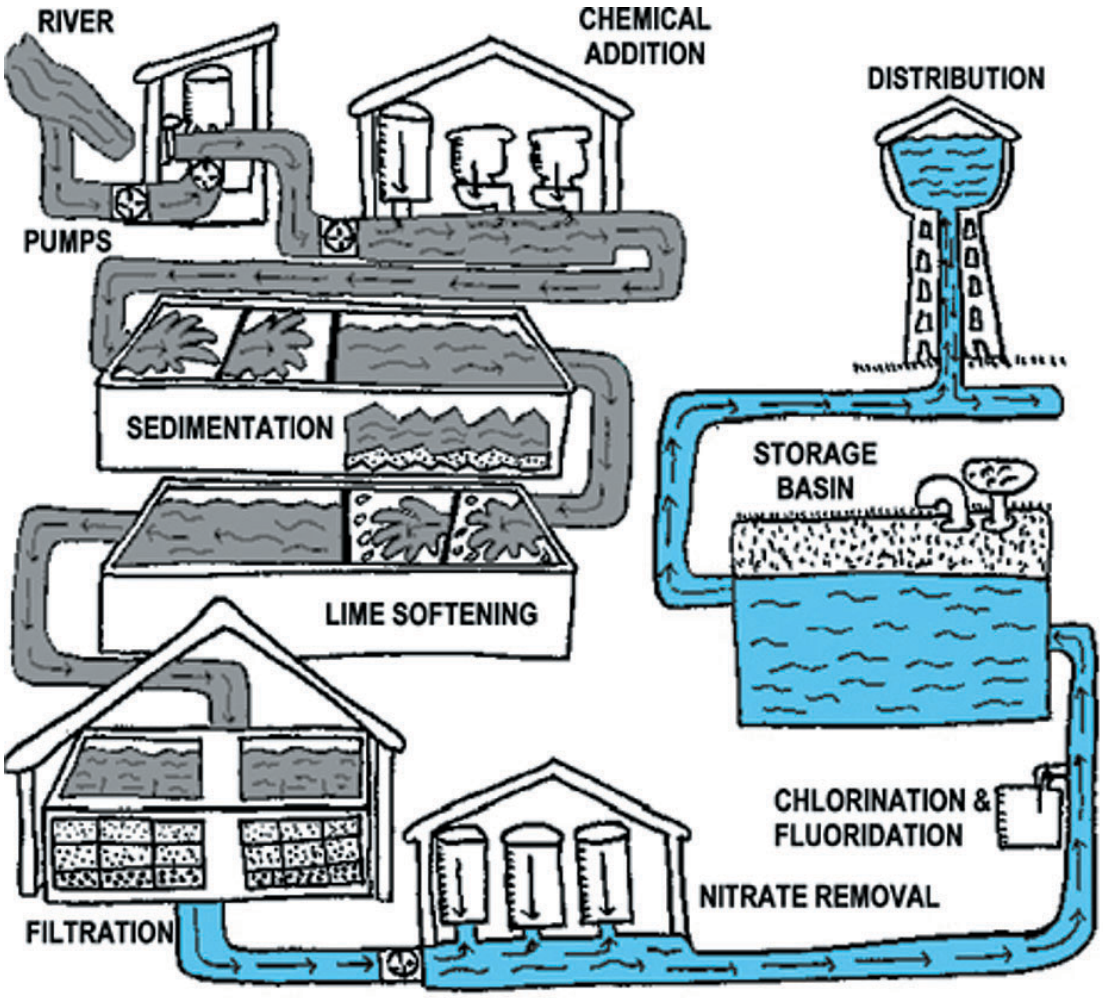
DMWW is located on the banks of the Raccoon River in the city of Des Moines. The utility draws source water from the Raccoon River, the Des Moines River, an infiltration gallery, and several wells. The infiltration gallery is a large horizontal well constructed in the sand and gravel adjacent to the Raccoon River. It yields river water and groundwater that have been naturally filtered through the sand and gravel. DMWW selected these source water supplies based on the quality of these waters and the utility's ability to treat these waters.

DMWW maintains an emergency supply of source water in the Maffitt Reservoir. This reservoir, constructed for DMWW during the 1940s, is located southwest of the Des Moines metropolitan area within 600 acres of wooded land; the area is popular for fishing and hiking. To enhance the quality of water in the reservoir, DMWW recently purchased 105 acres of surrounding farmland to provide watershed protection.

DMWW operates two drinking water treatment plants: the Fleur Drive plant and the Maffitt plant. The Fleur Drive plant (considered the main plant) has the capacity to treat 100 million gallons of source water per day. It is operated by DMWW staff on a continuous basis. The Maffitt plant was constructed to address reliability issues that arose when a serious flood put the Fleur Drive plant underwater and out of service in 1993. In addition to providing a backup for the main plant, the Maffitt plant provides an additional 25 million gallons of drinking water per day for the growing Des Moines population. The Maffitt plant is in service on a continuous basis; it is adjacent to the Maffitt Reservoir, located about 10 miles southwest of the main plant, outside of the Raccoon River flood plain. Typically, DMWW operates the Maffitt plant remotely.

Both of DMWW's treatment plants use a multi-step process to treat source water. The typical treatment process used at the Fleur Drive plant is illustrated in the diagram on page 18 and briefly described below.

- Source water for the Fleur Drive plant is obtained from the Raccoon River, the Des Moines River, and the infiltration gallery system.
- Powdered activated carbon is fed into river water to remove man-made and natural organic chemicals (thereby improving the taste and odor). Ferric chloride is added to remove particulates. The pre-treated river water is then combined with water from the infiltration gallery.
- The combined water is softened with soda ash and/or lime. Alum or ferric chloride is added to remove minerals and other particles from the softened water.




*Typical treatment process used at DMWW's Fleur Drive Plant*

- The pH of the water is adjusted with carbon dioxide, and the water is stabilized with polyphosphate.
- The water is filtered through layers of sand to remove any remaining particles.
- When increased levels of nitrate are possible in river water, DMWW treats the water in its nitrate removal process.
- Fluoride is added to the water to aid in the prevention of tooth decay, and chlorine is added as a disinfectant to kill bacteria. The treated drinking water is stored in a clear well until it is pumped into the distribution system.

Water at the Maffitt plant is treated using a similar multi-step process. Because source water for this plant is usually obtained exclusively from wells, DMWW does not pre-treat this water as it does river water. Also, DMWW does not operate a nitrate removal process at the Maffitt plant because nitrate is typically found at low levels in the well water.

Through more than 800 miles of underground water mains and pipe (both iron and plastic), DMWW distributes drinking water from both treatment plants to the Des Moines

metropolitan community. DMWW provides total water service (including distribution system maintenance) to the city of Des Moines, Polk County, Windsor Heights, and the Warren County Water System. Through this total water service, DMWW performs preventative maintenance on all valves and hydrants, detects main leaks, repairs main breaks, and replaces and repairs valves and hydrants. In addition, the utility reads meters, makes service calls, prepares bills, and responds to customer service inquiries. DMWW also supplies water to several other cities, communities, and water systems. For example, the utility maintains a partnership with the city of Ankeny. Through this partnership, DMWW provides drinking water, reads meters, manages billing, and responds to customer service inquiries while the city of Ankeny makes service calls and maintains its own distribution system.

In addition to its drinking water treatment and distribution responsibilities, DMWW operates the Water Works Park, about 1,500 acres of land near downtown Des Moines.

## 4.2 Support Programs and Systems

DMWW relies on several programs and systems to support its day-to-day operations. Sections 4.2.1 through 4.2.3 discuss a few of DMWW's key support programs and systems: the sample collection/analysis program, the data management system, and the communications/outreach program. All of DMWW's operations are further supported by an integrated collection of software and hardware components; this support system is discussed in Section 4.2.4.

### 4.2.1 Sample Collection/Analysis

DMWW monitors the quality of its drinking water and source water to satisfy both treatment process control and regulatory requirements. (See Chapter 3 for a discussion of applicable regulatory requirements and guidelines.) The utility maintains an in-house laboratory to conduct a variety of analyses on its water samples. To ensure that data are accurate and representative, DMWW follows a comprehensive set of procedures for sampling and laboratory quality assurance/quality control (QA/QC); many of these procedures are required by EPA. DMWW has a quality assurance project plan (QAPP) in place to document its adherence to these procedures.

#### DMWW'S QUALITY ASSURANCE PROJECT PLAN (QAPP)

DMWW's QAPP provides a detailed framework for the utility's sampling and analytical procedures. Specifically, DMWW's QAPP covers the following:

- The laboratory mission, organizational structure, personnel, the physical facility, laboratory reagents and supplies, reagent standardization, contamination control, and laboratory safety.
- Standard sampling procedures, acceptance criteria, chain-of-custody, a sampling plan for softening analyses, non-routine sampling, and on-site analysis.
- Inorganic, organic, and microbiological analytical procedures.
- Data quality assurance.
- Preventative equipment maintenance schedules, routine maintenance procedures, instrument performance and optimization, protocol for correcting equipment problems, and equipment use and maintenance record-keeping.
- Equipment inventory.

DMWW collects and analyzes samples within its water treatment and distribution system. The table below lists the drinking water parameters typically monitored by DMWW. Asterisks identify the parameters monitored to fulfill regulatory requirements for DMWW's drinking water. [Note that the parameters marked with asterisks do not add to the 90 federally regulated parameters because some listed parameters (e.g., HAAs, SOCs, VOCs) represent more than one standard and others have been omitted because subsequent monitoring has been waived or is very infrequent.] Monitoring frequency (monthly, weekly, daily, or continuous) varies with each analysis. The utility uses Hach® CL-17 analyzers to monitor chlorine levels and Hach® 1720D analyzers to monitor turbidity levels in its drinking water. These analyzers are connected, with other treatment process control monitors, to DMWW's supervisory control and data acquisition (SCADA) system. The SCADA system is equipped with data monitors and alarms with pre-set parameter levels to assist DMWW's water production personnel with monitoring the treatment system around the clock.

*The Hach® 1720D Process Turbidimeter*

*® CL-17 alyzer*

DMWW also periodically collects and analyzes source water samples. The table on the next page lists the source water parameters that are typically monitored by DMWW. When the utility is operating its nitrate removal process, DMWW monitors Nitrate-N to fulfill the requirements of its state operating permit. Monitoring frequency (monthly, weekly, daily, or continuous) varies with the source water type and location and each analysis. Samples are collected from selected sites within the Raccoon River and Des Moines River watersheds, wells, and the Maffitt Reservoir.

## DRINKING WATER PARAMETERS TYPICALLY MONITORED BY DMWW

| | | | |
|---|---|---|---|
| Acetochlor* | Conductivity | Mercury* | Sodium |
| Antimony* | Copper | Metolachlor* | Sulfate* |
| Arsenic* | *Cryptosporidium* | Nitrate-N* | SUVA* |
| Atrazine* | *E. coli** | Nitrite-N* | Temperature |
| Barium* | Fluoride* | Odors | Thallium* |
| Bromide | HAAs* | O-phosphate | THMs* |
| Cadmium* | HPC* | P-alkalinity | TOC* |
| Calcium hardness | Iron | pH* | Total coliforms* |
| CCPP* | Langalier's Index | Potassium | Total hardness |
| Chloride | Lead* | Radionuclides* | Turbidity* |
| Chlorine | Manganese | Selenium* | UV-254* |
| Chromium* | Magnesium hardness | SOCs* | VOCs* |

**Parameters collected to fulfill regulatory requirements are marked with asterisks.*

## SOURCE WATER PARAMETERS TYPICALLY MONITORED BY DMWW

| | | |
|---|---|---|
| Acetochlor | Iron | Potassium |
| Ammonia | Lead | Sodium |
| Atrazine | Manganese | Sulfate |
| Bromide | Magnesium hardness | SUVA |
| Calcium hardness | Metolachlor | Temperature |
| Chloride | Nitrate-N* | TOC* |
| Copper | Nitrite-N | Total coliforms |
| *Cryptosporidium* | O-phosphate | Total hardness |
| *E. coli* | Odors | Turbidity |
| Fluoride | P-alkalinity | UV-254 |
| HPC | pH | |

**Parameters collected to fulfill regulatory requirements are marked with asterisks.*

## URBAN RUNOFF STUDIES

DMWW conducted a series of urban runoff studies to determine the microbial and chemical influences of main urban creek watersheds on the utility's source waters. Each of DMWW's source water rivers has a primary urban creek (Walnut Creek for the Raccoon River and Beaver Creek for the Des Moines River) with a branch that not only meanders through residential and business areas but also extends beyond these areas into agricultural land. Walnut Creek is multi-branched and eventually empties into the Raccoon River 2 miles upstream of DMWW's water intake. Beaver Creek has one main creek channel plus a small branch. The mouth of Beaver Creek is located 3 miles upstream of DMWW's Des Moines River water intake.

DMWW conducted its urban runoff studies over a 2-3 year period. To determine the microbial and chemical influences of these creeks, DMWW tested creek water for total *E. coli* counts, nitrate, ammonia, and other chemistry determinations. Samples were collected by a DMWW laboratory technician during a rainfall event. DMWW performed the creek sampling using two different approaches. One approach was to sample water from the creek mouth, water from the river upstream from the creek, and water from DMWW's downstream intake. The second approach involved a complete or nearly complete study that used the basic approach above but included several other creek monitoring sites. DMWW selected 12 mapped sampling sites for the Beaver Creek watershed and up to 20 mapped sampling sites for the Walnut Creek watershed.

The results of DMWW's urban creek studies indicate that bacterial contamination of Des Moines urban creeks sometimes significantly affects the bacterial counts found in DMWW's source water rivers, despite the relatively small amounts of flow from these creeks. DMWW determined that the high bacteria levels in urban creeks are likely the result of pet and wild animal waste deposited in Des Moines metropolitan storm sewers; however, DMWW did locate more than one broken sewer line during its studies. DMWW's results also indicate that urban runoff accounts for very little of the nitrate measured in the utility's source water.

### 4.2.2 Data Management

DMWW carefully manages and validates its monitoring data to ensure that only data of known and documented quality are used to make environmental and operational decisions. DMWW's data validation process is illustrated in the flow diagram on page 23.

Data management begins with DMWW's laboratory analyst. All sample analyses must adhere to the laboratory QA/QC procedures documented in DMWW's QAPP. The laboratory analyst enters data that meet these requirements and the QC measurements made during the analysis into a laboratory information management system (LIMS). The LIMS automatically compares the data (both the analytical result and the QC measurements) to a range of acceptable values that DMWW has pre-programmed into the LIMS. The system flags data as suspect if they do not fall within the range. The laboratory analyst carefully reviews the data she has entered to ensure that she has not made a typographical error. The control range feature in the LIMS can help the analyst quickly identify suspect or erroneous data during her review.

After DMWW's data have been reviewed by the laboratory analyst, these data are validated by either DMWW's QA/QC officer or QA/QC supervisor. These personnel conduct their validation reviews in light of their extensive experience with the operation and control of DMWW's treatment process, historical trends in DMWW's water quality, and close communication with DMWW's treatment process operators and supervisors. Specifically, the QA/QC officer and QA/QC supervisor perform the following types of analyses:

- Compare data within the LIMS control range with hard-copy analytical results to locate any incorrectly transcribed data that may have still fallen within the LIMS control range and were therefore not detected by the laboratory analyst.
- Review records and documentation to ensure that samples were collected and nalyzed correctly.
- Review data in light of historical water quality measurements, treatment process expertise, and other known factors that may affect the values of certain parameters. During this review, the QA/QC officer or supervisor determine whether or not the data seem logical.

When his review is complete, either the QA/QC officer or the QA/QC supervisor marks validated data as "approved" in the LIMS. Because the LIMS package allows for the validation of individual analytical results, DMWW can approve one result and reject another result measured in the same sample. In some cases, DMWW may collect additional samples and/or repeat laboratory analyses to replace certain erroneous results. DMWW's data management process can take anywhere from a few hours to one week, depending on the staff available to perform the separate data reviews. Data are prioritized for review based on the significance of the results to the operation of DMWW's water treatment process.

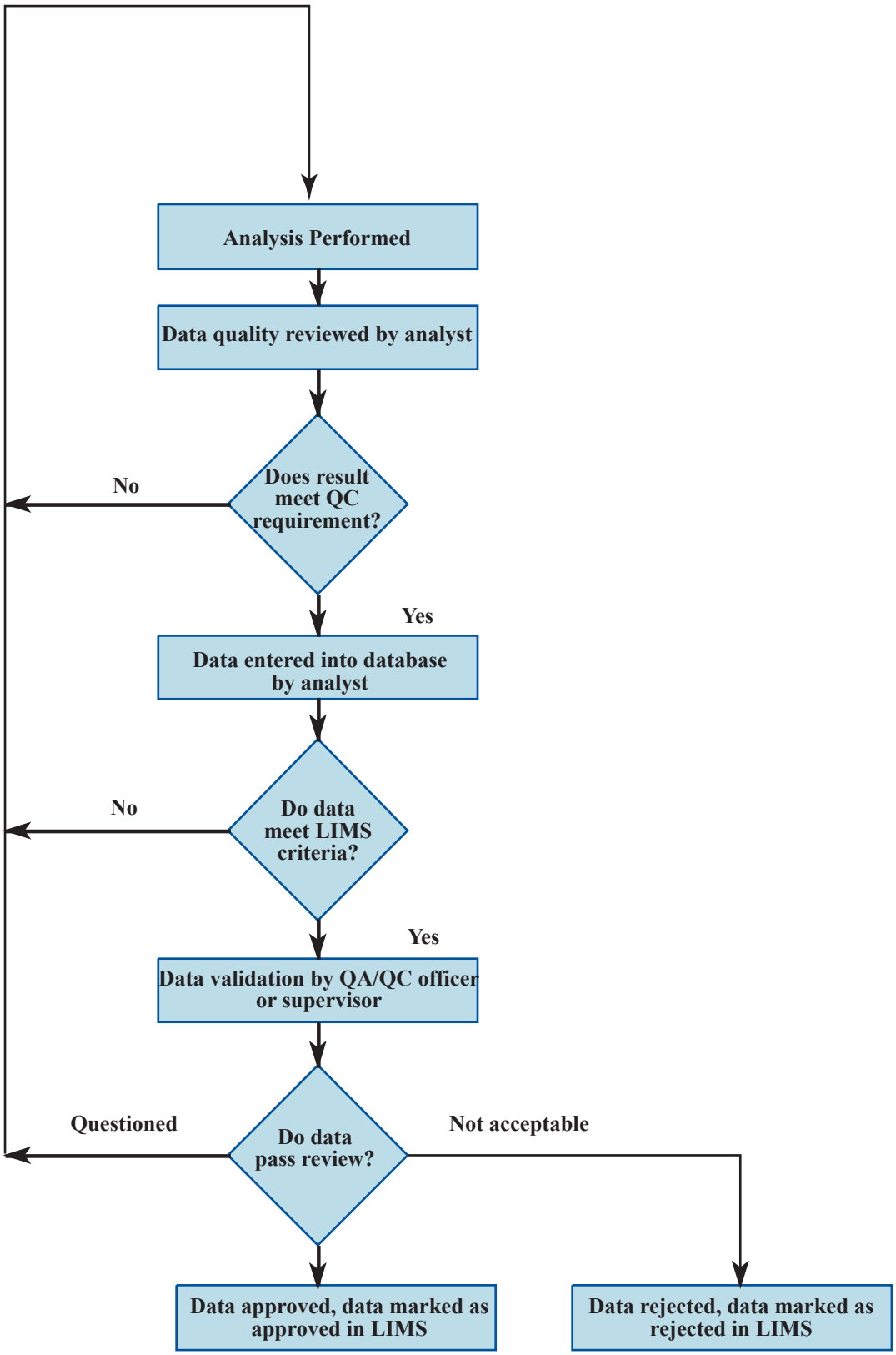
### 4.2.3 Communication and Outreach

DMWW follows a comprehensive plan for communication and outreach. Through this plan, DMWW uses several different mechanisms and products to convey information to the Des Moines metropolitan community. See Chapter 6 for more detailed information about DMWW's outreach plan. Some of DMWW's communications/outreach products and mechanisms are briefly introduced below.

**The Monthly Newsletter: H2O Line.** DMWW's monthly newsletter provides DMWW's customers with information on current issues related to drinking water and source water quality.

**Annual Consumer Confidence Report.** DMWW's June newsletter typically functions as a Consumer Confidence Report (CCR). The CCR, required by federal drinking water regulations, enables DMWW community residents to make practical, knowledgeable decisions

## DMWW's Data Validation Process



about their health and their environment. See Chapter 3 of this handbook for more information on the CCR and the federal regulations that require its publication.

**Welcome Brochure.** DMWW sends a "Welcome" brochure to all of its new customers. The pamphlet contains a variety of useful introductory information, including billing and payment options, a description of DMWW's treatment process, information about the services provided by DMWW, and applicable rules/regulations.

**Annual Business Report.** The main goal of DMWW's annual report is to present financial information to its customers; however, DMWW also includes a few pages of educational materials in the report. The content of these materials depends on issues and concerns of the current year.

**Other Outreach Mechanisms.** DMWW visits area schools to teach children of all grade levels about drinking water and source water. The utility also offers tours of its facilities to school children and adults. DMWW prepares technical outreach information for conferences held by organizations such as the American Water Works Association. In addition, the utility has prepared a series of fact sheets to answer specific questions from its customers.

**The DMWW Web Site**. DMWW uses its Web site *(http://www.dmww.com)* to communicate a wide variety of information to the Des Moines community.

### 4.2.4 Software and Hardware Systems

DMWW operates an integrated collection of software packages and hardware devices designed and programmed to compile, manage, retrieve, and post data and information in support of DMWW's day-to-day operations. This integrated system consists of three general components: the database server, the firewall, and the Web server. Consider these definitions:

- **Database Server**. A database server hosts a database management system, a software package that allows users to store and modify information in a database.
- **Firewall.** A firewall is either a hardware device, a software package, or a combination of these mechanisms designed to protect internal computer systems from intentional, hostile intrusion from outside sources.
- **Web Server.** A Web server hosts a software system that allows for data delivery to outside users over the Internet or internal users over an Intranet.

These system components are briefly discussed below.

#### Database Server

DMWW uses a database server to support both regulatory and treatment process control requirements for data compilation and management. DMWW's database server, a Hewlett-Packard® UXTM™ workstation, hosts an Oracle™ DBMS (Version 7.3.2) to manage the utility's drinking water and source water data. The Oracle™ database is relational, which means that it allows DMWW to store data in the form of related tables. As discussed previously, DMWW also uses a laboratory information management system (LIMS) package developed by PE Nelson to support its analytical data management requirements. DMWW selected the PE Nelson LIMS package based on its ease of use, system security features, flexibility, minimal hardware and equipment requirements, and compatibility with the utility's existing Oracle™ DBMS.

A request to extract information from the database is made in the form of a query. Although different database management systems support different types of query languages, Structured Query Language (SQL) is typically considered to be the most common format for constructing queries. DMWW's Oracle™ DBMS supports SQL (PL/SQL); DMWW personnel write code in SQL to query data.

DMWW personnel perform all DBMS maintenance and management. The utility has found that this maintenance can be very time consuming. DMWW's QA/QC officer dedicates at least 30 percent of his time to maintaining and managing DMWW's DBMS; he feels that the system typically requires about 50 percent of his time. DMWW conducts daily, monthly, and annual tape backups of all data on its internal network; archived data are stored in a secure location. The utility's monthly archives are maintained for 2 years. DMWW never discards its annual archives.

### Firewall

DMWW uses a Borderware™ firewall to protect its internal computer systems and Web site. A firewall examines all data traffic between two networks to determine if the traffic pattern meets certain criteria for security. If the criteria are met, the firewall allows data to flow between the networks. If the criteria are not met, the firewall halts the data transmission. A firewall can filter both inbound and outbound data traffic using a variety of filtering techniques.

### Web Server

DMWW's Web server allows DMWW to serve data over the Internet using Hyper Text Markup Language (HTML), a program language used for publishing information on the Web.

DMWW's Web server hosts its Web site, which provides a location on the Internet for the utility's customers to access information. DMWW has an existing high-speed Internet connection and a fully functioning Web site to communicate with its customers.

# 5 DMWW's EMPACT Project

In 1998, EPA's EMPACT program funded DMWW's EMPACT project, which provides Des Moines metropolitan community residents with timely information about the factors that affect their drinking water supply. This project is designed to enhance DMWW's day-to-day operations and community outreach program, in part, through the delivery of timely drinking water and source water quality information. The project strives to encourage Des Moines residents, as well as the entire watershed community, to assume a larger role in restoring and preserving the quality of community source waters.

This chapter presents a case study of DMWW's EMPACT project. Section 5.1 discusses the project phases. Section 5.2 discusses DMWW's EMPACT project Web site.

## 5.1 DMWW's EMPACT Project Phases

DMWW's EMPACT project is broken into three phases:

- Phase I is associated with the Web posting and updating of timely **drinking water** quality information.
- Phase II is associated with the Web posting and updating of timely **source water quality** information and supporting static information and documents.
- Phase III is associated with the Web posting of static results from DMWW's **urban runoff studies.**

These phases are discussed in detail below.

### 5.1.1 DMWW EMPACT Project—Phase I

Phase I of DMWW's EMPACT project focuses on the posting and updating of timely drinking water quality data to the EMPACT project area of DMWW's Web site. The table on page 28 presents the parameters and sampling frequencies for the Phase I data that are available on DMWW's project Web site. DMWW selected this subset of parameters based on what the utility felt would be of greatest interest to the Des Moines metropolitan community.

All drinking water data associated with the EMPACT project are validated and processed through DMWW's data management system (discussed in Chapter 4). Overall, DMWW's data management process has not been enhanced to support the utility's EMPACT project; DMWW has always required timely water quality data to effectively operate its treatment system. DMWW's EMPACT project does not directly increase or decrease the amount of time required to perform data validation; however, the implementation of the EMPACT project may in some cases require additional resources for QA/QC reviews.

All validated data are available for extraction and posting to the EMPACT project area of DMWW's Web site. Data that fail any of the data management review steps are marked as suspect or rejected; these data are not delivered to the public. Data are prioritized for review based on the significance of the results to the operation of the water treatment process. To ensure that most data are available to Web users within 1 week of collection, DMWW follows a review schedule (e.g., the QA/QC officer or supervisor plans to review data on Wednesday and Friday of each week).

| PARAMETER | REGULATED‡ | SAMPLING FREQUENCY |
|---|---|---|
| Alkalinity (Total) | | Daily |
| Carbonate Precipitation Potential | | Weekly |
| Calcium Hardness as $CaCO_3$ | | Daily |
| Chloride | | Weekly |
| Chlorine (Free) | ✓ | Continuous online |
| Conductivity | | Weekly |
| *Cryptosporidium* | | Monthly |
| Fluoride | ✓ | Daily |
| Heterotrophic Plate Count Bacteria | ✓ | Daily |
| Langeliers Index | | Weekly |
| Magnesium Hardness as $CaCO_3$ | | Daily |
| Metals (potassium, sodium, iron, manganese) | | Monthly |
| Metals (lead, copper) | ✓ | Monthly |
| Nitrate - N | ✓ | Weekly/daily when near MCL |
| Nitrite - N | ✓ | Weekly |
| Ortho-Phosphate | | Weekly |
| Pesticides (Metolachlor, Acetochlor, Atrazine) | ✓ | Weekly (April–October) |
| pH | | Daily |
| Silica (Reactive ) | | Annually |
| Sulfate | | Weekly |
| Temperature | | Daily |
| Total Dissolved Solids (TDS) | | Weekly |
| Total Hardness as $CaCO_3$ | | Daily |
| Total Coliforms | ✓ | Daily |
| Total Organic Carbon (TOC) | | Weekly |
| Total Trihalomethanes | ✓ | Weekly |
| Turbidity | ✓ | Continuous online |

‡Regulated constituents must be reported to the Iowa Department of Natural Resources (IDNR) as part of a regular compliance program. Unregulated constituents are monitored for general water quality and treatment process information but not reported to the IDNR.

*Timely data for these drinking water quality constituents are available on the EMPACT project area of DMWW's Web site.*

## VALIDATING TIMELY DATA

The analysis of drinking water is well regulated and conducted by certified laboratories using EPA-approved methods. A very important part of the data management process is data validation, which must occur before drinking water sample results can be considered final and ready for public release. The reason for this part of the process is to avoid the unnecessary public concern that would occur if invalid positive results were released and then found to be incorrect. For most parameters, the data validation process can occur in only a few days. Thus, in this context, timely data is that which minimizes the time between the generation of validated sample results and the availability of these results to the public. Typically, the time between sampling drinking water and providing the validated sampling results to the public can range from a few days to a maximum of 3 weeks.

To increase the timeliness of water quality data available to the Des Moines community, DMWW could post "provisional" data to the EMPACT project area of its Web site shortly after laboratory analysis. Although provisional data have met the QA/QC requirements for sample collection and laboratory analysis, these data are not validated. DMWW has chosen not to post provisional data to its Web site because the utility feels that the potential disadvantages of posting erroneous data (e.g., causing unnecessary community alarm) outweigh the advantages of increasing the timeliness of these data.

During the design and construction of Phase I, DMWW dedicated its resources to developing the data delivery approach, technical systems, and communications/outreach goals required to support all phases of its EMPACT project. DMWW spent approximately 2 years completing the design and construction of Phase I.

During the design of the data delivery approach and technical systems, DMWW analyzed its hardware and software systems to determine the utility's existing technical resources and expertise, identify the key technical issues to be addressed during EMPACT project design, and identify potential technical challenges. After fully evaluating its existing systems, DMWW chose to dedicate a significant portion of its EMPACT project funding to support the skilled technical labor (both internal and external) necessary create a new DMWW EMPACT project area on the utility's existing Web site and build the mechanisms necessary to deliver timely data to that site.

First, DMWW replaced its existing Web server. The new server runs Microsoft® Internet Information Server (IIS) 4.0™. DMWW selected Microsoft® IIS 4.0™ because it provides the utility with a platform for building more sophisticated Internet applications. At first, DMWW attempted to create an electronic link from the new Web server to its existing Oracle™ database. However, this link proved to be both unreliable and inefficient. DMWW suspects that these issues arose due to certain differences in communication between the Oracle™ and Microsoft® systems. To resolve these differences, DMWW converted an existing SQL Server database into a staging area for the data and electronically linked this database to the Web server. Each night, approved data are extracted from DMWW's Oracle™ database and stored in the SQL Server database. When a user requests information from the EMPACT project area on DMWW's Web site, these data are pulled from the SQL Server database. See Section 5.2 for more information on DMWW's Web site.

In some ways, DMWW's decision to modify some of its existing technical components conserved funding and resources: DMWW was not required to purchase many significant pieces of hardware and software to support its EMPACT project. In other ways, DMWW's decision resulted in some challenges: DMWW and its contractors were required to dedicate extra resources to closely examine and redesign specific features of the existing technical components to create a fully functional and compatible data delivery system.

While designing the data delivery system, DMWW considered its available technical resources (both internal and external) to support not only the design and development of the system but also the long-term implementation of the system. DMWW's project phasing approach allowed the utility to dedicate a portion of its internal technical resources to the EMPACT project while the utility conducted other important non-EMPACT information systems tasks (such as ensuring the Y2K compliance of DMWW's computer systems).

### 5.1.2 DMWW's EMPACT Project—Phase II

When Phase I of DMWW's EMPACT project was fully implemented, DMWW and its technical contractors modified the Phase I system to support the Phase II delivery of timely source water quality data to community residents. DMWW then dedicated its available technical resources to post key pieces of static data to the EMPACT project area on the utility's Web site to fully implement the subsequent components of Phase II.

Phase II includes the following three components:

- Component I focuses on the posting and updating of timely source water quality data to the EMPACT project area on DMWW's Web site. The complete implementation of this component took only a few weeks because it uses the data delivery approach and technical systems developed for Phase I.
- Through Component II, DMWW places its annual CCR on its Web site. DMWW's CCR enables Des Moines metropolitan community residents to make practical, knowledgeable decisions about their health and their environment. Refer to Chapter 6 for more information on DMWW's CCR, and refer to Chapter 3 for more information on the federal regulations that require its publication.
- Component III provides relevant data extracted from the Iowa Department of Natural Resources (IDNR) source water assessment program (SWAP), which was developed in compliance with Section 1453 of the Safe Drinking Water Act (SDWA). See Chapter 3 for more information on the SWAP and the SDWA.

The table on page 31 presents the parameters and sampling frequencies for the Phase II data available on the EMPACT project area of DMWW's Web site. DMWW selected this subset of parameters based on what the utility felt would be of greatest interest to the Des Moines metropolitan community.

Through the execution of Phase II of its EMPACT project, DMWW procured and installed two early-alert source water monitoring stations at the Racoon River intake and the Des Moines River intake. DMWW uses these monitoring stations to provide treatment plant operators with as much warning as possible when rapid changes in source water quality warrant immediate modifications to the drinking water treatment process. Each early-alert monitoring station contains four Hach® water analyzers to monitor nitrate, ammonia, pH, and turbidity.

Using the early-alert analyzers, DMWW collects and analyzes source water samples for nitrate every 2.5 minutes, samples for ammonia every 7.5 minutes, and samples for pH and turbidity continuously. The analyzers are currently programmed to collect and analyze samples at their maximum frequencies; however, DMWW may consider decreasing the monitoring frequency to reduce costs in the future. The early-alert analyzers are connected, with other treatment process control monitors, to DMWW's SCADA system. Data from these analyzers are not available on the EMPACT area of DMWW's Web site.

| PARAMETER | SAMPLING FREQUENCY |
|---|---|
| Alkalinity (Total) | 5/week |
| Ammonia - N | Weekly* |
| Calcium Hardness as $CaCO_3$ | 5/week |
| Chloride | Weekly |
| Cryptosporidium | Monthly |
| *E. coli* | 5/week |
| Fluoride | Weekly |
| Heterotrophic Plate Count Bacteria | 5/week |
| Magnesium Hardness as $CaCO_3$ | 5/week |
| Metals (potassium, sodium, iron, manganese, lead, copper) | Weekly |
| Nitrate - N | Weekly/daily when near MCL* |
| Ortho-Phosphate | Weekly |
| Pesticides (Metolachlor, Acetochlor, Atrazine) | Weekly (April - October) |
| Sulfate | Weekly |
| Temperature | 5/week |
| Total Hardness as $CaCO_3$ | 5/week |
| Total Coliforms | 5/week |
| Total Organic Carbon (TOC) | Weekly |
| Turbidity | 5/week* |

*Timely data for these source water quality constituents are available on the EMPACT project area of DMWW's Web site.*

*Note: Frequencies marked with an asterisk are for manual monitoring only. These parameters are monitored on a more frequent basis using automatic analyzers. Only the manual monitoring data are available on the EMPACT area of DMWW's Web site.

DMWW has found that maintenance of the Hach® early-alert analyzers can be very time-consuming. During the spring and summer, DMWW must repeatedly clean mud from the analyzers due to the seasonal turbidity increase in area source water rivers. The utility spends at least 1 hour per day cleaning and maintaining the analyzers at each station during this part of the year. During the fall and winter, the utility spends about 1 hour every 2 weeks maintaining the analyzers at each station.

| HACH® ANALYZER | WATER QUALITY PARAMETER |
|---|---|
| APA 6000 | Nitrate |
| APA 6000 | Ammonia |
| EC 310 | pH |
| Surface Scatter 6 | Turbidity |

*The Hach® APA 6000 Series Analyzer.*


*The Hach® EC 310™ pH Monitor.*

*The Hach® Surface Scatter 6 Turbidimeter*

The nitrate and ammonia analyzers are self-calibrating; DMWW reviews the calibration periodically. DMWW manually calibrates the pH and turbidity analyzers each month. Because the Hach® analyzers are modular instruments, DMWW can repair the analyzers on site simply by removing and replacing the broken part. DMWW keeps a large supply of spare parts on site to support routine and emergency replacements.

### THE CHALLENGES OF REAL-TIME QA/QC

The data provided by the early-alert analyzers have allowed DMWW to become more proactive in modifying its treatment process in response to sudden changes in source water quality. However, DMWW is still developing a QA/QC protocol for using these analyzers. When an early-alert analyzer indicates a sudden change in source water quality, DMWW water production personnel immediately collect and analyze a manual sample to verify the reading for that parameter. However, when the analyzers indicate a very large change in source water quality, DMWW personnel sometimes modify the water treatment process prior to verifying the analyzer reading. To develop a continuing log of accuracy measurements, DMWW programs its analyzers to collect periodic quality samples. For every seven source water samples analyzed, the analyzer will collect one sample from a separate intake line that DMWW has connected to a sample of water with a known quantity of parameters. DMWW periodically checks the results of the QC sample to ensure the accuracy of the analyzer readings. With time, DMWW hopes to decrease the amount of manual and QC samples it takes to verify the accuracy of its early-alert analyzers.

## 5.1.3 DMWW's EMPACT Project—Phase III

Through the execution of Phase III of its EMPACT project, DMWW will post the results from its urban runoff studies to the EMPACT project area of its Web site to enable its customers to observe the effects of urban watersheds on the quality of their drinking water. As discussed in Chapter 4, the urban runoff studies attempted to determine the microbial and chemical influences of main

urban creek watersheds on the utility's source waters. DMWW expects to post the results of these studies on its Web site by spring 2002.

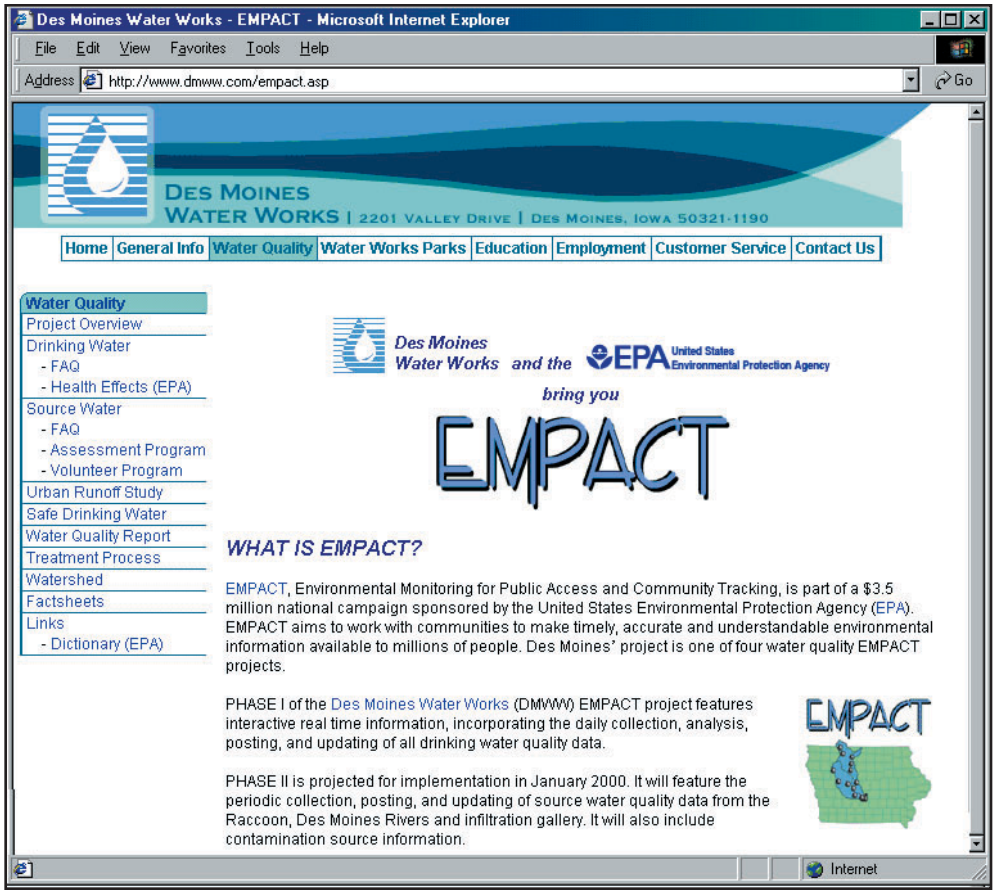
When Phase III of the EMPACT project has been fully implemented, DMWW will dedicate its available technical resources to operating, maintaining, and periodically enhancing its EMPACT project data delivery system and Web site, while continuing to support other important day-to-day information systems tasks (such as redesigning the utility's electronic billing system).

## 5.2 DMWW's EMPACT Project Web Site

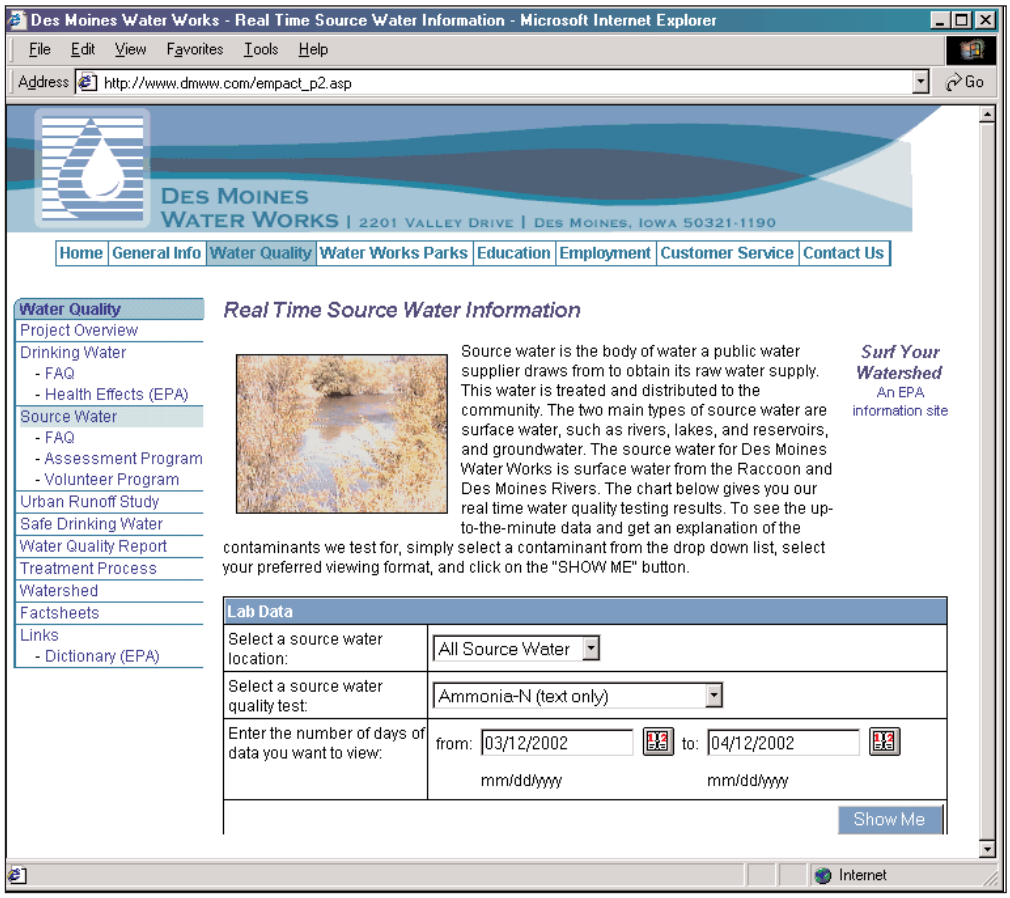
Because DMWW's EMPACT project phases represent unique topics and different implementation schedules, the EMPACT project area on DMWW's Web site is organized around these phases.

The EMPACT project area on DMWW's Web site is located at *http://www.dmww.com/empact.asp*. This site provides the following:

- An answer to the question, "What is safe drinking water?"
- Answers to frequently asked questions about drinking water and source water.
- A diagram of DMWW's drinking water treatment process.




*The EMPACT project area on the DMWW's Web site.*



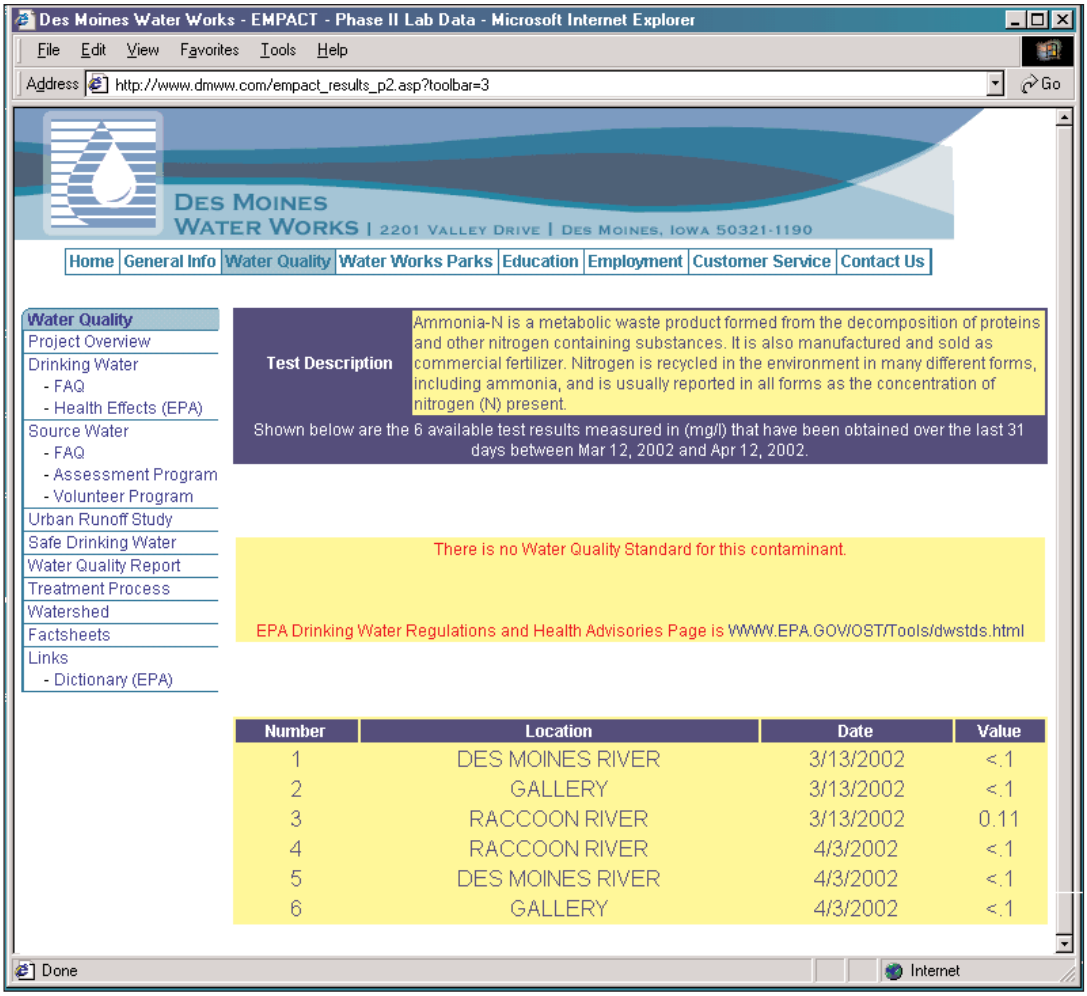

*A user can request source water data from the EMPACT project area on DMWW's Web site.*

- Information about the Des Moines River and Raccoon River watersheds.
- The DMWW service map.
- The most recent annual Consumer Confidence Report (CCR).
- An overview of the DMWW EMPACT project and descriptions of project Phases I, II, and III.
- Timely data on the presence and/or quantity of specific parameters found in Des Moines drinking water or source water.

From this site, Des Moines community residents can request timely water quality information from two links: Phase I—Drinking Water Information and Phase II—Source Water Information. Users can learn about the presence and/or quantity of specific parameters found in their drinking water or source water by selecting the parameter from a drop-down list of options.

From the user's computer, a data request works like this:

- The user selects a specific analytical parameter from a drop-down list.
- The user selects the desired range of sampling dates for that particular parameter. If the user does not specify a date, the Web site automatically defaults to a range beginning 1 month prior to the present date.
- The user clicks the "Show Me" button.




*Requested source water data are presented to the user in a table on a results page.*

At DMWW, the data retrieval process works like this:

- DMWW's Web server accepts the user's request in the form of HTML and repackages the request into SQL.
- The Web server sends the SQL request through the firewall.
- Inside the firewall, the SQL request is processed by DMWW's SQL Server, and the requested validated data are extracted from the staging database. Recall that DMWW uploads data from the LIMS/OracleTM database to the SQL Server database nightly.
- The extracted data are sent back through the firewall to the Web server.
- The Web server formats the data and displays a results page.

The results page contains the following features:

- A brief, succinct description of the selected parameter.
- An explanation of the data returned by the user's inquiry.

- The MCL and Maximum Contaminant Level Goal (MCLG) established by EPA for that parameter (applicable only to the drinking water page).
- A link to EPA's Drinking Water Regulations and Health Advisories page for more information about the health effects related to that parameter.
- A tabular or graphical representation of the data.
- A link to EPA's Drinking Water Regulations and Health Advisories page: *http://www.epa.gov/safewater/mcl.html* for information about the health effects of certain parameters in drinking water.
- Links to other Web sites providing information consistent with the topic and message of DMWW's EMPACT site.
- A link to EPA's "Terms of Environment" site *http://www.epa.gov/OCEPAterms*.
- A link that allows the customer to send an email to DMWW.

### PLUG-INS

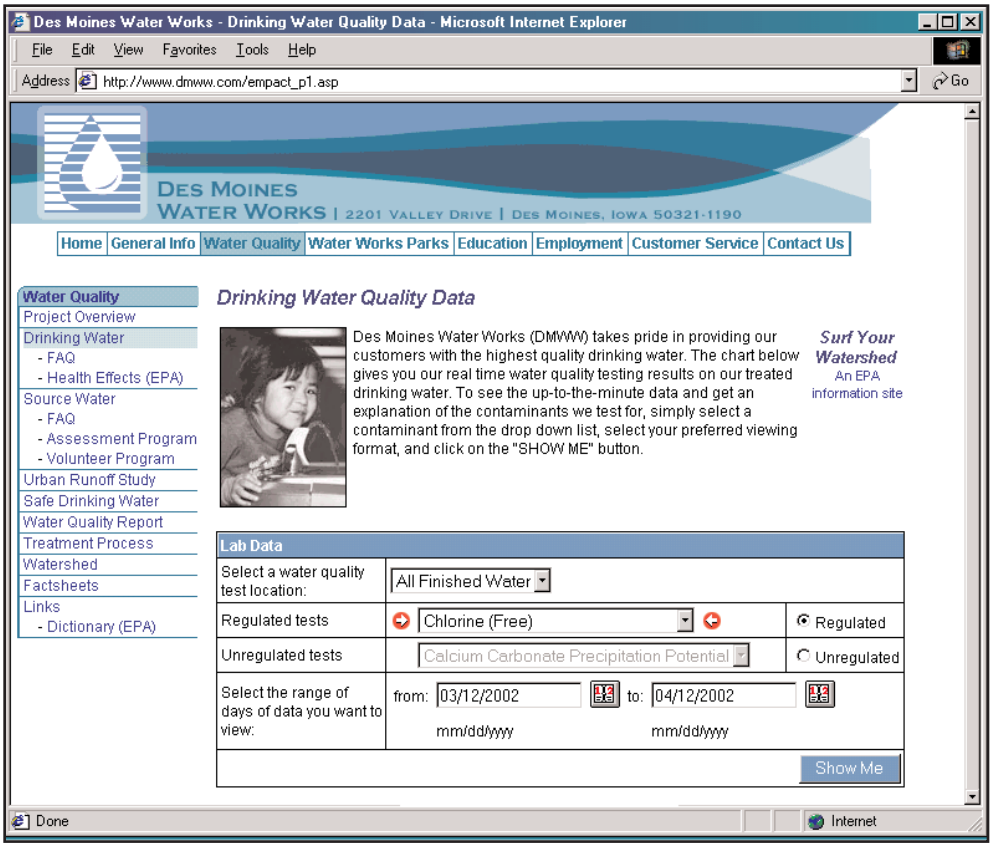
A "plug-in" is a software module that works along with an Internet browser to add a specific feature to a Web site. For example, a plug-in can allow users to listen to music or view videos on a Web site. If a Web site requires a plug-in to execute a specific feature, users must download the plug-in program to experience that feature. DMWW selected a software package, Chart FX™, to display certain pieces of requested data in a chart format on the EMPACT project area of its Web site. To use this feature, users must download Chart FX™ (a "plug-in"). The first time a user requests charted data from his or her personal computer, the Web site displays a "warning" asking the user to agree to download the plug-in. The Internet browser then guides the user through the downloading process. The user is required to download the plug-in only once; the user's computer will automatically access the plug-in for viewing charts in the future.

DMWW feels that this plug-in increases the number of options for viewing data on the site, thereby enhancing the user-friendliness of the site. Although DMWW could program its site to display charts, the plug-in allows DMWW to offer this feature without dedicating valuable resources to formatting data. DMWW has found that many of its customers are comfortable and familiar with plug-ins; the utility has received only a few questions and concerns about the requirement to download this module.

The EMPACT project area on DMWW's Web site is programmed to present data in either a table or a chart. The table format allows the user to view individual analytical results for a selected parameter measured on selected dates at selected sampling locations. The chart format allows the user to view and compare analytical results for a selected parameter over the entire range of selected dates and sampling locations. The charting function also allows the user to view information about a specific data point (e.g., parameter concentration, sample collection date, and sample description) by holding the cursor over that data point in the chart.

### 5.2.1 Designing the Web Site

The designers of the EMPACT project area on DMWW's Web site included water treatment and laboratory personnel, information systems personnel, technical contractors, and a communications specialist. This team found the design process to be iterative. The team's design initially focused on answering the following question: "Is my drinking water safe?" However, when the initial design




*The EMPACT project area on DMWW's Web site. Note the simple instructions (in the center frame) and explained links (in the right frame) for beginners and the direct links for experienced users (in the left frame).*

was reviewed, the team determined that a simple answer to this question would not necessarily benefit DMWW's customers. The team also considered that this question cannot always be answered simply. For example, when DMWW measured high levels of nitrate in its treated drinking water in 1999, the utility felt that customers should have access to detailed information about the condition of the water due to the increased risk of "blue baby syndrome" (methemoglobinemia) to infants under 6 months of age. However, DMWW could not simply answer "no" to the above question because nitrate levels in the water never exceeded the legal limits (MCLs) established for nitrate. (Refer to Chapter 3 of this handbook for public notification requirements and additional information on the regulation of drinking water.)

## WEB SITE DESIGN AND CONSTRUCTION OPTIONS

There are many software packages available to assist you with designing and constructing your Web site. These programs prompt you to design your Web pages in desktop publishing format and automatically convert your designs into HTML. These programs can greatly simplify Web page design and construction for inexperienced users. However, DMWW relied only partially on these tools–a large amount of automatically generated code can increase the complexity of a site's technical architecture. DMWW used Microsoft® FrontPage™ to create a conceptual design of the EMPACT project area on its Web site; the utility then passed these conceptual designs over to its technical contractor, who coded this area of the site based on the design proofs.

After reviewing the initial design, DMWW moved to a news-style design format with water quality data charting options prominently featured on both the drinking water and source water portions of the site. The team decided to address drinking water and source water on separate areas of the site because the information and messages associated with these water types differ greatly. The news-style design format allows DMWW to address water quality issues currently of interest to the media on the "front page" of the EMPACT project area on its Web site. DMWW feels that the current design of its site provides customers with direct access to important information while ensuring user friendliness, functionality, and user confidence in the information provided.

The EMPACT project area of DMWW's Web site is designed to keep written content brief, succinct, informative, and enhanced with illustrations. To maintain the attention and interest of the user, the site provides "quick hits" of written information followed by graphical representations of applicable data. DMWW feels that one of its biggest communication challenges is making sure that the timely water quality information presented on the Web is not too technical for the average audience member. When deciding on the content and technical detail to include on the site, DMWW was careful to avoid re-creating information that could already be accessed via links to other sites.

DMWW's Web site design included common navigational features (drop-down lists, radio buttons, dialogue boxes, and action buttons) that are familiar to Web users. DMWW felt that these features would make users more comfortable with navigating about the site. Also, by incorporating these common features, DMWW controlled user request options, streamlining data requests with available data to reduce error messages and user frustration. By making direct links constantly accessible on the site's left frame, DMWW organized the site to make navigational options simple and logical. The team also ensured that all links for additional information were related to the concept and purpose of the site to avoid leading users away from the site's topic and message.

Early in the design planning of DMWW's EMPACT site, the team realized that users would need to scroll down to fully view data charts. The team felt that this requirement diminished the overall effect of the results display, so the team had the page reconstructed to remove the DMWW EMPACT header when data results and charts are displayed. The trade-off, however, is that results are depicted on a separate Web page, and users must use the browser's "back" button (rather than a site link) to return to the previous page and continue navigation through the site.

DMWW designed the EMPACT project area of its Web site to be fairly complex. The project area includes several Web pages and offers different options for timely data requests and display. Many different SQL statements are required to support these options. The Web pages in the EMPACT project area are designed in framed format. Although this format simplified the initial technical design of the project area, DMWW feels that the frames now limit certain modifications to the look and organization of this area on the Web site.

To quantify the effectiveness and overall success of the EMPACT project area on its Web site, DMWW uses the following measurements:

- Total number of visits to the site.
- Visit patterns vs. time of day.
- The number of visits made by each type of user.
- Customer surveys.
- Customer feedback from the Web site.

## LESSON LEARNED: USING CONTRACTORS

DMWW's first Web contractor went out of business during the design and construction of the EMPACT project area of DMWW's Web site. DMWW hired a second Web contractor to move ahead with the design and construction. In light of project resource and schedule constraints, DMWW chose to move ahead with the frame format initiated by the first contractor. DMWW feels that this format currently limits some of its options for revising the Web design. Eventually, the utility would like to eliminate the frames from the EMPACT project area of its Web site.

It is important for a utility to require detailed and thorough written documentation of the work performed by contractors, especially when the utility plans to use internal personnel to implement technical systems that have been developed by its contractors.

## FEEDBACK

DMWW receives feedback on its Web site through its e-mail system. Most of the feedback regarding the EMPACT project area on DMWW's Web site has been positive and congratulatory in nature. Many times, customers request additional or more detailed information about a specific topic after having visited the Web site in search of basic information. DMWW sees this trend as a very positive sign that it is reaching out to its customers and sparking a new level of interest in community water quality–especially source water quality. DMWW has received some negative feedback as well. Some customers have asked to see more detailed technical information posted on DMWW's site, but DMWW feels that responding individually to requests for more information is the best way to ensure that the Web site is reaching out to the average member of its target audience.

A water utility in Sydney, Australia had some specific technical questions about the EMPACT project area on DMWW's Web site. After repeated communications with DMWW, the Sydney Water System is in the process of constructing a similar Web site for disseminating timely water quality data to its customers!

# 6 Communicating Drinking Water and Source Water Quality Information

Even the best programs and systems for data collection/analysis, data management, and data delivery won't ensure project success unless information has been accurately and effectively communicated with community residents and consumers. This chapter discusses DMWW's communication/outreach program. For general guidance on creating an outreach plan and a list of resources you can use to enhance your outreach efforts, see Appendix D.

## 6.1 Outreach Plan

At DMWW, a communications specialist coordinates and leads all outreach efforts. She works closely with DMWW's experts in water quality and information systems to implement the utility's outreach plan.

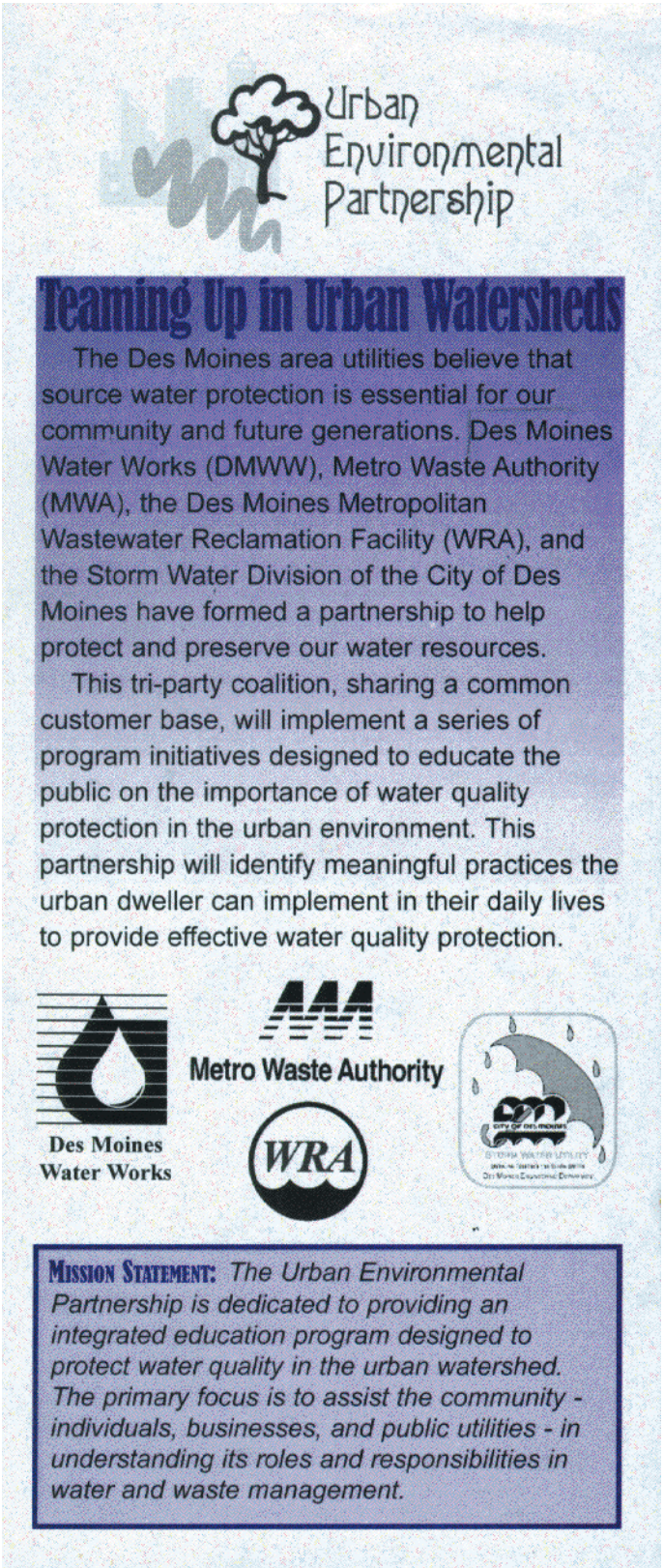
DMWW has an ongoing partnership with three municipal organizations in Des Moines: Metro Waste Authority, the Des Moines Metropolitan Wastewater Reclamation Facility, and the Storm Water Division of the City of Des Moines. DMWW and these organizations have joined to form the Urban Environmental Partnership. The partnership will implement a series of cooperative outreach efforts to communicate the importance of water quality protection in the urban environment. Working together, they avoid duplicating outreach efforts, increase their resources, and reach a greater number of people with their cohesive outreach message. The partnership is advertised with a flyer.

DMWW also partnered with the Natural Resources Conservation Service to offer a watershed tour that provided information about existing voluntary programs for watershed conservation and efforts to reduce nitrate in agricultural runoff. In addition, DMWW is partnering with Pheasants Forever, a group that promotes environmental responsibility as a way to conserve recreational opportunities like hunting. This partnership strives to communicate the importance of environmental responsibility to children in Des Moines.

The overall goal of DMWW's outreach program is to educate all members of the Des Moines community. DMWW is currently running a public relations campaign called "DMWW: Your Pipeline to Water Information." Through this campaign, DMWW is teaching its customers that the utility's purpose is not only to provide them with clean, safe drinking water but also to respond to any questions or concerns they may have about their drinking water and source water.

DMWW tailors many of its outreach efforts to fulfill the overall goal of the information pipeline campaign. Here are some examples of DMWW's specific outreach goals:

1. Provide Des Moines community residents with information on current issues related to drinking water and source water quality.
2. Enable Des Moines community residents to make practical, knowledgeable decisions about their health and their environment.
3. Present DMWW business and financial information to its customers.
4. Provide Des Moines community residents with convenient access to timely drinking water and source water quality information.




*DMWW has formed a partnership with three municipal organizations to communicate the importance of water quality protection in the urban area.*

DMWW's broad and diversified target audience includes the entire Des Moines community. DMWW has divided its audience into several categories, including youngsters, students, parents, senior citizens, new customers, business owners, and various organizations. DMWW has become familiar with the characteristics of its audience categories by providing over 80 years of water utility service to the Des Moines metropolitan area. DMWW continues to profile its audience categories by soliciting public feedback through a variety of different mechanisms. These mechanisms are discussed in Section 6.3.

## 6.2 Outreach Products

DMWW has developed several different outreach products to communicate with its target audience categories. Some of these products are discussed below.

### The DMWW Web Site

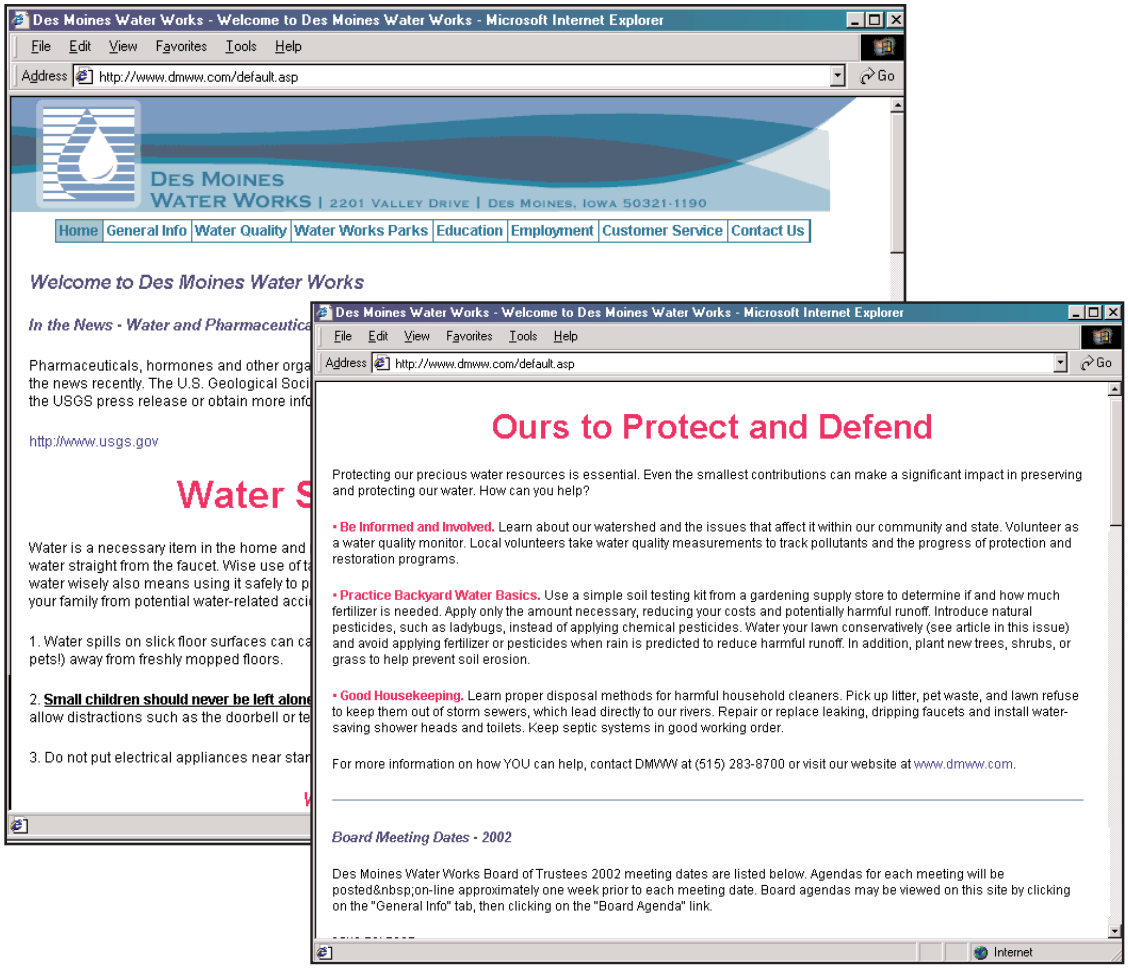
DMWW uses its Web site *(http://www.dmww.com)* to communicate a variety of information to the Des Moines community. The Web site provides community residents with convenient access to the following:

- General information about DMWW.
- Information on area parks and recreation.
- A customer service page.
- Utility engineering and construction information.
- Education for all users, from businesses and parents to teachers and students.
- Employment opportunities.
- A video clip and photos of the Des Moines flood of 1993.
- The DMWW EMPACT project area.

In response to customer requests, DMWW hopes to expand the Web services available to its customers by spring 2002.

### Monthly Newsletter: H2O Line

DMWW's monthly newsletter provides DMWW's customers with information on current issues related to drinking water and source water quality. DMWW introduced its information pipeline campaign in its January 2001 newsletter. Subsequent newsletters have




*DMWW's Web site at* ***http:/www.dmww.com***

discussed the watersheds and watershed protection, the presence of nitrate in treated drinking water, and "pros and cons" of water filtering devices. DMWW's monthly newsletters for January 2001 through April 2001 are included in Appendix A.

### Annual Consumer Confidence Report

DMWW's June newsletter typically functions as a Consumer Confidence Report (CCR). The CCR, required by federal drinking water regulations, enables DMWW community residents to make practical, knowledgeable decisions about their health and their environment. See Chapter 3 of this handbook for more information on the CCR and the federal regulations that require its publication. An example of DMWW's CCR is included in Appendix A.

### Welcome Brochure

DMWW sends a "Welcome" brochure to all of its new customers. The pamphlet contains information about the following topics:

- DMWW's mission, location, business hours, and contact information.
- Billing information and payment options.
- Responsibilities of DMWW and its customers.
- Procedures for water meter readings and maintenance.

- DMWW's drinking water treatment process.
- Utility tours.
- Parks and recreation.
- Community tree plantings.
- Rules/regulations.

### Annual Business Report

The main goal of DMWW's annual report is to present financial information to its customers; however, DMWW also includes a few pages of educational materials. The content of these materials depends on issues and concerns of the current year. To encourage customers to keep its 2001 report, DMWW incorporated a note pad into the report. For 2002, DMWW has incorporated a planning calendar into the report. The calendar includes water and health facts, in addition to DMWW's contact information, on each page.

### Other Outreach Products and Tools

In addition to the products and tools discussed above, DMWW uses these outreach mechanisms:

- DMWW visits area schools to teach children of all grade levels about drinking water and source water.
- DMWW offers tours of its facilities to adults and school children.
- DMWW prepares technical outreach information for conferences held by organizations such as the American Water Works Association.
- DMWW has prepared a series of fact sheets to answer specific questions from its customers. These fact sheets provide information on a wide range of topics, including the presence of alkalinity, lead and copper, nitrate, and *Cryptosporidium* in drinking water.

### Special Outreach Efforts

Occasionally, DMWW will prepare outreach products to address specific issues. For example, DMWW prepared one fact sheet on how to winterize a home. The target audience for this fact sheet lived in one particular Des Moines metropolitan neighborhood. This neighborhood had a higher percentage of water pipes break during the winter months due to poor maintenance practices. Because the occupants of this neighborhood were predominantly Hispanic, DMWW had the fact sheet prepared in Spanish. The fact sheet was disseminated to neighborhood residents by DMWW service workers.

## 6.3 Distribution and Feedback

DMWW uses a variety of mechanisms to distribute its outreach products. For example, DMWW's Web site is "distributed" to Web users via the Internet. Many of DMWW's newsletters, pamphlets, and fact sheets are distributed through the mail; some outreach flyers are included in customer bills. Also, through school visits, during tours of DMWW and area watersheds, and even through customer phone calls, DMWW conveys outreach messages by speaking directly with its customers.

DMWW tries to increase the longevity of many of its outreach products, thereby increasing the number of product distribution mechanisms available to the utility. For example, by making its

Annual Business Report into a notepad or a calendar, DMWW can distribute this product throughout the year not only to customers but also to visitors and convention groups.

DMWW has established several mechanisms for outreach follow-up and public feedback. For example, the utility held focus group meetings to solicit customer input and feedback on DMWW's CCR. Also, through its information pipeline campaign, DMWW encourages its customers to contact the utility with any questions or concerns they have about Des Moines drinking water or source water.

### FOCUS GROUP SUCCESS

DMWW conducted two focus group meetings on its CCR. The first meeting was held prior to the publication of the CCR to solicit input from customers on the ideal format and content of the report. A follow-up meeting was then held after the publication of the first CCR to solicit feedback. One of the CCR features that especially pleased this follow-up focus group was the "kids corner," which has games and activities for children. The customer feedback indicated that this tool is a very effective way to increase the longevity of the CCR and encourage parents and children to talk about Des Moines water issues.

DMWW's Web site provides customers with the option of providing feedback directly to the utility via e-mail. A central point of contact (DMWW's communications specialist) is responsible for either responding directly to the feedback or forwarding the comment, question, or request to the appropriate team member at DMWW. Technical feedback about water quality information is forwarded to the water laboratory or water production department, feedback about DMWW's history or educational opportunities is forwarded to DMWW's education specialist, and feedback about the general appearance and functionality of the Web site is forwarded to DMWW's information systems department. In all cases, DMWW responds to each customer's feedback as soon as possible.

# 2000 Consumer Confidence Report

DES MOINES WATER WORKS

City of Ankeny ▪ City of Clive Water Department ▪ City of Cumming ▪ Des Moines Water Works
Johnston Water Department ▪ City of Norwalk ▪ City of Pleasant Hill
Polk County Rural Water District #1 ▪ SE Polk Rural Water District
Urbandale Water Department ▪ Warren Water District ▪ City of Waukee
City of Windsor Heights ▪ Xenia Rural Water District - Southwest & Woodward

# Water For Your Future

Des Moines Water Works (DMWW) is an industry leader, providing our customers with high quality drinking water for 80 years. Our continued, proven treatment processes, along with new, innovative techniques and studies will ensure that DMWW remains an industry leader into the new millennium.

DMWW takes a proactive approach to controlling water taste and odor, an indicator of water quality. Our laboratory performs total organic carbon (TOC) and UV-254 tests on the rivers daily to determine which source water has the lowest concentration of dissolved organic material. Based on these tests, the Water Production Department will select which river to use and will adjust the dosage of powdered activated carbon to absorb these natural organic materials, allowing them to be removed during the treatment processes. This step significantly improves the taste and odor of your water.

### Record Nitrate Year

DMWW's Nitrate Removal Facility was operated a record setting 106 days during 1999, at a total operating cost of approximately $250,000. Nitrate concentrations reached record levels in the Raccoon River and Infiltration Gallery.

DMWW monitors nitrate concentrations weekly until levels begin to increase, then daily during peak nitrate season. When nitrate concentrations in our treated water exceed 8.5 milligrams per liter (mg/l), we begin operating the Nitrate Removal Facility. Water is diverted to the facility for treatment, to maintain a nitrate concentration of 8.5 mg/l or lower in the finished or drinking water. The drinking water standard for nitrate is 10 mg/l.

Trending data indicates that nitrate concentrations in our rivers are continually increasing. In an effort to address this challenge, DMWW made piping modifications in 1999 to increase the capacity of the Nitrate Removal Facility.

### Cutting Edge Science

One of the ongoing microbial studies being conducted at DMWW is on the cutting edge of water industry science. One method of studying bacteria, called culturing, grows bacteria in a lab environment. Recent studies conducted in molecular biology have confirmed that there are bacteria that have not been previously cultured. DMWW's microbiologist has grown bacteria believed to be previously uncultured. DMWW's microbiologist has grown uncultured bacteria using river water. While the significance of these uncultured bacteria is unknown, Des Moines metro area customers can rest assured that DMWW has the ability to stay current with water quality trends in order to have solutions in place should a problem arise.

### What's On Our Plates?

DMWW's daily water quality testing determines the total number of bacteria present in a water sample, including the harmless ones. Beyond standard utility water testing, DMWW routinely performs Heterotropic Plate Count (HPC) studies on its distribution system water, an important indicator of the on-going bacterial condition of the water. DMWW's average HPC is very low. These bacteria are harmless, but can reduce the residue chlorine that is available to protect the distribution system from bacterial contamination. That is why DMWW monitors both HPC and free chlorine residual in the distribution system - to ensure good, safe water quality at the point of delivery to our customers.

### Up A Creek

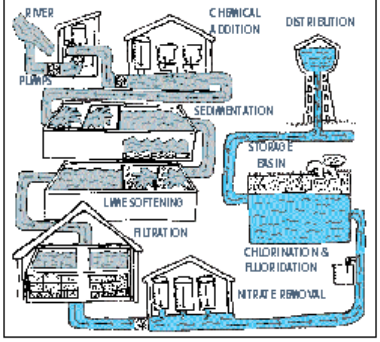
Recent studies have revealed that large amounts of bacteria enter Walnut Creek after hard rains. DMWW's bacterium study on Walnut Creek, initiated last summer, will help determine if human waste is leaking into the watershed. Preliminary studies have shown that these contaminants are in the raw water of the creeks. Evidence of a specific cause is still unknown. DMWW laboratory professionals are striving to ascertain the cause of the large bacterial loads in our urban creeks and find a solution to the problem.

DMWW will continue to ensure that you are provided with safe, high quality water. We are committed to being an industry leader in water treatment and quality now and in the future.

## How We Treat Your Drinking Water

We begin by feeding powdered activated carbon into the river water for removal of man-made and natural organic chemicals. The water is then pretreated to remove dirt and debris and combined with water from the infiltration gallery system. The combined water then flows into lime softening basins. The pH of the water is adjusted before the final filtering process. The water is passed through layers of sand and various sizes of gravel to remove any remaining particles. Des Moines Water Works activates its nitrate removal facility to remove this contaminant from your water during periods of high nitrate levels. After this final phase, fluoride is added to aid in the prevention of tooth decay and chlorine is added as a disinfectant to kill bacteria. The clean water is stored in a clearwell until pumped into the pipes of the distribution system.

Des Moines Water Works laboratory and water production staff collect and test water samples from throughout the system several times a day. These tests ensure that the proper chemical levels are maintained and that the water remains free of unwanted contaminants.




## Know Your Watershed


There are three sources of water fulfilling the needs of Des Moines Water Works customers. Approximately two-thirds is supplied by either the Raccoon or Des Moines Rivers. The remaining one-third comes from the infiltration gallery system (shallow groundwater).

As rain and snow run across the slope of land in our watershed, they carry soil and pollution, depositing them in creeks leading to the Raccoon and Des Moines Rivers. Some precipitation sinks into the ground, dissolving substances that may enter our groundwater supplies. Everyone can contribute to improving watershed health by utilizing conservation practices that protect the land and the quality of water in our rivers. Improving environmental quality improves our quality of life now and in the future.

# 1999 Drinking Water Quality Report

| SUBSTANCE | HIGHEST LEVEL ALLOWED (MCL) | | DMWW RANGE USING DES MOINES RIVER WATER | | DMWW RANGE USING RACCOON RIVER WATER | | DMWW MAXIMUM DETECTED LEVEL | | EPA MCLG (EPA GOAL) | | SOURCES OF CONTAMINANT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MICROBIOLOGICAL CONTAMINANTS** | | | | | | | | | | | |
| Turbidity | 0.5 | NTU | n/d-0.10 | NTU | n/d-0.8 | NTU | 0.10 | NTU | N/A | | Soil Runoff |
| **INORGANIC CONTAMINANTS** | | | | | | | | | | | |
| Fluoride | 4.0 | mg/l | 0.60-1.3 | mg/l | 0.81-1.2 | mg/l | 1.3 | mg/l | 4.0 | mg/l | Additive to Promote Strong Teeth |
| Nitrate (as N) | 10.0 | mg/l | 1.3-10.0 | mg/l | 1.1-9.3 | mg/l | 10.0 | mg/l | 10.0 | mg/l | Runoff from Fertilizer Use |
| Sodium | unregulated | | 7.8-20.0 | mg/l | 9.4-26.0 | mg/l | 26.0 | mg/l | unregulated | | Erosion of Natural Deposits |
| Sulfate | unregulated | | 28.0-93.0 | mg/l | 38.0-64.0 | mg/l | 93.0 | mg/l | unregulated | | Erosion of Natural Deposits |
| **ORGANIC CONTAMINANTS** | | | | | | | | | | | |
| Atrazine | 3.0 | µg/l | n/d-0.21 | µg/l | 0.20 | µg/l | 0.21 | µg/l | 3.0 | µg/l | Runoff from Herbicide Use |
| Metolachlor | N/A | | n/d-0.27 | µg/ | n/d | | 0.27 | µg/ | N/A | | Runoff from Fertilizer Use |
| Total Trihalomethane | 100.0 | µg/l | 27.0-41.0 | µg/l | 25.0-30.0 | µg/l | 41.0 | µg/l | 0 | µg/l | By-product of Chlorine Disinfection |

| SUBSTANCE | ACTION LEVEL (AL) | | DMWW 90th PERCENTILE** | | | SOURCES OF CONTAMINANT |
|---|---|---|---|---|---|---|
| **DMWW COPPER AND LEAD - Regulated at Customer Tap** | | | | | | |
| Copper | 1.3 | mg/l | n/d | | | Corrosion of Home Plumbing |
| Lead | 15.0 | µg/l | 10.0 | µg/l | (5 sites above AL) | Corrosion of Home Plumbing |

**Health Advisory Level*
***90% of samples must be below Action Level*

**LEAD:** Infants and young children are typically more vulnerable to lead in drinking water than the general population. It is possible that lead levels at your home may be higher than at other homes in your community as a result of materials used in your home's plumbing. If you are concerned about elevated lead levels in your home's water, you may wish to have your water tested and flush your tap for 30 seconds to 2 minutes before using tap water. Additional information is available from the Safe Drinking Water Hotline at (800) 426-4791.

**NOTE:** The EPA requires monitoring of over 80 drinking water contaminants. Those listed above are the only contaminants detected in your drinking water. For a complete list, contact Des Moines Water Works or your local water utility.

## Distribution Violations

The following utilities had distribution violations in 1999. The specifics of each violation and corrective actions are provided in detail. If you have any questions, please contact the utility.

| UTILITY | VIOLATION | CORRECTIVE ACTION |
|---|---|---|
| **City of Clive** | Home water filtration system nonacute Coliform detect | Repeat samples at origination point; notice mailed to customers |
| City of Cumming | Unsatisfactory Coliform Bacteria test 6/99 | Four repeat samples 6/19/99; all negative; 5 routine samplings in 7/99 |
| | Bacterial Coliform monitoring & reporting violation 9/99 - 5 samples not collected 7/99; 12/99 Coliform monitoring | Need to meet resampling requirements; Resampled; implemented new scheduling system for testing |
| **City of Norwalk** | Nonacute coliform bacteria violation 6/99 & 11/99; 12/99 Coliform monitoring | Resampled; implemented new scheduling system for testing |
| City of Waukee | Lead exceeded 90th percentile Action Level | Resume lead & copper testing; educated customers about lead |

## Definitions

**Action Level (AL)** - The concentration of a contaminant that, if exceeded, triggers a treatment or other requirement that a water system must follow.

**Inorganic Chemicals** - Chemical substances of mineral origin, such as lead and copper.

**Maximum Contaminant Level (MCL)** - The highest level of a contaminant allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

**Maximum Contaminant Level Goal (MCLG)** - The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

**Microbiological Contaminants** - Very small organisms, such as bacteria, algae, plankton, and fungi.

**N/A** - Not applicable

**n/d** - Not detected

**NTU** - Nephelometric Turbidity Units.

**Organic Contaminants** - Naturally occurring or synthetic substances containing mainly carbon, hydrogen, nitrogen, and oxygen. This includes most pesticides and industrial chemicals.

**pCi/l** - picocuries per liter; measure of radioactivity.

**µg/l** - micrograms per liter; parts of contaminant per billion parts of water. One part per billion (ppb) is equivalent to a single penny in ten million dollars.

**mg/l** - milligrams per liter; parts of contaminant per million parts of water. One part per million (ppm) is equivalent to a single penny in ten thousand dollars.

**Radionuclides** - Contaminants giving off ionizing radiation.

**Treatment Technique (TT)** - A required process intended to reduce the level of a contaminant in drinking water.

# Important Health Information

Inadequately treated water may contain disease-causing organisms. These organisms include bacteria, viruses, and parasites, which can cause symptoms such as nausea, cramps, diarrhea, and associated headaches. Some people may be more vulnerable to contaminants in drinking water than the general population.

Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV / AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. The Center for Disease Control has guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants. They are available from the Safe Drinking Water Hotline.

In order to ensure that tap water is safe to drink, the Environmental Protection Agency (EPA) prescribes regulations, which limit the amount of certain contaminants in water provided by public water systems.

Nitrate in drinking water at levels above 10 ppm is a health risk for infants of less than six months of age. High nitrate levels in drinking water can cause blue baby syndrome. Nitrate levels may rise quickly for short periods of time because of rainfall or agricultural activity. If you are caring for an infant, you should ask for advice from your health care provider.

FDA regulations establish limits for contaminants in bottled water that must provide the same protection for public health. Any bottled water that is labeled "drinking water" has to meet EPA's drinking water regulations. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk.

More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline.

**SAFE DRINKING WATER HOTLINE:**

**1-800-426-4791**

## Cryptosporidium

Cryptosporidium is a microscopic organism found in rivers and streams that can cause diarrhea, fever and gastrointestinal distress if ingested. It finds its way into the watershed through animal and human wastes. Cryptosporidium is effectively eliminated by a treatment process that includes sedimentation, filtration, and disinfection.

Cryptosporidium has **NEVER** been found in your drinking water.

DMWW recently concluded a study to determine the amount of *Cryptosporidium* we eliminate from our source water through the treatment process. *Cryptosporidium* is a microscopic organism, known to cause intestinal illnesses, found in the feces of infected animals and humans. It is rarely found in the rivers from which we draw water.

After extensive studies, DMWW's microbiologist determined that we effectively eliminate 99.99% of the *Cryptosporidium* from the raw water. The combination of DMWW's water treatment capability and the fact that the Des Moines and Raccoon Rivers contain very low numbers of *Cryptosporidium* are very encouraging data.

## Urban Environmental Partnership

To promote both improved service to our customers and environmental protection of our watershed, Des Moines Water Works (DMWW) has formed a new partnership with three other Des Moines area utilities: Wastewater Reclamation Authority (WRA), Metro Waste Authority (MWA), and the City of Des Moines' Storm Water Utility. The partnership is targeting three areas to enhance customer education and communication:

- Training of Customer Service employees in the functions and operations of each utility to assist them in answering customer calls about other local water utilities.
- Developing and presenting curriculum in the Des Moines area schools, emphasizing the interdependent relationship between the utilities and teaching children about protecting our water resources.
- Educating our customers about good water stewardship as it relates to all of the water utilities through publications such as existing utility newsletters, bill inserts, web pages, and press releases.

Contact DMWW or any of the Urban Environmental Partners for more information.

## DEWEY™

- Baking soda, borax, and white vinegar are effective, earth-friendly cleaning products.
- The greatest single cause of an increased water bill is a leaking or running toilet, wasting 250 to 5000 gallons of water a day!
- Bottled water costs up to 1000 times more than DMWW water from your tap.
- Using mulch around gardens, bushes, and trees is a great way to trap moisture, reducing your need to water more often. Mulch also becomes a rich nutrient for plants.
- An acre of corn contributes more to humidity than a lake of the same size.
- A 1/8th inch crack in a pipe can spew up to 250 gallons of water a day, wrecking floors, furniture, and valuable possessions in addition to wasting water.
- A leak of one drop per second wastes 2,400 gallons of water per year.
- As water flows in streams, sits in lakes, or filters through layers of soil and rock in the ground, it dissolves or absorbs the substances that it touches.
- Dispose used motor oil, antifreeze, paints, and other hazardous materials at the Regional Collection Center rather than down the drain.


## Word Find Fun!

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Z | T | R | B | H | K | G | N | I | N | E | T | F | O | S | E | M | I | L | S |
| A | C | C | R | R | M | J | D | T | C | U | M | M | I | N | G | Q | V | O | U |
| S | A | F | E | L | A | B | O | R | A | T | O | R | Y | I | Z | B | F | A | E |
| S | P | W | A | T | E | R | S | H | E | D | K | B | M | T | E | V | A | Q | M |
| S | M | R | H | N | J | L | T | Y | N | C | H | L | O | R | I | N | E | U | X |
| G | E | N | D | A | M | E | R | O | L | S | I | N | W | A | T | O | I | I | F |
| M | M | D | Y | N | A | N | O | X | I | E | T | I | T | T | Y | D | T | F | I |
| E | R | R | I | I | T | C | O | R | Y | C | C | O | L | E | I | I | M | E | L |
| A | X | A | M | M | C | E | W | A | U | K | E | E | N | R | R | I | C | R | T |
| A | N | E | X | A | E | H | I | L | E | R | A | T | O | E | I | N | G | T | R |
| P | E | R | R | T | P | N | E | T | U | A | L | P | U | M | P | S | I | M | A |
| A | N | K | E | N | Y | T | T | I | O | N | S | D | I | O | A | F | N | N | T |
| O | S | E | P | O | L | K | A | A | T | O | E | E | T | V | F | R | U | S | I |
| D | E | K | A | C | H | L | I | B | T | E | N | R | T | A | Y | H | Y | S | O |
| I | T | E | R | I | C | A | L | P | A | I | I | N | M | L | O | N | U | Y | N |
| S | M | O | U | S | F | O | Y | L | D | E | O | R | C | W | A | R | R | E | N |
| T | O | N | E | D | I | R | O | U | L | F | M | N | V | E | R | T | B | E | D |
| R | P | O | L | K | C | O | U | N | T | Y | S | A | U | R | U | S | A | V | M |
| I | Q | H | H | E | S | S | T | H | G | I | E | H | R | O | S | D | N | I | W |
| B | U | U | O | A | L | I | T | Y | W | E | D | E | B | S | T | E | D | L | W |
| U | A | S | T | D | I | G | N | I | R | O | T | I | N | O | M | C | A | C | I |
| T | L | O | L | N | A | R | P | L | E | A | S | A | N | T | H | I | L | L | Y |
| I | I | W | I | T | V | Q | M | K | W | K | E | R | E | A | I | N | E | X | A |
| O | T | S | N | O | N | A | B | N | O | R | W | A | L | K | L | E | F | D | B |
| N | Y | R | E | L | L | A | G | N | O | I | T | A | R | T | L | I | F | N | I |

## Word List

Ankeny
aquifer
CCR
chlorine
Clive
contaminant
Cryptosporidium
Cumming
distribution
DMWW
EMPACT
EPA
filtration
fluoride
hotline
infiltration gallery
Johnston
laboratory
lime softening
Maffitt
monitoring
nitrate
Norwalk
Pleasant Hill
Polk County
pumps
quality
Raccoon
safe
sedimentation
SE Polk
Urbandale
Warren
water
watershed
Waukee
Windsor Heights
Xenia

## WISE WATER WORDS

Use a blue crayon or pencil to color in all the letters with a ■ or a ★ (but not the *) to reveal the type of water made at DMWW.

After revealing the answer, color the background to complete the drop.

## Public Meeting Information

*We encourage our customers to attend and participate in the meetings of our water utility. Public meeting information is listed below.*

**ANKENY**
Ankeny City Council • 1st and 3rd Monday of each month at 5:00 p.m.
410 West 1st Street • Ankeny, Iowa 50021

**CLIVE**
Clive City Council • 1st, 3rd, & 5th* Thursday of each month
(*5 week months)
Clive City Hall • 1900 NW 114th St. • Clive, Iowa 50325

**CUMMING**
Cumming City Council • 2nd and 4th Monday each month
City Hall • Cumming, Iowa 50061

**DES MOINES**
Board of Water Works Trustees • 4th Tuesday each month at 9:00 a.m.
Des Moines Water Works • 2201 Valley Drive • Des Moines, Iowa 50321

**JOHNSTON**
Johnston City Council • 1st and 3rd Monday of each month
City Hall • 6221 Merle Hay Road • Johnston, Iowa 50131

**NORWALK**
Norwalk City Council • 1st and 3rd Thursday of each month at 5:30 p.m.
705 North Avenue • Norwalk, Iowa 50211

**PLEASANT HILL**
Pleasant Hill City Council • 2nd and 4th Tuesday of each month at 6:30 p.m.
Pleasant Hill City Hall • 5151 Maple Drive • Pleasant Hill, Iowa 50317

**POLK COUNTY RURAL WATER DISTRICT #1**
Annual Meeting in January each year • Call for date
6666 NW 66th Avenue, Suite 2 • Des Moines, Iowa 50313

**SOUTHEAST POLK RURAL WATER DISTRICT**
Water Board • 3rd Wednesday of each month • Contact office for time
6540 NE 12th Avenue • Altoona, Iowa 50009

**URBANDALE**
Water Board of Trustees • Meets monthly • Call 278-3940 for information
Urbandale Water Department • 3720 86th Street • Urbandale, Iowa 50322

**WARREN WATER**
Board of Directors • 3rd Monday each month at 7:30 p.m.
Warren Water Office • 1204 East 2nd Avenue • Indianola, Iowa 50125

**WAUKEE**
Waukee City Council • 1st and 3rd Monday each month
Waukee City Hall • 230 Highway 6 • Waukee, Iowa 50263

**WINDSOR HEIGHTS**
Windsor Heights City Council • 1st and 3rd Monday each month at 4 p.m.
Windsor Heights City Hall • 1133 66th Street • Windsor Heights, Iowa 50311

**XENIA - Southwest & Woodward**
Board of Directors • Thursday of 3rd full week of each month
2398 141st Street • Bouton, Iowa 50039

## Utility Contact Information

For more information on the Consumer Confidence Report or water quality, please contact your local water utility:

- **City of Ankeny:** Customer Service
  410 West 1st Street, Ankeny, Iowa 50021
  Phone: (515) 283-8700 • Fax: (515) 283-8727
  E-mail: jmckenH20@aol.com
- **City of Clive Water Department:**
  Bart Weller, Public Works Director
  9289 Swanson Blvd., Clive, Iowa 50325
  Phone: (515) 223-6231 • Fax (515) 223-6013
  E-mail: bweller@ci.clive.ia.us
- **City of Cumming:** Kathie Hungerford
  P.O. Box 100, Cumming, Iowa 50061
  Phone: (515) 981-9214 • Fax: (515) 981-9214
- **Des Moines Water Works:** Customer Service
  2201 Valley Drive, Des Moines, Iowa 50321
  Phone: (515) 283-8700 • Fax: (515) 283-8727
  E-mail: webmaster@dmww.com
- **Johnston Water Department:** Jerry R. Meyers or Donna Kluss
  P.O. Box 410, Johnston, Iowa 50131-0410
  Phone: (515) 278-0822 • Fax (515) 727-8092
- **City of Norwalk:** Dean Yordi, Director of Public Works
  705 North Avenue, Norwalk, Iowa 50211
  Phone: (515) 981-0808 • Fax: (515) 981-0933
  E-mail: deanyordi@ci.norwalk.ia.us
- **City of Pleasant Hill:** Gary Patterson, Public Works Director
  5151 Maple Drive, Suite 1, Pleasant Hill, Iowa 50317-8494
  Phone: (515) 262-9368 • Fax: (515) 262-9570
- **Polk County Rural Water District #1:** Francis E. Schlueter
  6666 NW 5th Street, Des Moines, Iowa 50313
  Phone: (515) 289-1877 • E-mail: feschlueter@worldnet.att.net
- **Southeast Polk Rural Water District:** Shirley J. Bos, General Manager
  6540 NE 12th Avenue, Altoona, Iowa 50009
  Phone: (515) 262-8581 • Fax: (515) 262-4536
  E-mail: shirley.bos@worldnet.att.net
- **Urbandale Water Department:** Customer Service
  3720 86th Street, Urbandale, Iowa 50322
  Phone: (515) 278-3940 • Fax (515) 278-3944
- **Warren Water District:** Peggy Crabbs, Systems Manager
  1204 East 2nd Avenue, Indianola, Iowa 50125
  Phone: (515) 962-1200 • Fax: (515) 962-9328
- **City of Waukee:** John R. Gibson - Director of Public Works
  230 Highway 6, Box 847, Waukee, Iowa 50263
  Phone: (515) 987-4363 • Fax: (515) 987-3979 • E-mail: gibsonjon@aol.com
- **City of Windsor Heights:** Customer Service
  1133 66th Street, Windsor Heights, Iowa 50311
  Phone: (515) 283-8700 • Fax: (515) 283-8727
- **Xenia Rural Water District - Southwest & Woodward:** Dave Modlin
  2398 141st Street, P.O. Box 39, Bouton, Iowa 50039-0039
  Phone: (515) 676-2117 • Fax: (515) 676-2208 • E-mail: Xenia@netins.net

## Water Works Your Body

Pure water has been said to be our most important nutrient, and possibly the most underestimated. Drinking water not only quenches our thirst, but it aids in the building and maintenance of a healthy body. Some of the numerous health benefits of drinking water include maintaining fitness, fighting illness, reducing effects of aging, and boosting energy. Simply turn on the faucet for a drink that works wonders for your body!

- Drinking adequate amounts of water helps your digestion and metabolism work at full capacity.
- Water can boost your endurance, making exercise more effective and helping you work out at higher levels.
- You can hold off hunger and prevent over eating by drinking more water.
- Research has found that water plays an active role in reducing the risk of some diseases or ailments like bladder cancer, urinary tract cancer, and kidney stones.
- Health officials consider water to be a weapon against the common cold and cough.
- Consuming plenty of water keeps your skin supple, helping you look younger.
- Drinking water when traveling can help reduce fatigue.
- Dehydration can contribute to migraine headaches; getting enough water is important in fighting them.

## DEWEY™ TIPS


Health experts recommend drinking at least eight 8-ounce glasses of water each day. DMWW has some tips on how to make sure you get enough water.

- Drink moderate-sized portions of water spread throughout the day.
- Drink a glass when you wake up, before and after exercising, and make water available at all times.
- Try carrying a water bottle with you during the day.
- Have one glass of water for each caffeinated beverage you drink.

*DMWW: Your pipeline for timely, accurate water information.*

**A monthly publication of**
**DES MOINES WATER WORKS**
**2201 Valley Drive**
**Des Moines, IA 50321**
**515-283-8700**
**www.dmww.com**

DES MOINES WATER WORKS

# h2o line

*January 2001*

**DMWW: Your Pipeline to Water Information**

January 2001 Des Moines Water Works is your water authority!

# Buckets of Information

Water is an essential element in life. Des Moines Water Works (DMWW) is your **water authority**. We will provide you with the information about drinking water, our treatment process, and important health issues that affect you every day.

## Leadership

As an industry leader, DMWW has provided high-quality drinking water to its customers for over 80 years. One of our duties as a utility is to provide you with information pertinent to your health and well being. DMWW uses informational vehicles such as the *$H_2O$ Line*, the *Consumer Confidence Report*, and other water-related newsletters to educate customers and young people about water treatment and quality. You can *rely on DMWW as a water expert* when it comes to research and distribution of information concerning water-related issues.

DMWW will gladly provide you with information on several water-quality related topics. Fact sheets, such as those on lead and copper, fluoride, and nitrate; treatment brochures; and other printed materials are available upon request by calling our Customer Service department at 283-8700.

## Commitment

In order to maintain high standards for water quality, DMWW believes it is important to advocate source water protection. DMWW teamed up with Metro Waste Authority, Wastewater Reclamation Authority, and the City of Des Moines-Storm Water Division, forming the Urban Environmental Partnership. This group emphasizes the importance of water quality protection and other environmental subjects through educational programs. Another project DMWW coordinated was the Volunteer Monitoring Project in the Raccoon River Watershed. Residents within the watershed provided river water samples to DMWW for analysis to determine the nitrate concentrations throughout the watershed. Results from that study are available on the EMPACT Web site.

## Action

DMWW takes a proactive approach in keeping your drinking water safe. Using state of the art facilities and innovative scientific research methods, we consistently produce high-quality drinking water that meets or exceeds Environmental Protection Agency (EPA) standards. Daily water-quality testing and ongoing scientific studies enable us to closely monitor the source water for contaminants. We can then ensure proper treatment techniques are maintained to produce safe, clean drinking water. With the Treatment Plants at Fleur and Maffitt Reservoir, DMWW provides reliable quantities of water to Des Moines and the surrounding communities.

It is our civic and legal duty to inform our customers of any health alerts or EPA violations affecting your drinking water. An example is a nitrate level higher than the maximum contaminant level set by the EPA. In the **rare** event that this were to occur, DMWW would issue a public notice explaining precautionary measures for customers. However, DMWW built the Nitrate Removal Facility in 1991, greatly reducing the probability of a nitrate violation in your drinking water and reaffirming our commitment to bring you safe drinking water.

DMWW is committed to remain an industry leader in water treatment and quality. The next time you have a question about water, tap into DMWW for the answer.

Get your 24-hour water quality data at DMWW's *newly updated* **EMPACT** Web site - **www.dmww.com/empact** *$H_2O$ Line*

## Do you need to filter your tap water to receive clean, delicious tasting water?

Many companies say they can rid your water of minerals and contaminants, making your water and food taste better in your home. However, the water you receive from DMWW is a *safe, pleasant-tasting product* to prepare food and to clean fruits and vegetables. DMWW's water is also *less expensive* for your cooking needs and has no adverse effects.

DMWW adds powdered activated carbon to absorb our source water's natural organic material and man-made chemicals, allowing removal during treatment. This significantly improves the taste and odor of your drinking water. Using activated carbon filters in your home, *such as those found in* filter pitchers or faucet-mounted filters, is not necessary because this process takes place at the treatment plant.

## How much maintenance is required for home filtration systems?

Consumers do not always recognize the importance of properly maintaining a home filtration system. Failing to change filters on a *routine schedule can lead to bacteria build-up,* causing serious health risks for your household. A number of filtration systems require you to change the filter on a monthly basis. This can be an *expensive process* compared to simply turning on the tap. Let DMWW maintain safe, clean water for you!

The real question should be...why aren't more Americans drinking tap water? We would be glad to hear from you at 283-8700 or through our Web site at www.dmww.com.

**Forget filtering, just turn on the tap!**

## Treating Water Right

Water treatment is a vital step to make sure a safe high quality product is delivered to your tap. Des Moines Water Works operates two facilities, the new *Treatment Plant at Maffitt Reservoir and the* Treatment Plant on Fleur Drive, treating up to *125 million gallons of water per day.*

The Maffitt plant draws its water from shallow groundwater collector wells that run along the *Raccoon River. This water is naturally filtered by the* earth's course sand and gravel delivering water free from river sediment. Maffitt Reservoir also serves as an emergency water supply for the plant. At the Fleur Drive plant, water can be drawn from either *the Raccoon or Des Moines Rivers in addition to the* infiltration gallery, a groundwater collection system. DMWW plant operators and laboratory staff screen all source water daily to determine which has the highest quality water for treatment and distribution.

### Treatment Process

1. Addition of powdered activated carbon to remove organic matter, silt, and dirt. This is used only at the Fleur plant due to river water as source water. The Maffitt plant begins treatment with lime softening.
2. Lime softening to remove hardness compounds, germs, and bacteria.
3. Filtration through sand and gravel to remove remaining particles. When necessary at the Fleur *plant, a nitrate removal process is used to keep the* filtered river water safe for drinking.
4. Addition of fluoride to help prevent dental cavities and chlorine to disinfect the water.
5. Treated, clean, safe water enters storage tanks, eventually to be pumped through the distribution network right to your tap!

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DES MOINES WATER WORKS

# H2O Line

February 2001

**Filtering Out Misconceptions**

February 2001 DMWW is your PIPELINE to water information!

# What are you really FILTERING out?

Have you heard claims about improving the drinking water in your home? Numerous water treatment and filtration companies say they can provide you with higher quality drinking water. However, many of these claims can be misleading. As your pipeline to water information, Des Moines Water Works (DMWW) has the answers you need to know about **your high quality drinking water - right from the tap!**

DMWW is a leader among the municipal water treatment facilities that help make America's drinking water supply one of the safest in the world. Yet, it is estimated that nearly 40 percent of Americans use some sort of home water treatment device instead of relying on **dependable, safe, and clean tap water**. Households use anything from simple filter pitchers to complex water filtration systems. What it may boil down to is creating an unnecessary expense in your home.

## Are home filtration systems necessary to remove and reduce contaminants?

DMWW's number one priority is to provide you with safe, high quality water. Our source water is tested several times a day to ensure proper chemical levels are added in the treatment process, so that the treated water remains safe according to Environmental Protection Agency (EPA) standards. By taking precautionary measures during the treatment process, DMWW makes certain your drinking water is safe when it reaches your tap.

Some home filtration systems may actually be removing *valuable nutrients and disinfection chemicals* found in your tap water. Fluoride is an additive, not a contaminant, beneficial to your dental health by helping to prevent tooth decay. While most simple filtration systems do not remove fluoride, more complex types do take this additive out. Chlorine - the number one chemical removed in filtration systems - is vital in eliminating harmful bacteria from your drinking water. These minerals are not harmful to you, and are necessary for maintaining good health and clean water.

Home filtration systems are not necessary to remove nitrate because DMWW treats the source water according to EPA standards for nitrate. In fact, most home filtration systems do not remove nitrate. DMWW has the capability of running its nitrate removal facility when source water nitrate levels exceed EPA standards.

*Helpful Hint:* To convert the hardness level from milligrams per liter (mg/L) to grains per gallon (gpg), divide the mg/L value by 17.1. Some appliance optimum performance standards ask for hardness in gpg.

## Do I need to use a water softener or filter to soften my tap water?

Some home filtration systems use brass faucets, a combination of copper and lead. As water stands in the faucet, it dissolves the metal and increases the lead content of your drinking water. Filtered water can also be more corrosive due to its deficiency in mineral content, possibly raising the amount of lead dissolving into your water. The consumption of lead may cause delays in physical and mental development in children, and kidney problems or high blood pressure in adults.

Lead and copper are not found in DMWW's treated water, but may enter from the plumbing in your home. DMWW leaves enough hardness compounds in the water to coat your pipes as it travels to your tap. This protects the pipes from the corrosiveness of water. The water DMWW sends to your tap is softened during the lime-treatment process. If you choose to use a water softener in your home, the benefits may not outweigh the costs.

Soft water helps soap and other cleaning products work more effectively. It is less likely to leave "scum" rings and other traces of mineral deposits in your home. DMWW strives to maintain the total hardness of the drinking water to less than 150 milligrams per liter (mg/L), the moderate range. This provides you with sufficiently soft water to make cleaning products work more effectively.

Keep "filtering through" this information for more clues about water quality.

$H_2O$ Line

# Bottled Water vs. DMWW's Tap Water

Recent studies targeting the water industry have provided evidence that tap water is as safe, if not safer, and contains less bacteria than some types of bottled water.

Fluoride, the number one tooth decay fighting agent, is an additive that most bottled water manufactures remove during their filtering process. Extensive dental research has shown that tooth decay among children and adults has been significantly reduced due to the presence of fluoride in public drinking water. The American Dental Association (ADA) has endorsed the addition of fluoride to community water supplies for over 40 years.

Des Moines Water Works (DMWW) adds fluoride to its water according to the ADA's recommended levels. Bottled water manufacturers are regulated by the Food and Drug Administration (FDA) and are not required to disclose the amount of fluoride contained in their product. Most brands fall short of the EPA's guidelines for healthful fluoride content.

In addition, bottled water manufacturers make claims of greater purity than tap water. This is not completely accurate. Two different federal agencies regulate the testing processes and standards of the water sources. The EPA is responsible for monitoring tap water, while the FDA monitors bottled water. Tap water is required to be tested more frequently and more stringently, providing greater scrutiny of its quality and bacterial content.

The next time you're looking for an inexpensive, healthy thirst-quencher, ***just turn on the tap!***

## Facts and Figures about Fire Hydrants

DMWW's employees painting a hydrant.

- Fire hydrants serve purposes other than fire protection. DMWW uses hydrants to flush stagnant water from water mains during maintenance and to release air after repairs have been made in order to prevent damage to home plumbing. The city also uses fire hydrants for street and sewer cleaning.
- DMWW owns and maintains the fire hydrants in the public right-of-way. Some fire hydrants are installed only for maintenance purposes because their capacity for water pressure is not high enough for fire protection. You can identify maintenance hydrants by their red-colored tops.
- Fire hydrant tops come in colors other than red. A color-coding system indicates how much water is available in gallons per minute (gpm) from the hydrants.

| | | |
|---|---|---|
| Red hydrant tops | = | under 500 gpm |
| Orange hydrant tops | = | 500-1000 gpm |
| Green hydrant tops | = | 1000 or more gpm |

Green-topped hydrants with green caps designate high-volume hydrants connected to feeder mains.

- Fire hydrants are painted to make them visible for the fire department. DMWW has standardized on a yellow color for the body of the hydrant.
- You can help DMWW and the fire department access and locate hydrants more easily for repair and protection. Shovel snow away from hydrants, keep grass or weeds trimmed low around them, and please, do not plant flowers or shrubs around hydrants - hydrants exist for your protection!

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DES MOINES WATER WORKS

# H2O Line

March 2001

Everything Between Rain and Stream

March 2001

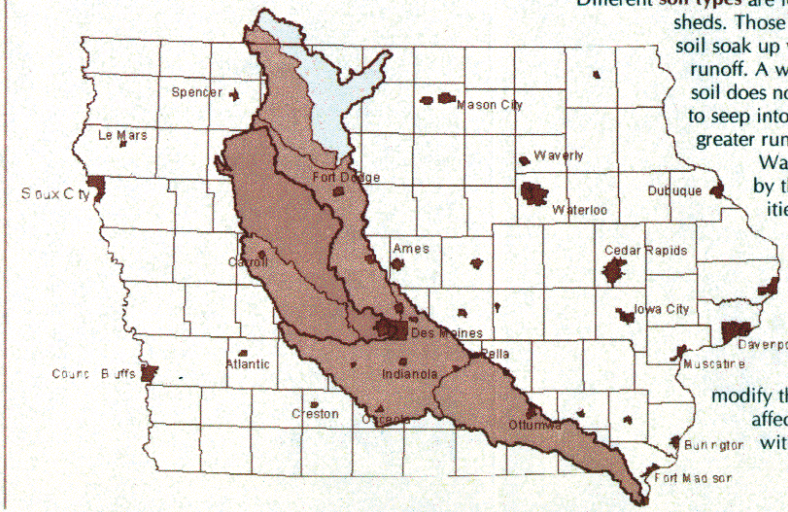
# over under around and across

## Winding Through Your Watershed

*No matter where we live, we are all in a watershed.*

Watersheds are areas where water flows across or under the land and drains into a river, lake, stream, pond, or other body of water. It includes the people who live in the area as well as land, air, plants, and animals. According to the Iowa Watershed Task Force, "A watershed is everything between the rain and the stream."

### Des Moines Water Works Watershed




*Several features make watersheds unique.*

Watersheds vary in **shape and size**. Some are large, including millions of acres of land and smaller watersheds within them. Others can be as small as a city block, or a puddle in your back yard. As a Des Moines Water Works' customer, you live in both the Raccoon and Des Moines River watersheds. Each is a part of the Mississippi River watershed, which is made up of thousands of smaller watersheds.

A geographical **boundary** around the watershed is formed by a ridge or high area. This forces water to drain toward or away from your watershed. But watersheds are also interconnected. The water that travels through one land area - including farm fields, forestland, suburban lawns, and city streets - will eventually affect and flow through another.

Watersheds are composed of different **terrain**. The flatness or steepness of the land (terrain) impacts how quickly the water empties into a body of water. If the water drains faster, there is more potential for flooding and soil erosion.

Different **soil types** are found within watersheds. Those that consist of sandy soil soak up water faster, reducing runoff. A watershed that has clay soil does not allow as much water to seep into the ground, leading to greater runoff.

Watersheds are affected by the **land use**. The activities and residents of the land area nearest the water impact the watershed. Cities, homes, roads, factories, farming, recreation, mining, and construction all modify the watershed and affect the natural resources within it.

*You play an important role in helping maintain a healthy watershed.*

Pollutants traveling through your watershed affect your entire home, work, and play areas. Water and other natural resources are necessary to live, and what we do in the watershed can change the quality and availability of these materials.

There are two types of watershed pollution: point-source and nonpoint-source. **Point-source pollution** begins from the leakage of contaminants from a specific, easily identifiable source. Examples include pollution coming from industrial or sewage discharge pipes, hog lots, or storm sewers. **Nonpoint-source pollution** comes from many different areas as water runs across or through the ground. This type of pollution is harder to identify, measure, and control. Some examples include runoff from fields or forestland, parking lots, failing septic systems, construction sites, and automobile exhaust.

By following **Best Management Practices** (BMPs), you can help keep your watershed clean and safe. BMPs are positive ways to control pollutants and prevent them from contaminating the water supply. You can use BMPs in your home, yard, and community to enjoy and maintain a healthy living environment.

### BMPs . . . at home & in your community

- Do not dump hazardous household chemicals, such as fertilizer, oil-based paint, or antifreeze, down the drain! Take them to the MWA's Regional Collection Center in Bondurant (967-5512) for safe disposal, or use environmentally safe cleaning products.
- Recycle your newspapers, magazines, milk jugs, juice bottles, metal cans, clear glass, and anything else possible to reduce the quantity of garbage you send to the landfill.
- Plant grass, trees, and shrubs to prevent soil from blowing or washing away. Bag leaves and grass clippings for compost collection to keep them from washing into storm sewers.
- Do not dump chemicals or anything else down storm sewers - most lead straight to our rivers.
- Keep your vehicles in good condition to prevent oil and antifreeze leaks from entering storm sewers from the street or your driveway.
- Do not litter! You can volunteer to help clean up area parks.

## Our Role in Reducing, Removing Nitrate

DMWW is committed to providing you with safe drinking water by helping to reduce or eliminate nitrate in our source water. We have built coalitions, implemented cost effective technologies, and developed landscapes that will protect our watershed. Some of these projects include:

- *A formalized education program.* Classroom presentations are available for grade levels K-8. The information focuses on daily water use, water conservation, the water treatment process, and the importance of protecting our watersheds. DMWW is the only water utility in Iowa with this type of program.
- *Participation in the Urban Environmental Partnership (UEP).* This group was formed to educate the public on the importance of water quality protection through watershed protection in an urban area. DMWW partners with Metro Waste Authority, Wastewater Reclamation Authority, and the City of Des Moines' Storm Water Division.
- *Volunteer Monitoring Project on the Raccoon River Watershed.* Along with DMWW, volunteers collected over 1000 water samples during a year-long project surveying the nitrate concentrations in various locations of the Raccoon River watershed.
- *Environmental Monitoring for Public Access and Community Tracking (EMPACT).* DMWW was awarded an EPA grant to develop a Web site that provides Des Moines' treated water and source water quality information to anyone with Internet access. Visit the Web site at www.dmww.com/empact.

DMWW continually looks for new ways to address nitrate issues while consistently providing you with **clean, safe drinking water**.

## DEWEY™ FACTS: Nitrate Removal Facility Vessels

- There are 8 nitrate removal vessels with a total operating capacity of 15 million gallons of water per day located in DMWW's Nitrate Removal Facility.
- Each vessel is 132 inches in diameter, 14 feet 2-7/8 inches high, and weighs 11,000 pounds.
- The vessels contain a total of 450 cubic feet of ion exchange resin and 232 cubic feet of support gravel for the resin.
- The Nitrate Removal Facility has enough space to add 2 more vessels, if necessary.

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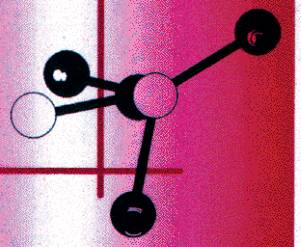
# H2Oline

April 2001

**DES MOINES WATER WORKS**

**Keeping an "Ion" Nitrate**



April 2001 *Quality Water, Quality Service - Our Commitment to You*

# Concentrating on Nitrate

## DMWW is Your Source for Important Nitrate Information

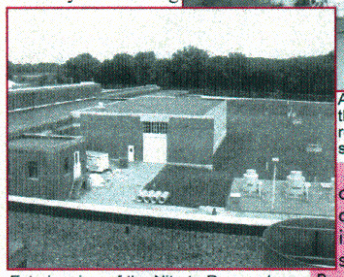
The word *nitrate* may generate some questions in your mind when you associate it with water quality and your health. Newspaper and television coverage about nitrate frequently discusses how it can harm the environment, water supply, or humans. Nitrate can lead to some serious consequences concerning your well-being, but Des Moines Water Works (DMWW) uses several methods to ensure that your drinking water remains below the Environmental Protection Agency (EPA) standards for nitrate concentrations, providing you with safe, healthy drinking water.

DMWW's Fleur Plant has the option of selecting from three water sources - the Raccoon River, Des Moines River, and infiltration gallery - for use in our drinking water treatment process. Our lab monitors the source water through daily testing of the water quality in each river. We then choose the one with the lowest nitrate concentrations to provide you with the best quality drinking water possible. Another alternative is running our Nitrate Removal Facility when nitrate levels are high in the source water (see "Nixing Nitrate in Your Water").

The maximum contaminant level (MCL) set by the EPA is 10 milligrams per liter (mg/l) of water. DMWW maintains a level below the MCL. If the nitrate level in your drinking water were to exceed the MCL, we are required to notify you of the necessary precautions to follow.

So what exactly is nitrate and how might it affect you? Nitrate is a chemical compound of nitrogen and oxygen that easily dissolves in water. It is typically used as a plant nutrient found in fertilizer, but it can form in septic systems, animal feed lots, manure, wastewater, and sanitary landfills as well. Nitrate enters our source water from both urban and rural watershed run-off or contamination of groundwater from the application of fertilizers.

In the unlikely event that nitrate levels exceed the MCL in your drinking water, a major concern exists for infants under the age of six months. Nitrate can enter the infant's body transforming into nitrite, which reduces the ability of blood to carry oxygen. This may cause Blue Baby Syndrome, a life threatening condition that requires immediate medical attention. Indicators of this condition include the infant appearing blue and having shortness of breath.



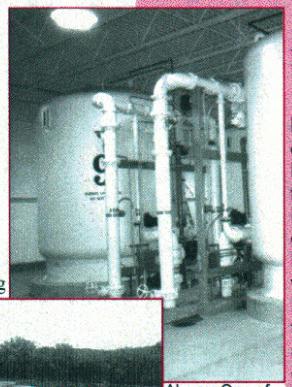
Exterior view of the Nitrate Removal Facility and underground clear wells.

Research has also linked nitrate to other health concerns, such as the development of certain types of cancer in adults. However, a higher risk is present for infants because their immature organs have a more difficult time processing nitrate.

Although the possibility of a nitrate warning exists, the likelihood of this event is very rare due to the preventative measures DMWW has built into the treatment process. We make it our priority to provide you with healthful, safe, and clean drinking water.

# Nixing Nitrate in Your Water

## Inside Our Nitrate Removal Facility



Above: One of the nitrate removal vessels.

One of the largest water quality issues that DMWW faces is the level of nitrate in the Raccoon and Des Moines River, two of our water sources. Data trends over the past 25 years show that the concentrations of nitrate have steadily increased. This problem may be caused by the continuing use and heavier application of fertilizer on the land in our watershed. DMWW built the Nitrate Removal Facility in the winter of 1990-1991 as a preventative measure to keep your drinking water safe at times when nitrate concentrations are extremely high in our source water.

The Nitrate Removal Facility consists of eight nitrate removal vessels that can treat up to 15 million gallons of water per day. Depending on the nitrate concentration level and plant flow, DMWW will operate between four and all eight vessels at one time. The facility has been operated from zero to 106 days in the year, with an average of 45 days of operation per year since 1991.

DMWW uses a process called "ion exchange" to remove nitrate from the water. Nitrate ions are captured by resin material as the water passes through the nitrate removal vessel, and chloride ions are released into the water to reduce the amount of nitrate ions. This process is similar to a home water softening device that removes calcium and magnesium ions from the water, exchanging them for sodium ions. The nitrate-reduced water is then blended with pre-treated drinking water to produce a safe, clean product with nitrate concentrations below the EPA's 10 mg/l MCL.

After the nitrate has been collected in the removal vessels, DMWW pumps water concentrated with sodium chloride through the vessels to exchange the captured nitrate for chloride. The water containing the collected nitrate is then diluted with infiltration gallery water and discharged back into the Raccoon River. Due to the large volume of nitrate concentrations already in the river and the small amount of water DMWW discharges, this process does not add to nitrate concentration problems in other cities and water utilities downstream.

Although the Nitrate Removal Facility is a proactive approach in keeping the drinking water safe from nitrate contamination, the best way to keep nitrate from entering the source water is through watershed protection programs. With your help in protecting our water sources, the need to use the Nitrate Removal Facility in the future could be greatly reduced, or even eliminated.

# Appendix B
## Glossary of Terms

**A**

**Acetochlor:** A herbicide sold under the trade name of Harness. It is an unregulated contaminant with no maximum contaminant level (MCL).

**Alkalinity:** A measure of the acid-neutralizing property of water.

**Anion:** A negatively charged ion.

**Aquifer:** A water-bearing stratum of permeable rock, sand, or gravel.

**Atrazine:** A herbicide and SDWA-regulated contaminant with a maximum contaminant level (MCL) of 0.003 mg/l.

**B**

**C**

**Calcium Carbonate Precipitation Potential (CCPP):** The amount of hardness that can come out of the water to form protective scale on plumbing surfaces.

**Calcium Hardness as $CaCO_3$:** A measure of the calcium mineral contribution to total hardness.

**Chloride:** A common table salt component found in all natural waters. Concentrations greater than 250 mg/l can cause the water to taste salty and contribute to metal corrosion.

**Chlorine:** A gas that is commonly added to drinking water as a disinfectant to make the water safe to drink.

**Coliforms:** Microorganisms that live in the digestive tracts of humans and animals. The detection of coliform bacteria in treated drinking water suggests that a treatment or distribution system is not working properly.

**Conductivity:** The ability to carry an electric current. Its measurement in water indicates the amount of dissolved salts or minerals in the water.

**Consumer Confidence Report (CCR):** An annual drinking water quality report required by the Safe Drinking Water Act (SDWA) for customers of public water supply systems.

**Copper:** A metal that can be present in drinking water through the corrosion of plumbing materials such as copper pipes.

***Cryptosporidium:*** A microscopic organism found in rivers and streams that can cause diarrhea, fever, and gastrointestinal distress if ingested. It finds its way into the watershed through animal and human wastes.

**D**

**Disinfection byproduct:** A compound formed by the reaction of a disinfectant such as chlorine with organic material in the water supply.

**Database:** A collection of data organized by fields, records, and files. A field is a single piece of information, a record is a complete set of fields, and a file is a collection of records.
(Definition from *http://www.webopedia.com*.)

**Database management system:** A collection of computer programs that enables you to store, modify, and extract information from a database. (Definition from *http://www.webopedia.com.)*

**Domain name:** A name that identifies one or more Internet Protocol (IP) addresses. Domain names are used in Uniform Resource Locators (URLs) to identify particular Web pages.
(Definition from *http://www.webopedia.com.*)

**Drinking water:** Water that is conveyed to residences and businesses from a public water system. Typically, this water is treated by a water utility to make it potable. Drinking water is sometimes referred to as finished water.

**E**

***E. coli:*** Bacteria whose presence indicates that the water may be contaminated with human or animal wastes.

**Ecosystem:** All of the interacting organisms in a defined space in association with their interrelated physical and chemical environment.

**F**

**Fecal Coliform:** Bacteria found in the intestinal tracts of warm-blooded animals. The presence of fecal coliform in water is an indicator of pollution and possible contamination by pathogens.

**Finished water:** See "Drinking Water."

**Firewall:** A system designed to prevent unauthorized access to or from a private network. Firewalls can be implemented in hardware, software, or a combination of both. (Definition from *http://www.webopedia.com.*)

**Fluoride:** A naturally occurring mineral added to water to help reduce cavities in young people.

**G**

**H**

**Hardness:** The amount of soap-precipitating minerals in the water. Both calcium and magnesium combine with soap to make it less effective. A hardness measurement is expressed as the amount of $CaCO_3$ (pure limestone) that would produce the hardness.

**Hardware:** Computer devices that you can actually touch, such as disks, disk drives, display screens, keyboards, printers, boards, and chips. (Definition from *http://www.webopedia.com.*)

**Heterotrophic Plate Count (HPC) bacteria:** All bacteria found growing on a non-selective food media. These are not indicators of disease, but large numbers in a drinking water distribution system indicate stale water, minimal disinfection and, therefore, an increased risk of disease. HPC bacteria can also cause unpleasant tastes and odor in the water.

**HyperText Markup Language (HTML):** Programming language for publishing hypertext on the Web. (Definition from *http://www.webopedia.com.*)

**I**

**Infiltration Gallery:** A sub-surface groundwater collection system, typically shallow in depth, constructed with open-jointed or perforated pipes that discharge collected water into a watertight chamber from which the water is pumped to treatment facilities and into the distribution system. Usually located close to streams or ponds.

**Inorganic Contaminants:** Mineral-based compounds such as metals, nitrates, and asbestos. These contaminants are naturally-occurring in some water, but can also get into water through farming, chemical manufacturing, and other human activities. EPA has set legal limits on 15 inorganic contaminants.

**Internet Browser:** A software application used to locate and display Web pages. The two most popular browsers are Netscape® Navigator™ and Microsoft® Internet Explorer™. (Definition from *http://www.webopedia.com.*)

**J**

**K**

**L**

**Langeliers Index:** A corrosion indicator based on pH. A positive number means that the water will deposit protective minerals on plumbing to prevent metal pipe corrosion.

**Lead:** A metal that can be present in drinking water through the corrosion of plumbing materials such as lead solder.

**M**

**Magnesium Hardness as $CaCO_3$:** The magnesium contribution to total hardness. It is measured and expressed as the equivalent amount of $CaCO_3$ (pure limestone) that would produce this hardness.

**Maximum Contaminant Level (MCL):** The highest level of a contaminant that EPA allows in drinking water. MCLs ensure that drinking water does not pose either a short-term or long-term health risk. EPA sets MCLs at levels that are economically and technologically feasible. Some states set MCLs that are more strict than EPA's.

**Methemoglobinemia**: A blood disorder caused when nitrite interacts with the hemoglobin in red blood cells. Unlike hemoglobin, the methemoglobin formed in this interaction cannot carry sufficient oxygen to the body's cells and tissues. Although methemoglobinemia is rare among adults, cases have been reported among infants, where nitrate-contaminated water was used to prepare formula and other baby foods.

**Metolachlor:** A herbicide sold under the trade name of Dual. It is an unregulated contaminant with no maximum contaminant level (MCL); however, a health advisory concentration for this pesticide has been set at 0.070 mg/l.

**Microorganisms:** Tiny living organisms that can be seen only with the aid of a microscope. Some microorganisms can cause acute health problems when consumed in drinking water. Also known as microbes.

**N**

**Nitrate-N:** A form of nitrogen fertilizer that is readily available to plants. This form of nitrogen is very water soluble and moved through the soil into groundwater and surface water.

*Nitrite-N:* The actual form of nitrogen that can combine with hemoglobin to form methemoglobinemia or "blue baby syndrome." It is an intermediate compound that is formed when ammonia is converted to nitrate by bacteria.

**Nonpoint source:** Any source of pollution not associated with a distinct discharge point.

**O**

**Organic Contaminants:** Carbon-based chemicals, such as solvents and pesticides, which can get into water through runoff from cropland or discharge from factories. EPA has set legal limits on 56 organic contaminants.

**Ortho-phosphate:** A naturally occurring substance that is sometimes added to the water for additional corrosion protection.

**P**

**Pfiesteria:** toxic dinoflagellate (microscopic, free-swimming, single-celled organisms, usually classified as a type of alga) associated with fish lesions and fish kills in mid-Atlantic Coastal Waters.

**pH:** A measure of the strength of an acid on a 0-14 scale, where 7 is neutral, less than 7 is acidic, and greater than 7 is basic.

**Plug-in:** A hardware or software module that adds a specific feature or service to a larger system. For example, there are a number of plug-ins for Internet browsers to enable the display of different types of audio or video messages.

**Point source:** A stationary location or fixed facility from which pollutants are discharged or emitted. Also, any single identifiable source of pollution, e.g., a pipe, ditch, ship, ore pit, factory smokestack.

**Pollutant loading:** The quantity of a pollutant entering the environment (soil, water, air).

**Potable (drinking) water:** Water that meets U.S. EPA and/or state water quality standards and is considered safe and fit for human consumption.

**Potassium:** A common element found at low levels in drinking water.

**Protazoa:** Single-celled, eucaryotic microorganisms without cell walls. Most protozoa are free-living although many are parasitic.

**Q**

**R**

**Radionuclides:** Any man-made or natural element that emits radiation. Radionuclides may cause cancer after many years of exposure through drinking water.

**S**

**Server:** A computer or device on a network that manages network resources. For example, a database server is a computer system that processes database queries. (Definition from *http://www.webopedia.com.*)

**Silica ($SiO_2$):** A common, naturally occurring substance in the earth's crust. It can contribute to scale formation and reduce pipe corrosion.

**Sodium:** One of the two components in ordinary table salt (sodium chloride). It is a common substance in nature and is a needed mineral in the diet. The amount of sodium in water is generally small relative to the amount present in food.

**Software:** Computer instructions or data. Anything that can be stored electronically. (Definition from *http://www.webopedia.com.*)

**Source water:** Ambient water that is accessed by water utilities to treat for distribution as drinking water. Source water can originate in either a surface source (such as a lake, river, or reservoir) or a subsurface source (such as a well). Source water is sometimes referred to as raw water.

**Structured Query Language (SQL):** A standardized query language for requesting information from a database. SQL was first introduced as a commercial database system in 1979 by Oracle Corporation. (Definition from http://www.webopedia.com.)

**Sulfate:** A stable form of sulfur common in natural waters, especially where gypsum is present. It can produce a taste in drinking water when present in concentrations over 200 mg/l and may produce a laxative effect when present in concentrations over 750 mg/l.

**Synthetic Organic Chemicals (SOCs):** Man-made (anthropogenic) organic chemicals. Some SOCs are volatile; others tend to stay dissolved in water instead of evaporating.

**T**

**Total Dissolved Solids (TDS):** The amount of dissolved substances, such as salts or minerals, in water.

**Total Organic Carbon (TOC):** A measure of carbon compounds in water that are from an organic (living) origin. In combination with a disinfectant such as chlorine, the presence of TOC can result in the formation of trihalomethanes.

**Trihalomethane (THM):** One of a class of compounds known as disinfection byproducts that result from chlorinating water containing naturally occurring organic material.

**Turbidity**: A measurement of scattered light (cloudiness) in a column of water. Light is scattered when it strikes suspended particles such as clay, silt, or microscopic organisms.

**Volatile Organics:** Chemicals that, as liquid, evaporate into the air.

**W**

**Quality:** A measure of the presence and quantity of certain constituents or parameters (like naturally occurring substances, man-made chemicals, and industrial contaminants) in water.

**Web server:** A computer that delivers (serves up) Web pages. Every Web server has an IP address and possibly a domain name. Any computer can be turned into a Web server by installing server software and connecting the machine to the Internet. (Definition from *http://www.webopedia.com.*)

**Wellhead:** A particular well site location, as differentiated from other well site locations, that exist in the same water system.

**Wetland:** an area that is regularly saturated by surface or groundwater and subsequently is characterized by prevalence of vegetation that is adapted for life in saturated soil conditions. Examples include swamps, bogs, fens, marshes, and estuaries.

# Appendix C
## Tucson Water's EMPACT Water Quality Project

The Water Quality Management Division of Tucson Water, in Tucson, Arizona, delivers more than 37 billion gallons of water annually to approximately 675,000 customers. The city of Tucson, Arizona is one of the largest U.S. cities that currently obtains its drinking water supply from groundwater wells. To ensure future sustainability, Tucson has started to supplement its groundwater supply with water from the Colorado River through the Central Arizona Project (CAP). Tucson's selected blend of recharged Colorado River water and groundwater is known as the Clearwater Supply. The Tucson Water EMPACT project seeks to introduce this alternate and necessary supply of water to the public by providing timely information on the quality of the blended drinking water at taps in homes and businesses. Tucson's EMPACT project not only provides a resource for water quality information, but also results in environmental benefits through a focused consumer outreach effort.

### Partner Organizations

Tucson Water has received a 2-year grant from EPA's EMPACT program. Tucson's EMPACT project partners include the following:

- Arizona Department of Environmental Quality
- Tucson Unified School District, David T. Smith Resource Center
- Tucson-Pima Public Library
- University of Arizona, Water Resources Research Center
- University of Arizona, Southwest Environmental Health Sciences Center
- Pima County Health Department
- Pima County Waste Water Management
- Tucson Hispanic Chamber of Commerce
- University of Arizona, National Science Foundation, Water Quality Center
- Citizens and Neighborhood Services

### Sample Collection/Analysis

Tucson Water's EMPACT project increases the number of water quality parameters currently measured by the utility and adds continuous on-line monitoring. Specifically, the utility has added continuous on-line monitoring of the quality of potable water and the quantity and general quality of recycled wastewater and secondary effluent discharged to the Santa Cruz River. One objective of the EMPACT project is to expand the utility's monitoring technology to include a new process for measuring total trihalomethanes. Trihalomethanes are suspected human carcinogens that can form when drinking water that contains organic material is disinfected with chlorine.

Also under the EMPACT project, Tucson Water has selected 22 locations for on-line monitoring to track the conveyance of finished water throughout the utility's distribution system. Tucson is installing the on-line instrumentation over the next year to continuously track chlorine residual, conductivity, estimated total dissolved solids, pH, and temperature. This special monitoring pro-

gram will provide Tucson Water's customers with information on water quality throughout the utility's distribution system.

## Data Management/Data Delivery

The objective of Tucson Water's EMPACT project data management, processing, and delivery system is to improve the time relevancy of water quality data related to the potable distribution system. To do this, Tucson Water is developing timely methods for transmitting and verifying the quality of data from the on-line and manual monitoring programs and posting these data to the project Web site. The EMPACT project will allow community residents to identify their street addresses on a Web site map, receive easily understandable results from nearby water monitoring stations, and obtain a timely report on the quality of their drinking water.

## Communications/Outreach

The outreach objectives for Tucson's EMPACT project include identifying the water quality/quantity data desired by targeted groups and developing effective, state-of-the art methods to communicate these data. Building on existing city programs, the EMPACT project will identify specific constituencies and solicit feedback on the water quality data desired and the best formats for individualizing data by location and creating a context for understanding water resources. Through its outreach products, Tucson hopes to eliminate any misperception about community water quality and provide a source of reliable, authoritative information on fast-breaking water quality issues.

## For More Information

For more information about Tucson Water's EMPACT water quality project, visit

*http://www.ci.tucson.az.us/water.*

# Appendix D
# Communications/Outreach Planning and Resources

This appendix will assist you with developing and implementing an outreach plan for communicating a variety of information to the public. Section D.1 provides general step-by-step guidance on creating an outreach plan. Section D.2 includes guidelines for effectively communicating technical information and provides a list of resources you can use to enhance your outreach efforts.

## D.1 Creating an Outreach Plan

Your outreach efforts will be most effective if you plan them carefully. An outreach plan ensures that you have thoroughly considered all aspects of your outreach efforts before you begin. Your plan does not need to be lengthy or complicated! You can develop a plan simply by documenting your answers to these questions, which are discussed in the following subsections:

- Who are your partners?
- What are your outreach goals?
- Whom are you trying to reach?
- What information do you want to communicate?
- What outreach products will you develop?
- How will your outreach products reach your audiences?
- What follow-up mechanisms will you establish?
- What is your schedule for implementation?

TIP: Outreach planning is a creative and iterative process that involves a number of interrelated steps. As you move through each of the planning steps discussed below, you should revisit the decisions you have made for previous steps to make sure you are creating a fully integrated, comprehensive, and achievable outreach plan.

### D.1.1 Who Are Your Partners?

Try to involve a variety of people in the design and development of your outreach plan. When possible, consider involving the following:

- A communications specialist or someone who has experience with developing and implementing outreach plans.
- Technical experts (e.g., experts in water quality, policy, information systems).
- Representatives of your target audience categories.
- Key individuals who will be involved in implementing your outreach plan.

Consider inviting community organizations to partner with you in planning or implementing your outreach efforts. Potential partners might include local businesses and trade associations, environmental organizations, schools, community groups, local health departments, local planning and zoning authorities, and other local or state agencies. Partners can help you with outreach

planning, product development and review, and/or product distribution. Partnerships can be valuable mechanisms for leveraging resources while enhancing the quality, credibility, and overall success of your outreach efforts.

### D.1.2 What Are Your Outreach Goals?

Outreach goals should be clear, simple, action-oriented statements about what you hope to accomplish through your outreach efforts. Every other aspect of your outreach plan should relate to your goals.

Try to rank and prioritize your goals in terms of relative importance. Consider the importance of your goals as you move through the planning process. For goals of greater importance, you will want to tailor your partnerships, outreach products, and information dissemination strategies to allow you to reach a greater number of affected people in a shorter amount of time.

### D.1.3 Whom Are You Trying to Reach?

To answer this question, you must both identify and profile your target audience. The identification and profiling processes are discussed below.

#### Identifying Your Audience

As you design your outreach plan, you will need to clearly identify the target audience for your outreach efforts. The types of audiences targeted for a water quality outreach program might include the general public, local businesses and trade associations, decision-makers, educators and students, and community groups (e.g., homeowners associations, fishing/boating organizations, and gardening clubs). Some types of target audiences, such as educators and community groups, might serve as pathways to help you disseminate information to other types of audiences, such as students and the general public.

If you have more than one target audience, you may want to consider dividing the group into audience categories. For example, if the water quality information you intend to provide to the general public differs from the information you intend to provide to businesses, you may want to consider these targets as separate audience categories.

#### Profiling Your Audience Categories

Your outreach efforts will be most effective if you tailor the type, content, and distribution of your outreach products to the characteristics of your target audience categories. To do this, you will want to profile the situations, interests, and concerns of your audience members. These profiles will help you identify the most effective ways to reach each audience category. Consider how you would describe your audience members:

- What is their current level of knowledge about drinking water and source water?
- What is their average education level? What language do they speak?
- What should they know about drinking water and source water quality in your community? What actions would you like them to take?
- What information is likely to be of immediate interest to them?
- Once they develop an awareness of water quality issues in your community, what information will they want to know?

- How much information will they want to see? How much time are they willing to spend to understand the information?
- How do they generally receive information? How would they prefer to receive your information?
- In what types of professional, recreational, and domestic activities do they typically engage? Are there any organizations or centers that might represent pathways for your outreach efforts?

When you answer these questions, talk with representatives of your target audience categories and with colleagues who have successfully reached out to your audience categories.

### D.1.4 What Information Do You Want To Communicate?

In this step, think about the key points, or "messages," you want to relate to your audience. A message is the "bottom-line" information you want your audience to remember, even if they forget the details. A message is usually phrased in a brief (often one-sentence) statement. Outreach products often have multiple related messages.

### D.1.5 What Outreach Products Will You Develop?

You will want to determine what types of outreach products or tools will most effectively reach each of your target audience categories. There are many different types of outreach products available in print, audiovisual, electronic, event, and novelty formats.

Your outreach goals and target audience profiles will help you select appropriate and effective outreach products and tools. A communications specialist can provide you with valuable guidance on choosing the most appropriate products to meet your goals within your resource and time constraints. When selecting your products, consider your answers to the following questions:

- How much information does your audience really need to have? How much does your audience need to know immediately? (Keep in mind that the simplest, most straightforward product is generally the most effective.)
- Is the outreach product likely to appeal to your audience? How much time will it take your average audience member to interact with the product? Is your audience likely to make that time?
- Will the distribution and organization of your product be easy and cost-effective?
- How many people will the product reach?
- What time frame is needed to develop and distribute/organize the product?
- How much will it cost to develop the product? Do you have access to the talent and resources needed for product development?
- What other related products are already available? Can you build on existing products?
- When will the information be out of date? (Keep in mind that you will want to spend fewer resources on products with shorter life spans.)

- Would it be effective to have distinct phases of products over time? (For example, consider the first phase of a product designed to raise awareness, followed by a second phase of products at later dates to encourage changes in behavior.)
- How newsworthy is the information you are trying to communicate? (Information with inherent news value is more likely to be rapidly and widely disseminated by the media.)

OUTREACH PRODUCTS

| | | |
|---|---|---|
| Print | Brochures<br>Educational curricula<br>Newsletters<br>Posters<br>Question-and-answer sheets | Editorials<br>Fact sheets<br>Newspapers and magazine articles<br>Press releases<br>Utility bill inserts |
| Audiovisual | Cable television programs<br>Exhibits and kiosks | Public service announcements (radio)<br>Videos |
| Electronic | E-mail messages<br>Web pages | Subscriber list servers<br>Interactive compact disks |
| Events | Briefings<br>Fairs and festivals<br>One-on-one meetings<br>Public meetings | Community days<br>Media interviews<br>Press conferences<br>Speeches |
| Novelty Items | Banners<br>Buttons<br>Floating key chains for boaters<br>Magnets | Bumper stickers<br>Coloring books<br>Frisbee discs<br>Mouse pads |

### D.1.6 How Will Your Outreach Products Reach Your Audiences?

You have many outreach product distribution options available to you. Consider the following examples:

- Mailing lists belonging to your organization or partner organizations.
- Phone and fax.
- E-mail.
- Internet.
- Journals or newsletters put out by partner organizations.
- Television.
- Radio.
- Print media.
- A hotline that distributes products upon request.
- Meetings, events, or locations (e.g., libraries, schools, community centers) where products are made available to the public.

You should consider how each of your products will be distributed and determine who will be responsible for distribution. For some products, your organization might manage the distribution. For other products, you might rely on intermediaries (e.g., the media or educators) or organizational partners. You should consult with a communications specialist to obtain information about the time and resources required for various distribution options. Consider the following issues when you select your distribution mechanisms:

- How does your audience typically receive information? How would they prefer to receive your information?
- What distribution mechanisms has your organization used in the past for this audience category? Were these mechanisms effective?
- Can you identify a partner organization that would be willing to assist you with distribution?
- Can the media play a role in distribution?
- Will your distribution mechanism really reach the intended audience? For example, although the Internet can be an effective distribution mechanism, certain audience categories may have limited access to it.
- How many people will your product reach through the distribution mechanism you are considering?
- Do you have sufficient resources available to fund and implement the distribution mechanisms you are considering?

### D.1.7 What Follow-up Mechanisms Will You Establish?

If you have successfully reached out to your target audiences, you may receive requests for additional information. Your audience members may become concerned about the issues you have communicated to them. As part of your outreach plan, you should determine if and how you will respond to the follow-up interests of people in your community. Consider the following questions:

- What types of reactions or concerns are audience members likely to have in response to the outreach information?
- Who will be responsible for handling requests for additional information?
- Should you indicate on your outreach products where people can go for additional information? Will you provide a contact name, phone number, and/or Internet, mail, or e-mail address? Will you establish a hotline?
- How will you track and analyze feedback?
- How and when will you use feedback to improve your outreach efforts?

### D.1.8 What is Your Schedule for Implementation?

Once you have selected the most effective combination of goals, audience categories, messages, products, and distribution mechanisms for your project, you should develop an implementation schedule for your outreach plan. First, consider the relative importance of each of your outreach goals. You

should have a shorter implementation schedule associated with your most important goals. For each of your outreach products, consider how much time will be needed for design, development, and distribution. Be sure to factor in sufficient time for product review. When possible, also factor in some time for testing and evaluation by representatives of your target audience category to solicit feedback on the effectiveness of your product.

## D.2 Resources for Presenting Water Quality Information to the Public

As you begin to implement your outreach plan and develop outreach products, you should make sure that these products present your messages and information as clearly and accurately as possible. This section discusses methods for effectively communicating technical information to the public and provides resources to help you shape the style and content of your outreach products.

### D.2.1 How Do You Present Technical Information to the Public?

Environmental topics are often technical in nature, and water quality is no exception. Nevertheless, this information can be conveyed in simple, clear terms to nonspecialists. Principles of effective writing for the public include avoiding jargon, translating technical terms into everyday language, using the active voice, keeping sentences short, and using headings and other formatting devices to provide a very clear, well-organized structure. You can refer to the following Web sites for more ideas about how to write clearly and effectively for a general audience:

- The National Partnership for Reinventing Government has developed a guidance document, Writing User-Friendly Documents, which is available at *http://www.plainlanguage.gov/.*
- The Web site of the American Bar Association, *http://www.abanet.org/lpm/writing/styl.html*, has links to important online style manuals, dictionaries, and grammar primers.
- The Web site of the Environmental Education and Training Partnership, *http://eee.eetap.org,* has guides for developing environmental education documents.

As you develop outreach products for a specific audience, remember to consider what your audience members are already likely to know, what you want them to know, and what they are likely to understand. Then tailor your information accordingly. Provide only the information that will be valuable and interesting to the target audience. For example, local businesses might be interested in the hardness of the potable water they are using for manufacturing processes; however, senior citizens interested in the overall safety of their drinking water are not likely to be engaged by this topic.

When developing outreach products, you should consider any special needs of the target audience. For example, if your community has a substantial number of people who speak little or no English, you will need to prepare communication materials in their native language.

The remainder of this section provides some online resources that you can consult when developing your outreach projects. Some of the Web sites listed below contain products, such as downloadable fact sheets, that you can use to support your communication and outreach efforts.

## Federal Resources

**EPA's Office of Groundwater and Drinking Water (OGWDW)**
http://www.epa.gov/safewater

This site provides information on a variety of topics, from drinking water and health, source water protection, and training to applicable regulations, standards, and guidance. The site also includes a kid's page, which contains games and activities to help children learn about drinking water.

**EPA's Office of Wetlands, Oceans, and Watersheds (OWOW)**
*http://www.epa.gov/owow*

This site provides a variety of information related to wetlands, oceans, and watersheds. The site provides new information, resources for concerned citizens, and answers to frequently asked questions. Specific to watersheds, the site provides information on water quality monitoring and watershed pollution issues.

**EPA's Surf Your Watershed**
*http://www.epa.gov/surf3*

EPA provides this service to locate, use, and share environmental information on watersheds. One section of this site, "Locate Your Watershed," allows users to enter the names of rivers, schools, or a zip code to learn more about the water resources in their local watersheds. Users can also access the Index of Watershed Indicators (IWI) from this site. The IWI is a compilation of information on the health of aquatic resources in the U.S. The index uses a variety of indicators to determine whether rivers, lakes, streams, wetlands, and coastal areas can be described as "well" or "ailing".

**EPA's NonPoint Source Pointers**
*http://www.epa.gov/owow/nps/facts*

This Web site features a series of fact sheets on nonpoint source pollution. The series covers topics including programs and opportunities for public involvement in nonpoint source control, managing urban runoff, and managing nonpoint pollution from various sources (e.g., agriculture, boating, households).

**U.S. Department of Agriculture Natural Resources Conservation Service**
*http://www.wcc.nrcs.usda.gov/water/quality/frame/wqam*

This site includes guidance documents that provide the following resources: a simple tool to estimate the sensitivity of a water body to nutrients, a procedure to evaluate the conditions of a stream based on visual characteristics, and information on how to design a monitoring system to observe changes in water quality associated with agricultural nonpoint source controls.

## Educational Resources

**Project WET (Water Education for Teachers)**
*http://www.montana.edu/wwwwet*

The goal of Project WET is to promote awareness, appreciation, knowledge, and stewardship of water resources by developing and disseminating classroom-ready teaching aids and establishing state and internationally sponsored Project WET programs. This site includes a list of all state Project WET Program Coordinators to help you locate a contact in your area.

**Water Science for Schools**
*http://wwwga.usgs.gov/edu/index.html*

The U.S. Geological Survey's (USGS's) Water Science for School Web site offers information on many aspects of water quality, along with pictures, data, maps, and an interactive forum where students can give opinions and test their water knowledge.

**Global Rivers Environmental Education Network (GREEN)**
*http://www.earthforce.org/green*

The Global Rivers Environmental Education Network (GREEN) helps young people protect the rivers, streams, and other vital water resources in their communities. This program merges hands-on, scientific learning with civic action. GREEN is working with EcoNet to compile pointers on water-related resources on the Internet. This site (http://www.igc.apc.org/green/resources.html) includes a comprehensive list of water quality projects across the country and around the world.

**Adopt–A–Watershed**
*http://www.adopt-a-watershed.org/about.htm*

Adopt-A-Watershed is a K-through-12 school/community learning experience that uses local watersheds as living laboratories in which students can engage in hands-on activities. The goal is to make science applicable and relevant to students' lives.

**National Institutes for Water Resources**
*http://wrri.nmsu.edu/niwr/niwr.html*

The National Institutes for Water Resources (NIWR) is a network of 54 research institutes throughout the U.S. They conduct basic and applied research to solve water problems unique to their areas and establish cooperative programs with local governments, state agencies, and industries.

## Other Organizations

**The Watershed Management Council**
*http://watershed.org/wmc/aboutwmc.html*

The Watershed Management Council is a not-for-profit organization whose members represent a broad range of watershed management interests and disciplines. Members include professionals, students, teachers, and individuals who are interested in promoting proper watershed management.