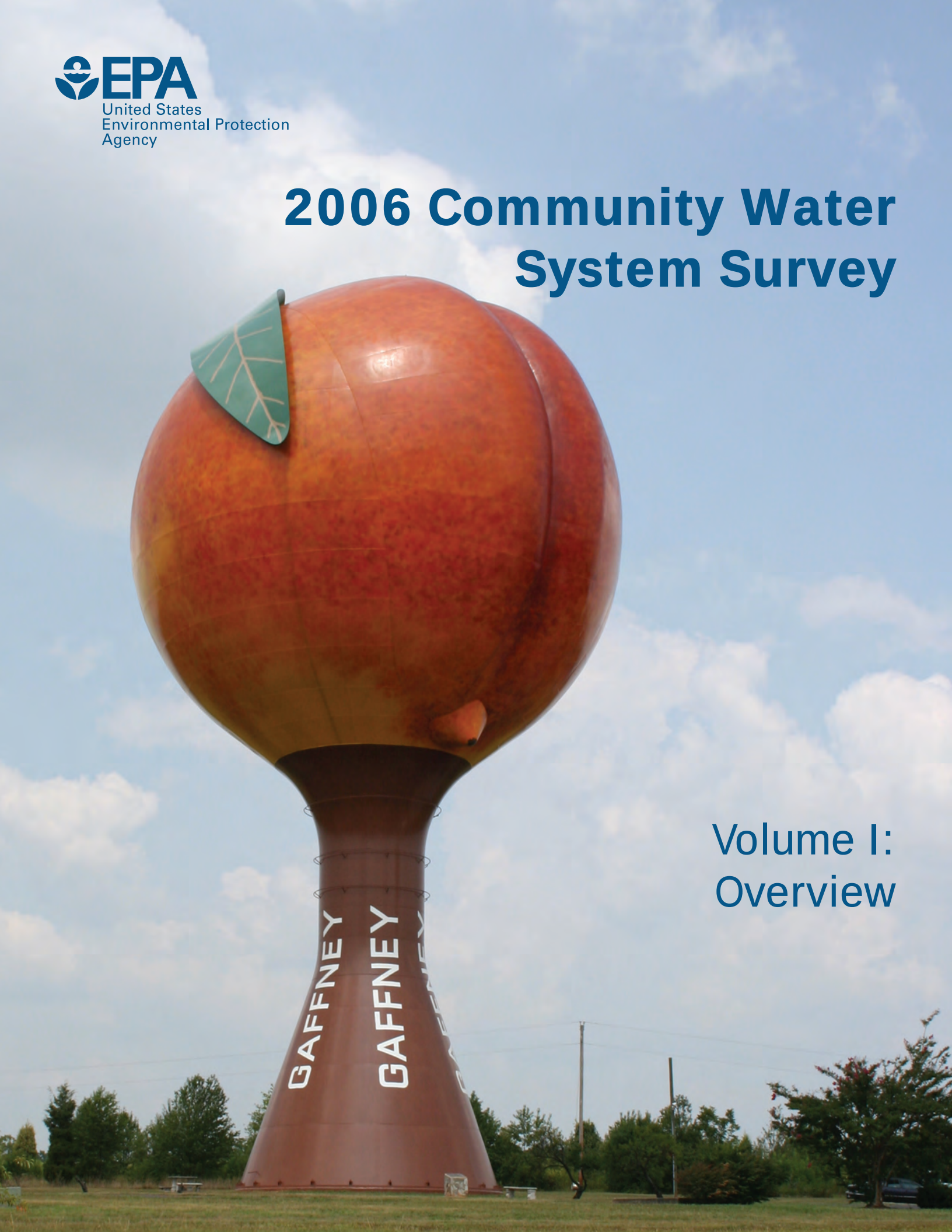
EPA
United States
Environmental Protection
Agency

2006 Community Water System Survey



Volume I: Overview

Cover Photo: The Gaffney Board of Public Works Water Tower, Gaffney, South Carolina

The Gaffney Board of Public Works Water Tower, or "Peachoid" as it is known, stands 135 feet tall and holds one million gallons of water. The tank was commissioned to be built in 1980. Contractors took five months to design and mold the steel. A seven-ton, 60-feet long leaf was applied to one side. Peter Freudenburg, an artist specializing in super-graphics and murals spent hours inspecting real peaches to use as a model to paint the tank. Fifty gallons of paint in twenty colors were required to complete the project. EPA wishes to thank the Board for participating in this survey, for allowing us to acknowledge this fact and for providing us with the cover photo.

Photo by Kim Fortner of the Gaffney Board of Public Works

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2006 Community Water System Survey

Volume I: Overview

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Acknowledgments

Many dedicated owners, operators, and managers of community water systems made this survey possible. We would like to thank the 1,314 water systems representatives who devoted their valuable time to searching through records and completing our questionnaires. Thanks also to James Taft of the Association of State Drinking Water Administrators and to Erica Brown of the Association of Metropolitan Water Agencies for encouraging the participation of their members who were sampled for this survey.

This survey was managed for EPA by Brian C. Rourke of EPA's Office of Ground Water and Drinking Water.

The Cadmus Group, Inc. was the prime contractor for this project, which was managed for them by Richard Krop, a principal with the company.

Executive Summary

Trends and Key Findings

Most of the characteristics of community water systems (CWSs) are unchanged from 1976, when the first CWS Survey was conducted. Although most systems serve fewer than 10,000 customers and the majority of systems that serve fewer than 500 are privately owned, most people still get their water from large, publicly owned systems. Nevertheless, there have been important changes since the first survey. They include an increase in the percentage of systems that treat their water and an overall improvement in water system financial performance. Key findings of the 2006 Survey are the following:

- The number of CWSs declined by 6 percent between 2000 and 2006. This change is the largest decrease in the number of systems that we have ever seen from one survey to the next. The largest decline is among private systems serving 100 or fewer persons (a drop of more than 2,000 systems, or 17 percent) and among systems serving between 101 and 500 persons (a drop of more than 1,300 systems, or 12 percent). On the other hand, the number of systems serving more than 10,000 persons increased by 13 percent. (See page 44 of this Volume as well as Table 1 in Volume II. Volume II, Tables 2-5 provide additional details on the number of systems in the country.)
- Water systems that receive their water primarily from purchased sources have increased 9 percent from 7,979 in 2000 to 8,670 in 2006. These systems have grown from 15 percent of total systems to 18 percent. The increase is particularly noticeable in systems serving fewer than 500 persons. Their numbers have grown from 2,248 to 3,021, or from 7.7 percent of systems in this size category to 11.3 percent. The increase is largest in purchased water systems serving 100 persons or less; their numbers having grown from 69 systems to 764. This change may explain part of the decrease in the number of small private systems. (See page 44 and Table 1 in Volume II.)
- When compared to the 5-year period prior to the 2000 CWS Survey, there has been an increase in the percentage of publicly owned systems making major capital investments in the 5 years preceding this survey. The number of privately owned systems making major capital investments, however, has declined. While the 2000 CWS Survey reported almost 54 percent of all systems made such investments, the current survey found that fewer than 44 percent did so between 2001 and 2006. (See pages 28 and 49 and Tables 86 and 87 of Volume II of this survey, and Tables 69 and 70 of Volume II of the 2000 CWS Survey.)
- When asked to group total capital expenditures over the past 5 years into three areas, systems responded that costs related to expanding their systems accounted for 53 percent of the total, while major repairs and replacement accounted for 37 percent and regulatory compliance costs, 10 percent. (See page 30. Also see Table 101 in Volume II.)
- The proportion of capital investment in treatment has declined over the past 5 years, accounting for only 14 percent of the average system's total capital investments. (See page 30, page 49, and Volume II, Table 94 for further details.) This compares with 25 percent of total capital investment spent by the average system on treatment as reported in the 2000 CWS Survey. (See Table 74, Volume II of the 2000 CWS Survey, which shows average capital investment by type in thousands of dollars.)
- The largest share of total national investment continues to go toward distribution mains and transmission lines, accounting for 44.9 percent of all capital expenses for publicly owned systems and 56.8 percent of such

expenses for privately owned systems. (See page 31 and Table 97 in Volume II.) This proportion is similar to that reported in the 2000 CWS Survey when 46.7 percent of capital expenditures made by publicly owned systems and 53.3 percent made by privately owned systems went for distribution and transmission lines. (See page 49 and Volume II Table 97 for further detail and Table 75, Volume II of the 2000 CWS Survey. Table 75 in the 2000 report shows the results by water source rather than ownership.)

- Storage capacity accounted for 13.3 percent of the total investment, on average. (See page 49 and Volume II, Table 94 for further details.) This percentage is virtually unchanged from that reported in 2000. (Similar information may also be found in Volume II, Tables 83-92.)
- More than 61 percent of the systems that made capital improvements over the past 5 years invested in their transmission and distribution systems. (See Volume II, Table 90. Tables 86-96 in Volume II provide additional information on capital investments.) However, the amount of pipe replaced as a percentage of the length of existing pipe did not rise significantly between 2000 and 2006. (See page 45 and Volume II, Tables 48 and 49 for additional information on pipe.)
- The percentage of systems in most size categories that operated at a loss increased between 2000 and 2006. A substantial portion of systems in most size categories continue to have costs that exceed revenues. (See the discussion on pages 45–50 and Volume II, Table 81 for further details. Information on revenue and expenses may also be found in Volume II, Tables 58-82.)
- Most systems, whether public or private, rely on current revenue for at least a portion of their major capital expenses. Sixty-five percent of systems use current revenue, which funded 32 percent of capital investment nationally. This is down slightly from 75 percent in 2000, when current revenue made up 39 percent investment nationally. (See pages 31 through 35 and Tables 102 and 104 in Volume II as well as Tables 79 and 81 in Volume II of the 2000 Survey.)
- Although most of the money for capital spending comes from current revenue and other sources, the Drinking Water State Revolving Fund (DWSRF) has become an important source of funds since it began over 10 years ago. Approximately 19 percent of publicly owned systems relied on DWSRF loans to finance at least a portion of their capital improvements, which is up from 10 percent in 2000. (See page 50 and Volume II, Table 102 for more details, and Table 79 in the 2000 Survey.) Nationally, 11 percent of all capital investment for publicly owned systems was financed through DWSRF loans, up from 4 percent in 2000. (See page 50, and Volume II, Table 105 for additional details. Information on capital investments may also be found in Volume II, Tables 86-103. Also see Table 81 in Volume II of the 2000 report.) On average, 13 percent of public systems' capital expenditures were funded by DWSRF loans, up from 7 percent in 2000. (See pages 34 and 50 and Volume II, Table 104, and Table 80 of Volume II of the 2000 report.)
- The percentage of small systems that do not provide some sort of treatment has continued to decrease for most size categories. This trend began in 1976 and is consistent with the Safe Drinking Water Act's (SDWA's) emphasis on water quality monitoring and treatment. Since the 1986 survey, virtually all of the larger water systems have supplied treatment. (See page 44 and Volume II, Table 15 for more details.)
- Increasing block rate structures reduce costs for customers who consume the least amount of water. Only 11 percent of systems serving 500 or fewer customers use this type of rate, slightly more than the 7 percent that used it in 2000. Small systems are much more likely to use uniform rates or to charge a flat fee for water. Larger systems are more likely to use increasing block rates; 27 percent of systems serving more than 100,000 persons use these rates. (See pages 22-24 and 48 for further detail. More information on residential and non-residential rate structures can be found in Volume II, Tables 71 and 72.)

- Between 2000 and 2006, the number of points at which water enters the distribution network (entry points) decreased slightly in every size category except ground water systems serving more than 100,000 persons. (See page 45 and Volume II, Table 13 for more details.)
- Additional topics added to the 2006 CWS Survey included technology, security, labor, storage, pressure zones, and flushing. (See Chapter 3 for additional details.) While few water systems cited EPA as their preferred source of security information, a substantial percentage attends EPA security training or uses EPA Security Technology Product Guides. (See page 37 and Volume II, Tables 54 and 55 for more details.)

Study Purpose

The U.S. Environmental Protection Agency (EPA) conducted the 2006 CWS Survey to obtain data to support its development and evaluation of drinking water regulations. EPA developed the survey database to provide critical data to support regulatory development and implementation. The Agency plans to use the data for regulatory, policy, implementation, and compliance analyses.

Regulatory Development Analyses. EPA must satisfy the requirements of various statutes and regulations for analyses of proposed regulations under the SDWA. The survey's data on water system operations and finances are critical to the preparation of these analyses.

Policy Development Analyses. The survey collected financial and operational data on the full range of water systems to support a variety of policy and guidance initiatives. EPA also uses the data to respond to requests for information on the water supply industry from Congress, other federal agencies, and the public.

Regulatory Implementation Analyses. The survey data, along with data from the Drinking Water Infrastructure Needs Survey, can be used to assess the financial capacity of water systems in general and small systems in particular.

Compliance Analyses. EPA may use the survey data to develop profiles of the operational and financial characteristics of different types of water systems, which can be compared to the Agency's database of compliance records in the Safe Drinking Water Information System (SDWIS).

The objective of these analyses would be to identify the characteristics of systems that may lead to future compliance problems. (The data from the survey will not be used in any enforcement actions.)

Survey Methodology

This is the sixth CWS Survey. EPA previously collected data in 1976, 1982, 1986, 1995, and 2000. As with past surveys, the Agency collected information on the most important operational and financial characteristics of community water systems. EPA took steps to improve response rates, ensure accurate responses, and reduce the burden of the survey on systems, especially small systems serving 3,300 or fewer persons. EPA sent water system experts from The Cadmus Group, Inc. and three other companies to collect data from small systems. It mailed the survey to medium and large systems, made available a spreadsheet and Web-based version of the questionnaire, and provided extensive assistance through e-mail and a toll-free telephone hot line.

EPA started the 2006 Survey in the summer of 2005 with the development of preliminary questionnaires and a sampling plan. The survey was designed to collect data for the year 2006. Full-scale data collection occurred from June to December 2007. The overall response rate was 59 percent; 95 percent of small systems selected participated in the survey.

1. Introduction

The U.S. Environmental Protection Agency (EPA) defines a community water system (CWS) as a public water system that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents. CWSs provide water to more than 280 million persons in the United States. They are a tremendously diverse group. CWSs range from very small, privately owned systems whose primary business is not supplying drinking water (e.g., mobile home parks) to very large publicly owned systems that serve millions of customers.

Gaffney, South Carolina's one million gallon water tank, featured on the cover of this report, is emblematic of the diversity of water systems. Commissioned by the Gaffney Board of Public Works and built with funds from the Appalachian Regional Commission and the South Carolina Appalachian Council of Governments, the Peachoid is far from a typical water tower. Yet distinguishing—and at times unusual—features are to be found in water systems throughout the country. Because EPA is charged with protecting the water quality of the nearly 50,000 systems, the challenge of this report is to describe water systems according to certain basic characteristics while still recognizing their incredible diversity.

The 2006 CWS Survey was part of EPA's ongoing effort to periodically collect information on the financial and operating characteristics of the public water supply industry in order to support the regulatory development process. EPA will use the information from this survey principally to prepare Economic Analyses (EAs) in support of new regulations and to analyze economic and operating factors that affect national drinking water quality. Other uses for the data are described below.

This report is comprised of two volumes. Volume I, the Overview, provides perspective on the industry by extrapolating the survey data to present a national picture of water systems. It presents the data by system size, ownership, and source of water. It also compares the 2006 data to similar data from the CWS Surveys of 2000, 1995, 1986, 1982, and 1976. Volume II, the Detailed Report, summarizes the survey findings in a series of tables that display national estimates of water system characteristics with particular application to regulatory development. Volume II also provides a detailed methodology and copies of the survey instruments.

Storage tank.

Background

The CWS Survey collected operating and financial information from a representative sample of community water systems. To reduce the burden on small systems, data from systems serving 3,300 or fewer persons were collected during site visits by water system professionals. Systems serving more than 3,300 persons (medium and large systems) were asked to respond to a Web-based electronic questionnaire or to fill out a traditional paper survey. Water system professionals were assigned to help each system respond to the survey questions. A toll-free telephone

number and an e-mail address also were provided to the systems for technical support.

Work on the survey began in the summer of 2005 with a series of planning sessions to determine which information to collect and how to collect it. Versions of the questionnaire were developed for systems of different sizes. For example, systems that serve more than 500,000 persons were asked additional questions about concentrations of unregulated contaminants in their raw and finished water. Similarly, questions that would not apply to very large systems were excluded from their version of the questionnaire. The draft questionnaires were tested in June 2006 to gauge respondents' reactions. A full-scale pilot test followed in February 2007. Two clusters of small systems were selected for site visits and questionnaires were sent to a random sample of 40 medium and large systems.

The 2006 Survey collected some information that had not been collected in the past, such as detailed data on distribution systems and on storage capacity and practices. New data on water security issues were collected. The survey also gathered information on system access to computers and the Internet.

The survey sample was drawn from the approximately 50,000 community water systems in the 50 states and the District of Columbia in the federal version of the Safe Drinking Water Information System (SDWIS/Fed). The survey used a stratified random sample design to ensure the sample was representative, and the sample was stratified to increase the efficiency of estimates based on it. Systems were grouped based on the populations they serve and their sources of water. (Details of the sampling plan are provided in Volume II.) A survey sample of 2,210 systems was selected, including all systems serving populations of 100,000 or more. To limit travel costs, systems serving up to 3,300 persons were selected in geographic clusters in a two-stage design.

Full-scale data collection was conducted from June to December of 2007. Site visitors were sent to approximately 600 small systems and questionnaires were sent to approximately 1,610 medium and large systems. Approximately 59 percent of the sampled systems responded to the survey. The table below summarizes the final status of the systems in the sample. Each completed questionnaire was subject to a thorough review by senior water system experts before being processed for data entry.

Data Presentation

Both volumes of the CWS Survey report present tabulations of the data collected by the CWS Survey. Volume I is intended to provide a broad overview of the data collected. Volume II shows the information in greater detail. Therefore, there are differences in how the data are displayed. In Volume II, numbers are shown to more significant digits than in Volume I. For example, estimates in Volume II are rounded to tenths of a percent, while in Volume I they are rounded to whole percentages. In both volumes, details may not sum to totals due to rounding. In Volume II, the data are generally presented according to eight service categories denoted by the size of the population served, either directly (i.e., retail customers), or through the sale of water to other public water suppliers (i.e., wholesale customers). The detailed size categories

Final Status of Systems Selected in 2006 CWS Survey

	Population Served					
	<500	501-3,300	3,301-10,000	10,001-100,000	More Than 100,000	Total
Sample selected	362	238	389	646	575	2,210
Inactive systems	7	1	2	5	2	17
Refusals and invalid responses	13	5	50	85	66	219
Received	340	231	154	292	297	1,314
Response rate	94%	97%	40%	45%	52%	59%

are the same as those used to stratify the sample and allow for detailed analyses and estimates within known confidence intervals. The size categories are:

- 100 or fewer
- 101–500
- 501–3,300
- 3,301–10,000
- 10,001–50,000
- 50,001–100,000
- 100,001–500,000
- More than 500,000

Systems serving up to 10,000 persons are considered small. Volume I presents data by fewer size categories to better illustrate certain characteristics and facilitate comparisons among categories. The categories used in Volume I are:

- 500 or fewer
- 501–3,300
- 3,301–10,000
- 10,001–100,000
- More than 100,000

These size categories support the Agency's various analytic requirements, as discussed below. Data on treatment plants also are presented by their average daily production, in millions of gallons, and are particularly useful for analyses of plant operations. These data are shown by seven size categories:

- 0.01 millions of gallons per day (MGD) or fewer
- 0.01–0.10 MGD
- 0.1–1.0 MGD
- 1–10 MGD
- 10–100 MGD
- More than 100 MGD

Data also are presented according to ownership (public or private) and primary water source. Systems are classified based on their primary source: ground water, surface water, or purchased water. For example, a system is classified as a ground water system if it gets more of its water from ground water sources than from surface sources or by purchasing it. Because systems can have three sources of water, some may receive less than half their water from their primary source.

Many of the tables in Volume II present the 95-percent confidence intervals for each cell. As discussed in Volume II, the confidence intervals are relatively large in some cases, due to the diversity of CWSs. Although characterizing the level of precision is difficult due to the large number of estimates provided and the diversity of water systems, the sample generally met the precision targets of the sampling plan. For example, the confidence interval for estimates of average revenue and expenses for all systems of all sizes is approximately ± 10 percent of the average (see Tables 62 and 79 in Volume II). The estimated confidence interval for the proportion of all systems of all sizes providing treatment is approximately ± 5 percentage points. (See Table 15 in Volume II. See Volume II for a detailed description of the sampling plan and precision targets.[1])

Intended Uses of CWS Survey Data

The primary purpose of the 2006 CWS Survey is to provide the Agency with critical data to support its regulatory development and implementation efforts. EPA conducted the 2006 CWS Survey to determine the current baseline of operational and financial characteristics of the water supply industry, last established by the 2000 CWS Survey. By comparing the results of this survey with the 2000 Survey, changes in water industry operations and expenses since 2000 can be measured.

Regulatory Development Analyses

Before establishing new regulations, the Agency must satisfy the analytic requirements of various statutes and regulations, including:

- Executive Order 12866.
- Paperwork Reduction Act (PRA).
- Regulatory Flexibility Act (RFA).
- Small Business Regulatory Enforcement Fairness Act (SBREFA).
- Unfunded Mandates Reform Act (UMRA).

1 The data presented in Volumes I and II are tabulated in Stata. The calculations are carried out in a series of programs known as "do files." EPA has these programs on file and will make them available upon request.

EPA is required by SDWA to specify best available technologies (BATs) for the removal of drinking water contaminants and must consider technologies that can be afforded by different classes (i.e., sizes) of water systems. Data from the CWS Survey will be useful when identifying BATs for the removal of contaminants, conducting affordability analyses, and developing affordability criteria. The survey data will be used in a national-level affordability criteria document. In addition, the Agency must prepare EAs that detail the national costs and benefits of all proposed regulatory actions and alternatives under consideration. In general, the CWS Survey data provide baseline information that is critical to the preparation of the EAs.

Without an accurate baseline, changes due to regulations cannot be measured. Analyses such as these support EPA's estimates of the cost of complying with new regulations. Toward this end, survey data will be used in the development of other tools and models needed for regulatory analyses.

The CWS Survey also collected data on production capacity, system storage capacity, pipe, population served, connections, and treatment facilities to support the development of SDWA burden estimates in Information Collection Requests (ICRs). The RFA and SBREFA require the Agency to demonstrate that SDWA regulations do not impose unreasonable economic and financial burdens on small businesses or governments. The analyses required by the RFA and SBREFA can be supported by many of the same CWS Survey data elements as the EA and ICR analyses.

Policy Development Analyses

The diverse water systems in the CWS Survey database provide financial and operational data that EPA can use to support various initiatives to develop policies and guidance for states and public water systems concerning the implementation and enforcement of drinking water regulations. These policy initiatives can involve, for example, defining financial affordability (i.e., ability to pay).

The Agency is continually engaged in efforts to provide summaries and reports on the status of regulatory and policy development and implementation. In addition, the Agency is from time to time required to prepare program-level ICRs to document the burden imposed on states, the water industry, and federal agencies in implementing SDWA regulations. The Agency also receives requests from Congress, federal agencies, and the public for information on the water supply industry. The 2006 CWS Survey provides up-to-date information on the water industry to satisfy these efforts.

Regulatory Implementation Analyses

A critical issue for EPA to address under the 1996 SDWA Amendments is whether the drinking water industry—especially small systems—have the technical and financial capacity to comply with SDWA regulations over a sustained period. Small water systems face financial problems, and larger systems have potentially serious financial concerns as regulatory compliance and infrastructure repair and replacement drive operating costs higher. As a result, the Agency is helping states and water suppliers build the necessary technical and financial capacity. Congress has provided money to assist the states, and EPA is building additional capacity through the Drinking Water State Revolving Fund for public water systems. Data from the CWS Survey data and from the Drinking Water Infrastructure Needs Survey and Assessment can be used to assess the water industry's ability to finance infrastructure investments.

Compliance Analyses

Another possible use of the CWS Survey database is to support the development of operational and financial profiles for different types of water systems that can be statistically correlated with the Agency's compliance records in SDWIS. The objective of such analyses is to identify the operational and financial characteristics that may lead to future compliance problems. EPA can then develop guidance to target systems that may exhibit these characteristics. (While the survey data will support analyses of compliance issues, they will not be used in any enforcement action.)

Organization of the Report

This report comprises two volumes. Volume I presents an overview of the data and the key findings of the survey. It is composed of an Executive Summary, which summarizes the key findings and highlights of the survey results, and three chapters:

- **Chapter 1. Introduction.** Chapter 1 describes the background, purpose, survey methodology, and intended uses of the data collected and the organization of the report.
- **Chapter 2. Overview of System Operations and Finances.** Chapter 2 provides a summary of basic water industry demographics and operational and financial characteristics of the industry.
- **Chapter 3. New Topics and Trends.** This chapter discusses the principal findings of the new topics that were addressed by the 2006 CWS Survey. It also summarizes the operational and financial survey findings and compares them to the 2000, 1995, 1986, 1982, and 1976 Surveys.

Volume II presents a detailed summary of the data collected in the CWS Survey. No narrative descriptions accompany these tabulations. The results are divided between operating and financial characteristics. The order of presentation generally corresponds to the order and organization of the survey questionnaire. The tables on system operation generally track the movement of water through the system, presenting data on source, then treatment, storage, distribution, and security issues. The financial tables present data on revenue, billing rates and structure, expenses, and capital expenditures.

Volume II also describes in detail the survey methodology. It provides information on sample design and weighting, the small system site visits, other data collection methods, and quality assurance. Copies of the survey questionnaires are supplied in an appendix.

2. Overview of System Operations and Finance

The 2006 CWS Survey collected operational and financial data for a representative, but diverse, group of water systems. The systems rely on various sources of water, use a number of treatment practices, and serve populations of various sizes and customer classes. They face a variety of financial challenges. This chapter presents an overview of the operations and finances of these systems, providing a broad description of the water industry. Using data from the sample, industry totals are presented in order to establish themes and patterns that will be explored in greater detail in Chapter 3.

An open reservoir.

Water System Profiles

Community water systems are public water systems that supply water to the same population year-round. They comprise approximately one third of all public water systems in the U.S. and serve the vast majority of the population. The survey estimates that there are 49,133 community water systems in the 50 states and the District of Columbia. (See Table 1 in Volume II for additional details on the estimated number of CWSs.) Because community water systems provide the most exposure to risks from contaminants (although not necessarily the highest concentrations of contaminants), they are the primary focus of public health regulations. The tables that follow, and the data reported in Volume II, deal only with community water systems.

A mountain point intake.

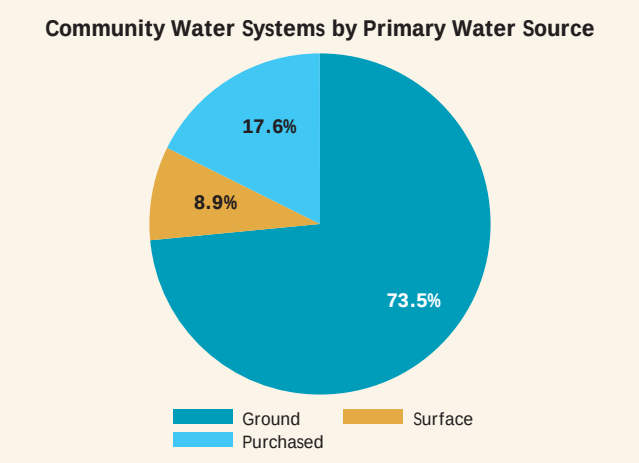
Water Source and System Ownership

A diverse set of water systems make up the water industry in the United States. The industry includes publicly owned systems, privately owned for-profit and not-for-profit systems, and systems that provide water only as an ancillary function of their primary business. It includes systems serving as few as 25 persons and relying largely on ground water, to large wholesalers that provide treated surface water to several million customers.

There are many ways to classify water systems. EPA regulatory analyses categorize systems by their source of water, ownership, and size of service population. Source water characteristics are used in EPA analyses to account for operational configurations, potential sources of contamination, regulatory requirements, and costs associated with different water quality conditions. The Agency takes water system ownership into account when estimating the potential cost impacts of drinking water regulations.

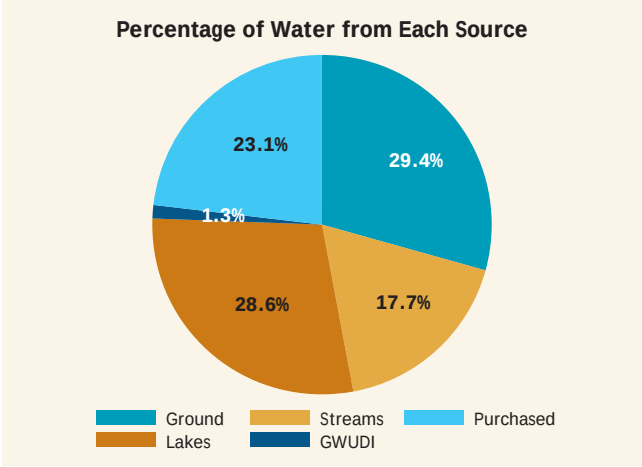
Publicly and privately owned systems differ in rate structures, sources of funds for capital improvements, sources of water, and size of service population. The size of the population served by a system affects not only the quantity of water needed but also production requirements, treatment practices, operations, and financial capacity. Water production tends to involve large fixed costs, so water systems typically exhibit economies of scale. Thus, the unit cost of providing water declines as system size increases.

Nearly 75 percent of the nation's CWSs rely primarily on ground water. Almost 9 percent rely primarily on surface water, while the remaining 18 percent purchases finished, partially treated, or untreated water.



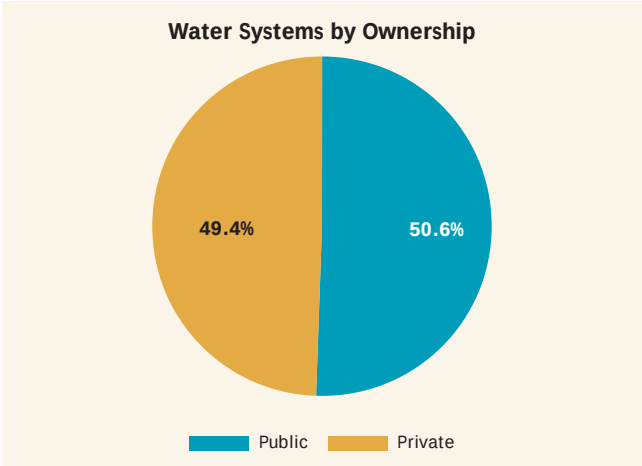
While three-quarters of the systems in the country rely on ground water, nearly 48 percent of all water produced by systems comes from surface sources, including flowing streams, lakes and reservoirs, and ground water under the direct influence of surface water (GWUDI). Approximately 60 percent of surface water comes from lakes or reservoirs. An additional 37 percent comes from flowing streams, and 3 percent is GWUDI.

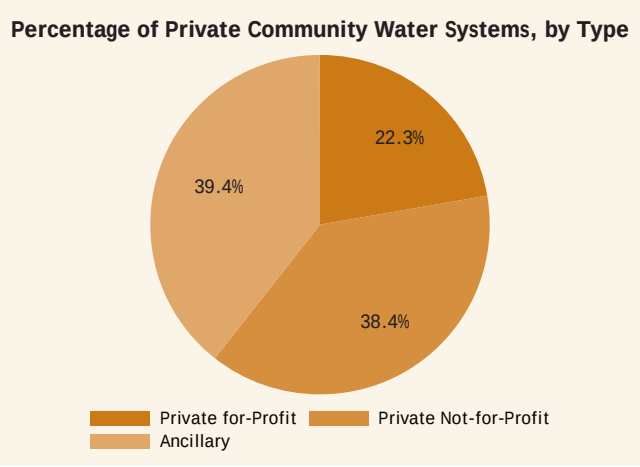
More than 23 percent of water is purchased, and 94 percent of the purchased water comes from surface sources. The vast majority of purchased water is finished water. The remaining 29 percent of the water produced by systems comes from ground water sources.

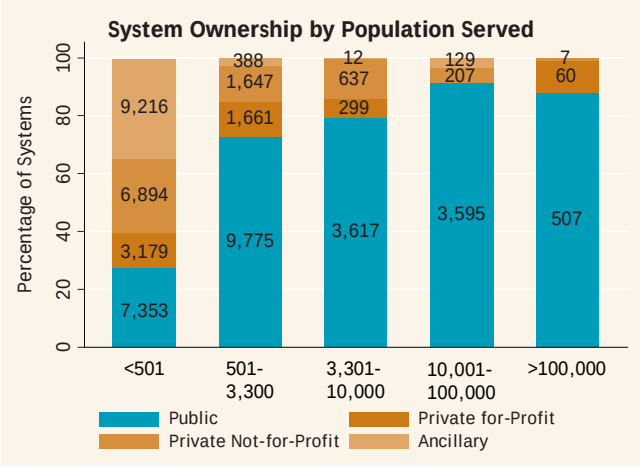


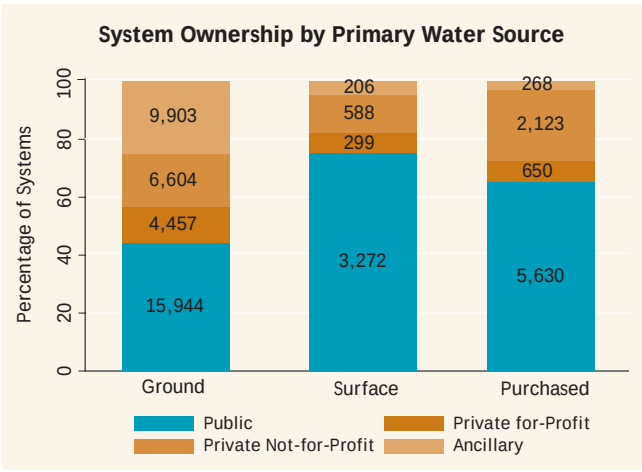
That water is drawn from more than 112,000 wells that feed into approximately 61,000 entry points to the nation's distribution networks. (See Volume II, Table 2 for more details on the number of systems by water source, Tables 7 through 10 for average daily flows by water source, and Table 13 for related information on the average number of entry points per system.)

CWSs are evenly split between public and private ownership. The overwhelming majority of publicly owned systems are the property of towns, cities, counties, or other forms of local government. Of the 49 percent of systems that are privately owned, 22 percent are run as for-profit businesses and 38 percent are not-for-profit entities. Approximately 40 percent of privately owned systems—nearly 20 percent of all systems—are ancillary systems (i.e., systems whose primary business is not water supply but that provide









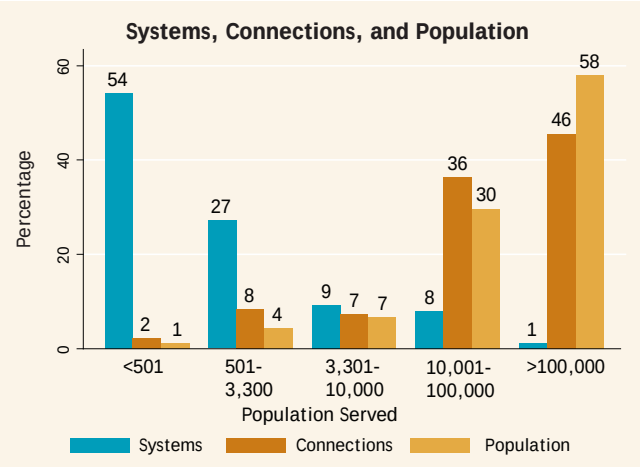
water as an integral part of their principal business). These ancillary systems tend to serve small populations, produce smaller quantities of water, and often do not bill customers separately for water. (See Tables 4 and 5 in Volume II for further details on system ownership. As discussed later, system size is at least as important as ownership in describing operating characteristics.)

Most systems that rely mainly on surface or purchased water are publicly owned. Publicly owned systems also are more likely to rely primarily on purchased or surface sources than ground water sources. (See Volume II, Tables 3 and 5 for detail on number of systems by water source.) Ancillary and private not-for-profit systems make up the majority of systems serving 500 or fewer persons. In contrast, only a very small percentage of the largest systems are ancillary or not-for-profit systems.

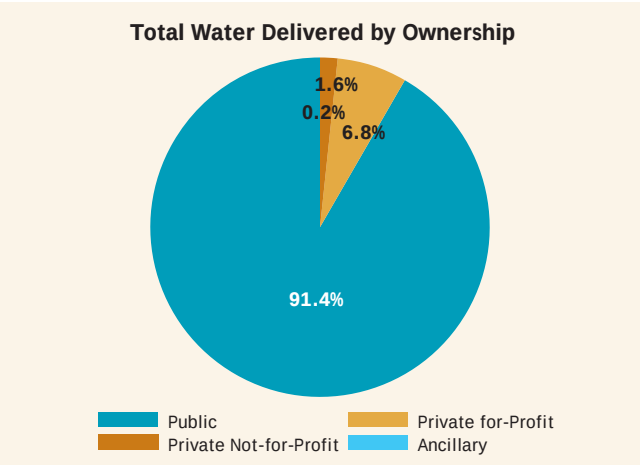
Water System Size, Customers, and Deliveries

According to the survey, CWSs directly serve more than 280 million individuals and over 80 million residential customer connections—an average of about 3.4 persons per residential connection. (The number of persons served per connection may be higher than reported by the U.S. Census because residential connections sometimes serve multiple households, but census data are reported for individual households only.) Because 91 percent of connections are residential, the number of connections correlates with the size of the population served. The balance of the connections is commercial, industrial, and other nonresidential connections. (See Volume II Tables 56 and 57 for details on the typical service connection profile for and population served by systems.)

The previous section described the sources of water on which systems rely. This section describes how water is produced and delivered to customers. Systems often will use different terms to describe each step. For this report, water **withdrawals** refer to all water withdrawn from ground water and surface water sources. Water **production** refers to water that is treated at a system's treatment facilities or plants. Water **deliveries**, which are discussed in this section, are water that is sold and delivered to customers or that is unaccounted for. **Unaccounted for water** includes system losses and water used for uncompensated purposes such as firefighting.



Although the vast majority of water systems are relatively small, most individuals get their water from large systems. Systems that serve 3,300 or fewer persons account for 82 percent of all water systems, but provide water to only 11 percent of all service connections. On the other hand, systems serving more than 100,000 persons account for a little more than 1 percent of all CWSs, yet they provide water to 46 percent of the customer connections. (See Volume II, Table 5 for details on the number of systems in each size category. For related information about average water withdrawals by system size and primary source of water, see Volume II Tables 7-10.) And because publicly owned systems tend to be larger, most people get their water from publicly owned systems. In fact, many of the differences in water deliveries between publicly and privately owned systems are likely due to scale, rather than ownership, since the majority of small systems are privately owned. (This is not true of all operating characteristics, however. As discussed later, there are many differences between public and private systems of the same size with regard to pipe replacement, capital investment, and other characteristics.) Many systems sell water wholesale to other public water suppliers. Some systems both buy and sell water. Wholesale deliveries account for more than 47 percent of all water delivered.[2] The remaining deliveries are for residential and nonresidential retail customers. Residential customers account for 69 percent of retail water deliveries, and nonresidential customers account for the balance. (See Table 11 in Volume II for related information on average retail water deliveries.)

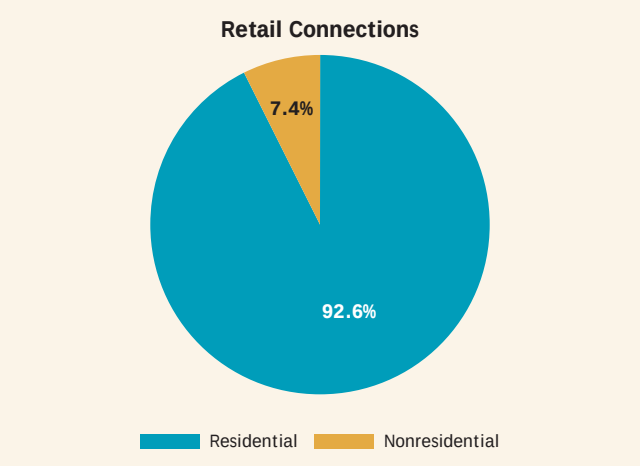


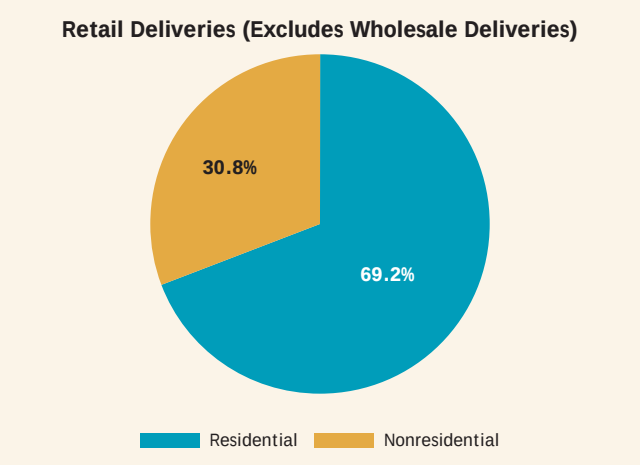
Residential customers account for the vast majority of all retail connections. While only 7 percent of connections serve nonresidential customers, each nonresidential customer receives far more water than does each residential customer. In fact, nonresidential customers consume more than 30 percent of the water delivered to retail customers. (See Volume II Table 12 as well as later in this section for further details on average deliveries per connection by customer class.)

Total retail deliveries by all CWSs are approximately 38 billion gallons per day—14 trillion gallons per year—including unaccounted for water. Large systems deliver most of the water. Since most large water systems are publicly owned, it is not surprising that publicly owned systems deliver much of the nation's retail drinking water. In fact, public systems of all sizes and sources account for 85 percent of all retail water deliveries.

The essential functions of a water system are the production and delivery of drinking water. Some CWSs have very sophisticated plants designed to treat several

2 This value does not equal the proportion of purchased water presented earlier. The two numbers reflect different types of responses. One is based on purchases of wholesale water by systems, while the other is based on deliveries of wholesale water by systems. These numbers will not be equal due to unaccounted for water and the fact that this is a sample of systems. In other words, some systems that sell water wholesale to systems in the sample may not be in the sample. Similarly, some systems that purchase water wholesale from systems in the sample that reported wholesale deliveries may not themselves be in the sample.





million gallons of surface water each day. Others have only one or two wells, provide little or no treatment, and serve small populations. Still other systems purchase all of their water from large wholesalers that sell no water directly to consumers.

This report uses the following terms to describe water treatment. A system's **average daily production** is the average amount of finished water produced daily by all of its treatment plants. **System design capacity** is the maximum amount of finished water that all a system's treatment plants taken together are designed to produce daily when operating at capacity. **Peak daily flow** is the maximum amount of finished water produced by a system's plants on a single day during a 12-month reporting period.

The table on the following page summarizes the treatment production and finished water storage capacities of primarily ground water and primarily surface water systems. Surface water systems tend to have larger average daily flows and peak demands, as measured by average daily production and peak daily production. Surface systems tend to be larger, but even compared to ground water systems of equivalent size, surface systems tend to treat more water, which reflects the fact that surface water is always treated while not all ground water is treated. (See Volume II, Tables 7–10 for related information on average daily flow for systems by size and source of water.)

An important difference among water systems is the extent to which they have excess capacity. With excess capacity, a system can accommodate fluctuations in demand, planned growth, and firefighting needs. One measure of excess capacity is the ratio of system design capacity to peak daily flow, which is inversely related to system size. That fact could indicate that larger systems tend to be more efficient or that they have more stable demand. Conversely, it could simply reflect that in a small system, a relatively small change in demand can require a significant change in production. The same fluctuation in demand for a larger system would not result in such a large proportional change.

The results of the past surveys indicate that the treatment and storage requirements associated with ground water and surface water affect the ratio of design-to-peak treatment capacity. This result is confirmed in the 2006 data. Ground water systems tend to have larger design-to-peak ratios than small surface water systems. Ground water systems generally rely on additional pumping and treatment capacity to meet peak demands. Surface water systems, on the other hand, generally use more complex treatment techniques and tend to rely on storage to meet peak demands. The ratio for large ground water systems, which tend to have more sophisticated and capital-intensive treatment processes and more storage, is similar to the ratio for large surface water systems.

The decline in the ratio of design-to-peak treatment capacity as the service population increases is reflected in the storage capacity of systems. On average, small ground water systems have less than 75,000 gallons of storage; in contrast, the average large ground water

Summary of System Production, Deliveries, and Storage					
	Population Served				
	<501	501-3,300	3,301-10,000	10,001-100,000	>100,000
Primarily ground water					
Average daily production (gallons)	21,118	138,572	746,026	3,120,594	33,295,058
Design capacity (gallons)	177,371	776,687	2,130,543	7,900,726	75,463,525
Peak daily production (gallons)	47,299	314,152	1,416,734	5,978,608	56,844,615
Average ratio of design to peak capacity	5.7	3.1	1.6	1.3	1.2
Finished water storage capacity (gallons)	72,756	470,970	963,505	4,090,698	23,266,323
Average daily deliveries, excluding unaccounted for water (gallons)	20,231	122,042	643,359	2,722,469	29,529,433
Average ratio of unaccounted for water to total daily deliveries	0.05	0.09	0.10	0.10	0.09
Primarily surface water					
Average daily production (gallons)	30,572	237,804	1,002,420	4,651,544	56,631,910
Design capacity (gallons)	146,807	866,530	2,748,295	10,715,276	121,423,768
Peak daily production (gallons)	68,679	451,076	1,692,247	7,459,213	92,289,108
Average ratio of design to peak capacity	2.9	2.1	1.7	1.5	1.4
Finished water storage capacity (gallons)	413,665	526,044	1,664,389	5,680,280	43,096,379
Average daily deliveries, excluding unaccounted for water (gallons)	27,421	222,470	899,020	3,952,522	48,431,566
Average ratio of unaccounted for water to total daily deliveries	0.10	0.13	0.15	0.11	0.09
To compare average daily production, design capacity, peak daily production, finished water storage, and daily deliveries, only systems that provided complete information on each metric are included in this table. Therefore, the estimates provided here may not be the same as corresponding tables in Volume II that used all available data. Please note that the average of the ratios is not equal to the ratio of the averages.					

system serving more than 100,000 persons have over 23 million gallons of storage. Storage capacity increases similarly among surface water systems. The ratio of storage to design capacity does not vary much with system size, with one exception: Systems serving 500 or fewer persons tend to have more storage given their design capacity than larger systems do. To some extent, there may be a floor on the minimum amount of storage that systems maintain. (See Volume II, Table 20 for related details at the treatment plant level rather than system level, and Table 45 for details about system storage capacity).

Another measure of a system's operations is the percentage of water it produces that actually gets to its customers. Approximately 13 percent of total water produced by the average system is unaccounted for water. Weighted by the volume of water delivered by systems, less than 7 percent of total water produced is unaccounted for water. Some of this water is uncompensated usage—for example, a system may be required to provide water for fire protection without direct compensation. (While not paid directly for this water, the system may incorporate these costs into its rates.) This water use is inherent in running a water system. System leaks and other losses, on the other hand, are a source of inefficiencies because they do not

Ratio of Peak to Average Daily Production, by Ownership				
Population Served	Publicly Owned Systems		Privately Owned Systems	
	Mean	Median	Mean	Median
<100	2.75	2.02	2.61	1.67
101-500	2.47	2.00	2.13	1.72
501-3,300	2.28	2.00	2.04	1.98
3,301-10,000	1.86	1.75	1.76	1.62
10,001-50,000	2.09	1.74	1.45	1.38
50,001-100,000	1.69	1.61	1.60	1.37
100,001-500,000	1.72	1.58	1.36	1.30
>500,000	1.62	1.58	1.47	1.39

provide added value. (Table 11 in Volume II provides additional details on unaccounted for water.)

The table above provides another way to measure system operations: comparing the average ratio of peak daily production to average daily production. Smaller systems tend to have larger ratios than larger systems, which could indicate that smaller systems plan for larger demand fluctuations relative to the amount of water they produce than do larger systems. Changes in consumption by a few customers can have a relatively large impact on a small system. A big system with larger and more predictable commercial and industrial demand may see less variation. In fact, systems that have higher percentages of non-residential customers are likely to have smaller peak-to-average-daily-production ratios. (See Table 20 in Volume II for additional details on capacity at the plant level.)

Smaller systems are more likely to primarily serve residential customers, as shown in the table to the right. On average, 96 percent of water deliveries in systems serving 100 or fewer persons are to residential customers; very small systems almost exclusively serve residential customers.

More than half the systems serving up to 500 persons provide water only to residential customers. Commercial, industrial, and other customers become more significant part of the customer base as water system size increases. Publicly owned systems serving more than 500,000 persons actually sell most of their water to other water systems and non-residential customers. (See Table 11 in Volume II for additional information on average water deliveries to each type of customer.)

The mean annual delivery per residential connection for systems of all sizes is approximately 96,000 gallons. Annual deliveries per residential connection tend to increase with system size. There is considerable variation in the quantity of water delivered per residential connection, even among systems of similar sizes. The mean in each size category is often driven by a handful of systems that have very high deliveries per connection. The median system annually delivers approximately 77,000 gallons per residential connection. (See Volume II, Table 12 for further details on the mean annual water delivered by customer class.)

Treatment, Storage, and Distribution

The 2006 CWS Survey collected detailed information on system operations from source to tap. These data will enable the Agency to identify operational differences among systems and develop an up-to-date characterization of water systems throughout the industry. The survey collected operational data on the quantities of water produced by source for

Residential Deliveries as Percentage of Total Deliveries				
Population Served	Publicly Owned Systems		Privately Owned Systems	
	Mean	Median	Mean	Median
<100	91%	99%	97%	100%
101-500	87%	97%	96%	100%
501-3,300	78%	86%	88%	94%
3,301-10,000	61%	58%	73%	76%
10,001-50,000	63%	65%	66%	74%
50,001-100,000	61%	64%	39%	38%
100,001-500,000	53%	52%	40%	37%
>500,000	43%	42%	49%	50%

An old wood stave pipe next to a current working pipe.

Annual Water Delivered per Residential Connection (Gallons)		
Population Served	Mean	Median
<100	97,939	70,759
101-500	94,475	73,782
501-3,300	96,953	82,291
3,301-10,000	87,227	81,387
10,001-50,000	88,492	76,798
50,001-100,000	111,670	101,538
100,001-500,000	114,585	104,898
>500,000	129,124	103,770
All	95,623	76,943

each entry point to the distribution system, including capacity information by well, intake, and points of purchase; treatment objectives and practices; treatment facility capacity; treatment residual management; and storage and distribution capacity. Detailed schematics of treatment plants or facilities and the systems were collected as well. Water treatment is often complex, and the schematics provide detailed information about the operation of the facilities in the sample.

Water Treatment

A system treats water in one or more plants or facilities. For this report, a treatment plant or facility is any location where the water system takes steps to improve the quality of the water. It includes standard plants that are clearly recognized as treatment facilities, such as conventional filtration plants. It also includes smaller facilities that may not be considered treatment plants in other contexts; for example, a chemical feed on a well that adds chlorine to the water is considered a treatment plant in this report. There is one exception to the general rule that each point where a system makes changes to the water is a treatment facility. Systems may boost disinfection or adjust pH within their distribution system, but these sites are not counted as treatment facilities. (So, a chemical feed within the distribution network was not counted as a treatment plant.) The terms plant and facility are used interchangeably throughout this report.

Sixty-nine percent of all water systems treat some or all of their water. This group includes systems that purchase all of their water, most of which purchase finished water. Only 3 percent of systems that purchase all of their water provide additional treatment. Therefore, if we exclude systems that purchase 100 percent of their water, the overall percentage of systems that treat increases. Eighty-three percent of systems that have their own sources of water (or do not purchase all of their water) provide some treatment from simple disinfection to complex filtration processes, as shown in the following table. (See Volume II, Table 15 for an overview by primary source.) Most of the systems that do not treat water are ground water systems; of the systems that do not provide treatment and do not purchase all of their water, 98 percent rely solely on ground water and the other 2 percent are primarily ground water systems that also purchase some water.

Percentage of Systems Treating Water of Those That Do Not Purchase 100% of Water	
100% Ground Water Systems	80.2%
100% Surface Water	100.0%
Mixed Source Systems	96.2%
All Systems	83.0%

As seen in the following table, the number of entry points increases with system size because larger systems tend to have more sources than smaller

systems. Ground water systems tend to have more entry points than surface water systems, since each well may feed directly into the distribution system. In fact, some large ground water systems in the sample had several hundred entry points. (See Table 13 in Volume II for additional details on the number of entry points per system.)

Average Number of Entry Points per System

Population Served	Primarily Ground Water Systems		Primarily Surface Water Systems	
	Mean	Median	Mean	Median
<501	1.2	1.0	1.1	1.0
501-3,300	1.7	1.0	1.2	1.0
3,301-10,000	2.2	2.0	1.2	1.0
10,001-100,000	4.2	3.0	1.5	1.0
>100,000	14.7	6.0	2.6	2.0

Treatment Practices of Systems

Water systems use many different practices to achieve their treatment objectives, including chemical addition, coagulation/flocculation, settling and sedimentation, filtration, membranes, and softening. To characterize the treatment practices, each plant in the sample was assigned to one of several treatment trains ranging from relatively simple to very complex.

On average, small systems that rely solely on ground water sources have 1.1 treatment facilities. This increases to 2.1 facilities for systems serving 3,301 to 10,000 persons, and to 10 facilities for systems serving more than 100,000 persons. Systems relying solely on surface water, by contrast, tend to have fewer plants on average. Small surface systems average a little more than one plant per system, since they tend to have one surface water intake. Surface water systems serving more than 100,000 persons have 1.6 plants on average. Some surface water systems have as many as 7 plants, while some ground water systems have more than 200. (See Table 17 in Volume II.)

As systems become larger, the treatment practices they use tend to become more complex. Approximately 50 percent of the small ground water systems that treat some or all of their water simply disinfect and do not provide any additional treatment. Larger ground water systems are more likely to use other chemicals, disinfectants, and some forms of filtration in addition to simple disinfection. They also are much more likely to use softening techniques, including cation exchange. Approximately 25 percent of surface water systems that serve up to 500 persons use disinfection without any additional treatment. Most surface systems serving more than 500 persons use more sophisticated treatment. Forty percent of systems serving 501–3,300 persons use conventional filtration; this increases to 87 percent for systems serving more than 100,000 persons. (See Volume II, Table 17 for more detail on the number of treatment plants per system. Table 43 provides additional details on treatment schemes used by systems.)

Treatment Practices and Objectives of Treatment Plants

Like the previous discussion of treatment at the system level, the complexity of treatment varies with the size and water source of each treatment plant. Nearly 50 percent of treatment plants that solely treat ground water only disinfect and do not provide any additional treatment. At the other end of the spectrum, 50 percent of surface water plants use conventional

Filters in a treatment plant.

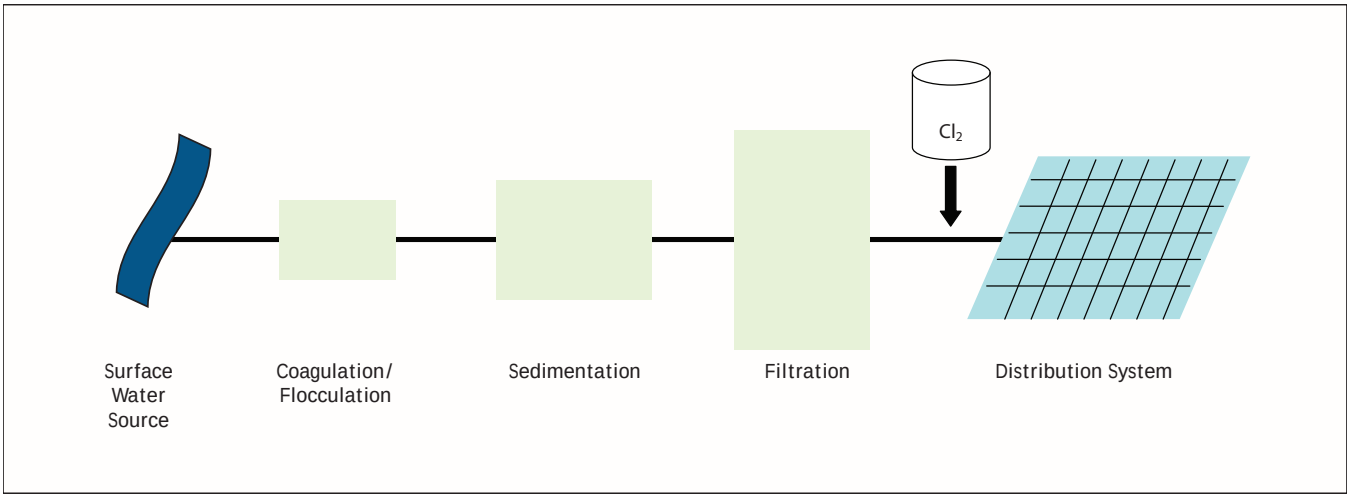
Treatment Characteristics and Percentage of Systems Applying Various Treatments at One or More Plants					
	Population Served				
	<501	501-3,300	3,301-10,000	10,001-100,000	>100,000
100-percent ground water systems					
Mean number of treatment plants per system	1.1	1.7	2.1	3.8	9.5
Percent of systems not providing treatment	29%	11%	7%	0%	8%
Treatment practices of systems that provide treatment					
Disinfection with no additional treatment	53%	48%	49%	33%	33%
Other chemical addition	13%	28%	28%	33%	26%
Ion exchange, activated alumina, aeration	13%	11%	10%	31%	17%
Other filtration (not including direct or conventional)	17%	15%	21%	30%	40%
Direct Filtration	0%	1%	0%	8%	3%
Conventional filtration	1%	2%	5%	1%	18%
Membranes	1%	1%	0%	1%	0%
Other	4%	1%	0%	3%	9%
100-percent surface water systems					
Mean number of treatment plants per system	1.1	1.1	1.1	1.2	1.6
Percent of systems not providing treatment	0%	0%	0%	0%	0%
Treatment practices of systems that provide treatment					
Disinfection with no additional treatment	25%	5%	0%	2%	0%
Other chemical addition	1%	7%	10%	2%	4%
Ion exchange, activated alumina, aeration	0%	0%	2%	2%	0%
Other filtration (not including direct or conventional)	37%	28%	12%	5%	3%
Direct filtration	12%	15%	22%	15%	16%
Conventional filtration	21%	40%	52%	78%	86%
Membranes	5%	7%	6%	1%	3%
Other	0%	0%	0%	0%	0%

Percentage of Plants using Various Treatment Schemes		
	Ground Water Plants	Surface Water Plants
Disinfection with no additional treatment	48%	6%
Other chemical addition	23%	6%
Ion exchange, activated alumina, aeration	10%	1%
Other filtration (not direct or conventional)	13%	17%
Direct filtration	1%	16%
Conventional filtration (with and without softening)	1%	51%
Membranes	1%	4%
Other	3%	0%

filtration similar to the schematic below. A conventional filtration plant may use many steps, including pre-disinfection, flocculation, sedimentation, filtration, post-disinfection, and use of a clearwell to provide contact time for the disinfectant. In the schematic shown, the plant disinfects with chlorine after filtration. Other conventional filtration plants may add chlorine or other disinfectants at this or other points in the process. (See Volume II, Tables 23 and 24 for details by the size of the population served by the system and the average daily flow of the plant. Tables 23-30 provide further information on treatment schemes and practices.)

Treatment plants are designed to meet many objectives. Ninety-one percent of the nation's treatment plants are designed to disinfect water. Twenty-three percent are designed to either remove or sequester iron and 13 percent are designed to remove or sequester manganese. Twenty-one percent are designed for corrosion control.

There are important differences in the treatment objectives of plants that treat ground water and plants that treat surface water. For example, 88 percent of plants treating surface water are designed to remove particulates or turbidity, compared to 6 percent of systems treating ground water. While 27 percent of surface water plants are designed to remove total organic carbon (TOC), only 1 percent of ground water plants are designed with this objective. (See Volume II, Tables 21 and 22 for additional details on treatment plant objectives.)



Treatment Residual Management by Systems

The cost to dispose of treatment residuals is an important component of treatment costs and must be included in evaluations of treatment requirements. Treatment practices produce a range of residual wastes, including brines, concentrates, and spent media. Systems have several options for disposing of residuals, including land application, direct discharge to surface water, and discharge to sanitary sewers. Approximately 50 percent of surface water systems, most of them larger systems, dewater their treatment residuals. Ground water systems, on the other hand, rarely dewater. Surface water systems also are more likely to rely on direct discharge than ground water systems, reflecting their proximity to surface water and the type of treatment they use. Only 14 percent of systems discharge to sanitary sewers; however, nearly 85 percent of systems that have access to sanitary sewers use them to dispose of liquid waste. (Tables 31-40 in Volume II provide related information on residual management practices.)

Percentage of Treatment Plants with Each Treatment Objective

Treatment Objective	Ground Water Plants	Surface Water Plants
Algae control	1%	12%
Corrosion control	18%	42%
Primary disinfection	90%	95%
Secondary disinfection	11%	45%
Disinfectant byproduct control	3%	21%
Dechlorination	0%	0%
Oxidation	8%	19%
Iron removal	24%	19%
Manganese removal	13%	21%
Taste/odor control	7%	27%
TOC removal	1%	27%
Particulate/turbidity removal	6%	88%
Softening (hardness removal)	5%	6%
Recarbonation	0%	2%
Organic chemical contaminant removal (e.g., VOCs, pesticides)	2%	7%
Inorganic chemical contaminant removal (e.g., arsenic)	4%	4%
Radionuclides contaminant removal	1%	1%
Security	0%	0%
Mussel control	0%	3%
Fluoridation	13%	36%
Other	1%	3%

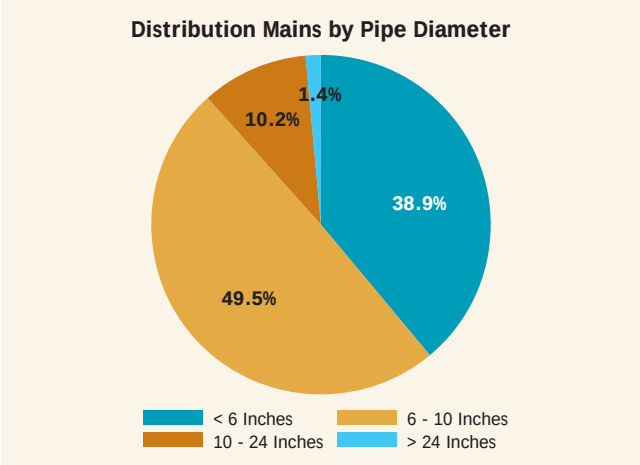
Storage

Finished water storage is an integral component of a water system. In addition to providing a cushion against fluctuations in demand, storage often is required to provide contact time for disinfectants. In this context, not all storage is equal: clearwells and storage with dedicated inlets and outlets provide contact time, but storage that "rides the line" (i.e., with a common inlet and outlet) may not. The 2000 CWS Survey asked detailed questions about the location of storage facilities and the type of inlets and outlets used. Systems of all sizes that rely primarily on surface water are more likely to have clearwell storage than are ground water systems. Surface water and ground water systems are more likely to use storage that has dedicated inlets and outlets than storage that rides the line. The need for storage is related to the complexity of the system. Surface water systems tend to have greater storage capacity than ground water systems because they typically have more complex treatment schemes that require longer production lead-time and need to rely on storage to meet short-term increases in demand. All systems tend to have most of their storage within their distribution networks, but purchased systems have a larger share than surface and ground water systems. This year, the survey asked detailed questions about the type of storage beyond the first connection in the distribution network. This new information is summarized in Chapter 3.

Distribution Networks

Buried infrastructure often is the largest component of a CWS's asset inventory. Water systems maintain more than 2 million miles of distribution mains, of which half is between 6 and 10 inches in diameter. The considerable variation in system spending to maintain distribution networks reflects not only the diverse age and condition of pipe in the ground but also the systems' financial condition.

Systems replaced over 56,000 miles, or 2.8 percent, of existing pipe in the past 5 years. They also added nearly 225,000 miles of new pipe. Each year during this period, systems serving up to 100 persons replaced 0.4 percent of their pipe. (Most replaced none, but several replaced more than 10 percent of their pipe each year. Most of these systems had less than 10 miles of distribution mains.) The median indicates that at least half of the small systems replaced no pipe between 2001 and 2006. (Volume II, Table 48 provides related information on miles of existing and replaced pipe.)



Large systems, especially publicly owned large systems, tend to be located in densely populated urban areas. Therefore, larger systems tend to serve larger populations per mile of pipe than smaller systems, as shown in the second table to the left. (Table 48 in Volume II provides related information on connections per mile of pipe. In addition to Table 48, Tables 49-52 in Volume II provide more information about systems' distribution networks.)

Miles of Pipe Replaced Annually during Previous 5 Years as a Percentage of Total Miles of Existing Pipe

Population Served	Publicly Owned Systems		Privately Owned Systems	
	Mean	Median	Mean	Median
<100	0.0%	0.0%	0.4%	0.0%
101-500	0.9%	0.0%	0.7%	0.0%
501-3,300	0.5%	0.0%	0.3%	0.0%
3,301-10,000	1.5%	0.3%	1.1%	0.2%
10,001-50,000	0.7%	0.2%	0.1%	0.0%
50,001-100,000	0.5%	0.2%	0.4%	0.0%
100,001-500,000	0.4%	0.2%	0.1%	0.1%
>500,000	0.3%	0.2%	0.4%	0.1%

Population Served per Mile of Existing Pipe

Population Served	Publicly Owned Systems		Privately Owned Systems	
	Mean	Median	Mean	Median
<100	87	56	118	98
101-500	106	79	227	185
501-3,300	123	114	182	125
3,301-10,000	166	133	155	104
10,001-50,000	212	179	196	127
50,001-100,000	230	198	273	195
100,001-500,000	266	210	250	206
>500,000	426	289	258	216

Financial Summary

EPA needs an accurate assessment of community water systems' finances to gauge the ability of these systems to make the technical and capital investments required for sustainable water operations. The survey asked systems to provide basic information on their annual revenue and expenses. It also requested data on the type of capital investments made over

the previous 5 years and the source of funds for the investments. Revenue and spending data cover a single year, which limits the Agency's ability to generalize about the industry's financial well being. As with the 2000 Survey, the data are intended to provide a snapshot of the water industry.

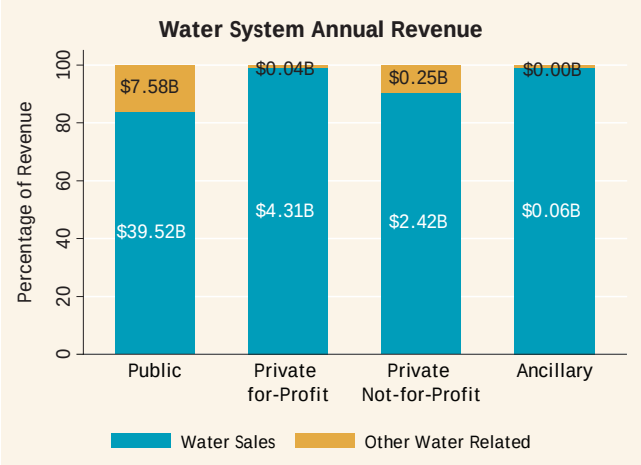
The diverse nature of water systems is reflected in their accounting systems and financial reports. Two systems with similar finances may report them differently, depending on their type of ownership and accounting practices. Due to differences in accounting practices, systems may use similar terms to describe different concepts. For example, the expenses included in "operations and maintenance" may vary across systems. This report clearly defines the terms used to describe systems' financial characteristics. These terms may not always take on the precise technical definition used in accounting or by individual systems, but they should accurately portray water system finances across the nation. To facilitate comparisons across systems (and to limit the burden of the survey on respondents), the financial data were collected at a relatively high level of aggregation and were subjected to thorough review.

Summary of Revenue and Expenses

Water systems earn revenue from water sales and other water-related revenue. Water sales revenue is payment for the delivery of water to customers. Water-related revenue is payment for water services not tied directly to the delivery of water, including development fees, connection fees, fines, and miscellaneous payments. Some publicly owned systems also receive transfers from a governmental general fund. (On the other hand, some municipalities may transfer water system revenue to the general fund to pay for activities not related to the provision of drinking water.)

Revenue from water sales in 2006 was $47 billion, which was 85 percent of total system revenue. The balance ($8 billion) was water-related revenue. (See Tables 58-70 and 75-79 in Volume II for further data on total revenue and expenses. The tables in Volume II report transfers from municipal general funds as water-related revenue. Also, the analysis presented here includes only systems that answered both the revenue and expense questions. The tables in Volume II include all systems that responded to each question, unless otherwise noted.) Private systems depend more heavily on water sales than do public systems—over 99 percent of private for-profit and ancillary systems' revenue comes from water sales, compared to 84 percent for publicly owned systems. Private not-for-profit systems are in between, with 91 percent of revenue from water sales.

These national figures mask important differences among systems. For the average system of any size, residential customers provide about 89 percent of water sales revenue. Commercial, industrial, institutional, and agricultural customers account for an additional 9 percent of water sales revenue, and wholesale revenue makes up 2 percent of the total. Smaller systems depend more on residential customers for revenue than do larger systems. More than 96 percent of water sales revenue for the smallest systems comes from residential sales. On the other hand, residential sales account for a bit more than 57 percent of water sales revenue in systems serving more than 100,000 persons. These systems typically derive a higher proportion of their total revenue from commercial and industrial customers than do smaller systems. (Because ancillary systems often do not charge directly for water and thus do not report water revenue, they are excluded from this analysis. Ancillary water sales revenue tends to



Percentage Distribution of Water Sales Revenue by Customer Class (Excludes Ancillary Systems)						
Customer Type	<501	501-3,300	3,301-10,000	10,001-100,000	>100,000	All Sizes
Residential	96.2%	87.8%	73.5%	72.9%	57.3%	88.8%
Nonresidential	2.8%	11.4%	16.9%	19.4%	26.9%	8.8%
Wholesale	0.9%	0.8%	9.6%	7.7%	15.8%	2.4%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

be overwhelmingly residential. Volume II, Table 66 provides details on the percentage of revenue from each customer category for the average system.)

On average, water systems received $1 million in revenue in 2006. Systems serving up to 500 persons received an average of $21,000 per year, while systems serving more than 100,000 persons received over $43 million. Public systems tend to receive more revenue because they tend to be larger. (See Volume II, Table 58. Tables 59-70 provide additional relevant information on average water system revenue.)

One way to compare revenue of different-sized systems is to consider revenue per customer connection. (This estimate excludes ancillary systems, which often do not charge directly for water. It also excludes wholesale revenue because systems did not report the number of retail customer connections associated with their wholesale deliveries.) Average revenue per connection from nonresidential customers is significantly larger than earnings from residential customers.

Publicly owned systems tend to receive less than privately owned systems per residential connection; this is true overall and within each system size category. Because a small number of systems have very large revenues per connection, median revenue is a better measure of central tendency than the average. (See Table 70 in Volume II for more details on residential revenue per connection.)

On average, water systems receive the large majority of their revenues from residential customers, who would bear much of the cost of efforts to improve water quality and to maintain or expand the system. Median revenue per residential connection is less

Average Annual Water System Revenue				
	Publicly owned systems	**Privately owned for profit**	**Privately owned not for profit**	**Ancillary**
<501	$46,325	$18,377	$17,646	$2,840
501-3,300	$477,446	$143,831	$418,825	$49,976
3,301-10,000	$523,298	$332,134	$751,584	
10,001-100,000	$3,341,898	$4,956,673	$2,848,003	
>100,000	$41,419,524	$59,932,110	$45,989,681	

Median Revenue per Connection, Excluding Ancillary				
Population Served	Residential	Nonresidential	Residential	Nonresidential
	Publicly Owned Systems		Privately Owned Systems	
<501	$285	$365	$342	$360
501-3,300	$283	$836	$397	$2,057
3,301-10,000	$264	$1,000	$423	$730
10,001-100,000	$265	$1,280	$366	$1,588
>100,000	$305	$1,640	$379	$2,321

than 1 percent of median household income nationally.[3] There is a great deal of variation around the median, as well as considerable variation in household income, so not every household pays this percentage of their income for drinking water. But on a national basis, water charges constitute a relatively small portion of household income.

The final factor that affects system revenue, in addition to the number and types of customers, is the rate the system charges for water. The median rate per thousand gallons charged to residential customers is $2.89. Nonresidential customers tend to pay less per thousand gallons (except for nonresidential customers of certain categories of small systems), and larger systems tend to charge less per thousand gallons, likely reflecting load profiles and scale economies. Wholesale customers tend to pay the lowest rates, which reflect the relatively high volume of their purchases and the lower cost per gallon of their service. (See Volume II, Table 69. Tables 67 and 68 provide additional information on water system revenue per thousand gallons delivered.) Allocating costs to nonresidential customers (especially large-volume users) and residential customers is important since demand stability is a key objective of systems. Large-volume customers can help cover fixed costs, which potentially lowers costs to residential customers.

Water systems rely on a variety of approaches to charging for water. The most common means of charging residential customers is to use a single rate per gallon of water sold; 36 percent of all systems rely on uniform rates. Separate flat fees (17 percent of systems) and combined flat fees (16 percent) are the next most common rate structures. (Combined flat

Piping supported by ropes and jacks.

3 Based on the estimated national median household income of $50,007 (U.S. Census Bureau, *2005-2007 American Community Survey*.)


Average Revenue per Thousand Gallons
Public
10.00
8.00
6.00
4.00
2.00
0.00
3.8
4.3
4.0
4.4
2.0
3.6
3.1
1.6
3.5
2.9
2.2
2.8
2.7
1.7
<501
501-3,300
3,301-10,000
10,001-100,000
>100,000
Private For-Profit
4.8
2.6
4.9
2.6
6.5
5.3
3.0
4.6
8.4
5.3
3.3
5.5
4.0
2.5
Dollars
Private Not-for-Profit
2.9
9.4
1.1
6.6
3.9
6.4
5.2
4.0
5.7
4.4
4.2
4.4
4.7
2.0
Ancillary
1.0
1.6
Population Served
Residential
Nonresidential
Wholesale

fees are fees for multiple services, such as rental fees, association fees, and pad fees.) Large systems are more likely to use an increasing block rate or a seasonal rate structure. The table below indicates only whether the rate structure was used; however, many systems may use a combination of these rate options, such as a flat fee and an increasing block rate. (See Volume II, Table 71. Tables 72-73 provide additional detail on residential rate structures.)

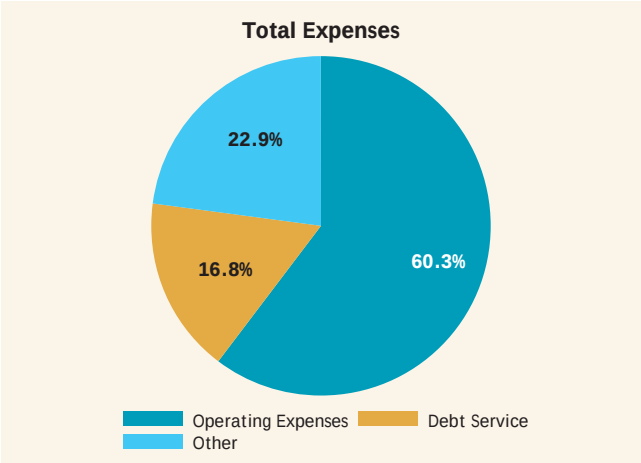
Percentage Use of Residential Rate Structures

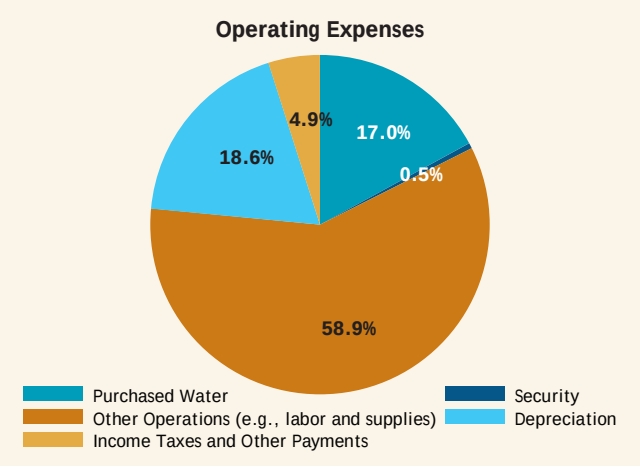
Rate Structure	<501	501-3,300	3,301-10,000	10,001-100,000	>100,000	All
Uniform rate	28%	53%	39%	39%	30%	36%
Declining block rate	4%	19%	13%	15%	23%	10%
Increasing block rate	11%	14%	14%	25%	27%	13%
Seasonal rate	0%	0%	0%	0%	5%	0%
Separate flat fee	18%	17%	17%	18%	20%	17%
Annual connection fee	0%	0%	4%	6%	3%	1%
Combined flat fee	28%	1%	2%	4%	2%	16%
Other	8%	8%	2%	3%	9%	7%

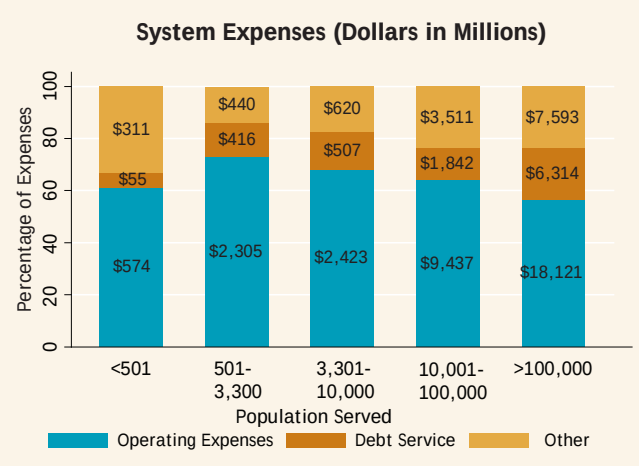
The survey groups expenses into three categories. First are **operating expenses**, which are costs regularly incurred by systems to provide water to their customers. They include costs for labor, power, chemicals, purchased water, and security. Operating expenses include the cost of routine maintenance, as well as **depreciation**, which is the cost of wear and tear of equipment and plants. Operating expenses also include income taxes for privately owned systems and payments in the lieu of taxes for publicly owned systems. Operating expenses accounted for 60.3 percent of system spending. The second category is **debt service**, which is the payment of principal and interest on past borrowing. It accounts for 16.8 percent of system spending. The balance of system spending is in the final category, which covers any **other expenses** incurred by systems, including purchases of capital equipment and payments to reserve funds.

The survey divides operating expenses into several categories. Purchased water costs are 17 percent of operating expenses. Embedded in the cost of purchased water are the labor, power, chemicals, and maintenance costs necessary to treat and deliver that water, so some of the expenses allocated for purchased water are actually for other operating expenses. Depreciation comprises 18.6 percent of operating costs. Security is a relatively small expense. Other operating expenses, including the cost of energy, chemicals, other inputs, and labor, make up nearly 60 percent of annual operating expenses. (A detailed discussion of labor costs is provided in Chapter 3. The 2006 survey did not ask for details on these expenses.)

Expenses depend largely on system size. Systems serving up to 500 persons spent approximately $55,000 on average, compared to $55 million for systems serving more than 100,000 persons. Expenses tend to be higher for publicly owned systems, even among





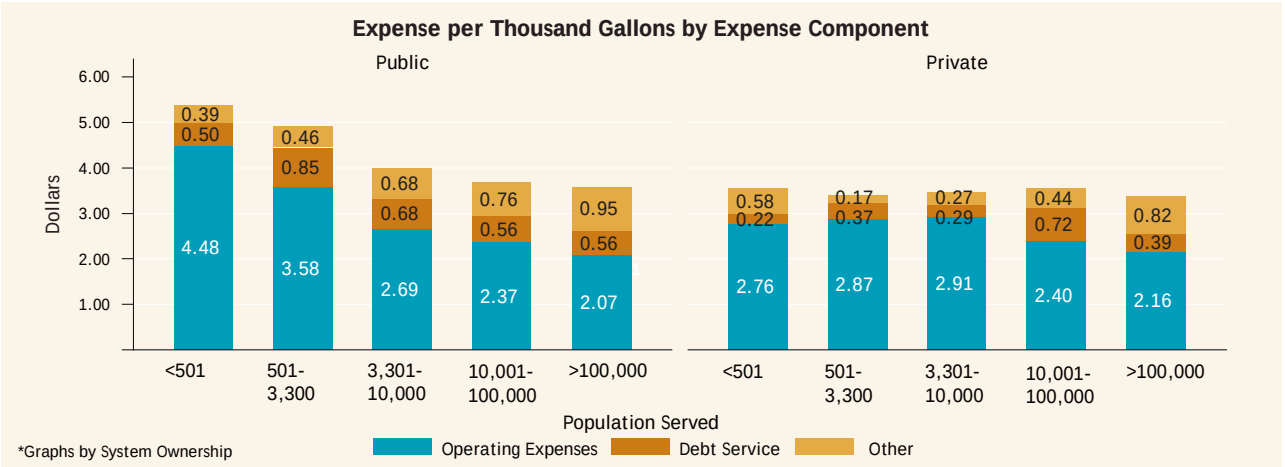


systems of similar size. (See Volume II, Tables 75 and 77.)

A more meaningful comparison is expense per thousand gallons sold. Expenses per thousand gallons tend to decline as system size increases, reflecting the economies of scale inherent in the production and delivery of drinking water. (Economies of scale for distribution networks exist only up to a certain threshold, beyond which there may be diseconomies of scale.) For both publicly and privately owned systems, spending per thousand gallons increases somewhat in the largest systems. (See Volume II Tables 76 and 78 for additional details on expenses per thousand gallons.) This increase is due, in part, to greater capital spending (included in "other" spending) and higher spending on operations and maintenance. Spending on operations as a share of total spending also tends to decline with system size. Bigger systems devote more of their expenditures to debt service and other expenses (which include capital improvements and payments to reserve funds). As a share of total expenses, debt service for systems serving more than 100,000 persons is more than twice that of the smallest systems. (See Volume, II Table 80 for a breakdown of expenses by major categories.)

Publicly owned systems tend to spend more per thousand gallons than privately owned systems, especially if the systems are small. In the smaller size categories, publicly owned systems also tend to spend more per thousand gallons on operations and maintenance than privately owned systems.

One method of measuring the financial health of a system is to compare the annual revenue generated and expenses incurred in its operation. The comparison should include revenue that is generated by the sale and delivery of water and should exclude payments not related to system operations. The survey's category "water sales revenue" is part of operating revenue. In



some cases, water-related revenue also may include operating revenue; in others, it may not. For example, some systems may charge a fee to connect new customers to the system. These may be one-time charges intended to recover the capital cost of connecting new customers. Other systems may charge fees on a regular basis and use them to fund annual operations. In both cases, systems may call these charges "connection fees" and include them on the same line under water-related revenue. Government transfers present a similar issue. In some cases, the transfers may be special payments to make up for a budget shortfall. In other cases, they may be payments from the government to the water system for services provided.

Because of these reporting differences, the survey data do not provide a consistent measure of operating revenue. Therefore, we present three alternative measures. The first uses water sales revenue only. The second uses water sales plus connection and development fees. The final version uses water sales, connection and development fees, and government transfers.

On the expense side of the ledger, the comparison of revenue and expenses should include the cost of **general operations**. The costs of general operations include purchased water, security, labor, chemicals, power, supplies, and contractor services. Expenses also should include depreciation, interest, and taxes or payments in lieu of taxes. Principle payments on debt, capital expenses, and payments to reserve funds should be excluded.

Net income is the difference between revenue and expenses. Three measures of net income, based on the three measures of operating revenue, are shown in the table to the right. It shows net income and its components by ownership of the system and illustrates how net income is calculated. It also highlights differences between publicly and privately owned systems. On average, water sales alone were not sufficient to cover publicly owned systems' expenses. If fees and payments are included, net income is positive. Fees play a smaller role for privately owned systems, especially for-profit systems. Fees play a bigger role among not-for-profit systems than among for-profit systems, both in absolute terms and as a share of total revenue. These differences may reflect differences in accounting systems and definitions of terms, rather than differences in how the systems generate revenue. Some of the differences also are due to system size. Table 83 in Volume II shows net income by ownership and system size.

One way to compare the financial performance of systems with different revenue and expenses is to use the ratio of revenue to expenses rather than net income. The table on the next page shows the ratio for the three measures of revenue. All expenses are used for all three ratios. (The letters in parentheses refer to the lines from the previous table.) The median publicly owned system has a ratio greater than 1.0 in all but the largest size category using the most limited measure of revenue. The median ratio is greater than 1.0 in all size categories for publicly owned systems if fees and government transfers are included. The ratios for privately owned systems tend to be somewhat higher

Average System Revenue, Expenses, and Net Income

Revenue and Expense Category	Public	Private	Ancillary
Revenue			
a. Water Sales	$1,455,670	$522,675	$19,398
b. Fees	$298,567	$22,279	$132
c. Government	$45,476	$2,261	$0
d. Total (a+b+c)	$1,799,713	$547,216	$19,530
Expenses			
e. General Operations	$1,048,470	$297,401	$13,079
f. Depreciation	$261,115	$68,867	$525
g. Interest	$194,666	$51,740	$1,037
h. Taxes	$64,681	$16,541	$118
i. Total (e+f+g+h)	$1,568,933	$434,550	$14,759
Net Income			
j. Sales only (a-i)	($113,263)	$88,125	$4,639
k. Sales and Fees (a+b-i)	$185,304	$110,405	$4,771
l. Sales, Fees, & Government (d-i)	$230,780	$112,666	$4,771

than for publicly owned systems. Ancillary systems also perform relatively well. Again, some of these differences may be due to different accounting methods, but the relatively low ratios for the larger for-profit systems are noteworthy. (Tables 81-82 in Volume II provide additional details on this ratio.)

Another way to present these results is to report the percentage of systems that have a ratio less than 1.0. Systems with a ratio less than 1.0 are running an operating deficit or loss that year, or may be relying on other revenue sources to finance operations. The table on the next page shows the percentage of systems that have ratios greater than or equal to 1.0 for the three measures of revenue.

Median Ratio of Revenue and Expense

Revenue Included	Population Served				
	<501	501-3,300	3,301-10,000	10,001-100,000	>100,000
Public					
Sales (a/i)	1.12	1.05	0.96	1.02	0.99
Sales and Fees ((a+b)/i)	1.24	1.14	1.08	1.18	1.15
Sales, Fees, & Government (d/i)	1.28	1.17	1.10	1.20	1.15
Private					
Sales (a/i)	1.13	1.11	1.05	1.13	1.14
Sales and Fees ((a+b)/i)	1.17	1.18	1.15	1.16	1.19
Sales, Fees, & Government (d/i)	1.17	1.18	1.15	1.16	1.19
Ancillary					
Sales (a/i)	1.07	1.20			
Sales and Fees ((a+b)/i)	1.15	1.20			
Sales, Fees, & Government (d/i)	1.15	1.20			

A couple of notes of caution regarding the interpretation of these measures are warranted. Systems are grouped into the three categories based on commonly applied thresholds. The ratio thresholds are intended to characterize the industry in general, but they may not be appropriate measures of the well being of specific water systems. Some well-run water systems may have ratios of less than 1.0 for reasons that are consistent with good planning and management, and it would be inappropriate to characterize them as weak. The ratios are "snap shots" that capture conditions for only a limited period of time. (For example, a water system may experience an emergency such as flooding that shuts down operations for an extended period during a particular year.) But if the ratio of a significant portion of systems in a sector is less than 1.0, the financial well being of systems in that sector may be in question. By the same measure, if a ratio for a particular system is less than 1.0 over consecutive years, the financial health of that system is doubtful. Second, financial data are recorded and reported in different ways by

Standpipe storage.

Percentages of System with a Ratio Greater than or Equal to 1.0					
Revenue Included	Population Served				
	<501	501-3,300	3,301-10,000	10,001-100,000	>100,000
Public					
Sales (a/i)	57.5%	58.5%	49.2%	55.2%	47.4%
Sales and Fees ((a+b)/i)	68.2%	67.2%	62.5%	70.0%	72.3%
Sales, Fees, & Government (d/i)	75.1%	72.2%	64.7%	71.2%	73.3%
Private					
Sales (a/i)	61.0%	72.4%	56.0%	50.9%	91.3%
Sales and Fees ((a+b)/i)	69.4%	83.2%	56.0%	50.9%	95.6%
Sales, Fees, & Government (d/i)	69.4%	83.2%	61.6%	50.9%	95.6%
Ancillary					
Sales (a/i)	52.2%	100.0%			
Sales and Fees ((a+b)/i)	59.0%	100.0%			
Sales, Fees, & Government (d/i)	59.0%	100.0%			

different systems. The questionnaire was designed to collect general information on revenue and expenses in a consistent manner across systems. The ratio is intended to provide a general measure of financial well being; more detailed financial data than were available in this survey are required for more specific analyses.

Capital Spending

Water systems made nearly $66 billion in capital investments in the 5 years leading up to the survey, more than $13 billion a year. Just less than 44 percent of CWSs made capital investments over the 2001–2006 period, investing an average of $1.3 million each. Publicly owned systems tended to invest more than privately owned ones. Most investments are made by large systems. (See Tables 86-89 in Volume II for related information on the percentage of systems making capital investments and the amount invested.[4])

Systems need to invest in infrastructure for a variety of reasons. They may need to upgrade their treatment to improve water quality to comply with federal drinking water standards or for other reasons. They also need to maintain their capital stock by making major repairs to worn assets or replacing assets that have reached the end of their useful lives. Finally, they may need to expand their capacity to provide water to a growing population.

The survey asked systems to divide their recent capital investments into these three categories. The responses provided a general sense of the underlying reasons for the investment. There is some overlap, because the reasons for investment are not mutually exclusive. For example, a system may need to replace a worn-out asset. In doing so, it may install a larger capacity asset to meet the needs of a growing population; it also may change the technology to comply with federal rules.

Whether this investment is for water quality improvements, repair and replacement, or system expansion depends largely on the priorities of the system; therefore, the survey allowed the system to

4 Systems were asked to report the amount of funds invested in treatment, as well as land, water source, distribution networks, etc. In a separate question, they were asked to report the percentage of their total capital investment that went towards replacement or major repair of existing assets, system expansion, or compliance with water quality regulations. Spending on treatment and on compliance is not identical. Some investment in treatment may be considered spending on water system expansion, system replacement, or major repair. Also, spending on items other than treatment, such as the distribution network, may be counted by systems as a cost of compliance.

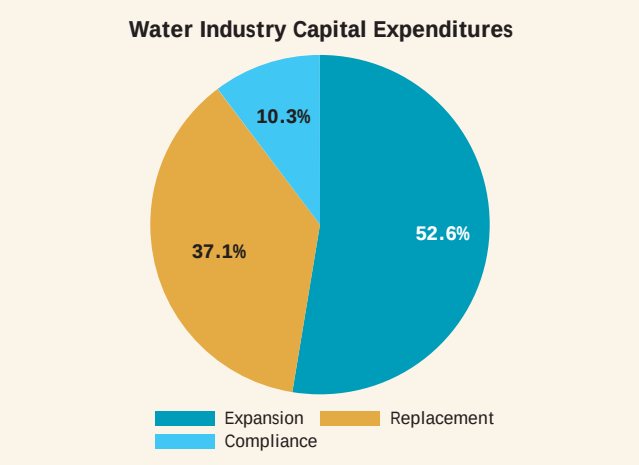
Presenting Data on Capital Investment

Throughout this report, we describe the type of investment systems make and how they are funded. We show whether an investment was for compliance, replacement, or expansion. We also show what systems buy: land, treatment facilities, pipe, etc. Other tables show how systems pay for this investment—with current revenue, by borrowing, or through private investment.

In each case, there are three ways to describe systems' capital investment activities. First, we can describe how many systems make a type of investment or rely on a specific source of funds. Several tables in this report show the **percentage of systems** that made capital investments or relied on a source of funding. For example, approximately 64 percent of publicly owned systems serving 500 or fewer persons paid for their capital investments with current revenue. (See page 33.) Note: systems may make more than one type of investment or rely on more than one source of funds for their investments. Therefore, the total of the percentage of systems making investment of each type or relying on sources of funds need not sum to 100 percent.

Second, we can describe the **distribution of funds used by the average system.** This metric shows how the typical systems allocate their investments and how their investments are funded. For example, consider two systems. One has $200,000 in capital investments and spends $80,000, or 40 percent, on treatment. A second system invests $1,000,000 in capital equipment, of which it invests 20 percent (or $200,000) on treatment. On average, these two systems put 30 percent of their investment towards treatment. The other 70 percent of average capital investment is for land, transmission and distribution, storage, and other types of capital expenses.

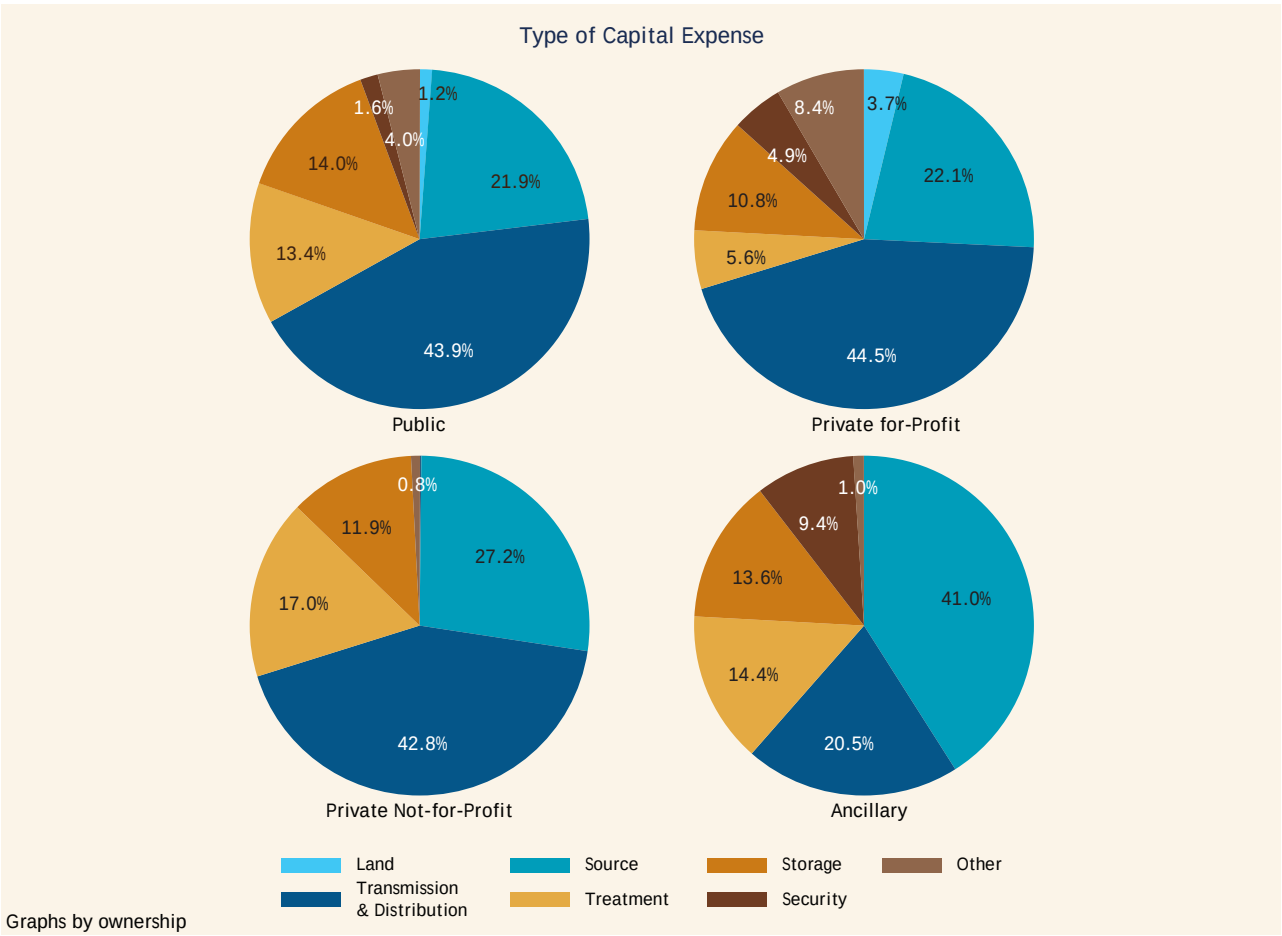
Finally, the **distribution of funds for the nation** shows system investment and sources of funds for all systems in the aggregate. The distribution may be different than it is for the typical system because the magnitude of total investment varies greatly among systems. Continuing with our example above, the two systems invested a total of $1,200,000. Of that, $280,000 was for treatment. Overall, treatment counted for 23 percent of total investment ($280,000/$1,200,000). This percentage is lower than the two systems' average investment of 30 percent because the second system invests 5 times as much as the first system, but invests a smaller portion in treatment.



make the designation. Also, systems may report an expenditure as affecting quality only if it is related directly to treatment. Water systems spend much of their funds on their distribution networks; much of this expense may be to improve the quality of their water, but may be reported as repair and replacement.

Based on the systems' responses, 37 percent of the investment for the nation over the past 5 years was to replace or repair assets. Fifty-three percent of national investment was for system expansion. The remaining 10 percent of the total capital investment was for compliance with regulations. Privately owned systems tended to use more of their investments for compliance than publicly owned systems. This difference is due, in part, to the larger size of public systems. For both publicly and privately owned systems, the share of investment attributed to compliance tends to decline with system size (and publicly owned systems tend to be larger). (The percentages given here are for systems that reported positive investments on capital projects. See Volume II, Table 101. Tables 98-99 provide related information on the purpose of capital investments.)

An alternative way to view the purpose of the investment is to look at what was purchased. Spending on distribution mains and transmission lines accounted for 41 percent of the average system's capital investments over this period. Treatment accounted for an additional 14 percent and storage another 13



Distribution of Capital Investment Nationally						
	Population Served					
	<501	501-3,300	3,301-10,000	10,001-100,000	>100,000	All Systems
Publicly Owned Systems						
Land	0.0%	1.1%	0.3%	1.1%	1.6%	1.3%
Water source	15.5%	18.2%	3.4%	7.2%	8.2%	8.6%
Transmission and distribution	63.6%	47.6%	45.2%	49.7%	42.2%	44.9%
Treatment	12.8%	10.2%	34.0%	22.3%	27.2%	25.0%
Storage	7.4%	21.7%	13.0%	12.1%	6.2%	8.8%
Security	0.1%	0.0%	1.1%	0.4%	0.4%	0.4%
Other	0.6%	1.1%	3.0%	7.2%	14.2%	11.0%
Privately Owned Systems						
Land	0.1%	0.7%	0.0%	0.6%	0.6%	0.5%
Water source	18.9%	24.4%	9.4%	12.3%	4.1%	9.3%
Transmission and distribution	45.1%	50.9%	51.6%	57.5%	60.6%	56.8%
Treatment	14.3%	12.2%	31.5%	7.7%	19.7%	18.3%
Storage	20.7%	10.3%	5.8%	16.5%	3.7%	7.8%
Security	0.8%	0.2%	1.1%	0.0%	3.4%	2.1%
Other	0.2%	1.3%	0.6%	5.5%	8.0%	5.4%

percent. The percentage of its capital investments that the average system directs toward treatment has remained relatively constant since the 1995 CWS Survey. Spending for land, source development, and other investments accounted for the remainder of the investments.

Forty-five percent of the total national investment in capital improvements made by publicly owned systems was for distribution and transmission networks; total national investment in this category by privately owned systems was 57 percent. Treatment accounts for an additional 25 and 18 percent of the national investment by public and private systems, respectively. The percentage of capital investments that larger, privately owned systems make in distribution and transmission networks, treatment, and security is greater than the percentage of investments smaller, privately owned systems make in those areas. Small public systems together invest more than large systems in transmission and distribution, storage, and source development.[5] It should be noted that the distribution of these expenditures has remained virtually unchanged since the 2000 Survey. (Tables 90-97 in Volume II provide related information on types of capital investments made. The table above and Table 97 in Volume II show the distribution of capital investment nationally. In other words, they show the distribution of capital investment by all systems in the aggregate. (Table 95 in Volume II presents the distribution for the average system.)

Systems have several means of financing their capital investments, including cash, government grants and loans, and private sector borrowing. The following table estimates the percentage of total capital investment by all systems in the nation that is financed by each source of funds. Overall, private sector debt (loans) and current revenues fund investments equally. Larger systems get more of their investment funds by

5 Investment in treatment does not need to equal investment in compliance. The discussion of investment in treatment reported the amount of investment by all systems. This discussion focuses on the average investment in compliance by type of system.

Distribution of Total Funds for Capital Investments Nationally by Each Source of Funds						
Question Type	Population Served					
	<501	501-3,300	3,301-10,000	10,001-100,000	>100,000	Total
Publicly Owned Systems						
Current revenues	11.5%	6.1%	25.6%	53.7%	30.6%	34.0%
Equity or other funds from private investors	3.2%	16.6%	0.9%	0.7%	0.1%	1.7%
Borrowing from private sector sources	19.9%	6.5%	15.5%	16.7%	48.1%	33.6%
Department of Homeland Security grants	0.0%	0.1%	0.1%	0.4%	0.1%	0.2%
Other government grants	35.9%	17.0%	26.2%	9.1%	1.7%	7.4%
DWSRF principal repayment forgiveness	0.4%	2.9%	0.0%	0.0%	0.0%	0.2%
DWSRF loans	19.9%	29.3%	20.4%	9.5%	6.7%	10.5%
Other borrowing from public sector sources	8.5%	18.5%	6.5%	6.9%	9.9%	9.5%
Other	0.9%	3.1%	4.8%	3.0%	2.8%	2.9%
Privately Owned Systems						
Current revenues	16.3%	25.4%	a.	36.1%	a.	14.4%
Equity or other funds from private investors	29.2%	24.4%	a.	2.7%	a.	9.7%
Borrowing from private sector sources	3.1%	11.4%	a.	10.3%	a.	10.6%
Department of Homeland Security grants	0.0%	0.0%	a.	0.0%	a.	0.0%
Other government grants	37.8%	14.7%	a.	2.9%	a.	5.4%
DWSRF principal repayment forgiveness	0.0%	0.0%	a.	0.0%	a.	0.0%
DWSRF loans	0.0%	0.1%	a.	7.9%	a.	27.6%
Other borrowing from public sector sources	4.5%	22.2%	a.	32.9%	a.	8.8%
Other	9.2%	1.8%	a.	7.4%	a.	23.5%
All Systems						
Current revenues	12.4%	8.7%	a.	52.9%	a.	32.3%
Equity or other funds from private investors	7.9%	17.6%	a.	0.8%	a.	2.4%
Borrowing from private sector sources	16.9%	7.1%	a.	16.4%	a.	31.6%
Department of Homeland Security grants	0.0%	0.1%	a.	0.4%	a.	0.2%
Other government grants	36.2%	16.7%	a.	8.8%	a.	7.2%
DWSRF principal repayment forgiveness	0.3%	2.5%	a.	0.0%	a.	0.2%
DWSRF loans	16.3%	25.4%	a.	9.4%	a.	12.0%
Other borrowing from public sector sources	7.7%	19.0%	a.	8.1%	a.	9.5%
Other	2.4%	2.9%	a.	3.2%	a.	4.7%

a. The number of systems that provided information on sources of funds in these size categories was relatively small. Three systems account for most of the investment made by private systems serving 3,301-10,000 persons. Four systems account for most of the investment made by private serving more than 100,000. These systems funded large capital projects primarily with DWSRF loans.

borrowing from private sector sources than do smaller systems. While over 48 percent of funding for systems serving populations greater than 100,000 comes from private sector borrowing, less than 20 percent of funding for systems serving 500 or fewer persons comes from private sector loans. Current revenue is another important source of funds—especially for publicly owned systems—and accounts for 34 percent of public system investment.

Percentage of Systems Acquiring Capital Funds from Each Source						
Question Type	Population Served					
	<501	501-3,300	3,301-10,000	10,001-100,000	>100,000	Total
Publicly Owned Systems						
Current revenues	63.7%	48.3%	74.5%	76.7%	62.0%	61.1%
Equity or other funds from private investors	0.3%	3.4%	8.8%	2.7%	2.5%	3.2%
Borrowing from private sector sources	12.2%	12.0%	23.9%	23.3%	40.3%	16.5%
Department of Homeland Security grants	0.0%	1.5%	2.8%	5.5%	5.7%	2.1%
Other government grants	35.8%	29.9%	28.5%	16.6%	16.3%	28.5%
DWSRF principal repayment forgiveness	0.2%	3.9%	0.0%	0.0%	0.0%	1.6%
DWSRF loans	16.4%	24.6%	19.2%	10.5%	14.1%	19.0%
Other borrowing from public sector sources	11.0%	7.2%	7.5%	10.2%	11.0%	8.9%
Other	4.5%	4.1%	10.7%	6.8%	7.8%	5.7%
Privately Owned Systems						
Current revenues	70.7%	73.1%	a.	53.0%	a.	70.8%
Equity or other funds from private investors	12.4%	23.7%	a.	3.2%	a.	14.5%
Borrowing from private sector sources	2.6%	21.7%	a.	11.7%	a.	8.5%
Department of Homeland Security grants	0.0%	0.0%	a.	0.0%	a.	0.0%
Other government grants	6.5%	3.9%	a.	20.6%	a.	5.9%
DWSRF principal repayment forgiveness	0.0%	0.0%	a.	0.0%	a.	0.0%
DWSRF loans	0.0%	0.8%	a.	9.7%	a.	2.4%
Other borrowing from public sector sources	2.1%	7.9%	a.	20.5%	a.	4.2%
Other	12.0%	8.6%	a.	3.2%	a.	10.6%
All Systems						
Current revenues	68.2%	55.0%	a.	75.1%	a.	64.9%
Equity or other funds from private investors	8.1%	9.0%	a.	2.8%	a.	7.7%
Borrowing from private sector sources	6.0%	14.6%	a.	22.5%	a.	13.4%
Department of Homeland Security grants	0.0%	1.1%	a.	5.1%	a.	1.3%
Other government grants	17.0%	22.8%	a.	16.9%	a.	19.6%
DWSRF principal repayment forgiveness	0.1%	2.8%	a.	0.0%	a.	1.0%
DWSRF loans	5.9%	18.1%	a.	10.5%	a.	12.5%
Other borrowing from public sector sources	5.3%	7.4%	a.	10.9%	a.	7.0%
Other	9.3%	5.3%	a.	6.5%	a.	7.6%

a. The number of systems that provided information on sources of funds in these size categories was relatively small. Three systems account for most of the investment made by private systems serving 3,301–10,000 persons. Four systems account for most of the investment made by private serving more than 100,000. These systems funded large capital projects primarily with DWSRF loans.

The Drinking Water State Revolving Fund (DWSRF) program also is an important source of funds for small systems. DWSRF assistance finances over 20 percent of capital investments made by public systems serving populations of up to 10,000. This assistance includes loans in which all or a portion of the principal repayment is forgiven. Many large private systems received funding from sources that could not be categorized by the options given. Some of these

sources were developer contributions, disaster relief, and revenue bonds. (See Volume II, Table 105.)

Even though roughly the same amount of total national investment funds come from current revenues as from private sector loans, many systems are much more likely to use current revenues than borrow funds. The table on the previous page demonstrates the percentage of systems that use each type of funding source.

Approximately 71 percent of all privately owned systems financed some of their investment with current revenue, while only 9 percent borrowed from private sources. Borrowing by publicly owned systems from private sector sources tends to increase with system size: 40 percent of public systems serving more than 100,000 persons borrow from private sources, while only 12 percent of public systems serving up to 500 persons borrow from the private sector. Approximately 19 percent of publicly owned systems relied on DWSRF loans to finance at least a portion of their capital improvements. The percentage of publicly owned systems whose DWSRF principle repayments were forgiven was 1.6 percent. (See Volume II, Table 102.)

The table on page 35 shows the distribution of the source of funds, or the percentage of funds obtained from each source, for the average system (as opposed to the aggregate for all systems, which was shown in the table on page 32). Not only do 65 percent of systems use current revenue, most systems (53 percent) finance the majority of their investments out of current revenue.

Larger systems are much more likely to rely on borrowing than are small systems. As system size increases, reliance on borrowing as a source of funds more than quadruples. Since larger systems also invest more than smaller systems, this increase in borrowing (and decrease in the use of current revenues) by large systems explains why less than one-third of total national investment funds come from current revenues. (See Table 105 in Volume II.) On average, systems receive an additional 10 percent of their investment funds through private sector borrowing. Publicly owned systems finance somewhat more of their investments through borrowing, due in large part to the systems' size.

Publicly owned systems used the DWSRF loans to fund approximately 13 percent of their investment, on

Each System's Distribution of Total Funds for Capital Investments by Each Source of Funds						
Question Type	Population Served					
	<501	501-3,300	3,301-10,000	10,001-100,000	>100,000	Total
Publicly Owned Systems						
Current revenues	49.2%	36.9%	54.5%	64.5%	52.2%	47.4%
Equity or other funds from private investors	0.3%	3.0%	1.0%	0.6%	0.5%	1.6%
Borrowing from private sector sources	9.6%	11.3%	13.2%	16.9%	29.7%	12.4%
Department of Homeland Security grants	0.0%	0.5%	0.0%	0.3%	0.9%	0.3%
Other government grants	25.7%	18.6%	13.5%	5.4%	2.6%	17.3%
DWSRF principal repayment forgiveness	0.1%	0.7%	0.0%	0.0%	0.0%	0.3%
DWSRF loans	9.5%	19.6%	7.8%	7.2%	5.5%	13.0%
Other borrowing from public sector sources	4.6%	7.2%	3.6%	4.2%	5.2%	5.5%
Other	1.1%	2.2%	6.2%	0.9%	3.4%	2.3%
Privately Owned Systems						
Current revenues	68.0%	50.4%	a.	51.2%	a.	61.9%
Equity or other funds from private investors	11.8%	17.6%	a.	4.1%	a.	12.6%
Borrowing from private sector sources	1.7%	17.5%	a.	8.3%	a.	6.6%
Department of Homeland Security grants	0.0%	0.0%	a.	0.0%	a.	0.0%
Other government grants	5.8%	1.6%	a.	3.1%	a.	4.5%
DWSRF principal repayment forgiveness	0.0%	0.0%	a.	0.0%	a.	0.0%
DWSRF loans	0.0%	0.2%	a.	9.1%	a.	1.7%
Other borrowing from public sector sources	0.4%	5.3%	a.	22.9%	a.	2.2%
Other	12.3%	7.4%	a.	1.5%	a.	10.5%
All Systems						
Current revenues	61.1%	40.7%	a.	63.7%	a.	53.2%
Equity or other funds from private investors	7.6%	7.1%	a.	0.8%	a.	6.0%
Borrowing from private sector sources	4.6%	13.0%	a.	16.4%	a.	10.1%
Department of Homeland Security grants	0.0%	0.4%	a.	0.3%	a.	0.2%
Other government grants	13.1%	13.8%	a.	5.3%	a.	12.2%
DWSRF principal repayment forgiveness	0.0%	0.5%	a.	0.0%	a.	0.2%
DWSRF loans	3.5%	14.1%	a.	7.3%	a.	8.5%
Other borrowing from public sector sources	1.9%	6.6%	a.	5.3%	a.	4.2%
Other	8.2%	3.7%	a.	1.0%	a.	5.5%

a. The number of systems that provided information on sources of funds in these size categories was relatively small. Three systems account for most of the investment made by private systems serving 3,301–10,000 persons. Four systems account for most of the investment made by private serving more than 100,000. These systems funded large capital projects primarily with DWSRF loans.

average. Publicly owned systems also are more likely to use DWSRF loans than privately owned systems. (Some states do not make DWSRF funds available to private systems.) While small privately owned systems met a larger percentage of their funding needs through private investors than small publicly owned systems did, small publicly owned systems more than make up for the difference with DWSRF and other public sector loans. (See Volume II, Table 104.)

Conclusions

The drinking water industry is large and capital-intensive. Water systems incurred more than $54 billion in total expenses to provide water to more than 280 million persons, and they invested more than $13 billion annually in capital improvements. They rely on a range of water sources and treatment practices. The summary measures presented in this chapter provide an overview of the industry as a whole; the tables in Volume II provide detailed information at the system and treatment facility levels. The tables provide a sense of the diverse nature of the industry by highlighting differences by system size, ownership, and water source. The tables in Volume II also show a 95-percent confidence interval for most estimates; these intervals often are relatively large, which also reflects the diverse nature of the systems.

Profile of CWSs

The 49,133 CWSs in the 50 states and the District of Columbia supply water to 280 million persons. They are publicly owned systems, privately owned systems, and systems that provide water only as an ancillary function of their principal business. Most systems rely primarily on ground water sources. The great majority of systems also serve 3,300 or fewer persons, but most people get their water from large, publicly owned systems that rely primarily on surface water.

Community Water Systems	
By Ownership	
Public	24,847
Ancillary	9,554
Private	14,733
By Water Source	
100% Ground	34,570
Other Ground	1,527
100% Surface	3,237
Other Surface	1,129
100% Purchased	7,823
Other Purchased	848
By System Size	
<501	26,642
501-3,300	13,421
3,301-10,000	4,564
10,001-100,000	3,928
>100,000	578

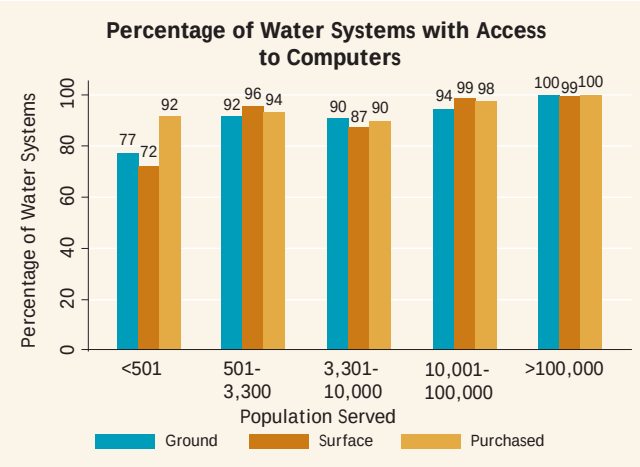
3. New Topics and Trends

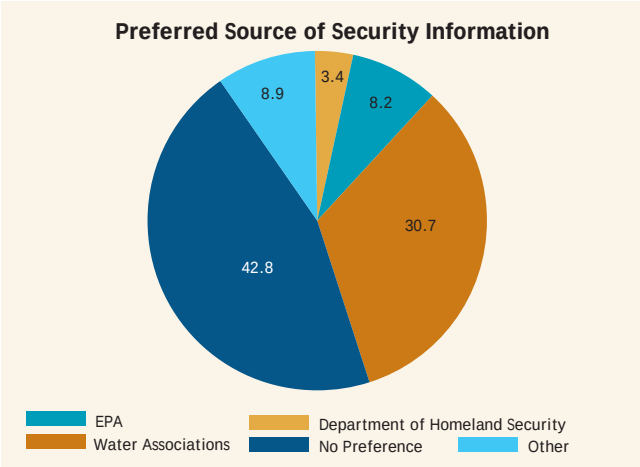
Topics New to the Survey

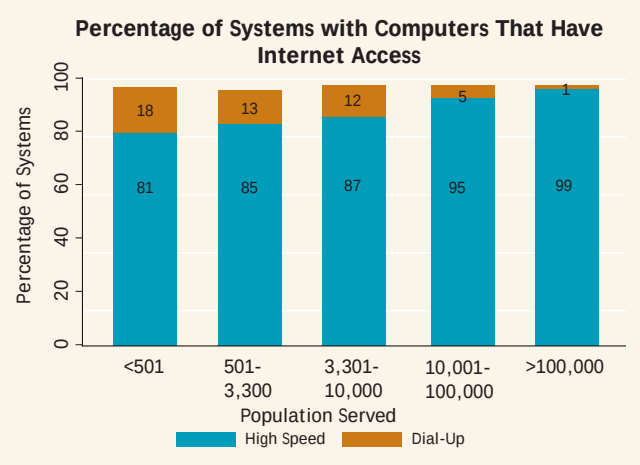
Several new categories of questions were added to the CWS Survey this year in an effort to address the changing analytical requirements of new rules and revisions to existing rules. The sections below provide an overview and some interpretations of the results from those categories.

Technology

Computers have become a pervasive and vital piece of water system technology throughout the nation. The vast majority of systems have access to computers for sending and receiving information. There is a slight upward trend as the size of water system increases, but no less than 70 percent of systems in each size category presented here have access to computers. (There are differences within the smaller size categories. Less than 50 percent of surface water systems serving 100 or fewer persons have access to a computer, compared to more than 85 percent of surface water systems serving 101 to 500 persons.) Of the systems that have computers, almost all have either dial-up or high-speed Internet access. The percentage of systems that have high-speed modems trends upwards with the size of the system. This trend may be due to the greater financial resources of larger systems and some economies of scale of high-speed access. And these high-speed technologies may not be available in rural areas. (Additional details are provided in Table 6 of Volume II.)







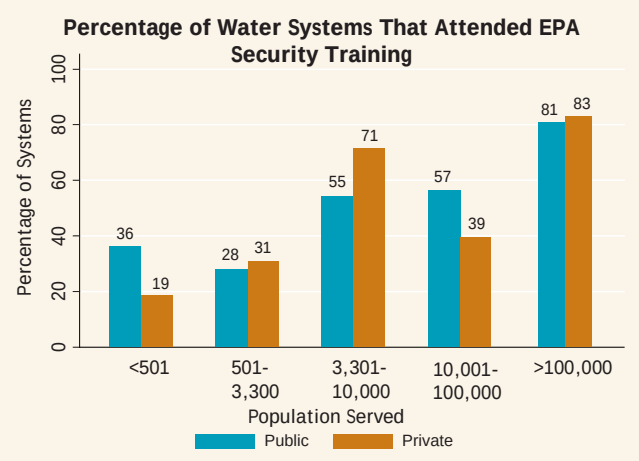
A well behind a secure fence at a water system.

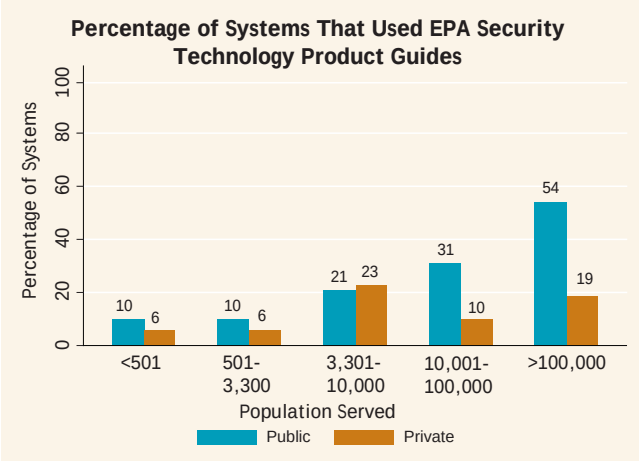
Security

Water systems have several possible sources of security information. The pie chart below shows where systems prefer to obtain security information or products. More than 40 percent of water systems did not have a preferred source of information, and over 30 percent preferred to rely on water associations.

While few systems cited EPA as their preferred source, many attended EPA security training or use EPA security guides. The bar graph below shows the percentage of systems that have attended any EPA-sponsored water security training. This percentage tends to grow with the size of the system. The percentage of systems using EPA's Web-based security technology product guides is also substantial, but far lower than the percentage that attended the training. Again, there is an upward trend with system size.

There are many barriers that may prevent water systems from enhancing security at their facilities. Systems must balance funds and other resources based on their priorities, and those priorities are affected by other system needs as well as the interests of stakeholders. The table below shows the percentage of systems that selected each of the listed categories as one of their greatest barriers to enhancing security. (Each respondent was asked to choose two.) There are a couple of notable trends in this table: first, as system size increases the lack of interest at the system, public, or rate board level also increases. Conversely, a small percentage of large systems reported a lack of funding as one of their largest barriers to security, while smaller systems reported funding as a major barrier. Many smaller systems may not have the funding necessary to make security improvements. The categories "competing priorities" and "lack of funding" are often

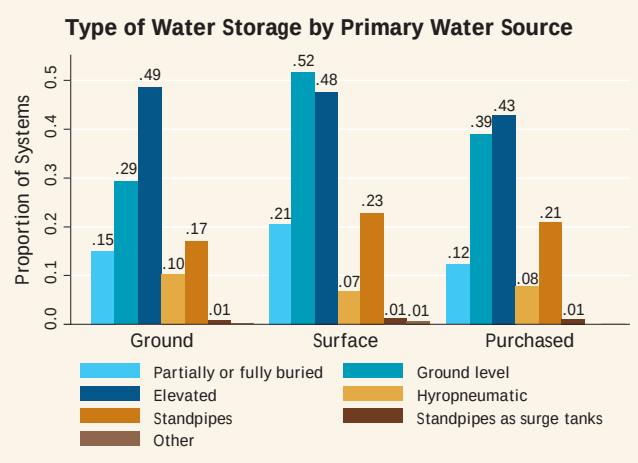




Systems Reporting the Following Barriers to Enhancing Security

Barriers to Enhancing Security	Population Served				
	<501	501-3,300	3,301-10,000	10,001-100,000	>100,000
Lack of interest at the system, public, or rate board level	33.3%	44.7%	54.5%	58.4%	67.8%
Competing priorities (regulatory compliance, aging infrastructure, etc.)	51.2%	67.4%	62.6%	61.0%	53.4%
Lack of funding	35.5%	29.5%	13.5%	12.1%	8.3%
Lack of knowledge/guidance/ training material	18.8%	16.4%	21.6%	10.0%	5.1%
Other	36.3%	27.0%	26.5%	35.6%	37.9%

linked, since budget constraints may force systems to choose among competing priorities. Sixty-nine percent of systems reported either competing priorities or the lack of funding as one of their greatest barriers. Many systems reported "other" barriers. In most cases, these systems reported that they do not face a security threat or that their existing security is adequate. Other issues raised include inadequate staffing, lack of reliable equipment, and coordination with other departments and jurisdictions. (Additional details are provided in Tables 54 and 55 of Volume II.)

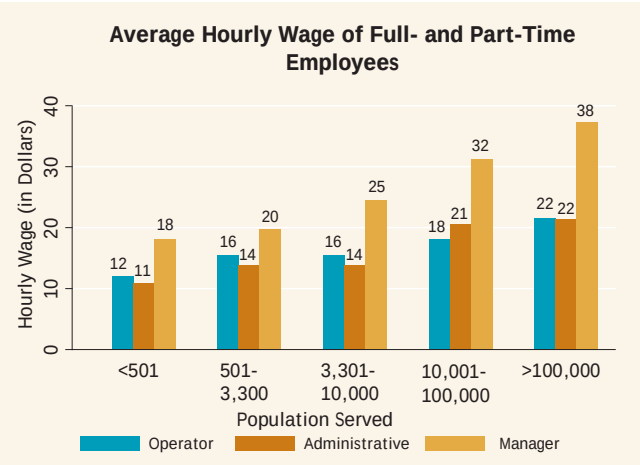


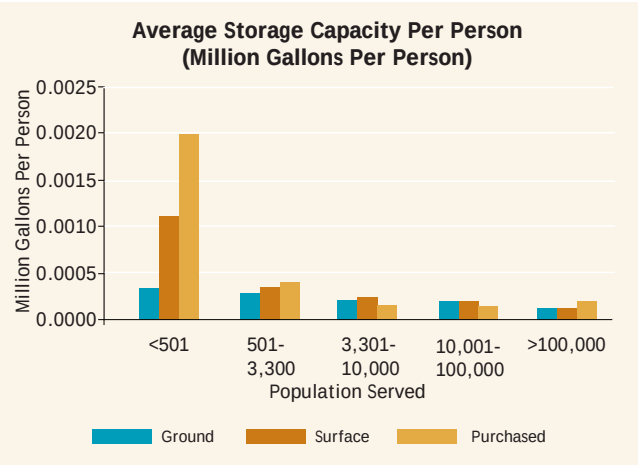
Labor

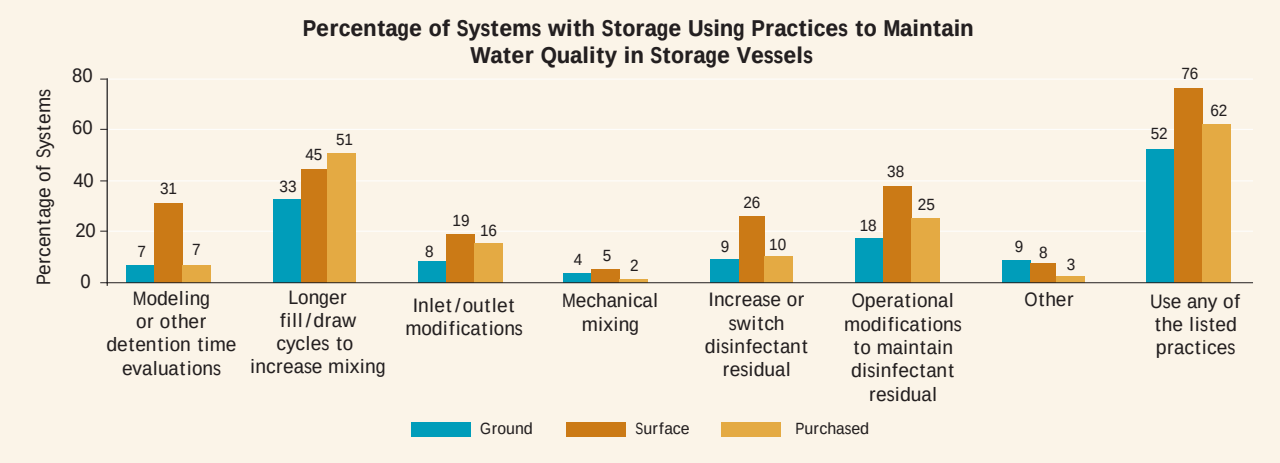
The graph below summarizes average hourly salaries and wages by system size. The average includes both full- and part-time employees. (The average number of hours worked per employee per week for part-time employees was used to convert their hourly wages to full-time equivalents.) Contract employees are excluded because their hourly costs cannot be compared directly to employee wages. For example, contract costs may include overhead or other non-labor costs. The employees are categorized as operators, administrative staff members, and managers. (Distribution and treatment operators are combined into the same category because very little difference in hourly wages was found between the two.) The graph shows that hourly wages increase with the size of the water system, and that managers receive a higher wage than administrative employees or operators. Benefits were approximately 20 percent of wages. There is little difference among type of employee (operators, managers, administrative staff), but benefits as a percentage of wages do increase somewhat with the size of the system. (Additional details are provided in Tables 84 and 85 of Volume II.)

Storage

As described in Chapter 2, storage is an important part of a water system, improving water availability and benefiting many treatment schemes. (Storage here refers to finished water storage past the first residential customer.) The graph above shows the percentage of systems that use each type of finished water storage facility past the first residential customer. (Additional details are provided in Table 44 of Volume II.) Ground level and elevated storage facilities are used far more than any other storage types. In most cases, there are not substantial differences between ground, surface, and purchased water systems. (The questionnaire focused on finished water storage past the first customer





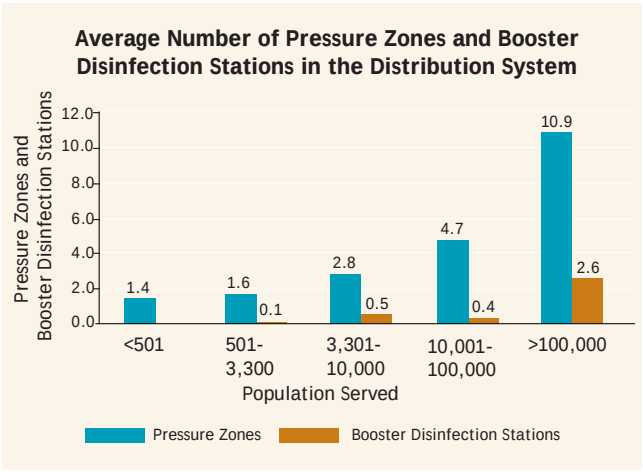


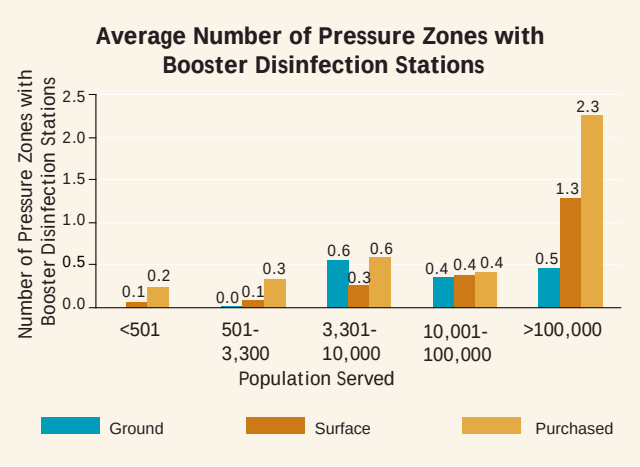
connection. There likely are differences between surface and ground water systems in the amount of raw water storage.) As would be expected, average storage capacity increases with water system size; however the graph below shows that the average capacity per person actually decreases with system size. (It is also true that storage needs increase with fire protection and pressure requirements, but these topics were not covered in the survey.)

Water systems must also maintain water quality in their storage vessels, and they use varied means to do so. The graph above shows the percentage of systems that use each of the listed practices. The last category shows the percentage of systems that use any of the listed practices. A far greater percentage of surface water systems use each of these practices except longer fill/draw cycles. That said, the average number of years between cleaning a storage vessel is 6.5 for all water systems, and it does not vary substantially by system type or size. (Additional details are provided in Table 46 of Volume II.)

Pressure Zones

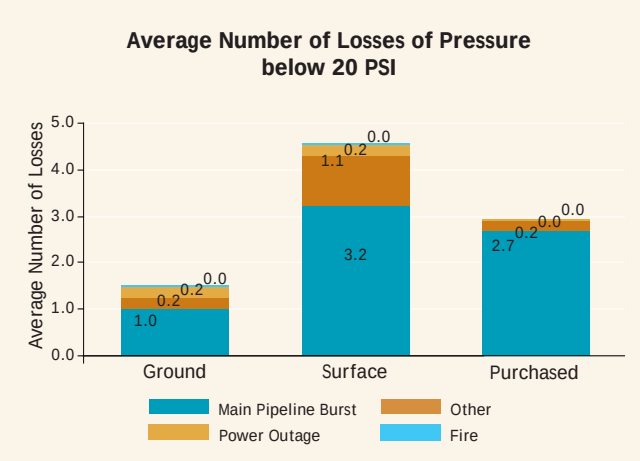
Water systems often boost finished water disinfection in their distribution systems (i.e., after the formal treatment process). These boosts occur at specific stations within pressure zones. As seen in the graph below, the average number of pressure zones and booster disinfection stations increases with system size, and there are far more pressure zones than booster stations. Given that the size of the distribution system increases with a system's service population, both trends are expected. The graph at the top of page 41 also shows that the number of pressure zones that have booster disinfection stations is higher for surface





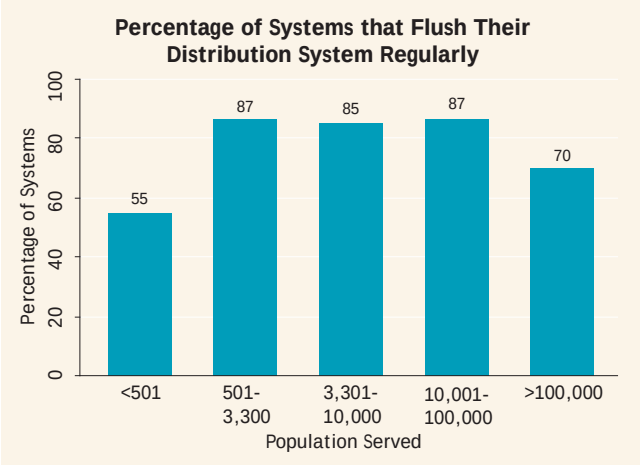
and purchased water systems than for ground water systems. This trend may be caused by several factors: 1) surface water treatment rules call for disinfection residual maintenance; 2) surface and purchased water systems are more likely to have problems with disinfectant byproducts, which can be controlled by booster disinfection; and 3) surface water systems tend to have greater disinfection demand. (Additional details are provided in Table 50 of Volume II.)

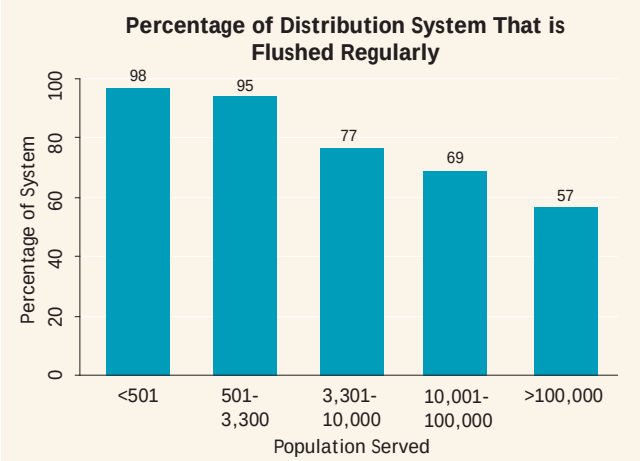
In some instances, there are pressure losses within these zones caused by fire, power outages, pipeline bursts, or other events. The average number of pressure losses below 20 psi per year for each of these situations is shown in the bar graph below. The vast majority of losses are caused by main pipeline bursts, with surface water systems experiencing far more losses than ground or purchased water systems. The causes of the differences in pressure losses between ground water, purchased water, and surface water systems are not clear. (Additional details are provided in Table 51 of Volume II.)



Flushing

Water systems flush their distribution system to clear out stagnant water, provide a measure of cleaning to the pipes, and maintain water quality. The percentage of systems that flush their distribution systems regularly grows as system size increases from small to medium, but then it falls for larger systems. This drop may be caused by the way systems interpreted the question about flushing. The question did not specify a minimum percentage that had to be flushed in order to respond "Yes" to this question; however, very large systems may be flushing such a small percentage of their distribution systems that the respondents did not count these activities. Some evidence for this





Average Annual Water Sales Revenue by Ownership			
Population Served	Publicly Owned Systems	Privately Owned Systems	All Systems
25-100	$26,962	$10,613	$14,254
101-500	$42,398	$31,743	$37,117
All systems, 25-500	$39,575	$22,385	$29,427
501-3,300	$233,998	$338,117	$257,359
3,301-10,000	$783,150	$1,020,381	$832,171
All systems, 25-10,000	$230,244	$136,609	$191,953

possibility is shown in the following graphs. Among systems that regularly flush their distribution systems, the percentage of the distribution system that is flushed declines steadily as system size increases. (Additional details are provided in Table 52 of Volume II.)

Small System Revenue

Small water systems face a number of challenges that can affect their capacity to comply with public health standards. The extent to which small systems can fund their operations through water rates and other charges will have a significant impact on their financial capacity. This section provides an overview of the major sources of funds available to small water systems, including revenue generated through rates and payments from the local government's general fund. Not every small system has access to each source of funds; therefore, only systems that have positive revenue from a source of funds are included in the estimated average revenue for that source. (Additional details are provided in Table 65 of Volume II.)

Small systems generate substantial revenue from the direct sale of water to customers. The table "Average Annual Water Sales Revenue by Ownership" summarizes water sales revenue for small systems that have this revenue source. Average revenue from water sales is higher for the smallest publicly owned systems than for the smallest privately owned systems. But privately owned systems serving 501–10,000 persons tend to have higher water sales than publicly owned systems of the same size.

Average Annual Water-related Revenue by Ownership			
Population Served	Publicly Owned Systems	Privately Owned Systems	All Systems
25-100	$15,964	$3,536	$7,245
101-500	$27,437	$4,366	$20,067
All systems, 25-500	$25,577	$3,958	$16,141
501-3,300	$50,779	$30,079	$46,745
3,301-10,000	$144,298	$80,602	$132,816
All systems, 25-10,000	$59,943	$21,023	$49,275

Systems rely on other charges that are related to water, but not tied directly to water sales. These charges include connection fees, penalties, and, in the case of publicly owned systems, transfers from the local government's general fund. The table "Annual Other Water-related Revenue by Ownership" summarizes these charges. Publicly owned systems rely more on water-related charges than do privately owned systems. Average revenue tends to increase with system size.

Small systems often have sources of revenue that are not at all related to water. Many small systems, such as mobile home parks, provide water as an ancillary component of their main business. The business's total

Average Annual Non-water Revenue by Ownership			
Population Served	Publicly Owned Systems	Privately Owned Systems	All Systems
25-100	$25,495	$211,715	$210,909
101-500	$44,046	$580,569	$536,067
All systems, 25-500	$43,249	$402,364	$385,638
501-3,300	$137,623	$3,685,785	$1,113,768
3,301-10,000	$64,975	$6,014,066	$1,986,360
All systems, 25-10,000	$96,268	$773,652	$639,251

Average Annual Municipal Non-water System Revenue (Net or Transfers to System) by Ownership			
Population Served	Publicly Owned Systems	Privately Owned Systems	All Systems
25-100	$385,927	N/A	$385,927
101-500	$213,651	N/A	$213,651
All systems, 25-500	$240,486	N/A	$240,486
501-3,300	$993,251	N/A	$993,251
3,301-10,000	$5,349,726	N/A	$5,349,726
All systems, 25-10,000	$1,571,303	N/A	$1,571,303

revenue will often exceed its water revenue. Non-water revenue is summarized in the table below.

Finally, many local governments operate water systems. The tax revenue of the locality may be used to fund water system operations or capital investments. The table above summarizes municipal revenue, net of water system revenue, and transfers to water systems.

The table below summarizes total resources available to small water systems. It includes water sales, water-related revenue, non-water system revenue, and, for publicly owned systems, non-water related municipal revenue. Total revenue is not derived from the simple addition of all the subcategories of revenue. Rather, it is the weighted average of the subcategories with the weights dependent on the likelihood that the average system will have access to that particular revenue category. The revenue of systems serving 3,301 to 10,000 is lower for publicly owned systems than it is for privately owned systems. Privately owned smaller systems tend to have higher revenue than smaller publicly owned systems.

Average Annual Total Water System Revenue by Ownership			
Population Served	Publicly Owned Systems	Privately Owned Systems	All Systems
25-100	$186,474	$116,343	$126,840
101-500	$164,078	$292,685	$242,323
All systems, 25-500	$168,291	$211,801	$198,735
501-3,300	$908,211	$791,382	$880,052
3,301-10,000	$3,914,971	$4,577,333	$4,010,351
All systems, 25-10,000	$1,171,867	$431,109	$804,636

Trends

Trends in Industry Structure and Operating Characteristics

The fundamental characteristics of the water industry have not changed since the 2000 CWS Survey. As described in Chapter 2, most systems are small, privately owned, and rely on ground water sources. Most people, however, receive their water from large, publicly owned systems that rely primarily on surface water sources. The portion of systems that relied primarily on ground water remained virtually unchanged at 73.5 percent in 2006, compared to 73.9 percent in 2000.

Within this basic structure, however, there have been noticeable changes in the numbers of systems, their ownership, and water sources. The total number of systems decreased 6 percent between the 2000 and 2006 surveys, from 52,186 to 49,133, as shown in the table on the next page. The number of systems serving up to 10,000 persons fell more than 7 percent, while systems serving more than 10,000 persons grew by nearly 13 percent. Among all size categories, the percentage of systems that are publicly owned increased from 49 percent in 2000 to 51 percent in 2006.

These trends are particularly evident in the smaller size categories of systems, as shown in the first table on the next page. Since the previous survey, the number of privately owned systems serving 500 or fewer persons declined by almost 15 percent. The decline is even more pronounced for systems serving 100 or fewer persons, as can be seen in Table 1 of Volume II. This change follows a trend first noted in the 2000 Survey in which the number of systems in

Number of CWSs in 2000 and 2006, by System Ownership and Population Served			
Population Served	Systems in 2000	Systems in 2006	Percentage Change
Publicly Owned Systems			
<501	6,487	7,353	13.3%
501-3,300	11,282	9,775	-13.4%
3,301-10,000	4,315	3,617	-16.2%
>10,000	3,426	4,103	19.8%
All sizes	25,510	24,847	-2.6%
Privately Owned Systems			
<501	22,632	19,289	-14.8%
501-3,300	2,734	3,647	33.4%
3,301-10,000	738	948	28.5%
>10,000	571	403	-29.4%
All sizes	26,675	24,287	-9.0%
All Systems	52,185	49,133	-5.8%

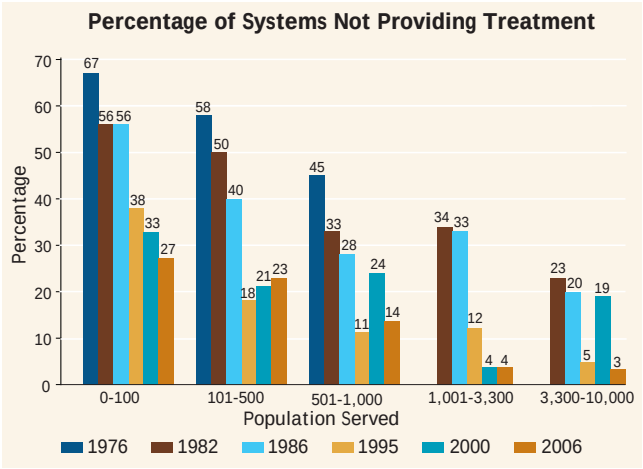
the smallest size categories—those serving up to 500 persons—declined by more than 8 percent. However the decline in the number of small privately owned systems has been accompanied by a significant increase in the number of publicly owned systems serving the same size categories. (See Table 1 in Volume II for further detail on the changes in the types and numbers of systems since the 2000 Survey.)

The table on the right compares the number of systems in the 2000 and 2006 surveys by water source and size of the population served. The number of systems that rely primarily on purchased water increased from 7,979 in 2000 to 8,670 in 2006, an increase of 8.7 percent. This category of systems has grown from 15 percent to 18 percent of total systems. This change also marks an increase from 1995, when only 10.6 percent of systems relied primarily on purchased water. The increase is particularly noticeable in systems serving 500 persons or fewer. Their numbers grew from 2,248 to 3,021, or from 7.7 percent of systems in this size category to 11.3 percent. As shown in Table 1 of Volume II, the increase is largest in systems serving 100 or fewer persons; their numbers grew from 69 systems to 764.

One of the metrics EPA has followed over the

Number of CWSs in 2000 and 2006, by Water Source and Population Served			
Population Served	Systems in 2000	Systems in 2006	Percentage Change
Primarily Ground Water			
<501	24,902	22,673	-9.0%
501-3,300	8,970	8,719	-2.8%
3,301-10,000	3,071	2,629	-14.4%
>10,000	1,645	2,076	26.2%
All Sizes	38,588	36,097	-6.5%
Primarily Surface Water			
<501	1,969	949	-51.8%
501-3,300	1,212	1,068	-11.9%
3,301-10,000	1,008	864	-14.3%
>10,000	1,430	1,485	3.8%
All sizes	5,619	4,366	-22.3%
Primarily Purchased Water			
<501	2,248	3,021	34.4%
501-3,300	3,835	3,634	-5.2%
3,301-10,000	973	1,071	10.1%
>10,000	923	945	2.4%
All Sizes	7,979	8,670	8.7%

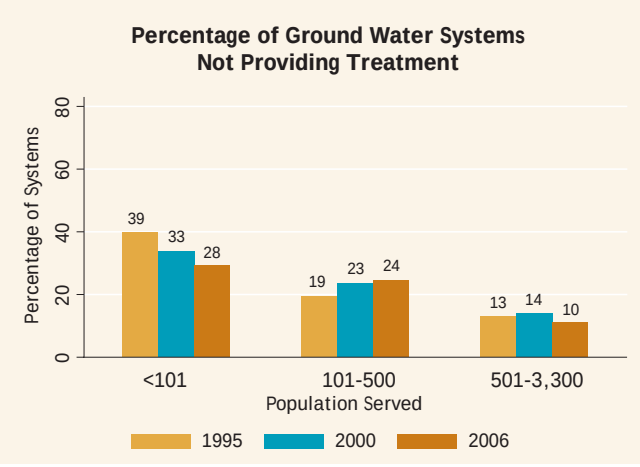
previous CWS Surveys is the percentage of systems that provide no treatment. Since the first survey, this number has generally declined, as seen in the graph below. (Since most large systems provide treatment, the graph focuses on smaller systems.) While the share of systems that do not treat was somewhat higher in 2000 and 2006 than it was in 1995, the general trend remains downward. While the percentage of systems not treating



continued to decline or remained the same between 1995 and 2006 in three of the five size categories, it increased slightly in the two other categories. This increase may indicate that the downward trend is leveling off. The percentage of the population that consumes water from CWSs with untreated sources is very small because the vast majority of systems that do not treat their water are small ground water systems which serve less than 2 percent of the total population. (Table 15 in Volume II provides further detail on systems not providing treatment in 2006.)

The graph below shows that the percentage of ground water systems not providing treatment has declined slightly in two of the three size categories and increased slightly in the other. It combines the 501–1,000 and 1,001–3,300 size categories to increase the precision of the estimate. The graph focuses on smaller ground water systems, because most large systems provide treatment. The differences are not statistically significant.[7]

Some significant changes in the structure and refurbishment of distribution systems occurred between 2000 and 2006. (See Table 48 and Table 36, Volume II of 2000 CWS Survey.) The table "Miles of Pipe Replaced During Previous 5 Years as a Percentage of Total Miles of Existing Pipe" shows that the average amount of pipe replaced over the past 5 years as a percentage of total existing pipe has increased slightly.



The slight decrease in the number of entry points into the distribution system in almost every size category is also worth noting. The table "Average Number of Entry Points per System by Primary Water Source" shows the change from 2000 to 2006. (Additional details are provided in Table 13 of Volume II of this survey and Table 7 of the 2000 CWS Survey.)

Trends in Financial Characteristics

Average water sales and water-related revenue increased between 2000 and 2006, and the growth in revenue appears to have been relatively strong. Some of the reported increase in water system revenue, however, may have been due to non-response issues in the survey—especially regarding water-related revenue. The table on the next page compares water system revenue for systems that reported positive revenue. (In other words, systems that reported no revenue or did not respond are excluded.) Data from 2000 were converted to 2006 dollars using the Consumer Price Index; non-water related revenue was excluded. From the 2000 to the 2006 Surveys, water

Miles of Pipe Replaced During Previous 5 Years as a Percentage of Total Miles of Existing Pipe

System Ownership	2000 Survey	2006 Survey
Public	2.1%	3.2%
Private	3.0%	1.4%
All	2.3%	2.7%

Average Number of Entry Points per System by Primary Water Source

	Ground Water Systems		Surface Water Systems	
Population Served	2000 Survey	2006 Survey	2000 Survey	2006 Survey
<501	1.4	1.2	1.4	1.1
501-3,300	1.8	1.7	1.3	1.2
3,301-10,000	2.9	2.2	1.6	1.2
10,001-100,000	4.6	4.2	2.2	1.5
>100,000	7.6	14.7	3.3	2.6

7 Note that the percentage of systems not treating water in 1995 is slightly different than previously reported. The 1995 data include systems that did not respond fully to the treatment questions. Previously, it was assumed that these systems in fact provided treatment. This assumption likely understated the percentage of systems not providing treatment in 1995. These systems were dropped from the current analysis.

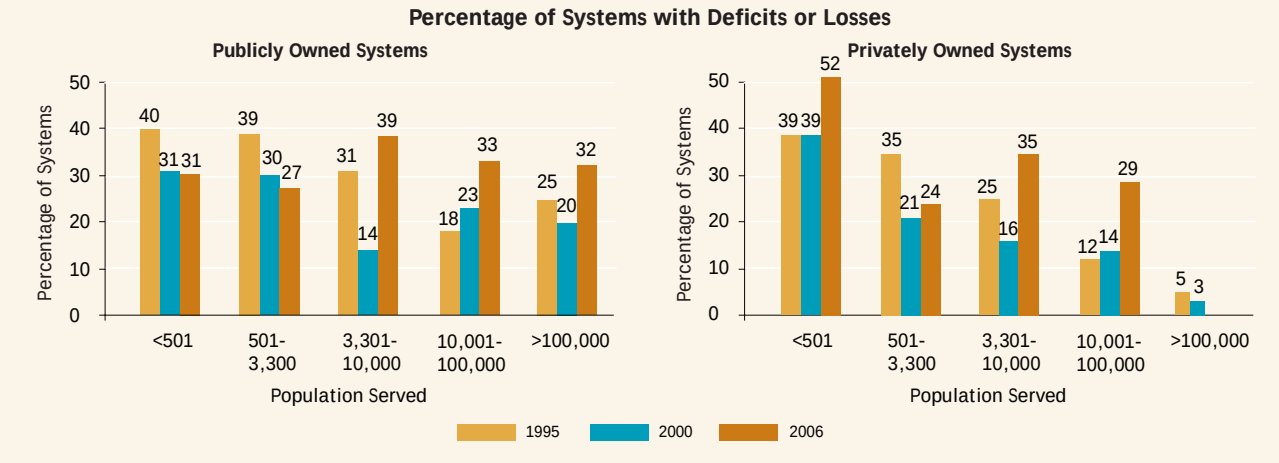
Trends in Water System Revenue Average Water System Revenue (in 2006 Dollars)						
Population Served	Publicly Owned Systems			Privately Owned Systems		
	2000 Survey	2006 Survey	Percent Change	2000 Survey	2006 Survey	Percent Change
Water Sales						
<501	35,443	39,575	12%	22,826	22,385	-2%
501-3,300	196,265	233,998	19%	208,986	338,117	62%
3,301-10,000	800,562	783,150	-2%	880,363	1,020,381	16%
10,001-100,000	3,648,251	3,623,261	-1%	4,514,351	3,621,358	-20%
>100,000	39,996,583	41,307,641	3%	52,372,644	74,689,545	43%
All Sizes	1,407,043	1,502,107	7%	316,651	523,928	65%
Water-related Revenue						
<501	7,630	25,577	235%	5,576	3,958	-29%
501-3,300	33,030	50,779	54%	21,718	30,079	38%
3,301-10,000	122,970	144,298	17%	94,065	80,602	-14%
10,001-100,000	681,518	942,165	38%	341,425	607,979	78%
>100,000	9,344,574	10,622,558	14%	1,711,026	740,608	-57%
All Sizes	318,055	474,898	49%	37,006	45,839	24%
Water Sales Plus Water-related Revenue						
<501	25,024	34,764	39%	18,439	18,309	-1%
501-3,300	123,786	154,912	25%	135,849	218,413	61%
3,301-10,000	470,058	489,450	4%	549,801	588,277	7%
10,001-100,000	2,228,942	2,354,284	6%	2,744,080	2,137,384	-22%
>100,000	26,086,836	26,378,432	1%	30,408,636	49,543,009	63%
All Sizes	926,395	1,067,394	15%	235,241	386,217	64%

sales revenue of publicly owned systems increased by 7 percent and sales by privately owned systems increased 65 percent. Water-related revenue from fees and other charges increased by 49 percent for publicly owned systems and 24 percent for privately owned systems. (Tables 59, 61, and 65 of Volume II provide additional information on system revenue.)

Systems' annual expenses also grew in real terms (i.e., faster than the rate of inflation) between the two surveys. Total expenses included routine operating expenses (employee and other operations and maintenance costs), debt service, payments to reserve funds, and other expenses. While expenses of publicly owned systems increased by 57 percent between 2000 and 2006, revenue increased by only 15 percent. Increases of 64 percent in the revenue of privately owned systems, however, easily outstripped increases in expenses of 29 percent during this period. Unlike the expenses of publicly owned systems, the expenses of large privately owned systems largely kept pace with inflation. (Tables 77 and 79 in Volume II provide additional information on total expenses.)

A substantial portion of systems continued to have annual operating costs that exceeded revenue. To compare operating expenses and revenue, we included employee and other operating expenses and interest payments. We excluded depreciation, a non-cash expense, as well as principal payments, other capital purchases, and other expenses not related to system operations. Revenue includes water sales and water-related revenue and excludes non-water-related revenue.

Trends in Water System Expenses Annual Expenses (in 2006 Dollars)						
Population Served	Publicly Owned			Privately Owned		
	2000 Survey	2006 Survey	Percent Change	2000 Survey	2006 Survey	Percent Change
<501	45,612	79,285	74%	16,777	27,487	64%
501 - 3,300	190,309	286,417	51%	198,037	210,286	6%
3,301 - 10,000	841,370	1,068,841	27%	812,132	1,154,767	42%
10,001 - 100,000	3,912,316	4,906,701	25%	3,643,246	4,409,779	21%
>100,000	38,821,400	62,367,379	61%	33,310,122	35,594,711	7%
All Sizes	1,378,519	2,159,740	57%	146,470	189,477	29%



Except for publicly owned water systems in the two smallest size categories and privately owned systems in the largest category, the percentage of systems operating with a deficit or a loss increased between 2000 and 2006.[8] The percentage of publicly owned systems serving 500 or fewer persons that operated with a deficit declined from 32 percent to 31 percent between 2000 and 2006. The percentage of publicly owned systems serving 501 to 3,300 persons that operated with a deficit declined from 30 percent to 27 percent. While the percentage of small publicly owned systems that had an operating deficit decreased between the two surveys, the percentage of small privately owned systems operating at a loss increased. Privately owned systems serving populations of 500 or fewer persons that were operating at a loss increased from 39 percent to 52 percent. Privately owned systems serving populations of 501 to 3,300 that operated at a loss increased from 21 to 24 percent. None of the privately owned systems in the sample that serve more than 100,000 persons operated at a loss.

Some caveats are needed before drawing conclusions about the industry's financial well being:

- The survey's estimates of surpluses and deficits are based on a single year's financial data. As noted earlier, water systems often face temporary

8 Publicly and privately owned systems tend to use different terms when comparing revenue and expenses. When the expenses of public systems exceed their revenue, they operate with a **deficit**. If revenue exceeds expenses, public systems operate with a **surplus**. Private systems incur a **loss** if expenses exceed revenue. They earn a **profit** if revenue exceeds expenses.

deficits while waiting to implement higher rates. There also may be a strong cyclical component to system finances; the recent downturn in the economy may affect system finances, reversing some of the improvements shown in the graphs on the previous page (at least for systems with substantial nonresidential sales).

- Combined systems (e.g., water and sewer, water and power) often had difficulty disaggregating their operating expenses. Many combined utilities track sales revenue for each operation separately, but combine operating expenses. Systems (and site visitors to small systems) often used simple rules of thumb to approximate water related expenses, such as assuming expenses are proportional to revenue. In some cases, non-water-related expenses may remain in reported expenses, resulting in an overestimate of the percentage of systems that have operating losses or deficits.
- The relatively small percentage of large, privately owned systems that have losses may reflect these systems' reliance on equity capital. Profits are needed to pay dividends to shareholders or to maintain share value. The small portion of large, privately owned systems with losses could also reflect rate regulation by public utilities commissions.
- Many systems operate with a negative cash flow. Although this situation may indicate the systems are in financial trouble, there may have good reasons for the negative cash flow. The system may be "paying it backward," or using revenue from next year to pay for this year's expenses. Rate lag causes some of this, as do dividend payments to investors.
- Expenses include some items that are important accounting expenses, but do not require cash outlays. Depreciation, for example, often is a large item, but requires no cash payments. A system, therefore, may be operating with a deficit but still have positive cash flow. (See Jordan, J.L., "Do You Use Your Depreciation Funds Wisely," Opflow, Vol. 21, No. 12, December 1995, p.1.)
- The way systems account for depreciation over time has changed. Large privately owned systems have consistently reported depreciation as an annual expense. Publicly owned systems—especially those run as public enterprise funds—now tend to do so as well. Depreciation was not always reported consistently in previous surveys. In the 2000 Survey, depreciation was reported as an "other" expense (distinct from labor and routine operating expenses). Some systems may not have reported it at all, while others may have lumped it in with other routine operating expenses. Whether—and how—systems report depreciation can affect the reported results.

Comparison of Residential Rate Designs, 1995 and 2006

	1995	2006
Uniform rate	35%	36%
Declining block rate	11%	10%
Increasing block rate	8%	13%
Peak period or seasonal rate	1%	0%
Separate flat fee	11%	17%
Combined flat fee	7%	16%
Other	6%	7%

The way systems charge residential customers for water has changed over time. As the table to the left shows, the percentage of systems that use increasing block rates increased from 8 percent in 1995 to 13 percent in 2006, while the use of uniform rates and declining block rates remained virtually unchanged. The use of fees also increased. The changes may reflect increased use of conservation rate designs and efforts to decouple rates from sales. The reasons for the changes cannot be determined from this survey. (Table 71 in Volume II provides additional detail.)

Trends in Capital Investment

When compared to the 5-year period prior to the 2000 CWS Survey, there was a decline in the number of systems making major capital investments in the 5 years preceding the 2006 survey. The 2000 CWS

Percentage of Systems Making Capital Investments in the Previous 5 Years		
	2000 Survey	2006 Survey
Publicly Owned Systems		
<101	65%	41%
101 - 500	59%	45%
501 - 3,300	52%	54%
3,301 - 10,000	69%	49%
10,001 - 50,000	84%	62%
50,001 - 100,000	85%	69%
100,001 - 500,000	84%	77%
>500,000	93%	87%
All Sizes	40%	52%
Privately Owned Systems		
<101	49%	32%
101 - 500	56%	29%
501 - 3,300	65%	54%
3,301 - 10,000	82%	39%
10,001 - 50,000	81%	51%
50,001 - 100,000	74%	42%
100,001 - 500,000	51%	52%
>500,000	42%	24%
All Sizes	53%	35%
All Systems		
<101	42%	33%
101 - 500	53%	35%
501 - 3,300	53%	54%
3,301 - 10,000	69%	47%
10,001 - 50,000	84%	61%
50,001 - 100,000	84%	66%
100,001 - 500,000	83%	74%
>500,000	89%	79%
All Sizes	54%	44%

Survey reported that almost 54 percent of all systems made capital investments. The current survey shows that fewer than 44 percent did so between 2001 and 2006. (See Table 70, Volume II of the 2000 CWS Survey and page 28 and Tables 86 and 87 of Volume II of this survey.)

While systems continue to make substantial capital investments to fund water quality improvements, totaling nearly $66 billion over the past 5 years,

Average Distribution of Capital Investment in the 2000 and 2006 Surveys		
Type of Investment	2000 Survey	2006 Survey
Land	10.2%	1.0%
Water Source	9.8%	25.3%
Transmission and Distribution System	27.1%	40.8%
Treatment	25.0%	13.5%
Storage	12.4%	13.3%
Other	15.5%	6.1%

Distribution of Capital Investment in the 2000 and 2006 Surveys for the Nation		
Type of Investment	2000 Survey	2006 Survey
Publicly Owned Systems		
Land	2.3%	1.3%
Water source	8.4%	8.6%
Transmission and distribution	46.7%	44.9%
Treatment	22.8%	25.0%
Storage	12.5%	8.8%
Other	7.4%	11.4%
Privately Owned Systems		
Land	1.5%	0.5%
Water source	8.8%	9.3%
Transmission and distribution	53.3%	56.8%
Treatment	16.3%	18.3%
Storage	8.5%	7.8%
Other	11.6%	7.4%
All Systems		
Land	2.2%	1.3%
Water source	8.4%	8.7%
Transmission and distribution	47.3%	45.9%
Treatment	22.2%	24.4%
Storage	12.1%	8.8%
Other	7.8%	11.0%

investment in treatment accounts for an average of only 14 percent of systems' total capital investments. (See Volume II, Table 95 for further detail.) In 2000, systems reported spending $53 billion on capital investment over the previous 5 years. On average, 25 percent of total capital investment in 2000 was spent

on treatment. (See Table 74, Volume II, 2000 CWS Survey.)

The largest share of water system investments nationwide continue to be made in distribution mains and transmission lines, accounting for 44.9 percent of all capital expenses for publicly owned systems and over 56.8 percent of such expenses for privately owned systems. (See page 31.) This proportion is similar to that reported in the 2000 CWS Survey when 46.7 percent and 53.3 percent of all capital expenditures, for publicly and privately owned systems respectively, went to distribution and transmission lines. (See Table 95 of Volume II. The "Other" category in the previous tables includes security, which is shown as a separate category in Volume II Table 95.) How capital investments stacked up in 2000 and 2006 is shown in the next table. (See Table 96 of Volume II of this Survey and Table 75 of the 2000 CWS Survey.)

Trends in Sources of Funds for Capital Investment for Publicly Owned Systems: The Growth of the DWSRF

Chapter 2 presented data on the sources of funds for capital investment over the past 5 years. Since the 2000 survey, the DWSRF has grown in importance as a source of funds for capital investment, especially for publicly owned systems. Approximately 19 percent of publicly owned systems relied on DWSRF loans to finance at least a portion of their capital improvements, which is up from 10 percent in the 2000 Survey. The percentage of publicly owned systems whose DWSRF principle repayments were forgiven was 1.6 percent, down from 7 percent in 2000. Associated with this change is a shift away from current revenue and borrowing from other private and public sources. (See Volume II, Table 102 and Table 79, Volume II of the 2000 CWS Survey.)

The increase in the share of systems relying on the DWSRF also was accompanied by an increase in the percentage of capital investment funded by the DWSRF for the average system. Publicly owned

Percentage of Public Systems Acquiring Capital Funds from Each Source

Source of Funds	2000 Survey	2006 Survey
Current revenues	69.5%	61.1%
Borrowing from private sector sources	19.5%	16.5%
Other government grants	21.8%	29.4%
DWSRF principal repayment forgiveness	7.1%	1.6%
DWSRF loans	9.8%	19.0%
Other borrowing from public sector sources	12.9%	8.9%
Equity or other funds	3.6%	8.8%

Each Public System's Distribution of Total Funds for Capital Investment by Each Source of Funds

Source of Funds	2000 Survey	2006 Survey
Current revenues	51.1%	47.4%
Borrowing from private sector sources	14.3%	12.4%
Other government grants	12.9%	17.6%
DWSRF principal repayment forgiveness	4.3%	0.3%
DWSRF loans	7.0%	13.0%
Other borrowing from public sector sources	7.8%	5.5%
Equity or other funds	2.9%	3.8%

Distribution of Total Funds for Capital Investments of Public Systems Nationally by Each Source of Funds

Source of Funds	2000 Survey	2006 Survey
Current revenues	38.8	34.0%
Borrowing from private sector sources	42.0	33.6%
Other government grants	4.8	7.5%
DWSRF principal repayment forgiveness	1.2	0.2%
DWSRF loans	4.1	10.5%
Other borrowing from public sector sources	7.9	9.5%
Equity or other funds	1.2	4.6%

systems used DWSRF loans to fund approximately 13 percent of their investment, on average. This is up from approximately 7 percent in the 2000 Survey. (See Table 104 in Volume II and Table 80 of Volume II of the 2000 CWS Survey.)

The share of publicly owned systems using the DWSRF has grown since 2000, as has the average proportion of funds coming from the DWSRF. This translates into an increase in the total share of investment of publicly owned systems nationally that is funded by the DWSRF. Nationally, DWSRF loans account for 11 percent of funds for all publicly owned systems, up from 4 percent in 2000.

Reliance on current revenue and borrowing from public sources is down. Other public sources of funds—including grants and loans—account for a larger share of total funding in 2006 than in 2000. The share paid for out of current revenue and borrowing from private sources declined. (See Table 105 in Volume II. Also see Table 81 in Volume II of the 2000 report.)

Glossary

Ancillary System: A water system that is privately owned and operated as a necessary part of another business (e.g., a mobile home park).

Average Daily Production: The average amount of finished water produced daily by all of a system's treatment plants.

Capital Expenses: Spending on any capital project that is not part of routine maintenance.

Compliance Analyses: EPA may use the survey data to develop profiles of operational and financial characteristics for different types of water systems, which can be compared to the Agency's database of compliance records in the Safe Drinking Water Information System (SDWIS).

Community Water System (CWS): Defined by the U.S. Environmental Protection Agency as a public water system that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

Connection Fees: A one-time charge that water systems impose on new customers to connect to the distribution system. Connection fees are used by some water systems to fund capital projects, while others use these fees to fund general operations.

Debt Service: The payment of interest and principal on past borrowing.

Deficit: The difference between expenses and revenue in a year, if expenses exceed revenue. The term is used for publicly owned systems. Privately owned systems generally use the term "loss."

Deliveries: Water that is sold and delivered to customers. For this report, deliveries include unaccounted for water.

Depreciation: The cost of wear and tear on a system's equipment and plant.

Distribution Network: The network of pipes that distributes finished or potable water to consumers.

Drinking Water State Revolving Fund (DWSRF): Established by the Safe Drinking Water Act, as amended in 1996, to make funds available to drinking water systems to finance infrastructure improvements. The program also emphasizes providing funds to small and disadvantaged communities and to programs that encourage pollution prevention as a tool for ensuring safe drinking water.

Entry Points: Points at which water enters a water system's distribution network.

Excess Capacity: Production capacity beyond that required to meet peak flows.

Finished Water: Potable water that is ready for delivery. If treatment is required, finished water has been filtered, disinfected, or otherwise treated.

General Operational Expenses: Expenses for purchased water, security, energy, chemicals, materials, laboratory costs, and other supplies. It equals operating expenses minus depreciation, income taxes, and payments in lieu of taxes.

Government Transfers: Transfers from a municipal general fund to a publicly owned water system for operations and, in some cases, other expenses.

Ground Water: Water that originates in underground streams and aquifers beneath the earth's surface.

Loss: The difference between expenses and revenue in a year, if expenses exceed revenue. The term is generally used by privately owned systems. Publicly owned systems generally use the term "deficit."

Net Income: Revenue from sales minus general operational expenses, depreciation, interest, and income taxes or payments in lieu of taxes.

Non-Community Water System (NCWS): A water system that provides water in a place where people do not remain for long periods of time (transient NCWS) or that supplies water at least six months per year, but not year-round (non-transient NCWS). Examples of transient NCWSs are gas stations or campgrounds. Examples of non-transient NCWSs are schools, factories, office buildings and hospitals that have their own water systems.

Operating Expenses: Expenses for purchased water, security, energy, chemicals, materials, laboratory costs, and other supplies. It includes the cost of depreciation. It also includes income taxes paid by privately owned systems and payments in lieu of taxes by publicly owned systems.

Other Expenses: Capital improvements and payments to the reserve fund.

Peak Daily Flow: The maximum amount of finished water produced by a system's treatment plants on a single day over a 12-month reporting period.

Policy Development Analyses: The survey is designed to collect financial and operational data on the full range of water systems to support a variety of policy and guidance initiatives. EPA also uses the data to respond to periodic requests from Congress, federal agencies, and the public for information on the water supply industry.

Primary Water Source: The primary water source of a system (i.e., ground, surface, or purchased) is defined as the source from which the system receives the largest percentage of its water. For example, a system is classified as a ground water system if it receives more of its water from ground water sources than from surface or purchased sources. Because systems can have three sources of water, some may receive less than half their water from their primary source.

Private Not-for-Profit System: A system that is owned privately and not operated for profit (e.g., a system operated by a homeowners association or a non-profit cooperative).

Privately Owned System: A system that is owned privately and operated for profit primarily as a water business (e.g., American Water Company).

Production: Treatment of water at a system's treatment facilities or plants.

Profit: The difference between revenue and expenses if revenue is greater than expenses. The term is used by privately owned systems. Publicly owned systems generally use the term "surplus."

Publicly Owned System: A system that is owned and operated by a government or public agency.

Raw Water: Water that has not been filtered, disinfected, or otherwise treated.

Regulatory Development Analyses: EPA must satisfy the requirements of various statutes and regulations for analyses of proposed regulations under the Safe Drinking Water Act (SDWA). The survey provides data on water system operations and finances that are critical to the preparation of these analyses.

Regulatory Implementation Analyses: The survey data, along with data from the Drinking Water Infrastructure Needs Survey and Assessment, can be used to assess the financial capacity of water systems in general and of small systems in particular.

Retail Customers: Customers that water systems serve directly.

Small Water Systems: The definition of a small water system varies depending on the context, but the SDWA defines small systems as those serving 3,300 persons or fewer. This is the definition used throughout this document, except in specific instances where small systems are explicitly defined as serving 10,000 persons or fewer.

Storage: The capacity to store water in tanks or other vessels. For the purposes of this report, storage is limited to finished water and is located past the first residential customer.

Stratified Random Sample: To obtain a more representative sample of water systems, the population (number of community water systems in the nation) is first divided into strata according to population served and source of water. Then, a particular number of participants (determined by percentages in the actual population) are randomly selected from each stratum.

Surface Water: Water that originates from surface sources such as lakes, streams, and reservoirs. Surface water also includes ground water that is under the direct influence of surface water (GWUDI).

Surplus: The difference between revenue and expenses if revenue is greater than expenses. The term is used by publicly owned systems. Privately owned systems generally use the term "profit."

System Design Capacity: The maximum amount of finished water that a system's treatment plants are designed to produce daily in the aggregate when operating at capacity.

Transmission Network: The network of pipelines that transport raw or partially treated water to a water treatment plant or that transport finished water to distribution mains.

Treatment Plant: Any facility where water is filtered, disinfected, or otherwise treated prior to its transmission to the distribution system (or its conveyance to another purchasing water system). For this report, simple disinfection only or pH adjustment prior to entry into the distribution system are considered to constitute a water treatment plant. Other examples include large-scale filtration plants and chemical feeds on wells to provide disinfection. For this report, treatment plants do not include facilities within the distribution system that boost disinfection.

Unaccounted for Water: Water that is lost (e.g., leaks) or used for uncompensated uses (e.g., firefighting).

Water-Related Revenue: Payments for water services that are not tied directly to the delivery of water. They include development fees, connection fees, fines, and other miscellaneous payments. Some publicly owned systems also receive transfers from a municipal general fund. (On the other hand, some municipalities may transfer water system revenue to fund other activities.)

Water Sales Revenue: Payments received for the delivery of water to customers.

Wholesale Customers: Public water suppliers that purchase water from other public water suppliers.

Withdrawals: Water taken from ground water or surface water sources.

Acronyms

AwwaRF	American Water Works Association Research Foundation
BAT	Best Available Technology
CWS	Community Water System
DWSRF	Drinking Water State Revolving Fund
EA	Economic Analysis
EPA	U.S. Environmental Protection Agency
GWUDI	Ground Water Under the Direct Influence of Surface Water
ICR	Information Collection Request
MGD	Millions of Gallons per Day
NCWS	Non-Community Water System
PRA	Paperwork Reduction Act
PSI	Pound per Square Inch
RFA	Regulatory Flexibility Act
SBREFA	Small Business Regulatory Enforcement Fairness Act
SDWA	Safe Drinking Water Act
SDWIS	Safe Drinking Water Information System
TOC	Total Organic Carbon
UMRA	Unfunded Mandates Reform Act
VOC	Volatile Organic Compound