

# EXECUTIVE SUMMARY

---

---

*In 1999, the U.S. Environmental Protection Agency conducted the second survey of the nation's infrastructure needs. The survey covers the nation's approximately 55,000 community water systems and 21,400 not-for-profit noncommunity water systems. The total national need for drinking water investments is large—\$150.9 billion for the next 20 years. Of this total, \$102.5 billion is needed now to ensure the continued provision of safe drinking water. Large and medium-sized systems account for most of the total need, although small systems have the greatest needs on a per-household basis. American Indian and Alaska Native Village systems represent \$2.2 billion of the total national need. The results of this survey support the findings of the first survey, conducted in 1995, by documenting the continued need to install, upgrade, and replace the infrastructure on which the public relies for safe drinking water.*

---

**P**ublic water systems must invest in infrastructure improvements to ensure that they can continue to deliver safe drinking water to consumers. These improvements vary greatly in complexity and cost: from replacing a low-capacity well pump that will serve a small community to constructing a 500 million gallon-per-day water treatment plant that will serve a large metropolitan area.

Despite the importance of these projects for protecting public health, water systems often encounter difficulties in obtaining affordable financing for such improvements. Recognizing this problem, Congress established the Drinking Water State Revolving Fund (DWSRF) in the 1996 Safe Drinking Water Act (SDWA) Amendments. The DWSRF provides low-interest loans and other forms of assistance to public water systems so they can supply safe drinking water. Since 1997, Congress has appropriated \$3.6 billion to the DWSRF.

The Drinking Water Infrastructure Needs Survey is an important tool of the DWSRF program. The purpose of the survey is to estimate the documented 20-year capital investment needs of public water systems eligible to receive DWSRF funding—

community water systems and not-for-profit noncommunity water systems.<sup>1</sup> The survey includes infrastructure needs that are required to protect public health, such as projects to preserve the physical integrity of the water system, convey treated water to homes, or ensure continued compliance with specific SDWA regulations.

As required by the SDWA, EPA uses the results of the most recent survey to allocate DWSRF funds to the States. Each State develops a priority system for funding projects based on public health criteria specified in the SDWA. Annual appropriations to the DWSRF are allocated to each State based on its share of the total national need—with each State receiving a minimum allotment of 1 percent of available funds. In addition, EPA uses the survey as a tool for allocating the Tribal Set-Aside (up to 1.5 percent of the DWSRF annual appropriation) to American Indian and Alaska Native Village water systems.

Sections 1452(h) and 1452(i)(4) of the Safe Drinking Water Act direct the EPA to conduct the Drinking Water Infrastructure Needs Survey every four years. The results are used to allocate Drinking Water State Revolving Fund monies to the States and Tribes. The 1999 Needs Survey is due to Congress by February 6, 2001.

---

<sup>1</sup> Community water systems serve at least 25 people or 15 connections year-round. Noncommunity water systems serve at least 25 people for more than 60 days, but less than year-round.

## Total National Need

### Total Need by System Size and Type.

The survey found that the total infrastructure need nationwide is \$150.9 billion. This estimate represents the needs of the approximately 55,000 community and 21,400 not-for-profit noncommunity water systems that are eligible to receive DWSRF assistance. The total national need includes all eligible water systems. These systems are found in all 50 States, Puerto Rico, the Virgin Islands, the Pacific Islands, and the District of Columbia. American Indian and Alaska Native Village water systems also are included in the total need.

The survey includes only infrastructure needs that are required to protect the public health. It is important to emphasize, however, that most of the needs represent projects that systems would address as preemptive measures to ensure the continued provision of safe drinking water,

rather than as remedial actions to correct an existing violation of a drinking water standard. In addition, the majority of the total need derives from the inherent costs of being a water system which involves the nearly continual need to install, upgrade, and replace the basic infrastructure that is required to deliver safe drinking water to consumers.

As shown in Exhibit ES-1, the nation's 886 largest community water systems (each serving more than 50,000 people) account for the greatest share, 41 percent, of the total national need. Medium and small community water systems also have substantial needs of \$43.3 billion and \$31.2 billion, respectively. The Virgin Islands and the Pacific Island territories represent \$387.5 million of the total need. The survey estimates that not-for-profit noncommunity water systems have \$3.1 billion in needs. American Indian water systems need \$1.2 billion in infrastructure improvements, while Alaska Native Village systems require \$1.1 billion.<sup>2</sup>

**Exhibit ES-1: Total 20-Year Need  
(in billions of January 1999 dollars)**

System Size and Type	Need
Large Community Water Systems (serving over 50,000 people)	\$61.8
Medium Community Water Systems (serving 3,301 to 50,000 people)	\$43.3
Small Community Water Systems (serving 3,300 and fewer people)	\$31.2
Not-for-Profit Noncommunity Water Systems	\$3.1
American Indian and Alaska Native Village Water Systems	\$2.2
<b>Subtotal National Need</b>	<b>\$141.6</b>
Costs Associated with Proposed and Recently Promulgated Regulations (Taken From EPA Economic Analyses)	\$9.3
<b>Total National Need</b>	<b>\$150.9</b>

### Total Need by Current and

**Future Needs.** About 68 percent of the total need, \$102.5 billion, is needed now to continue to protect the public health and maintain existing distribution and treatment systems. Appendix B-2 presents a further breakdown of the current need. Current needs are projects that a system would begin immediately.

In most cases a current need would involve installing, upgrading, or replacing infrastructure to enable a water system to continue to deliver safe drinking water. A system with a current need, therefore, usually is not in violation of any health-based drinking water

<sup>2</sup>These estimates slightly exceed the total \$2.2 billion American Indian and Alaska Native Village system need due to rounding.

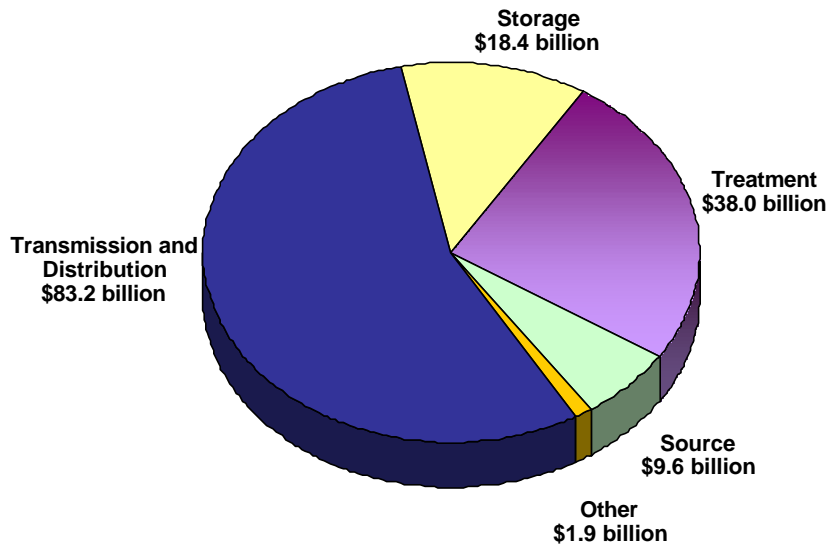
standard. For example, a surface water treatment plant may currently produce safe drinking water, but the plant's filters may require replacement due to their age and declining effectiveness, if the plant is to continue to provide safe water.

Future needs are projects that water systems expect to address in the next 20 years as part of routine rehabilitation of infrastructure or due to predictable events such as reaching the end of a facility's service-life. Approximately 32 percent of the total need, \$48.4 billion is reported as future needs.

**Total Need by Category.** Every project in the survey belongs to one of five categories of need: source, transmission and distribution, treatment, storage, and "other." Each category represents projects that are of critical importance to providing safe drinking water. Exhibit ES-2 illustrates the total 20-year need by category.

- With \$83.2 billion needed over the next 20 years, transmission and distribution projects constitute the largest category of need. Although the treatment plant is usually the most visible component of a water system, most of a system's infrastructure is buried underground in the form of transmission and distribution mains. For this reason, the transmission and distribution category comprises the largest proportion of the total need. The transmission and distribution category includes the installation and rehabilitation of raw

**Exhibit ES-2: Total 20-Year Need by Category  
(in January 1999 dollars)**



Note: Numbers may not total due to rounding.



*A ruptured water main in New York City closed a section of a major thoroughfare and limited service to two hospitals. The majority of the nation's distribution lines were installed in the mid-1900s. Towns and cities are finding it increasingly necessary to replace old and deteriorated pipe.*

and finished water transmission pipes, distribution water mains, replacement of lead service lines, flushing hydrants, valves, and backflow prevention devices. Failure of transmission and distribution lines can interrupt the delivery of water. Broken transmission lines also can disrupt the treatment process, and leaking distribution mains can lead to a loss of pressure causing back-siphonage of contaminated water.

- Treatment projects represent the second largest category of need, \$38.0 billion over the next 20 years. This category consists of projects needed to reduce contaminants through, for example, filtration, chlorination, corrosion control, and aeration. More than half of the total treatment need, \$22.7 billion, is needed to address contaminants that pose acute health risks. The installation, upgrade, or rehabilitation of treatment infrastructure also

is required to remove contaminants that can cause chronic health effects or taste, odor, and other aesthetic problems.

- The total 20-year need for storage projects is \$18.4 billion. This category includes projects to construct new or rehabilitate existing finished water storage tanks. A water system with inadequate storage capacity cannot always provide water at pressures sufficient to prevent back-siphonage of microbial contaminants. In addition, constructing new tanks is necessary if the system cannot meet peak demands. Many projects in this category involve rehabilitating existing tanks to prevent structural failures that can cause microbiological contamination.
- The source category includes projects that are necessary to obtain safe supplies of surface or ground water. The infrastructure needs in this category include the installation and rehabilitation of drilled wells. The total 20-year need for source water projects is \$9.6 billion.
- Other needs account for an estimated \$1.9 billion. This category captures needs that cannot be assigned to one of the prior categories. Examples include emergency power generators, computer and automation equipment, and improvements for flood or earthquake protection.

Los Angeles Department of Water and Power and U.S. EPA



*Water systems require storage facilities to serve the public during periods of peak use, to supply water in the event of an emergency, and to prevent contamination by maintaining water pressure. Two 30 million gallon tanks under construction in Los Angeles, California, and a 100 gallon tank (insert) underscore the difference in scale between large and small systems.*

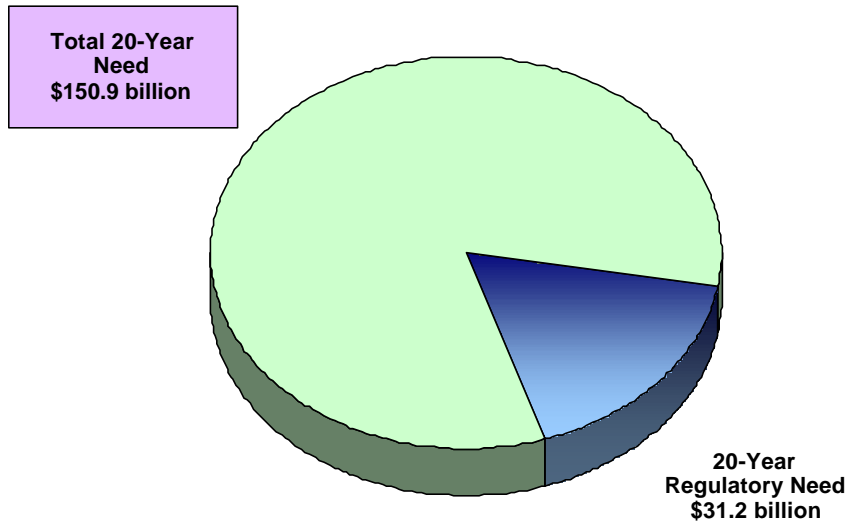
#### **Conservative Estimate of Need.**

Although the total estimate of need is large, it is important to emphasize that the methods used by the survey produce a conservative estimate of need. The second chapter, *Findings*, discusses this issue in greater detail.

**Exhibit ES-3: 20-Year Total Need and Regulatory Need  
(in January 1999 dollars)**

**The Regulatory Need**

The SDWA aims to ensure that public water systems meet national standards to protect consumers from the harmful effects of contaminated drinking water. Although all of the infrastructure projects included in the survey promote the SDWA’s public health objectives, some are directly attributable to SDWA regulations. This report refers to these needs collectively as the “regulatory need.” The total regulatory need is divided into two broad categories: existing SDWA regulations and recently promulgated and proposed regulations.



As shown in Exhibit ES-3, the total regulatory need accounts for 21 percent, or \$31.2 billion, of the total national need. This statistic reveals that most of the total need results from the costs of installing, upgrading, and replacing the basic infrastructure that is required to deliver drinking water to consumers—costs that are borne by water systems independent of the SDWA. For a need to be included in the survey, however, it must be required to protect public health. Therefore, if a system fails to address a need, then a health-based violation of a standard eventually may occur.

**Existing SDWA Regulations.** The estimated need directly associated with existing SDWA regulations is \$21.9 billion. Exhibit ES-4 displays the regulatory need by type of regulation and identifies how much of the need is a current need and how much is a future need.

**Exhibit ES-4: 20-Year Regulatory Need  
(in millions of January 1999 dollars)**

Regulations	Current Need	Future Need	Total Need
<b>Existing SDWA Regulations</b>			
Surface Water Treatment Rule <sup>1</sup>	\$14,492.1	\$4,873.3	<b>\$19,365.4</b>
Total Coliform Rule <sup>1</sup>	\$358.1	\$112.8	<b>\$470.9</b>
Nitrate/Nitrite Standard <sup>1</sup>	\$197.1	\$31.9	<b>\$229.0</b>
Lead and Copper Rule	\$1,039.6	\$186.5	<b>\$1,226.2</b>
Total Trihalomethanes Standard	\$39.1	\$60.6	<b>\$99.7</b>
Other Regulations <sup>2</sup>	\$430.8	\$85.4	<b>\$516.2</b>
<b>Subtotal National Need</b>	<b>\$16,556.9</b>	<b>\$5,350.4</b>	<b>\$21,907.4</b>
Costs Associated with Proposed and Recently Promulgated Regulations (Taken From EPA Economic Analyses) <sup>3</sup>		\$9,324.3	<b>\$9,324.3</b>
<b>Total National Need</b>	<b>\$16,556.9</b>	<b>\$14,674.8</b>	<b>\$31,231.7</b>

Note: Numbers may not total due to rounding.

<sup>1</sup> Regulations for contaminants that cause acute health effects.

<sup>2</sup> Includes regulated VOCs, SOCs, IOCs, and Radionuclides.

<sup>3</sup> Includes regulations for contaminants that cause acute and/or chronic health effects. In the Economic Analyses, the compliance costs with some regulations are given as a range. In calculating the \$9.3 billion need, the survey used EPA’s lead option, unless one was not available in which case the survey used the more conservative estimate.

The SDWA requires that States use 15 percent of their DWSRF allotment for providing financial assistance to small water systems. In reality, States have committed an average of 41 percent of their allotments to small systems.

**Microbial Contaminants.** Projects to address microbiological contamination account for 91 percent, or \$19.8 billion, of the total existing regulatory need. Under the SDWA, the Surface Water Treatment Rule (SWTR) and the Total Coliform Rule (TCR) are designed to reduce the amount of microbial contaminants in drinking water. Microbial contaminants, such as *Giardia* and *E. coli*, can cause acute gastrointestinal illness and, in extreme cases, death.

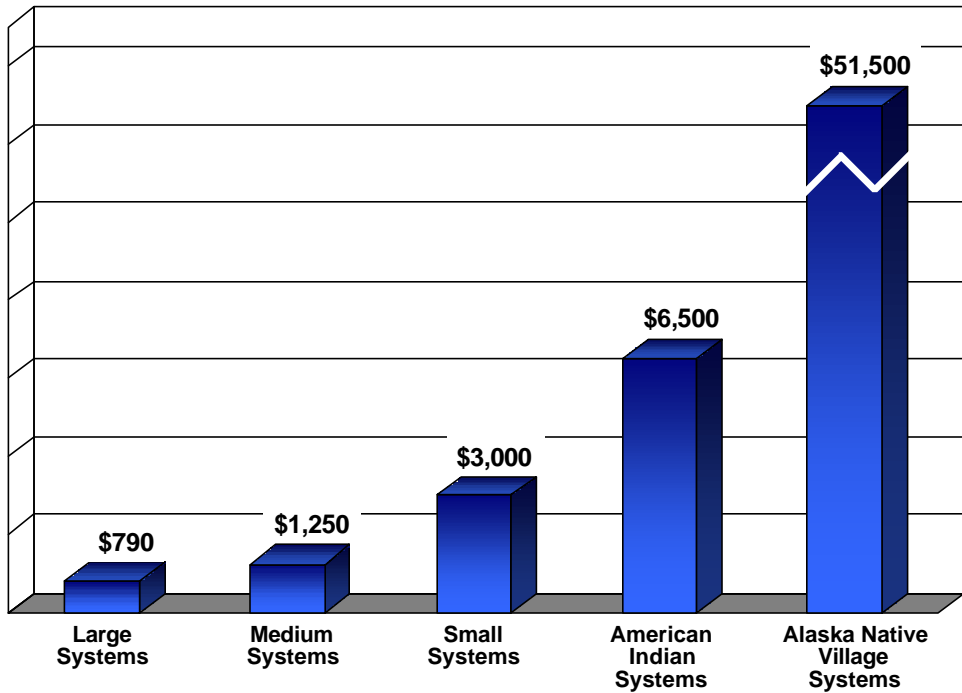
The installation of a treatment plant to filter a surface water source and the installation of a disinfection system are examples of needs associated with this category.

**Chemical Contaminants.** Infrastructure needs to protect the public health from chemical contaminants comprise \$2.1 billion of the total existing regulatory need. This category includes projects necessary

for compliance with the Nitrate/Nitrite Standard, Lead and Copper Rule, Total Trihalomethanes Standard, and other regulations that set maximum allowable limits for organic and inorganic contaminants. Examples of projects in this category are aerating water to remove volatile organic compounds and applying corrosion inhibitors to reduce the leaching of lead from pipes.

**Proposed or Recently Promulgated Regulations.** The total need for proposed and recently promulgated regulations is \$9.3 billion. Of this total, \$2.6 billion is for the regulation of acute contaminants under the Interim Enhanced Surface Water Treatment Rule (IESWTR), Long Term I Enhanced Surface Water Treatment Rule (LT1), Ground Water Rule, and Filter Backwash Recycling Rule. The remaining \$6.7 billion is for chronic contaminants regulated under the Stage 1 Disinfectants/Disinfection Byproducts Rule (DBPR), Arsenic Rule, Radon Rule, and Radionuclides Rule.

**Exhibit ES-5: Average 20-Year Per-Household Need (in January 1999 dollars)**



Does not include the costs associated with proposed or recently promulgated SDWA regulations.

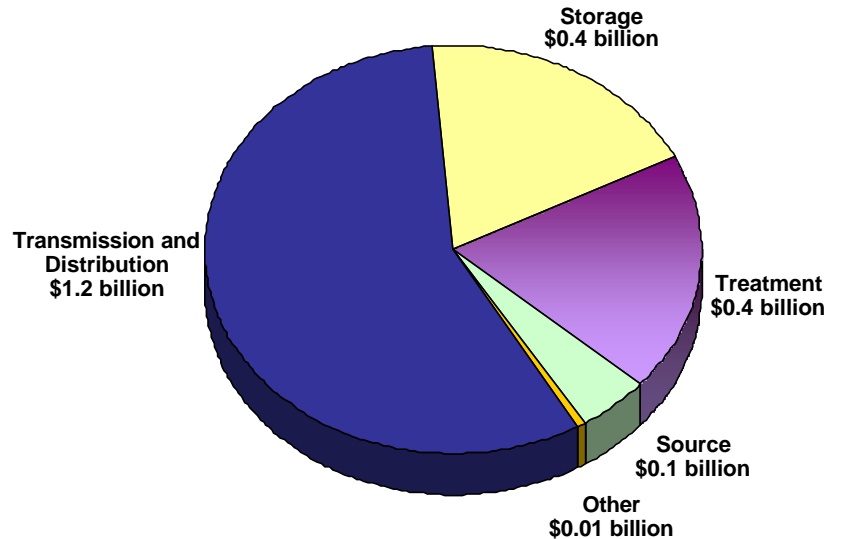
## Economic Challenges Faced by Small Water Systems

Approximately 45,000 of the nation's 55,000 community water systems serve fewer than 3,300 people. Small water systems face many unique challenges in providing safe drinking water to consumers. The substantial capital investments required to rehabilitate, upgrade, or install infrastructure represent one such challenge. Although the total small system need is modest compared to the needs of larger systems, the costs borne on a per-household basis by small systems are significantly higher than those of larger systems. Exhibit ES-5 compares the average 20-year need per-household for water systems.

## Needs of American Indian and Alaska Native Village Water Systems

**Total American Indian and Alaska Native Village Water System Needs.** The total need for American Indian and Alaska Native Village systems is \$2.2 billion over 20 years. Exhibit ES-6 presents the total need by category for these systems. The significance of this need in terms of public health is underscored by considering the per-household costs, which average \$6,500 for American Indians and \$51,500 for Alaska Natives. The difficulty in transporting materials to remote areas, the lack of economies of scale for small system projects, and the limited annual construction period in some regions contribute to the high per-household costs for these systems.

**Exhibit ES-6: Total 20-Year for American Indian and Alaska Native Village Water System Need by Category (in January 1999 dollars)**



Note: Numbers may not total due to rounding.  
Does not include the costs associated with proposed or recently promulgated SDWA regulations.



*The construction of a treated water storage tank nears completion in Nuiqsut, one of the most northerly communities in Alaska. In many Alaska Native communities, water tanks and treatment plants must be elevated on pilings to prevent the heated facilities from subsiding into the permafrost.*

**American Indian Needs.** The total 20-year need for American Indian systems is \$1.2 billion. Of this total, approximately \$1.0 billion is currently needed to ensure the continued provision of safe drinking water. Transmission and distribution projects account for 65 percent of the total need, followed by projects in the treatment, storage, and source categories of need.

**Alaska Native Village Needs.** The total 20-year need for Alaska Native Village systems is \$1.1 billion. Of this total, approximately \$1.0 billion is needed now to ensure the continued provision of safe drinking water. The largest categories of need in descending order are transmission and distribution, storage, and treatment.

## Households Not Served by Public Water Systems

Data from the 1990 census indicate that approximately 16 million households are not served by public water systems. This survey was restricted to public water systems eligible for DWSRF assistance. It therefore, was not designed to estimate the needs for households that use private wells, haul water from non-public systems, or lack running water. However, the survey addressed these needs in a limited way by including projects to extend service from existing public water systems to homes that do not have access to safe drinking water. Approximately \$6.0 billion is needed for such projects. This figure underestimates the true scale of the need, given that most systems in the survey focused their efforts on identifying projects for current consumers.

## Methods

The approach for the survey was developed by EPA in consultation with a workgroup consisting of representatives of the States, American Indians and Alaska Native Villages, and the Indian Health Service. The workgroup refined the methods used in 1995 based on lessons learned from the 1995 survey and options made available from technological advancements in the Internet.

### **Methods Used to Assess State Needs**

The survey used questionnaires to collect infrastructure needs from medium and large water systems. EPA mailed questionnaires to all 1,111 of the nation's largest water systems serving over 40,000 people and to a random sample of



U.S. EPA

*Water systems use a variety of treatment technologies to remove harmful contaminants from drinking water. For example, aeration units (pictured) are used to remove volatile organic compounds and certain secondary contaminants, such as hydrogen sulfide.*



2,556 of the 7,759 medium systems serving over 3,300 people. Approximately 96 percent of these systems returned the questionnaire: with 100 percent of the largest water systems responding.

Small systems serving fewer than 3,300 people often lack the specialized staff and planning documents needed to respond adequately to the questionnaire. Therefore, EPA conducted site visits to 599 randomly selected small community water systems and 100 not-for-profit noncommunity systems to identify and document their infrastructure needs.

### ***Methods Used to Assess American Indian and Alaska Native Village Water System Needs***

Each of the 19 American Indian systems serving more than 3,300 people completed a questionnaire. To assess the needs of small systems serving fewer than 3,300 people, EPA conducted site visits to a random sample of 78 American Indian water systems.

In Alaska, the availability of key personnel and data resources (such as aerial photographs) allowed for a census of the 174 Alaska Native Village water systems. The survey included 2 medium-sized systems and all 172 small systems. Current and future needs for Alaska Native Village systems were documented by EPA in consultation with district engineers, Village Safe Water, and Alaska Native Village representatives.

## **Total Need Compared to the 1995 Drinking Water Infrastructure Needs Survey**

The 1995 Needs Survey estimated a total national need of \$152.6 billion<sup>3</sup>—as compared to the \$150.9 billion estimate of this survey. The *Findings* section discusses the \$1.7 billion difference between the surveys' estimates in greater detail.

It is important to note that the fundamental methods used to collect and evaluate needs in 1999 remained largely unchanged from the 1995 survey. Most importantly, the 1999 survey retained the stringent documentation and eligibility requirements of the 1995 survey.

## **Conclusions**

The 1999 Drinking Water Infrastructure Needs Survey, the second such national survey by EPA, estimates that the nation's public water systems need to invest \$150.9 billion over the next 20 years to ensure the continued provision of safe drinking water to consumers. This finding lends support to the results from the previous survey which also identified a substantial need for infrastructure investments. The need to replace, upgrade, and install infrastructure will continue to increase as these systems age. The large magnitude of the need reflects the challenges confronting water systems as they deal with an infrastructure network that has aged considerably since the systems were constructed, in many cases, 50 to 100 years ago.

---

<sup>3</sup> The 1995 Needs Survey reported the total need as \$138.4 billion. Adjusted to 1999 dollars this amount is \$152.6 billion.



*This 31-year-old storage tank ruptured in Westminster, California, sending a 6-foot wave of water through the city that damaged or destroyed about 50 buildings and over a dozen vehicles. Storage tanks should be replaced or periodically rehabilitated to preserve their structural integrity.*