United States
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Drinking Water Infrastructure Needs Survey and Assessment

Third Report to Congress

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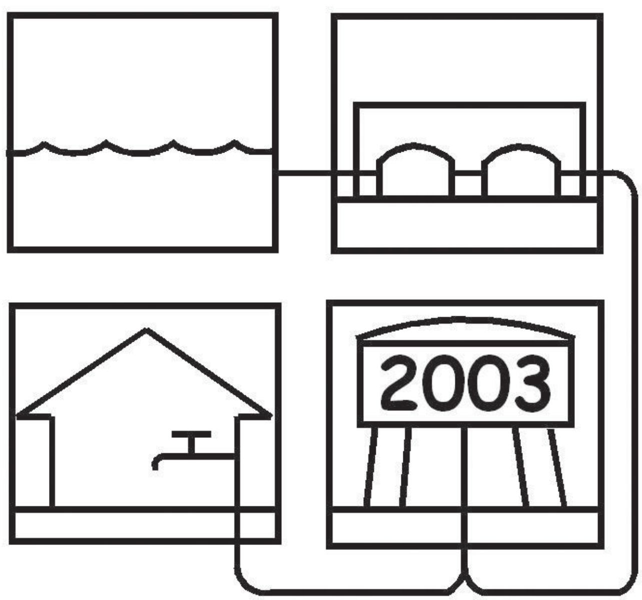

June 2005

U.S. Environmental Protection Agency
Office of Water
Office of Ground Water and Drinking Water
Drinking Water Protection Division
Washington, DC 20460

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Content

Oklahoma Department of Environmental Quality

These photographs show the construction and completion of a tank in Bartlesville, Oklahoma.

Exhibits

Montana Department of Environmental Quality

Fort Peck-Dry Prairie Regional Water System. This raw water intake pump station will draw an average daily flow of 5.5 million gallons per day (MGD) from the Missouri River to serve 22 communities in northeastern Montana. These communities are currently served by individual wells with poor water quality.

ACKNOWLEDGMENTS

Many dedicated individuals contributed to the 2003 Drinking Water Infrastructure Needs Survey and Assessment. We would like to thank the state and EPA Needs Assessment Coordinators and their supporting staff and contractors for active participation and continuing interest in the project. Not listed are the operators and managers of the approximately 4,000 systems who spent their valuable time completing the questionnaires we sent to them. We thank them for their assistance.

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EXECUTIVE SUMMARY

In 2003, the U.S. Environmental Protection Agency conducted its third assessment[1] of the nation's public water system infrastructure needs. The total national need for drinking water investment is $276.8 billion over the next 20 years. The 2003 Needs Assessment documents the continued need to install, upgrade, and replace the infrastructure on which the public relies for safe drinking water.

The U.S. Environmental Protection Agency's (EPA's or "the Agency's") third national assessment of public water system infrastructure needs shows total investment needs of $276.8 billion over the next 20 years. This document, the *Third Report to Congress*, conveys the results of the 2003 Drinking Water Infrastructure Needs Survey and Assessment and covers the 20-year period from January 1, 2003, through December 31, 2022.

The national total comprises the infrastructure investment needs of the nation's approximately 53,000 community water systems[2] and 21,400 not-for-profit noncommunity water systems[3] found in all 50 states, Puerto Rico, the Virgin Islands, the Pacific island territories, and the District of Columbia. American Indian and Alaska native village water systems are also included in the total need. Among the needs reported in the 2003 Needs Assessment are projects to protect public health, to preserve the physical integrity of water systems, to convey treated water to homes and commercial and industrial establishments, and to ensure continued compliance with specific Safe Drinking Water Act (SDWA or "the Act") regulations.

Public water systems continually install, upgrade, and replace the infrastructure on which the public depends for safe drinking water. Projects reported in the 2003 Needs Assessment range from replacement of short sections of deteriorated water mains to construction of large-scale, state-of-the-art treatment plants that produce drinking water from sea water. Many projects were identified as current needs; many more projects will arise over the next 20 years as existing infrastructure reaches the end of its useful life.

The cost of infrastructure investment is borne primarily by water system customers in the form of water rates. However, general revenues from federal, state, and local governments may supplement revenues from users. For major capital improvements, long-term financing is often critical; it allows communities to spread out the cost of improvements over the expected life of a project, thereby allocating the costs to those customers who

Sections 1452(h) and 1452(i)(4) of the Safe Drinking Water Act direct EPA to conduct an assessment of drinking water infrastructure needs every 4 years. The results are used to allocate Drinking Water State Revolving Fund monies to the states and tribes. In partnership with the states, EPA undertakes a survey of drinking water utilities as a basis for the Agency's assessment. EPA conducted prior surveys in 1995 and 1999.

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[1] EPA's previous assessments of infrastructure need in 1995 and 1999 were called "Needs Surveys" because the assessment relied primarily on survey methods. In 2003, EPA relied in part on surveys but also on analysis of previous survey data. Accordingly, the term "assessment" is more appropriate. Hereinafter, these studies will be referred to as "Needs Assessments."

[2] A community water system is a public water system that serves at least 15 connections used by year-round residents or that regularly serves at least 25 residents year-round. Cities, towns, and even small communities such as retirement homes are examples of community water systems.

[3] A noncommunity water system is a public water system that is not a community water system and that serves a nonresidential population of at least 25 individuals or 15 service connections daily for at least 60 days of the year. Schools and churches are examples of noncommunity water systems.

benefit from the improvements. Despite the importance of these projects for protecting public health, some utilities may encounter difficulties in obtaining affordable financing for such improvements.

The Drinking Water State Revolving Fund (DWSRF) was established by Congress in the 1996 SDWA Amendments to help public water systems obtain financing for improvements necessary to protect public health and comply with drinking water regulations. Between FY1997 and FY2004, Congress appropriated $6.96 billion for the DWSRF. The DWSRF is one of many local, state, and federal programs that water systems can use to supplement user fees and help finance large-scale capital investments. Appendix A provides a more detailed discussion of financing for water system improvements in the context of sustainable infrastructure.

> Between FY1997 and FY2004, Congress appropriated more than $6.96 billion for the DWSRF program. Through June 30, 2004, states had received $5.7 billion in capitalization grants, which, when combined with state match, bond proceeds, loan repayments, and other funds, made for a total of $9.7 billion in funds available for loans. As of that date, states had made close to 3,700 loans totaling $8.0 billion, leaving $1.7 billion, which had not yet been allocated to loans. The total assistance provided represented 166 percent of the awarded federal grants or 83 percent of the total funds available.

As mandated by the SDWA, EPA uses the results of the most recent infrastructure needs assessment to allocate DWSRF funds to the states based on their share of the total national need, with each state receiving at least 1 percent of the available DWSRF funds. For example, the 1999 Needs Assessment found 22 states and the District of Columbia each had less than 1 percent of the total national need (in aggregate, 11.3 percent of the total national need). However, from 2002 to 2005, each of these states were eligible for 1 percent of the annual DWSRF allotments (or, in aggregate, 23 percent of the total DWSRF allotment). The discrepancy may be due, in part, to a number of these states participating in the needs assessments effort to a lesser degree than the other states.

Eligible projects are funded according to each state's priority system, consistent with public health criteria specified in the SDWA. EPA also uses the assessment results to allocate the tribal set-aside (up to 1.5 percent of the DWSRF annual appropriation) for American Indian and Alaska native village water systems.

Methods for the Assessment

The approach for the 2003 Needs Assessment was developed by EPA in consultation with a workgroup consisting of representatives of the states and EPA Regions. The state/EPA workgroup refined the methods used for medium and large water systems in 1995 and 1999 based on lessons learned from these assessments and options made available from technological advancements in the Internet. To account for the needs of small community water systems, EPA adjusted the 1999 Needs Assessment findings to January 2003 dollars and reallocated the needs to states based on the current inventory of small systems. The needs for not-for-profit noncommunity water systems, American Indian water systems, and Alaska native village water systems were based on the 1999 Needs Assessment findings adjusted to January 2003 dollars.

Methods Used to Assess State Needs

Medium and Large Systems. EPA used questionnaires to collect data on infrastructure needs from medium and large water systems (see Appendix B for a discussion of different system size categories). EPA sent questionnaires to all of the nation's 1,041 large water systems (those that serve over 50,000 people) and all 301 of the medium systems that serve between 40,001 and 50,000 people. This census included 1,342 systems. Questionnaires were also sent to a random sample of 2,553 of the 7,337 systems serving 3,301 to 40,000 people. Approximately 96 percent of all questionnaires were completed and returned.

Questionnaires for most systems were returned by systems to their state contacts, who reviewed the information for completeness and then added projects or improved documentation of projects as needed. In some cases, states completed the questionnaires for the systems. States then forwarded their amended questionnaires to EPA for review and tabulation. EPA reviewed all 128,600 projects submitted to ensure that each met strict documentation requirements and were allowable DWSRF projects. This individual project review resulted in removal of 23,600 projects due to ineligibility or inadequate documentation. States were given the opportunity, through an interactive Web site, to provide additional information on projects for EPA consideration.

Small Systems. Small systems serving populations of 3,300 or fewer have often lacked the staff and planning documents needed to respond to the questionnaire. Therefore, for the 1999 Needs Assessment, EPA conducted site visits to identify and document their infrastructure needs. Site visits were conducted at 599 of the approximately 45,000 small community water systems and at 100 of the approximately 21,400 not-for-profit noncommunity systems.

Because these data were collected on site by EPA using consistent and comprehensive system interview tools, there was a high level of confidence in the findings. In addition, the small system need from the 1995 Needs Assessment, also collected using EPA site visits, was comparable to the findings in the 1999 Needs Assessment, indicating that the need was properly identified and did not decrease over time.

Alaska Department of Environmental Conservation

This man in a native village in Alaska fills several containers from this watering point to get drinking water for his family.

For these reasons, EPA used the 1999 data to estimate small system need. The Agency determined an average cost per system for each of several strata (based on population and source type) from the 1999 data. The Agency then adjusted this cost to 2003 dollars and reallocated the small system need to each state based on the number of small systems active at the time of the 2003 Needs Assessment.

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

For many of the same reasons that apply to other small systems, the 1999 questionnaires for small American Indian systems were completed during on-site visits with information provided by EPA and the Indian Health Service (IHS). All 19 American Indian systems serving more than 3,300 people completed a questionnaire and were provided technical support upon request. EPA estimated Alaska native village water system needs by census, using key personnel and data resources made available by representatives of the Alaska Native Health Consortia, the IHS, and Village Safe Water. Because of the high level of confidence in the 1999 findings, EPA adjusted the need from the 1999 Needs Assessment for American Indian and Alaska native village systems from 1999 dollars to 2003 dollars, and used that estimate for this 2003 Needs Assessment.

Examples of Cost Modeling

When modeling the cost of construction of a complete conventional water treatment plant, items included are:

- Coagulation, flocculation, sedimentation, filtration, waste handling, and the building;
- All raw and finished water pumps;
- The finished water clearwell and disinfection;
- Tanks;
- Process control system and building; and
- Engineering design and contingencies.

When modeling the cost of replacement of distribution mains, components included are:

- Pipe cost, trenching, bedding, backfill, hydrants, valves, road repair, easements, and service leads from the main to the curb stop; and
- Engineering design and contingencies.

When modeling the cost of construction of a storage tank, items included are:

- Tank;
- All appurtenances including piping, water level controls, and valves; and
- Engineering design and contingencies.

Models for Assigning Costs to Projects Without Costs

During the 1999 Needs Assessment, EPA invested considerable effort in obtaining project cost information from data submitted by systems. With this cost information, models were developed for nearly all types of projects included in the assessment. For 2003, most of those project costs were not expected to change beyond typical adjustments for inflation, except for automated meter reading devices for domestic water meters and the cost of pipe installation and rehabilitation. The workgroup determined that efforts for 2003 should focus on other areas of the assessment, and that most of the 1999 cost models could be adjusted to 2003 dollars. The "cost modeling" text box discusses the components of three types of cost models. Appendix B provides more detail on the cost models used for the assessment.

EPA did develop new cost models for automated meter reading projects and for transmission and distribution pipe installation and rehabilitation using 2003 project data. The new pipe models were developed using the same method as those used for the 1999 Needs Assessment. The 2003 meter model reflects the expected increase in cost to accommodate new, more efficient technology.

Total National Need

The 2003 Needs Assessment found that the nation's water systems need to invest $276.8 billion over the next 20 years in order to continue to provide clean and safe drinking water to their consumers. The need includes installation of new infrastructure as well as rehabilitation or replacement of deteriorated or undersized infrastructure. It also includes the need to address aging infrastructure that is adequate now but will require replacement or significant rehabilitation over the next 20 years.

Most of the needs are not related to violations of any SDWA regulations. Instead, they are ongoing investments that systems need to make to continue to deliver water to their customers, as well as to remain in compliance with regulations.

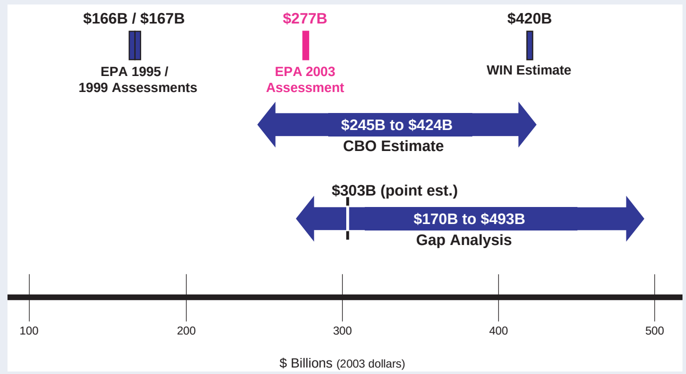
Total Need Compared to Previous Needs Assessments

The 1995 and 1999 Needs Assessments estimated the total national need at $167.4 and $165.5 billion respectively.[4] The findings of this assessment estimate a need of $276.8 billion, exceeding the previous assessments' national need by more than 60 percent.

The methods used to collect and evaluate needs in EPA's 2003 Needs Assessment remained largely unchanged from those used in 1995 and 1999, except for an emphasis on capturing previously underreported needs for infrastructure rehabilitation and replacement.[5] EPA recognized the necessity to more accurately capture these infrastructure needs. This objective is consistent with EPA's initiative for "sustainable infrastructure," (See Appendix A) which emphasizes improved management of assets, including collection of better data on infrastructure condition, and long-term planning for rehabilitation and replacement. For the 2003 Needs Assessment, it is likely that a more systematic approach to asset identification and evaluation led some systems and states to consider and report a larger number of replacement and rehabilitation projects. EPA has some anecdotal evidence that states began to investigate the backlog of projects that had been deferred in the past.

Systems' and states' efforts to correct underreporting appear to have been successful. States reported many more projects (covering all types of need) in

While the 2003 Needs Assessment estimate represents a substantial increase in need from the previous assessments, it is still within the range identified in other reports.



- EPA's "Clean Water and Drinking Water Infrastructure Gap Analysis" estimated drinking water systems' 20-year capital needs within a range of $170 to $493 billion, with a point estimate of $303 billion.[6]
- The Congressional Budget Office (CBO) report "Future Investment in Drinking Water and Wastewater Infrastructure," estimates annual water system needs of $12.2 to $21.2 billion, which would extrapolate to a 20-year total need in the range of $245 to $424 billion.[7]
- The Water Infrastructure Network's (WIN's) "Clean and Safe Water for the 21st Century - A Renewed National Commitment to Water and Wastewater Infrastructure," estimates water system needs of $21 billion annually, which extrapolates to $420 billion over 20 years.[8]

[4] The 1995 and 1999 total needs have been converted to January 2003 dollars for comparison purposes. The 1995 need in 1995 dollars was $138.4 billion. The 1999 need in 1999 dollars was $150.9 billion.

[5] In the 1999 Needs Assessment, EPA noted the problem of underreporting. Quality assurance reviews of data from 1995 confirmed this. For a comparison of the 1999 EPA Needs Assessment with other estimates, see Congressional Budget Office, op. cit., Chapter 2.

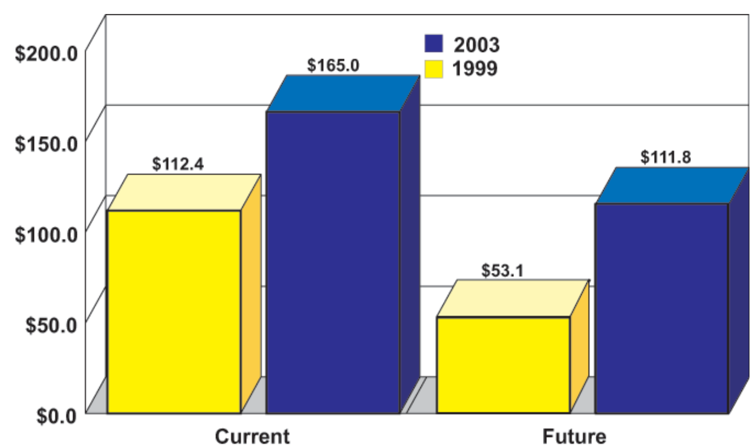
[6] U.S. Environmental Protection Agency, "Clean Water and Drinking Water Infrastructure Gap Analysis," (September 2002), p. 5. Needs were assumed to be in 1999 dollars based on the date of the report and planning period used. Needs have been adjusted to 2003 dollars for comparison purposes.

[7] Congressional Budget Office, "Future Investment in Drinking Water and Wastewater Infrastructure," (November 2002), p. ix. Needs were reported in 2001 dollars and have been adjusted to 2003 dollars for comparison purposes.

[8] Water Infrastructure Network, "Clean and Safe Water for the 21st Century - A Renewed National Commitment to Water and Wastewater Infrastructure," (undated), p. 3-1. Needs were assumed to be in 1999 dollars based on the planning period and data used. Needs have been adjusted to 2003 dollars for comparison purposes.

2003 than in the previous assessments. In the 1999 Needs Assessment, there were 61,400 projects for all large and medium systems. In the 2003 Needs Assessment, there were 128,600 projects for all large and medium systems. Equally important, the largest increase in 2003 (both in dollars and in percentage) compared to previous assessments came in future needs. Current needs increased by about 50 percent, but future needs rose by over 100 percent as shown in Exhibit ES-1.

Exhibit ES-1: 1999 versus 2003 Current and Future Need (in billions of January 2003 dollars)



For this comparison, the 1999 Needs Assessment results have been adjusted to January 2003 dollars.

This increase suggests the 2003 Needs Assessment was more complete in capturing the longer term needs to address aging infrastructure that is currently adequate, but will require replacement or significant rehabilitation over the next 20 years. While EPA cannot confirm that systems reported all of their 20-year needs, the increase in both the number of projects and the total need indicates much of the underreporting was eliminated.

The Agency's objective to better capture the true 20-year need did not outweigh the primary imperative to maintain the credibility of the assessment and determine the need of individual states. EPA made a considerable effort to ensure that the 2003 Needs Assessment retained the stringent documentation and eligibility requirements of both of the previous assessments. In addition, the 2003 Needs Assessment incorporated further quality assurance measures to prevent over-reporting of needs.

Total Need: System Size and Type

As shown in Exhibit ES-2, the nation's 1,041 largest community water systems (those serving populations more than 50,000 people) account for $122.9 billion, or 44 percent, of the total national need. Medium and small community water systems also have substantial needs of $103.0 billion and $34.2 billion, respectively. These figures include the needs for small, medium, and large systems in the Pacific island territories and Virgin Islands, which are $509.1 million and $172.6 million, respectively. Not-for-profit noncommunity water systems have infrastructure needs of $3.4 billion. American Indian water systems need $1.3 billion in infrastructure improvements, while Alaska native village systems need $1.2 billion.[9]

Total Need: Current and Future

The 2003 Needs Assessment differentiates "current needs" from "future needs;" the definitions of these two types of needs, as well as examples, are described below. About 60 percent of the total needs, $165.0 billion, are identified as current needs. In Appendix D, Summary of Findings, Exhibits D-2 and D-7 present a breakdown of current needs by project type. Although current needs have increased in dollars from previous assessments, they are a smaller percentage of the total need in 2003 (60 percent, compared with 68 percent in 1999). As discussed

[9] These estimates slightly exceed the total $2.4 billion American Indian and Alaska native village system need because of rounding.

above, this is evidence of successful efforts to more accurately capture "future needs."

Current Needs. Current needs are projects that a system considers a high priority for near-term implementation to enable a water system to continue to deliver safe drinking water. For instance, a system may have had numerous leaks and breaks in a section of main that should be replaced before a major main break occurs and inhibits the delivery of safe drinking water.

A system with current needs is not necessarily in violation of any health-based drinking water standard or in the midst of responding to an emergency. For example, a surface water treatment plant may currently produce safe drinking water, but the plant's filters may require replacement because of their declining effectiveness. By replacing the filters the plant would be able to continue providing safe water and avoid emergency situations.

Future Needs. Future needs are projects that water systems do not currently need, but would expect to address in the next 20 years as part of routine rehabilitation or replacement of infrastructure because of predictable events, e.g., reaching the end of a facility's service-life. Approximately 40 percent of the total need, $111.8 billion, is reported as future needs.

Growth-Related Needs. To be consistent with the eligibility requirements for the DWSRF, the 2003 Needs Assessment did not include projects that would be undertaken solely to accommodate future growth (e.g. extension of service lines to new housing developments). However, for both current and future needs, the 2003 Needs Assessment did include DWSRF-eligible projects that had reasonable accommodation for expansion of capacity that is consistent with the design life of the infrastructure (e.g., replacing deteriorated 6-inch pipe with new, and larger capacity, 12-inch pipe).

Total Need: Project Type

Every project in the 2003 Needs Assessment belongs to one of five categories of need: transmission and distribution, treatment, source, storage, or "other."

Exhibit ES-2: Total 20-Year Need (in billions of January 2003 dollars)

System Size and Type	Need
Large Community Water Systems (serving over 50,000 people)[1]	$122.9
Medium Community Water Systems (serving 3,301 to 50,000 people)[1]	$103.0
Small Community Water Systems (serving 3,300 and fewer people)[1, 2]	$34.2
Costs Associated with the Recently Promulgated Arsenic Rule[3]	$0.9
Not-for-profit Noncommunity Water Systems[4]	$3.4
American Indian and Alaska Native Village Water Systems[4, 5]	$2.4
Subtotal National Need	**$266.9**
Costs Associated with Proposed and Recently Promulgated Regulations (Taken from EPA Economic Analyses)	$9.9
Total National Need	**$276.8**

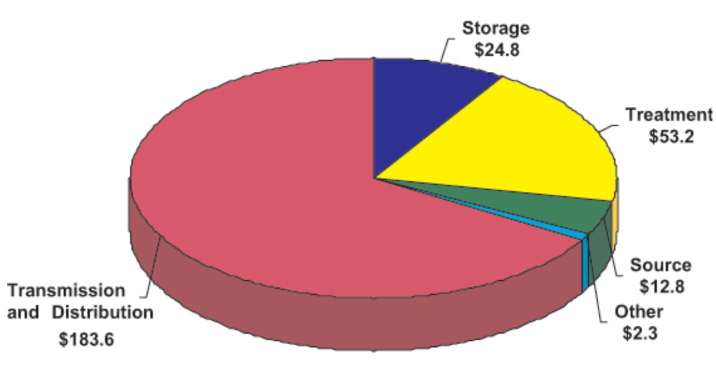
Note: Numbers may not total due to rounding.

[1] Does not include the costs associated with the recently promulgated Arsenic Rule and proposed or recently promulgated SDWA regulations; these costs are included on a separate line in this table.
[2] 1999 Needs Assessment findings adjusted to January 2003 dollars and reallocated based on 2003 inventory of small systems.
[3] Does not include costs for American Indian and Alaska native village water systems to comply with the recently promulgated Arsenic Rule; these costs are incorporated in the estimate for American Indian and Alaska native village water systems.
[4] 1999 Needs Assessment findings adjusted to January 2003 dollars.
[5] Includes cost for compliance with the recently promulgated Arsenic Rule.

Exhibit ES-3 illustrates the total 20-year need by category based on project type.

- **Transmission and Distribution.** With $183.6 billion needed over the next 20 years, transmission and distribution projects constitute the largest category of need, accounting for almost two-thirds of the total need. Little of this category of need is related to any federal mandate. Instead, utilities need to install and maintain distribution systems to provide potable water to their customers while preventing contamination of that water prior to delivery. Although treatment plants or elevated storage tanks are usually the most visible components of a water system, most of a system's infrastructure is underground in the form of transmission and distribution mains. Failure of transmission and distribution mains can interrupt the delivery of water leading to a loss of pressure, possibly allowing a backflow of contaminated water into the system. Broken transmission lines also can disrupt the treatment process. The transmission and distribution category also comprised the largest proportion of the total need in the 1995 and 1999 Needs Assessments. Its increased share of the total in 2003 reflects EPA's emphasis on fully capturing previously underreported rehabilitation and replacement needs, most of which were in this category. The underreporting in the 1995 and 1999 Needs Assessments was due in part to the limitations of planning documents. The transmission and distribution category includes the installation and rehabilitation of raw and finished water transmission mains and distribution mains and replacement of lead service lines, flushing hydrants, valves, meters, and backflow prevention devices.

Exhibit ES-3: Total 20-Year Need by Project Type (in billions of January 2003 dollars)



Note: Numbers may not total due to rounding.

- **Treatment.** Treatment projects represent the second largest category of need, $53.2 billion, nearly one-fifth of total need, over the next 20 years. This category consists of projects needed to reduce contaminants through treatment processes such as filtration, disinfection, corrosion control, and aeration. The installation, upgrade, or rehabilitation of treatment infrastructure also enables removal of contaminants that can cause chronic health effects or taste, odor, and other aesthetic problems.

- **Storage.** The total 20-year need for storage projects is $24.8 billion. This category includes projects to construct new or rehabilitate existing finished water storage tanks. Construction of new tanks is necessary if the system cannot provide adequate flows and pressure during peak demand periods. Many projects in this category involve rehabilitating existing tanks to prevent structural failures or sanitary defects that can allow microbiological contamination.

- **Source.** The source category includes projects that are necessary to obtain safe supplies of surface water or ground water. The infrastructure needs in this category include the installation and rehabilitation of drilled wells and surface water intakes. The total 20-year needs for source water projects are $12.8 billion.

- **Other.** Other needs account for an estimated $2.3 billion. This category captures needs that cannot be assigned to one of the prior categories. Examples include emergency power generators not associated with a specific system component, computer and automation equipment, and projects for system security.

The Regulatory Need

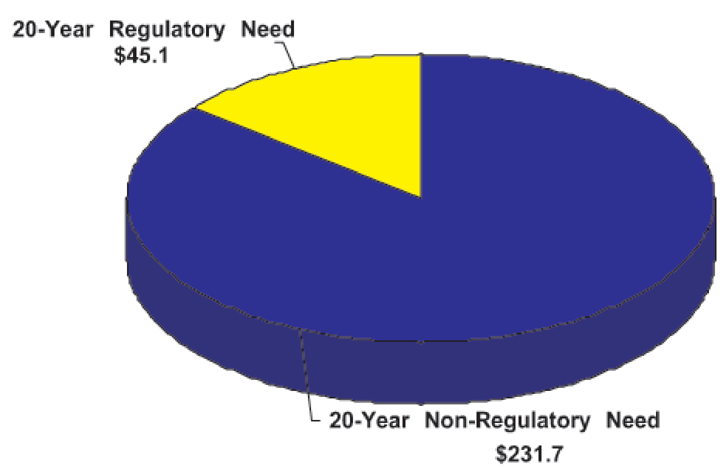
The SDWA requires that public water systems meet national standards to protect consumers from the harmful effects of contaminated drinking water. Although all of the infrastructure projects included in the 2003 Needs Assessment promote the SDWA's public health objectives, most are driven by the need to provide an essential service to the utility's customers. However, some of the projects are directly attributable to specific SDWA regulations. This report refers to these needs collectively as the "regulatory need." The total regulatory need is divided into two broad categories: the need associated with existing SDWA regulations, and the need associated with recently promulgated and proposed regulations. The second category accounts for new or proposed regulations that may impact systems in the near future, even though systems have not yet determined the extent to which they will need capital investment to achieve compliance. As shown in Exhibit ES-4, the total regulatory need is $45.1 billion, or only 16 percent of the total national need.

While most of the total need is not driven by compliance with a particular regulation, properly maintaining a system's infrastructure is not only economical in the long run, but also is protective of public health. These nonregulatory costs include routine installation, upgrade, and replacement of basic infrastructure and are borne by the system regardless of regulations.

Existing SDWA Regulations. The estimated needs directly associated with existing SDWA regulations (including the recently promulgated Arsenic Rule that will be effective in January 2006) are $35.2 billion. The total capital cost of compliance with the recently promulgated Arsenic Rule (from the Economic Analysis for the final rule) was included in this category because state-specific occurrence data were available, allowing EPA to allocate costs to states. Exhibit ES-5 displays the regulatory need by existing regulation and differentiates between current and future needs.

Microbial Contaminants. Projects that address microbiological contamination comprise 86 percent, or $30.2 billion, of the total existing regulatory need. Under the SDWA, the Surface Water Treatment Rule (SWTR), the Interim Enhanced Surface Water Treatment Rule (IESWTR), and the Total Coliform Rule (TCR) are designed to remove or inactivate 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 or the replacement of an aging disinfection system are examples of needs in this category.

Exhibit ES-4: 20-Year Regulatory and Non-Regulatory Need (in billions of January 2003 dollars)



Note: Numbers may not total due to rounding.

Chemical Contaminants. Projects designed to protect the public health from chemical contaminants comprise $5.0 billion, or 14 percent, of the total existing regulatory need. This category includes projects necessary for compliance with the existing Nitrate/Nitrite Standard, the Lead and Copper Rule, the Total Trihalomethanes Standard, and the recently promulgated Arsenic Rule, as well as other regulations that set maximum allowable limits for organic and inorganic contaminants. Examples of projects in this category include aeration facilities to remove volatile organic compounds or projects to add corrosion control to reduce the leaching of lead from pipes.

Exhibit ES-5: 20-Year Regulatory Need (in millions of January 2003 dollars)

Regulations	Current Need	Future Need	Total Need
Existing SDWA Regulations			
Interim Enhanced Surface Water Treatment Rule and Surface Water Treatment Rule[1]	$16,463.1	$11,063.0	**$27,526.2**
Total Coliform Rule[1]	$1,283.5	$1,349.1	**$2,632.6**
Nitrate/Nitrite Standard[1]	$404.1	$97.2	**$501.4**
Costs Associated with the Recently Promulgated Arsenic Rule		$962.1	**$962.1**
Lead and Copper Rule	$1,633.5	$371.9	**$2,005.4**
Total Trihalomethanes Standard	$123.5	$75.2	**$198.7**
Other Regulations[2]	$1,075.2	$255.4	**$1,330.6**
Subtotal National Need	**$20,982.9**	**$14,174.0**	**$35,156.9**
Costs Associated with Proposed and Recently Promulgated Regulations (Taken from EPA Economic Analyses)[3]		$9,927.4	**$9,927.4**
Total National Need	**$20,982.9**	**$24,104.4**	**$45,084.3**

Note: Numbers may not total due to rounding.

[1] Regulations for contaminants that cause acute health effects.
[2] Includes regulated Volatile Organic Chemicals (VOCs), Synthetic Organic Chemicals (SOCs), Inorganic Chemicals (IOCs), and Radionuclides.
[3] 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 $9.9 billion need, the 2003 Needs Assessment used EPA's lead option, unless one was not available, in which case the 2003 Needs Assessment used the higher estimate. These estimates include only the capital costs (i.e., excludes operation and maintenance costs). Costs for the recently promulgated Arsenic Rule are not included in this row.

Proposed or Recently Promulgated Regulations. The total need associated with proposed and recently promulgated regulations is $9.9 billion. Of this total, $3.2 billion is for the regulation of acute contaminants under the Long Term I and/or the Proposed Long Term 2 Enhanced Surface Water Treatment Rules (LT1ESWTR and/or LT2ESWTR), the Proposed Ground Water Rule, and the Filter Backwash Recycling Rule. The remaining $6.7 billion is for chronic contaminants regulated under the Stage 1 and/or the Proposed Stage 2 Disinfectants/Disinfection Byproducts Rules (Stage 1 and Stage 2 DBPR), the proposed Radon Rule, and the recently promulgated Radionuclides Rule. The 2003 Needs Assessment obtained the costs for this category from the Economic Analysis published for each rule; they are not estimates from respondents to the 2003 Needs Assessment questionnaire. These costs are added to the total national need for this assessment, but do not affect individual states' total need or allocation because the Economic Analysis relies on regional data only.

Security Needs

Water systems have long included protections against vandalism and natural disasters as part of their water system improvement programs. However, systems have only recently begun to address more robust security needs to identify and protect the system from terrorist-type activities. Because the 2003 Needs

Assessment was concurrent with this expanded security evaluation and planning process, many systems may not have adequately captured these specific needs for the 2003 Needs Assessment. Systems with completed vulnerability assessments and corrective action plans often did not have documented costs for those improvements. These were not the types of costs that EPA was prepared to model. It is anticipated that these needs will be more completely reported in future assessments. The total security need estimated from the 2003 Needs Assessment is $1.0 billion.

Needs for Small Water Systems

Approximately 45,000 of the nation's 53,000 community water systems serve 3,300 or fewer people. Small water systems' 20-year infrastructure need is estimated to be $34.2 billion. The total is based on findings from the 1999 Needs Assessment, adjusted to 2003 dollars and applied to the 2003 inventory of small systems. 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, without the economies of scale available to larger systems, represent one challenge. Although the total small system need is modest compared to the need of larger systems, the costs borne on a per-household basis by small systems are significantly higher than those of larger systems.

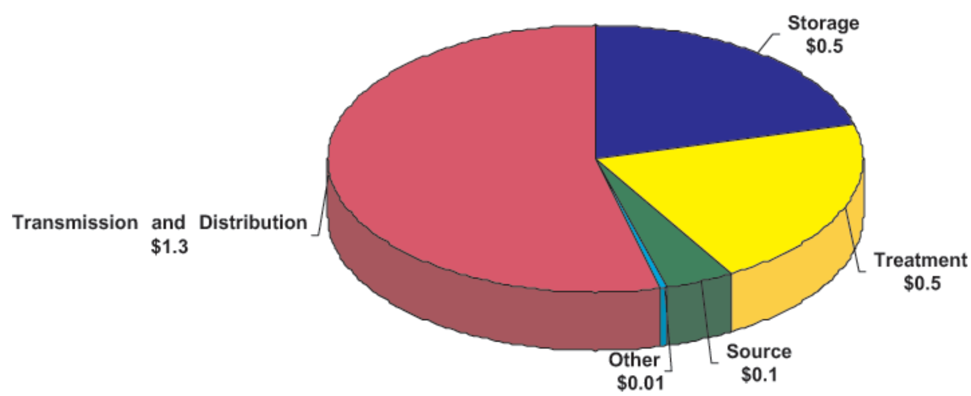
Needs of American Indian and Alaska Native Village Water Systems

The total need for American Indian and Alaska native village systems is $2.4 billion over 20 years. The total is also based on findings from the 1999 Needs Assessment, adjusted to 2003 dollars, and the portion of the total capital cost of compliance with the recently promulgated Arsenic Rule attributed to these systems. Exhibit ES-6 presents the total need by project type for these systems. The total 20-year need for American Indian systems is $1.3 billion, and for Alaska native village systems is $1.2 billion.

Challenges for Future Assessments

All assessments that include surveys impose a data collection burden on respondents. EPA has considered options to reduce respondent burden in each of the assessments (1995, 1999, and 2003). These efforts must be renewed in planning for the next assessment. EPA will pay particular attention to the number of projects to be considered in a 20-year planning effort, the comprehensiveness of the data collection goal, and documentation requirements for each project. All of these factors create a burden for participating water systems, state agencies, and EPA. While the data obtained through the survey and assessments are extremely valuable for many applications, the approach used to collect the data is regularly reviewed by EPA to determine more efficient and effective ways to capture the full need.

Exhibit ES-6: Total 20-Year American Indian and Alaska Native Village Water System Need by Project Type (in billions of January 2003 dollars)



Note: Numbers may not total due to rounding.

EPA is addressing two additional issues for future assessments: engineering assumptions of life cycles for future rehabilitation and replacement projects, and encouraging greater response rates from systems in states receiving the minimum 1-percent DWSRF capitalization grants.

With respect to life cycle assumptions, more explicit nationally applicable guidelines would facilitate consistency from the outset of the assessment. This would streamline quality control efforts and eliminate the need to identify assumptions used in projections of infrastructure replacement and rehabilitation needs (and reject projects where assumptions are inconsistent with industry practice). Regarding response rates, states that are near or below 1 percent of the total national need have little incentive to promote responses from systems in their jurisdictions. This can lead to underestimates of the needs in these states.

In the estimation of total national needs, these two issues may partially offset each other. (Inconsistent engineering assumptions may drive needs up, but low response rates in states receiving minimum capitalization grants may drive needs down.) Yet, these issues can affect the relative distribution of needs among states receiving more than 1 percent of the DWSRF appropriation. Without more complete participation in states receiving minimum capitalization grants, questions may be raised about the appropriateness of the current statutory approach.

EPA realizes these issues should be discussed with stakeholders before data collection begins on the next assessment. Stakeholders on this issue include states, their Governors and Legislators, the water supply industry and its associations, and researchers, particularly those who have specialized in empirical research on the useful life of pipe. As the Congressional Budget Office noted in 2002, methods of estimation and assumptions about requirements for rehabilitation and replacement typically drive national estimates of infrastructure needs.[10] The Agency recognizes that reaching agreement on the approach to this issue in future assessments will improve the credibility of the estimates that are submitted to Congress.

Finally, EPA recognizes that assessment methods result in uncertainty in the estimated needs. The sampling plan for medium and large systems was designed to produce estimates of the total need for each state with 95 percent confidence intervals that are ± 10 percent. However, sampling error is only one source of uncertainty. The assessment also involves statistical cost models and economic analyses of regulations. Each of these creates additional uncertainty. While the 2003 Needs Assessment does not include a comprehensive quantitative analysis of uncertainty, EPA plans to continue efforts to more accurately characterize these in future assessments.

Conclusions

The 2003 Drinking Water Infrastructure Needs Survey and Assessment, the third such national effort by EPA, estimates that the nation's public water systems need to invest $276.8 billion over the next 20 years to ensure the continued provision of safe drinking water to consumers.

The findings of the previous assessments, conducted by EPA in 1995 and 1999, indicated that the need was most likely underreported because of limitations of water system planning documents. EPA believes that changes made to the assessment to address underreporting resulted in a more complete assessment of the 20-year need.

The need to rehabilitate and replace infrastructure is expected to increase as systems age, particularly if funding constraints limit the systems' ability to meet these needs. The needs summarized in this report highlight the challenges facing water systems as they cope with aging infrastructure in the 21st century.

[10] Congressional Budget Office, op. cit., pp. 13-17.

SCOPE OF THE ASSESSMENT AND SURVEY METHODS

The 2003 Drinking Water Infrastructure Needs Survey and Assessment represents the collective efforts of the states, EPA, and thousands of water systems—all of which participated in identifying and documenting infrastructure needs. This chapter provides an overview of the methods used by these participants to assess drinking water needs. It also describes the refinements made to the methods used in the 1995 and 1999 Needs Assessments to improve the accuracy of the results, and the extent of reliance on the 1999 Needs Assessment in determining the need for small, American Indian, Alaska native village, and not-for-profit noncommunity water systems.

Scope of the Assessment

Goal and Purpose. EPA's goal for the 2003 Drinking Water Infrastructure Needs Survey and Assessment was to document the 20-year national infrastructure needs for the approximately 53,000 community and 21,400 not-for-profit noncommunity public water systems eligible to receive DWSRF assistance. Needs were assessed for the 20-year period beginning January 1, 2003, and ending December 31, 2022. A total of approximately 4,000 medium- and large-population public water systems completed the 2003 Drinking Water Infrastructure Needs Survey and Assessment questionnaire. Medium and large systems' infrastructure needs projected over the next 20 years (excluding costs to comply with the recently promulgated Arsenic rule) constituted 82 percent of the total need.

- **States.** The 1996 Safe Drinking Water Act (SDWA) Amendments direct EPA to assess the needs of water systems, and to use the results of the assessment to allocate DWSRF funds. To this end, the Agency designed an assessment that would provide accurate estimates of need for each of the states. The DWSRF funds are allocated based on each state's share of the total national need (although, under SDWA, each state receives a minimum allotment of 1 percent).

> The survey of medium and large systems was designed to provide a high level of precision for each state's estimate of need. For most of the survey, a precision target of 95 percent ± 10 percent was established.

- **Territories.** The results of the assessment are also used to allocate the 0.33 percent of the DWSRF appropriation designated for the Pacific island territories. Therefore, the workgroup designed the assessment to generate separate estimates of need for Guam, American Samoa, the Commonwealth of Northern Mariana Islands, and the U.S. Virgin Islands. Needs for the Virgin Islands were determined by adjusting 1999 needs to 2003 dollars. The assessment results dictate what percentage of the 0.33 percent will go to each territory.

- **American Indian Communities and Alaska Native Villages.** For this assessment, the need determined from the 1999 Needs Assessment was adjusted and used to determine the 2003 need. The results are used to help determine how to allocate funds that are available through the DWSRF to American Indian and Alaska native village water systems.

This corroded, valveless filter is badly in need of replacement.

Eligible Needs. Since the purpose of the assessment is to allocate DWSRF funds, EPA included only projects that met the eligibility criteria established under the DWSRF program.[11] In general, projects eligible for DWSRF funding facilitate compliance with the SDWA's National Primary Drinking Water Regulations or otherwise significantly further the health protection objectives of the Act.

Categories of Need by Project Type. Each project was assigned to one of five categories of need based on the project type: source, transmission and distribution, treatment, storage, or "other." This classification shows where the nation's water systems need to make capital investments.

- The source water category includes projects necessary to obtain adequate quantity and quality of surface water and ground water supplies. Examples include wells, surface water intakes, and spring collectors.

- The transmission and distribution category includes the needs associated with installing or rehabilitating raw and finished water transmission pipes, distribution water mains, pumping stations, flushing hydrants, valves, water meters, and backflow prevention devices.

- The treatment category includes projects needed to deal with microbial pathogens and chemical contaminants present in the water supply.

- The storage category includes projects to construct new or rehabilitate existing finished-water tanks.

- The "other" category is reserved for needs that cannot be assigned to one of the four major categories. Examples include emergency power generators not assigned to specific types of projects, computer and automation projects, and projects to address security.

Current and Future Needs. For the 2003 Needs Assessment, EPA distinguished between current and future needs for the 20-year period from January 1, 2003, through December 31, 2022. Current needs are projects that systems consider a high priority for near-term implementation that will enable a water system to continue to deliver safe drinking water. An example of a current need is replacement of a section of distribution line that is susceptible to breaks or leaks.

Future needs are projects that are not necessary at the time of the assessment but that water systems expect to undertake within the next 20 years. These include routine rehabilitation and replacement projects. For example, a system may anticipate that it will need to rehabilitate a storage tank in approximately 10 years, or that it needs to replace a certain length of distribution pipe every year over the 20-year period to phase out old pipe. These future needs were underreported in previous assessments, in part due to limitations of the planning documents.

[11] EPA's assessment excluded DWSRF-eligible needs which do not involve the installation, replacement, or rehabilitation of infrastructure; for example, refinancing loans, conducting studies, and acquiring other water systems.

To mitigate underreporting for this assessment, EPA made changes in the format of the questionnaire and trained state coordinators on needs assessment tools. The new questionnaire asked systems to review their entire inventory of infrastructure assets and consider what projects might be necessary to manage those assets through the end of 2022. The questionnaire also provided examples of appropriate projects and related documentation. The Agency encouraged states to help systems review their inventories and identify realistic estimates of system needs. Many states visited or called each system within their jurisdictions to facilitate completion of the questionnaires. States used in-house inventories (where available) to ensure that all major infrastructure was considered. Some states used their own analyses of infrastructure condition to identify needs.

Reasons for Need. The questionnaire also asked systems to identify and code the reason, or reasons, each project was needed. Options included:

- Projects for existing infrastructure that is, or will be, old or deteriorated by the end of the 2003 Needs Assessment period.
- Projects to correct a deficiency in source water quantity caused by current user demand.
- Projects to correct a deficiency in storage capacity caused by current user demand.
- Projects to correct existing pressure problems not related to fire flow.
- Projects to obtain or maintain compliance with an existing regulation.
- Projects to obtain or maintain compliance with a secondary standard.
- Projects for consolidation with and/or connection to an existing public water system.
- Projects for extending service to existing homes without adequate water quantity or quality.

California Department of Health Services

This 0.75 million gallon ground level storage tank in Kerman, California was constructed to compensate for the reduced capacity of three wells that are being constructed to replace three larger contaminated wells.

Not surprisingly, a majority of the systems and states listed “replacement or rehabilitation of old or deteriorated infrastructure” as the primary reason for need. Sixty-seven percent of projects listed “old and deteriorated infrastructure” as the only reason for need, and 77 percent listed this as at least one of the reasons for need if more than one reason was provided.

Security Needs. Projects intended wholly or in part to address security needs were separated into the following categories:

- Projects to prevent or detect an intrusion or security violation.
- Major security projects.

- Communication needs for security.
- Projects for redundancy or to respond to a security breach.
- Projects to address safety issues.

Assessment Methods

The 2003 Needs Assessment consisted of two components: a new survey of needs for large and medium systems; and an estimate of needs for systems serving 3,300 or fewer persons, not-for-profit noncommunity water systems, American Indian systems, and Alaska native village systems. These two components are discussed below.

A workgroup of state and EPA representatives developed the methods for the 2003 Drinking Water Infrastructure Needs Survey and Assessment. The workgroup decided to adopt the general approach of the 1995 and 1999 Needs Assessments. However, the workgroup refined the questionnaire to prompt more complete assessment of needs. These refinements were based on lessons learned from the 1999 Needs Assessment regarding effective interview methods for capturing needs that are not included in relatively short-term water system planning documents. The workgroup also revised some documentation policies to reduce the burden on systems without compromising the validity of the data. Communications options made available by changes to the Internet also allowed more efficient information exchange on specific projects between EPA and states.

Conducting the State Survey for Large and Medium Systems

EPA and the states developed a questionnaire used to collect infrastructure needs from large and medium community water systems. The questionnaires were provided to all of the nation’s water systems serving over 40,000 people and from a random sample of systems serving 3,301 to 40,000 people. Each system received a package containing the questionnaire, instructions, an example of a completed questionnaire, and a list of frequently asked questions.

Systems returned the questionnaires and accompanying documentation to their state contacts. The states reviewed each questionnaire to ensure that systems identified all of their needs and that the projects fulfilled the eligibility and documentation criteria. If these criteria were not met, the states had the option of contacting the system to obtain more information. EPA conducted a final review of each project and entered the information into a database. Web-based communications allowed the states to review the data, including any changes made by EPA. Using the project Web site, states could identify projects not meeting the established criteria and submit additional documentation of the project need or the cost to support a project.

Improvements for the 2003 Needs Assessment of Medium and Large Systems

Compared with the previous two assessments where EPA had a substantial role in data collection, the 2003 Needs Assessment placed the responsibility for collecting data primarily on the states. To assist states, EPA held 2-day training sessions at eight regional locations. These training sessions were designed to educate state coordinators, staff, and their contractors on the approach, available needs assessment tools, and documentation criteria. EPA also worked directly with each state in reviewing responses for the first five questionnaires to maintain consistency.

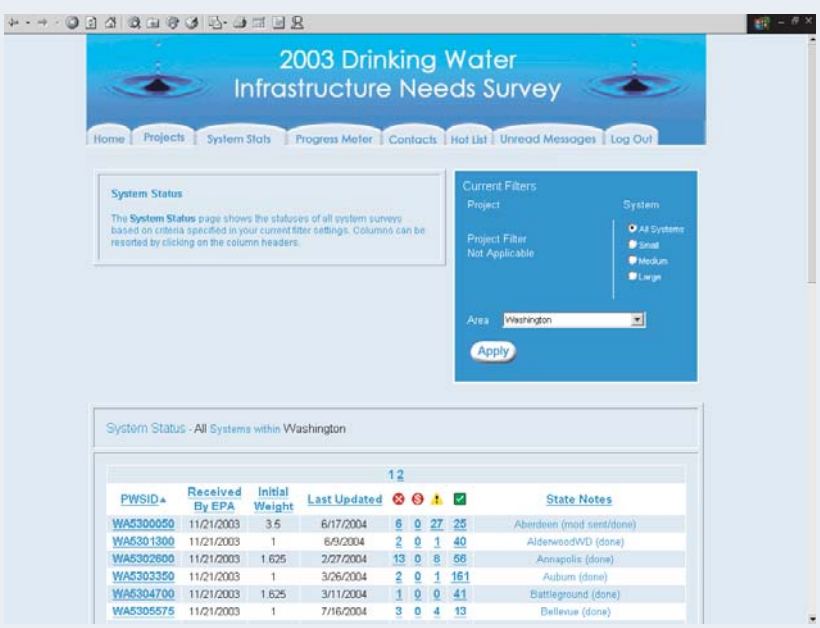
As an improvement over the 1999 questionnaire, the workgroup modified the design of the 2003 questionnaire to prompt systems to more thoroughly consider their entire infrastructure inventory and projects that might be needed over the next 20 years. The 2003 questionnaire asked the system about the length and diameter, or number and size, of major pieces of existing infrastructure. The questionnaire included tables to record the gross infrastructure inventory and asked follow-up questions to prompt the system to consider the 20-year need for rehabilitation or replacement of the infrastructure and whether it was adequate to meet the needs of existing consumers. The questionnaire provided examples of projects and acceptable documentation, and simplified the data collection format into three category-related tables—transmission and distribution; source, treatment, storage, pumping, and other; and backflow prevention devices/assemblies, flushing hydrants, service lines, valves, and water meters.

The workgroup reconsidered some policies that had been adopted for the 1999 Needs Assessment. Specifically, the workgroup decided that it was not necessary to require systems to identify ownership of backflow prevention devices or non-lead service lines. If the projects were identified as needs, the workgroup assumed that they were likely the responsibility of the public water system.

Advances in Internet technology prompted the development of an interactive Web site that allowed states and EPA to track survey progress and communicate questionnaire and project status updates. States were able to identify projects that required additional documentation and to respond to most issues via the Web site.

Another policy change was related to the eligibility of domestic water meter projects. In the 1999 Needs Assessment, systems were limited to metering currently unmetered systems or replacing meters that were currently malfunctioning. In 2003, recognizing the value of metering to water audits, conservation programs, and asset management, the workgroup allowed metering of unmetered systems and a single replacement of each existing meter over the 20-year assessment period. Under the new policy, the meter projects for large and medium systems accounted for $12.1 billion in need. This amount is included in the total transmission and distribution category of need.

For the 1999 Needs Assessment, if a project was categorized as a regulatory need, systems were required to include as part of their documentation a laboratory report showing an actual or imminent violation of a maximum contaminant level (MCL) or treatment technique requirement. For the 2003 Needs Assessment, the workgroup decided that an actual laboratory slip was not needed as part of the documentation.



The user-friendly Web site allowed EPA and states to communicate the status of the survey and projects submitted.

Method for Estimating the Small System, Not-for-Profit Noncommunity System, and American Indian and Alaska Native Village Need

Small Systems and Not-for-Profit Noncommunity Systems. Small systems serving 3,300 or fewer people and not-for-profit noncommunity systems generally lack the personnel and planning documents necessary to complete the questionnaire. Therefore, for the 1999 Needs Assessment, EPA conducted site visits to determine the infrastructure needs of these systems.

EPA believes that the needs captured from the site visits in 1999 represented a fair and complete assessment of these systems' 20-year needs. Findings from 1999 were very similar to the findings in 1995, indicating that system's needs did not change significantly over a 4-year period. Because there was a high level of confidence in the data obtained from the site visits, EPA decided that it could estimate 2003 needs by adjusting the 1999 needs to 2003 dollars. The total national small system need was then reallocated to each state based on the number of systems that existed in each stratum in 2003.

The 1999 not-for-profit noncommunity needs were likewise adjusted to 2003 dollars and assigned to each state's need.

American Indian and Alaska Native Village Needs. During the 1999 Needs Assessment EPA helped the American Indian and Alaska native village water systems complete their questionnaires.

- **American Indian Systems.** In 1999, all 19 medium-sized American Indian systems completed a questionnaire with technical support from EPA. The Agency conducted site visits at 78 randomly selected small systems to represent the 781 small American Indian systems.

- **Alaska Native Village Systems.** In 1999, questionnaires were mailed to the two medium-sized systems. For the 172 small systems, representatives from the Alaska Native Village Health Consortia, the IHS, and the Village Safe Water completed the questionnaires, with assistance from EPA.

Because of the high level of confidence in the findings from 1999, EPA did not survey these systems again in 2003. Instead, EPA adjusted the data from 1999 to 2003 dollars to estimate the 2003 needs for these systems.

Documented Costs and Cost Models

If systems had documented cost estimates for a given project, EPA converted these costs to January 1, 2003 dollars and applied the cost to the system's total need. If no costs were available, the questionnaire requested information about the project so that EPA could model a cost for the project. For example, if a system identified a need to replace a section of leaking pipe, but lacked cost documentation, the system supplied the length and diameter of pipe to be replaced. Based on this information, EPA modeled the cost for this project.

The number of projects submitted without cost documentation increased in 2003 compared with the previous assessments. Of the 105,000 accepted projects, 82 percent were submitted without costs. This increase resulted in a heavy reliance on cost modeling.

Acceptable Documentation

For Need and/or Cost Documentation:
- Capital Improvement Plan or Master Plan
- Facilities Plan or Preliminary Engineering Report
- Grant or Loan Application Form
- Engineer's Estimate

For Need Documentation Only:
- Intended Use Plan/State Priority List
- Indian Health Service Sanitary Deficiency System Report
- Comprehensive Performance Evaluation (CPE) Results
- Sanitary Survey
- Monitoring Results
- Other Need Document

For Cost Documentation Only:
- Cost of Previous Comparable Construction
- Other Cost Document (such as manufacturer's catalog costs)

In addition to developing requirements for documenting needs, the workgroup set rigorous documentation criteria for assessing the legitimacy and scope of project costs. If systems submitted project costs, there had to be documentation showing that the cost had undergone an adequate degree of professional review. These would have included Capital Improvement or Master Plans developed for the system by professional engineers, tabulations of bids received for a project developed by contracting firms, or costs of previously completed projects of comparable scope. Documentation had to be detailed enough that EPA could review all component costs included in the estimate. This enabled EPA to model portions of the project that had been omitted from a cost estimate, or to delete DWSRF-ineligible portions of the submitted cost (such as interest payments).

In general, EPA used the models developed from the 1999 Needs Assessment data and adjusted the 1999 data to 2003 dollars for the 2003 Needs Assessment. For the 1999 Needs Assessment, 59 models were developed to assign costs to infrastructure needs—from replacing broken valves to building new treatment plants. Most of the cost models were derived from projects that listed both cost estimates and modeling parameters. For some types of need, the 1999 Needs Assessment data proved inadequate for a statistically significant model. Therefore, for 19 of the models, EPA obtained cost data from additional sources—engineering firms and state DWSRF programs—to supplement data submitted by respondents.

For the 2003 Needs Assessment, EPA derived new models for transmission and distribution piping and meters. A new meter model was needed to accommodate improvements in standard technology. Since the 1999 Needs Assessment, the standard technology for domestic water meters changed from predominantly manual-read meters to radio-read meters. This new technology had a higher cost, so a new model was appropriate.

EPA also updated the cost models for transmission and distribution pipe based on cost information received from the 2003 Needs Assessment. These models had not been updated since the 1995 Needs Assessment. Because the transmission and distribution category represents the largest percentage of need, developing up-to-date models was a high priority.

Information Quality

The findings of the 2003 Needs Assessment are reinforced by adherence to EPA's Guidelines for Information Quality,[12] which implement the Data Quality Act for the Agency. Appendix C of this report contains more detail on information quality.

Quality Assurance. The most fundamental requirement for information quality is the Agency's Quality System. EPA implements the system on a project basis through the development of a quality assurance project plan (QAPP), the cornerstone of which is the definition of data quality objectives (DQOs). The Agency uses the results of this assessment to allocate DWSRF capitalization grants to states. Allocations are made on the basis of proportional state need for water systems eligible for DWSRF funding. Therefore, this project (like those that preceded it in 1995 and 1999) sought to maximize the accuracy of the state-level estimates of infrastructure needs. Decisions about precision levels were also established by a state/EPA workgroup that met regularly during the 2003 Needs Assessment.

Many water systems are improving the efficiency and accuracy of water usage data collection by replacing old and outdated water meters with new radio-read meters. Hand-held radio meter units communicate with the meter transmitter from a remote location, such as a vehicle. This dramatically reduces labor hours needed to collect water usage data.

[12] U.S. Environmental Protection Agency, "Guidelines for Ensuring and Maximizing the Quality, Objectivity, and Integrity of Information Disseminated by the Environmental Protection Agency," EPA/260R-02-008 (October 2002).

Accuracy was maximized through the following steps. First, since this was a sample survey, the workgroup established targets for precision of estimates (acceptable sampling error). These decisions shaped sample design. Second, EPA used quality assurance (QA) procedures from the QAPP to ensure that "eligible infrastructure" was clearly defined and that documentation standards were rigorously enforced. For a project to be included in the 2003 Needs Assessment, systems and states had to submit documentation describing the purpose and scope of the project for each need. The documentation was reviewed by EPA to determine if each project submitted for the 2003 Needs Assessment met the eligibility criteria for DWSRF funding and allowability criteria set for the 2003 Needs Assessment. The workgroup established the documentation requirements so that uniform criteria were applied to all questionnaires. These requirements not only lend credibility to the findings, but also address the issue of fairness when the results are used by EPA to apportion DWSRF funds.

Of the 128,600 projects submitted to the survey, EPA deleted 18 percent that failed to meet the documentation criteria, or appeared to be ineligible for DWSRF funding. Some projects were adjusted to correct a variety of measurement problems: overlaps between two projects (raising the issue of double-counting), inconsistency with project documentation, and use of overly aggressive infrastructure life cycles by states where system planning documents were not used or available.

To adjust for the use of aggressive infrastructure life cycles, EPA made technical adjustments to individual projects based on engineering literature and benchmarks of engineering practices. The Agency tailored adjustments to the unique assumptions implemented by each state and then negotiated with state officials. EPA's general direction of these adjustments was to place a cap on the state's assumptions about the rate of rehabilitation and replacement of pipe, unless there was project-specific documentation of a need provided by the water system.

Other subjects discussed in the QAPP were: training and certification of staff working on data collection and evaluation; standards for questionnaire design and survey implementation; procedures for manual editing, coding, and data entry; automated data validation; database quality assurance; tabulation quality assurance; and QA for report preparation.

Transparency and Reproducibility. EPA's Guidelines on Information Quality explain that influential information (such as this report) "should be subject to a higher degree of quality (for example, transparency about data and methods). Such

Quality Assurance

The 2003 Needs Assessment followed the Agency's Guidelines for Ensuring and Maximizing Information Quality (2002). EPA's goal for these guidelines is to ensure the quality, objectivity, utility, and integrity of information disseminated by the Agency. These guidelines are particularly important for projects such as the 2003 Needs Assessment, which influences public policy decisions.

The 2003 Needs Assessment workgroup implemented the guidelines through quality assurance and reproducibility of its results. Also, given the influential nature of the report, EPA ensured a high degree of transparency regarding data, assumptions, analytic methods, and statistical procedures.

For more information on quality assurance, see Appendix C. For more information on data, assumptions, analytic methods, and statistical procedures, see Appendix B.

transparency facilitates reproducibility of this information, and reproducibility should meet commonly accepted standards.”

The 2003 Needs Assessment (like those in 1995 and 1999) maintained high standards of transparency. For example, all decisions about the study approach, analytical methods, cost models, and statistical methods, were presented to the workgroup for their review. All data collected by this study were made available on-line to state experts for their review and comment.

Appendix B contains information on the statistical methods and cost modeling procedures that were used in the preparation of this report. Given this information, and access to the database, any qualified third party could reproduce the results of this assessment.

FINDINGS

The 2003 Drinking Water Needs Survey and Assessment estimated the capital investment needs of the nation's approximately 53,000 community water systems and 21,400 not-for-profit noncommunity water systems. Appendix D provides greater detail of the need by state.

Total 20-Year National Need

The 2003 Needs Assessment indicates that community water systems and not-for-profit noncommunity water systems need $276.8 billion over the next 20 years to install, upgrade, and replace infrastructure. For the 2003 Needs Assessment, states were required to present documentation that described the purpose and scope of each project. In general, infrastructure projects were acceptable if they were needed to protect public health or to maintain the delivery of potable water to homes. Such projects varied greatly in scale, complexity, and cost—from rehabilitating a small storage tank to constructing a high-capacity water treatment plant for a large metropolitan area. EPA excluded projects solely for future growth, fire flow, and general operation and maintenance needs.[13] However, EPA included projects to rehabilitate or replace significant components of deteriorated infrastructure because they were not considered operation and maintenance.

The estimate of total national need represents all community water systems and not-for-profit noncommunity water systems in the states, Puerto Rico, the Virgin Islands and the Pacific island territories, District of Columbia, American Indian communities, and Alaska native villages.

Exhibit 1 shows the total national need by system size and type, and by current and future need. The nation's 1,041 largest community water systems (serving more than 50,000 people) account for $122.9 billion, or 44 percent of the total need. Medium and small community water systems have needs of $103.0 billion and $34.2 billion, respectively. These figures include the needs for small, medium, and large systems in the Pacific island territories and Virgin Islands, which are $509.1 million and $172.6 million, respectively. Not-for-profit noncommunity water systems have $3.4 billion in estimated needs. The American Indian and Alaska native village system needs total $2.5 billion: American Indian water systems need $1.3 billion in infrastructure improvements, and Alaska native villages need $1.2 billion.

Because public water systems are not expected to have accurate estimates of their capital needs for proposed or recently promulgated regulations, EPA used capital costs from Economic Analysis documents for the rules to estimate those needs. Proposed or recently promulgated regulations account for $9.9 billion of the total national need. In addition, the need for compliance with the recently promulgated Arsenic Rule is $1.0 billion. This includes the cost of compliance for water systems in the states ($947.4 million) as well as water systems serving American Indian communities and Alaska native villages ($14.7 million).

Most of the infrastructure needs in the assessment represent projects that systems would address as preventive measures to ensure the continued provision of safe drinking water rather than as corrective actions to address an existing violation of a drinking water standard. EPA recognized that the majority of the total national need stems from the inherent costs of producing and delivering water—which involves an ongoing need to install, upgrade, and replace the basic water system infrastructure.

[13] Projects solely for operation and maintenance, dams, reservoirs, future growth, and fire flow are generally ineligible for DWSRF assistance.

Exhibit 1: Overview of Needs by System Size and Type (in billions of January 2003 dollars)

System Size and Type	Current Need	Future Need	Total Need	Number of Systems[1]
Large Community Water Systems (serving over 50,000 people)[2]	$80.7	$42.1	**$122.9**	**1,041**
Medium Community Water Systems (serving 3,301 to 50,000 people)[2]	$56.4	$46.6	**$103.0**	**7,638**
Small Community Water Systems (serving 3,300 and fewer people)[2,3]	$24.4	$9.8	**$34.2**	**43,039**
Costs Associated with the recently promulgated Arsenic Rule[4]		$0.9	**$0.9**	
Not-for-profit Noncommunity Water Systems[5]	$1.2	$2.2	**$3.4**	**21,400**
American Indian and Alaska Native Village Water Systems[5,6]	$2.3	$0.2	**$2.4**	**974**
Subtotal National Need	**$165.0**	**$101.8**	**$266.8**	
Costs Associated with Proposed and Recently Promulgated Regulations (Taken from EPA Economic Analyses)		$9.9	**$9.9**	
Total National Need	**$165.0**	**$111.8**	**$276.8**	

Note: Numbers may not total due to rounding.

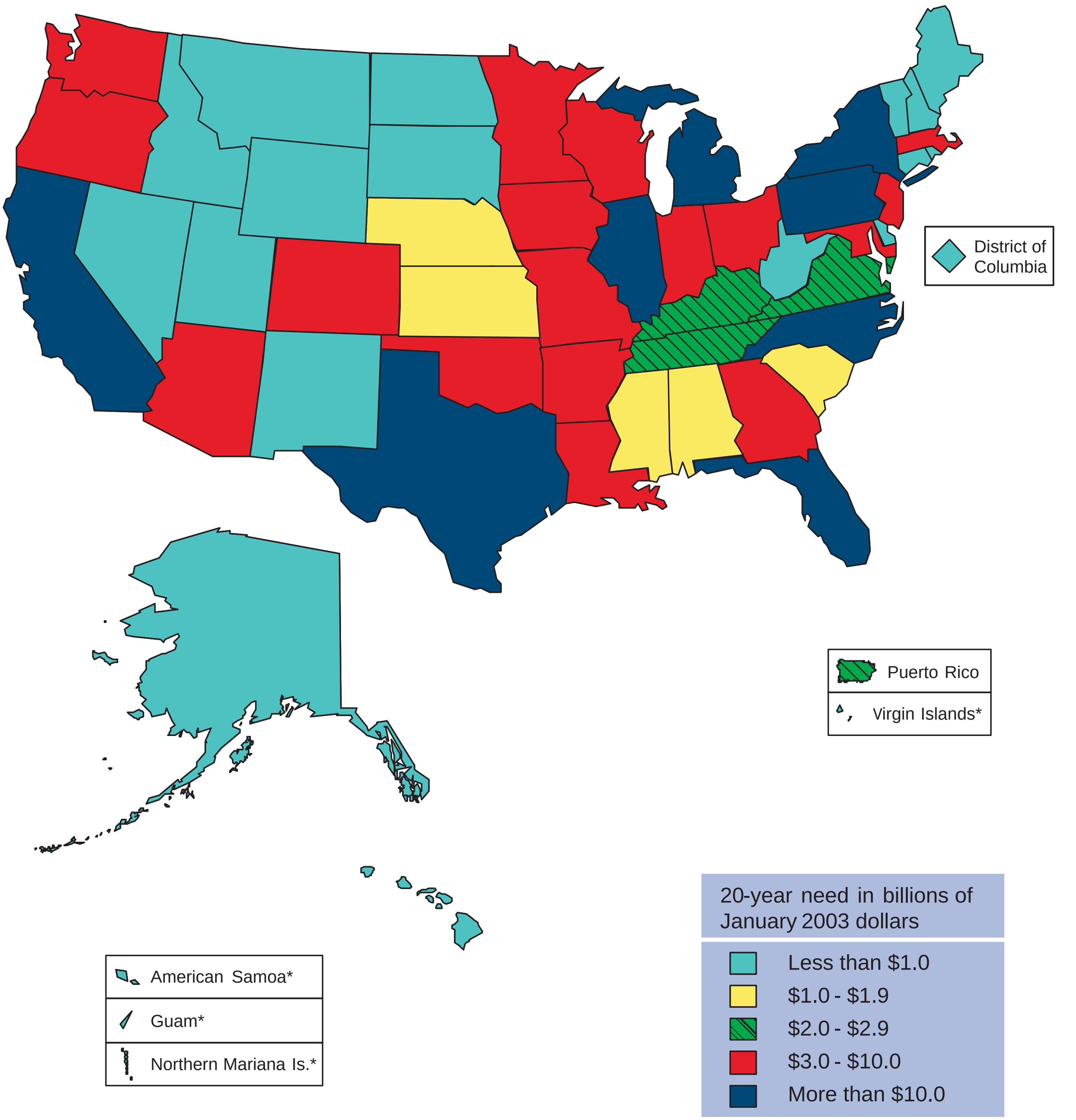
[1] Number of large, medium, and small systems is determined from the 2003 Needs Assessment sample frame. Number of not-for-profit, American Indian, and Alaska native village systems is determined from the 1999 Needs Assessment sample frame. The numbers in the 2003 Needs Assessment may differ from the Safe Drinking Water Information System (SDWIS) due to changes in system inventories and the way the 2003 Needs Assessment classifies some systems (i.e., systems that serve Alaska native villages are classified in SDWIS as small systems, but are classified in the 2003 Needs Assessment as Alaska native village water systems).
[2] Does not include the costs associated with the recently promulgated Arsenic Rule and proposed or recently promulgated SDWA regulations; these costs are included on a separate line in this table.
[3] 1999 Needs Assessment findings adjusted to January 2003 dollars and reallocated based on 2003 inventory of small systems.
[4] Does not include costs for American Indian and Alaska native village water systems to comply with the recently promulgated Arsenic Rule; these costs are incorporated in the estimate for American Indian and Alaska native village water systems.
[5] 1999 Needs Assessment findings adjusted to January 2003 dollars.
[6] Includes cost for compliance with the recently promulgated Arsenic Rule.

Exhibit 2 provides an overview of the needs by state. Appendix D provides a more complete breakdown of needs for each state.

Current and Future Needs

Of the total national need, $165.0 billion are for current needs. Although most systems have current needs, this does not preclude their delivery of safe drinking water to their customers. Rather, many current needs are preventive projects to avoid water quality problems. For example, a system may conclude that some of its 50-year-old pipe is deteriorated. Although the system is in compliance with all regulations, the condition of the pipe makes compliance with the Total Coliform Rule difficult, and occasional breaks may cause interruptions in service.

Exhibit 2: Overview of Needs by State



Includes need for the recently promulgated Arsenic Regulation. Does not include needs for American Indian and Alaska native village water systems.

*The needs for American Samoa, Guam, the Northern Mariana Islands, and the Virgin Islands are less than $1 billion each.

The size of current need reflects the age and deteriorated condition of the nation's infrastructure. Many water systems were constructed 50 to 100 years ago. Some systems have adopted a reactive approach to capital investment that involves replacing or upgrading infrastructure only as it fails. For example, a system may fix leaks in the distribution system, rather than invest in rehabilitation or replacement. A more pro-active approach of planned rehabilitation or replacement should prove less costly over the long run and reduce the likelihood of emerging risks to public health.

Future needs account for $111.8 billion of the total need. Future needs are projects that are not currently necessary. Nevertheless, systems will need to undertake these projects during the 20-year period of the assessment to ensure the continued provision of safe drinking water. Future needs address components of a water system that operate adequately now, but will exceed their design life or performance capabilities within the next 20 years. For example, a recently constructed storage tank operates adequately now, but based on historic trends, the system knows that the tank will require some major rehabilitation within the next 20 years.

Total Need by Project Type

Infrastructure needs of water systems can be grouped into four major categories based on project type–source, transmission and distribution, treatment, or storage—each of which fulfills an important function in delivering safe drinking water to the public. Most needs were assigned to one of these categories. An additional "other" category is comprised of projects that do not fit into one of the four categories. Examples are system-wide security or computer controls. Exhibit 3 shows the total national need by water system size and type and by project type.

Transmission and Distribution Needs. Transmission and distribution projects represent the largest category of need (two-thirds of the total need), $183.6 billion over the next 20 years. Of this total, $120.0 billion is identified as current needs. Although the least visible component of a public water system, the buried pipes of a transmission and distribution network generally account for most of a system's capital value. It is not uncommon for even medium-sized systems to have several hundred miles of pipe. Little of this $183.6 billion is related to any federal mandate. Projects are typically driven by the utilities' need to install and maintain distribution systems to provide potable water to their customers while preventing contamination of that water prior to delivery.

Industry benchmarks indicate that although most systems address less than 1 percent of their existing pipe per year, an aggressive program would provide for replacement or rehabilitation of as much as 1 to 2 percent of a system's total pipe per year.

Transmission and distribution projects include replacing aging and deteriorated water mains, refurbishing pipes to remove build-up on pipe walls, looping dead-end mains to avoid stagnant water, installing water mains in areas where homes do not have a safe and adequate supply, and installing pumping stations to maintain adequate pressure. This category also includes projects to address the replacement of appurtenances, such as valves that are essential for controlling flows and isolating problem areas during

Insituform Technologies, Inc.

Pipebursting is an effective way to upgrade deteriorated pipe. A pneumatic bursting head is attached to new pipe and threaded through the old pipe. As it passes through the old pipe, the bursting head destroys the old pipe, compacting it into the surrounding soil—making room for the new pipe of the same or even larger diameter. Pipebursting is a preferred method of pipe upgrade since it is semi-trenchless and minimizes disruption to streets, homes, and businesses in the area.

repairs, hydrants to flush the distribution system to maintain water quality, and meters to record flow.

Replacing or refurbishing transmission and distribution mains is critical to providing safe drinking water. Failures in transmission and distribution lines can interrupt the delivery of water and possibly allow backsiphonage of contaminated water. Deteriorated distribution mains can pose acute health risks by providing an environment in which bacteria will grow.

The rate at which pipe requires replacement or rehabilitation varies greatly by the age of the pipe, soil characteristics, weather conditions, construction methods, and pipe material. Systems that have neglected to rehabilitate or replace mains may have more aged infrastructure, and therefore a higher level of need.

In addition, some pipe materials have not stood the test of time. Galvanized pipe is particularly susceptible to corrosion in certain soils. Unlined cast

Exhibit 3: Total Need by Project Type (in millions of January 2003 dollars)

System Size and Type	Distribution and Transmission	Treatment	Storage	Source	Other	Total Need
Large Community Water Systems (serving over 50,000 people)[1]	$89,779.9	$20,091.3	$6,994.5	$4,715.8	$1,270.2	**$122,851.7**
Medium Community Water Systems (serving 3,301 to 50,000 people)[1]	$73,454.4	$14,906.2	$9,473.3	$4,392.8	$790.9	**$103,017.4**
Small Community Water Systems (serving 3,300 and fewer people)[1, 2]	$18,624.3	$6,164.1	$6,263.8	$2,871.0	$248.3	**$34,171.5**
Costs Associated with the Recently Promulgated Arsenic Rule[3]		$947.4				**$947.4**
Not-for-profit Noncommunity Water Systems[4]	$425.3	$670.2	$1,620.3	$681.0	$0.8	**$3,397.5**
American Indian and Alaska Native Village Water Systems[4, 5]	$1,347.3	$462.2	$490.3	$135.1	$13.6	**$2,448.5**
Subtotal National Need	**$183,631.1**	**$43,241.4**	**$24,842.2**	**$12,795.6**	**$2,323.7**	**$266,834.1**
Costs Associated with Proposed and Recently Promulgated Regulations (Taken from EPA Economic Analyses)		$9,927.4				**$9,927.4**
Total National Need	**$183,631.1**	**$53,168.8**	**$24,842.2**	**$12,795.6**	**$2,323.7**	**$276,761.5**

Note: Numbers may not total due to rounding.

[1] Does not include the costs associated with the recently promulgated Arsenic Rule and proposed or recently promulgated SDWA regulation; these costs are included on a separate line in this table.
[2] 1999 Needs Assessment findings adjusted to January 2003 dollars and reallocated based on 2003 inventory of small systems.
[3] Does not include costs for American Indian and Alaska native village water systems to comply with the recently promulgated Arsenic Rule; these costs are incorporated in the estimate for American Indian and Alaska native village water systems.
[4] 1999 Needs Assessment findings adjusted to January 2003 dollars.
[5] Includes cost for compliance with the recently promulgated Arsenic Rule.

iron pipe and ductile iron pipe are susceptible to internal corrosion. Furthermore, health concerns associated with asbestos make asbestos cement pipe undesirable. Many water suppliers are systematically removing these types of mains and replacing them with ductile iron or polyvinyl chloride (PVC).

Treatment Needs. The total 20-year need for treatment is $53.2 billion, of which $23.7 billion are current needs. This category includes the installation or rehabilitation of infrastructure to reduce contamination through, for example, filtration, disinfection, corrosion control, and aeration. Since the majority of the capital costs for proposed and recently promulgated regulations are related to treatment, these costs also are included in this category. Treatment facilities vary significantly in scale depending on the quality of source water and type of contamination. Treatment systems range from a simple chlorinator for disinfection to a complete conventional treatment system with coagulation, flocculation, sedimentation, filtration, disinfection, laboratory facilities, waste handling, and computer automated monitoring and control devices.

> The workgroup developed 47 different treatment codes for the 2003 Needs Assessment to identify the specific type of treatment being employed by a system. This ensured that the cost of the project was modeled appropriately if costs were not provided.

Treatment technologies primarily address two general types of contaminants: those with acute health effects and those with chronic health effects.

An acute health effect usually occurs within hours or days of short-term exposure to a contaminant. Acute illnesses are associated mostly with microbial contaminants, although some chemical contaminants, such as copper and nitrate, also can cause acute health effects. Gastrointestinal illness resulting from the ingestion of microbial pathogens is the most common acute health effect.

Chronic health effects develop typically after long-term exposure to low concentrations of chemical contaminants. Examples of these effects include cancer and birth defects. The largest need associated with contaminants that pose chronic health effects is treatment for lead. Research has shown that exposure to lead may impair the mental development of children and cause other chronic health effects such as high blood pressure.

The treatment category also includes projects to remove contaminants that adversely affect the taste, odor, and color of drinking water. Treatment for these “secondary contaminants” often involves softening the water to reduce magnesium and calcium levels or applying chemical sequestrants for iron and/or manganese contamination. Although not a public health concern, the aesthetic problems caused by secondary contaminants may prompt some consumers to seek more palatable, but less safe or more expensive, sources of water.

Storage Needs. The total 20-year need for storage projects is $24.8 billion, $12.9 billion of which are current needs. This category includes projects to construct or rehabilitate finished water storage tanks.

A water system with sufficient storage can provide an adequate supply of treated water to the public even during periods of peak demand. The system can sustain the minimum pressure required to prevent the intrusion of contaminants into the distribution network. Moreover, many states require that systems have the storage capacity to provide a 1- to 2-day supply of water in the event of an emergency, such as a water source being temporarily unusable.

Source Needs. The total 20-year need for source water infrastructure is $12.8 billion. Of this total, $6.7 billion are current needs. The source category includes needs for constructing or rehabilitating surface water intake structures, raw water pumping facilities, drilled wells, and spring collectors.

Drinking water is obtained from either ground water or surface water sources. Wells are typically considered ground water sources; rivers, lakes, other open bodies of water, and wells under direct influence of surface water are considered surface water sources. Whether drinking water originates from ground or surface water sources, its raw water quality is an important component in protecting public health. A high quality water supply can minimize the possibility of microbial or chemical contamination and may not require expensive treatment facilities. Many source water needs involve construction of new surface water intake structures or drilling new well fields to obtain improved raw water quality.

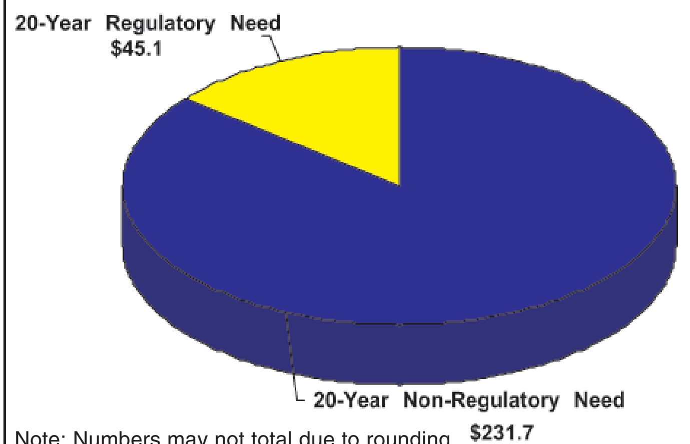
A water source should also provide enough water under all operating conditions to enable the water system to maintain minimum pressures, even at peak flows. Low water pressure may result in the intrusion of contaminants into the distribution system through backsiphonage. The 2003 Needs Assessment includes projects to expand the capacity of intake structures and add new wells to address supply deficiencies.

Other Needs. Needs not included in the previous categories are labeled "other" needs. These needs account for $2.3 billion of the total 20-year need. Examples of "other" projects include system-wide telemetry or Supervisory Control and Data Acquisition (SCADA), and system-wide security measures.

The Regulatory Need

As shown in Exhibit 4, 16 percent of the total national need, or $45.1 billion, is for compliance with current, new, and proposed SDWA regulations. Although all of the projects in the 2003 Needs Assessment are needed to attain or maintain compliance with the SDWA regulations and goals, most are driven by the need to provide an essential service—potable water—to the utility's customers. However, some of the projects are directly attributable to specific regulations under SDWA. These projects are collectively referred to as the "regulatory need." Most of the regulatory need involves the upgrade, replacement, or installation of treatment technologies.

Exhibit 4: 20-Year Total Regulatory and Non-Regulatory Need (in billions of January 2003 dollars)



Note: Numbers may not total due to rounding.

The total regulatory need is divided into two broad categories: existing SDWA regulations ($35.2 billion), and recently promulgated or proposed regulations ($9.9 billion). Exhibit 5 displays the regulatory need by type of existing regulation. For reporting purposes, the recently promulgated Arsenic Rule is included in the existing regulations section because the total need has been distributed amongst the states.

Proposed or Recently Promulgated Regulatory Needs. The total need to comply with proposed or recently promulgated regulations is $9.9 billion. Of the total, $3.2 billion is to address microbial contaminants that have acute health effects. The total costs of these regulations are included in the 2003 Needs Assessment as future regulatory needs.

The regulations included in this category are the Stage 1 and Stage 2 Disinfectants/Disinfection Byproducts Rules (Stage 1 and Stage 2 DBPR), the Radon Rule, the Ground Water Rule, the Filter Backwash Recycling Rule (FBRR), the Long Term 1

Exhibit 5: 20-Year Regulatory Need (in billions of January 2003 dollars)

Regulations	Total Need
Existing SDWA Regulations	
Interim Enhanced Surface Water Treatment Rule and Surface Water Treatment Rule[1]	**$27.5**
Total Coliform Rule[1]	**$2.6**
Nitrate/Nitrite Standard[1]	**$0.5**
Costs Associated with the Recently Promulgated Arsenic Rule	**$1.0**
Lead and Copper Rule	**$2.0**
Total Trihalomethanes Standard	**$0.2**
Other Regulations[2]	**$1.3**
Subtotal National Need	**$35.2**
Costs Associated with Proposed and Recently Promulgated Regulations (Taken from EPA Economic Analyses)[3]	**$9.9**
Total National Need	**$45.1**

Note: Numbers may not total due to rounding.

[1] Regulations for contaminants that cause acute health effects.
[2] Includes regulated Volatile Organic Chemicals (VOCs), Synthetic Organic Chemicals (SOCs), Inorganic Chemicals (IOCs), and Radionuclides.
[3] 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 $9.9 billion need, the 2003 Needs Assessment used EPA's lead option, unless one was not available, in which case the 2003 Needs Assessment used the highest estimate. These estimates include only the capital costs (i.e., excludes operation and maintenance costs). Costs for the recently promulgated Arsenic Rule are not included in this category.

and Long Term 2 Enhanced Surface Water Treatment Rules (LT1ESWTR and LT2ESWTR), and the Radionuclides Rule. Capital cost estimates for each of these rules are provided in Exhibit D-9. EPA derived the estimates from the Economic Analysis (EA) that the Agency published when proposing each regulation, or from the final EA (if the regulation has been promulgated).

In general, water systems can readily identify the infrastructure needs required for compliance with existing regulations, but most systems have not yet determined the infrastructure needed to comply with future or recently promulgated regulations. Therefore, relying on systems to report the costs of future or recently promulgated regulations would significantly understate the true need. Because of this, EPA relied on EAs to estimate these compliance costs.

However, since the EAs rely on regional data, they are not good predictors of state-specific needs. Therefore, the costs associated with the proposed or recently promulgated regulations other than the new arsenic standard are allocated at a national level, not apportioned to each state.[14]

Existing Regulations

Microbial Contaminants. The Surface Water Treatment Rule (SWTR), the Interim Enhanced Surface Water Treatment Rule (IESWTR) and the Total Coliform Rule (TCR) are SDWA regulations that address microbial contamination. Projects directly attributable to these regulations account for $30.2 billion, or 86 percent of the total existing regulatory need. (Note: Numbers may not total due to rounding.)

The SWTR and the IESWTR account for almost all of the microbial contaminant-related need and most of the total regulatory need. This reflects the fact that the majority of the nation's large municipal systems use surface water sources. Under these regulations, all systems using surface water sources must provide treatment to minimize microbial contamination. In most cases, this means installing filtration plants to remove and inactivate microbial pathogens, such as the bacterium *E. coli*, the virus Hepatitis A, and the protozoan *Giardia lamblia*. Projects associated with

[14] See the section in Appendix B, "Estimating Costs for Proposed and Recently Promulgated Regulations," for a more detailed discussion.

Many water sources in the nation have arsenic levels above the future regulatory limit of 0.010 milligrams per liter (mg/L). To meet the more stringent arsenic regulation, the pilot plant shown is examining adsorptive and specialty media for optimal arsenic removal.

these regulations also include rehabilitating and upgrading existing treatment facilities. Disinfection for compliance with the IESWTR and the SWTR would also protect the system from TCR violations.

Chemical Contaminants. Existing SDWA regulations to minimize chemical contamination accounts for $5.0 billion of the total regulatory need. This estimate includes projects attributable to the Nitrate/Nitrite Standard, the recently promulgated Arsenic Rule, the Lead and Copper Rule, the Total Trihalomethanes Standard, and other regulations that set MCLs or treatment techniques for organic and inorganic chemicals. Examples of projects include aerating water to remove volatile organic compounds, such as tetrachloroethylene, and applying corrosion inhibitors to reduce the leaching of lead from pipes in home plumbing. This category includes regulation of more than 80 inorganic or organic chemicals for which infrastructure projects may be needed.

Most chemical contaminants are associated with chronic health effects such as cancer, reproductive difficulties, and liver or kidney problems. However, nitrate levels above the health-based standard can cause an acute illness, known as “blue baby syndrome,” a condition in which infants are deprived of oxygen in the bloodstream. Also, excessive copper levels can induce acute gastrointestinal illness.

Security Needs

Since the September 11th tragedy, there has been a concentrated national focus on our vulnerabilities, and water systems are no exception. The Public Health Security and Bioterrorism Preparedness and Response Act of 2002 requires any community water system that serves more than 3,300 people to prepare a Vulnerability Assessment. Systems serving at least 50,000 people should have completed the vulnerability assessments during the data collection period of the 2003 Needs Assessment.

Current and Future Regulatory Needs

Of the $45.1 billion total regulatory need, $21.0 billion is the current need for attaining and maintaining compliance with existing regulations. Most water systems with current regulatory needs are currently not in violation of any health-based standards. Rather, these systems identified needs that would enable them to continue to maintain compliance with existing regulations. Water systems also identified projects for future regulatory needs, such as projects that are largely due to the routine rehabilitation or replacement of infrastructure. For example, most conventional filtration plants require the refurbishment of pumps, filters, chemical feed units, and other components within a 20-year period. All of the costs associated with the proposed or recently promulgated regulations are included as future regulatory needs.

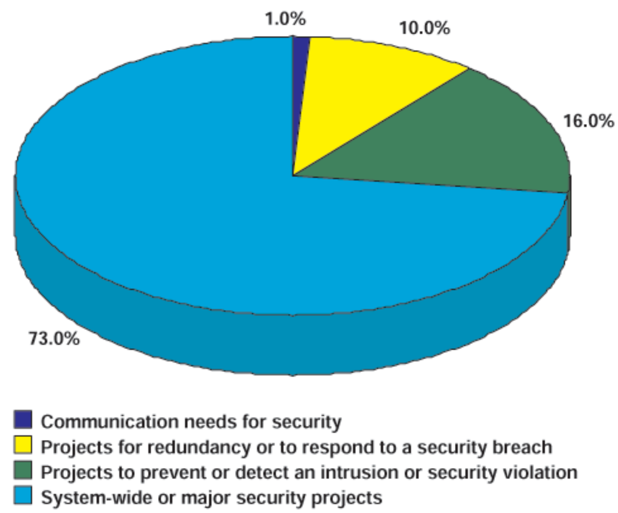
Although water systems have begun to identify their security needs, responses indicate that in 2003 many did not yet have a complete grasp of these needs or their costs. States reported that systems had difficulty in determining security needs because many were in the process of developing their vulnerability assessments, but had not yet completed their comprehensive review.

Despite these limitations, the 2003 Needs Assessment represents some information on security needs from medium and large water systems, and EPA did receive a substantial response from larger metropolitan utilities regarding their security needs. Of the total national need, $1.0 billion was identified as having security as at least one reason for the need. The 2003 Needs Assessment put security projects into five categories. Exhibit 6 provides the breakdown of the total security need into these categories:

- System-wide or major security projects
  — For security reasons, systems could not reveal detail
- Projects to prevent or detect an intrusion or security violation
  — Fencing, lighting, cameras
- Projects for redundancy or to respond to a security breach
  — Generators, parallel pipelines, redundant tanks
- Communication needs for security
  — System Control and Data Acquisition (SCADA) or telemetry
- Projects to address public health and safety issues
  — Changing from gas to liquid chlorine

In addition, many other projects included a component of security as part of a large project. An example is inclusion of a security fence in the description of a project for construction of a new treated water storage tank. The costs for the fence are included in the total national need as a part of the specific project's need; they were not allocated separately to security. The costs of all security components are therefore not included in the totals shown in Exhibit 6.

Exhibit 6: Security Needs by Project Type (Percentage of $1 billion Security Need)



The percentage of security needs attributed to projects to address safety issues was less than 0.5 percent and therefore not represented in this chart.

Understandably, many systems were reluctant to provide much specificity regarding their security plans. EPA therefore required no explicit description of the projects. Most major metropolitan areas, however, did report some security-related needs.

Vulnerability assessments and identification of security needs are rapidly evolving. In the future, it is likely that the industry will adopt security measures that address these vulnerabilities, including the development of new technology for improved surveillance as well as for detection of security breaches. In the longer term, security measures will become more fully incorporated into the capital costs for major infrastructure improvements.

With increased security awareness, the total national security need could rise significantly in the future. Fencing, security cameras and closed circuit television, and well housing are all common first generation security needs. In the future, these items will likely be included in the cost of building new facilities.

Community Water Systems Serving 10,000 and Fewer People

The 2003 Needs Assessment estimates for systems serving fewer than 10,000 people represent $72 billion or 28 percent of the total national need for community water systems regulated by the states. In approximately one-third of the states, these systems' needs comprise over 50 percent of the state's total need. Exhibit E-1 presents the 20-year needs for systems serving 10,000 people and fewer by state.

> The SDWA requires that states use at least 15 percent of their DWSRF funding for financial assistance to water systems serving populations of 10,000 or less. Through FY2003, states had allocated 40 percent of their assistance to those systems.

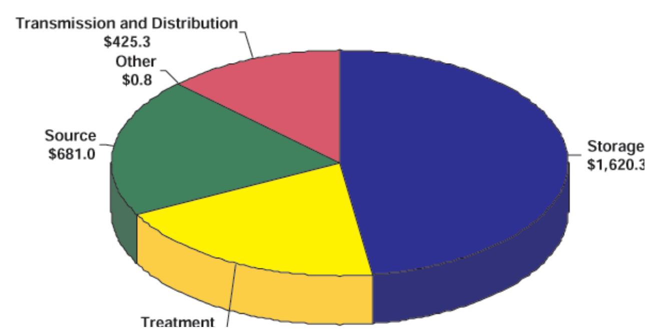
Systems serving 10,000 people and fewer face considerable economic challenges in delivering safe drinking water to their consumers. The substantial capital investments required to rehabilitate, upgrade, or install infrastructure represent one such challenge.

Small systems lack the economies of scale that allow larger systems to spread the costs of capital improvements among their many consumers. For example, the installation of a new 1.0 million gallons per day (MGD) conventional treatment plant designed to serve a community of 5,000 people may cost approximately $2.5 million or $500 per person, whereas a 20 MGD plant serving 150,000 people may cost $30 million but will cost $200 per person. The cost per household is substantially higher for the smaller community. Moreover, larger systems are usually able to purchase material in quantities that result in significant savings.

Not-for-Profit Noncommunity Water Systems

EPA adjusted the 1999 Needs Assessment results to January 2003 dollars to determine the estimate of need for not-for-profit noncommunity water systems. These systems need to invest $3.4 billion in infrastructure improvements over the next 20 years. Of this total, $1.2 billion is identified as current needs to ensure the continued protection of public health. Exhibit 7 presents the not-for-profit noncommunity need by project type. In comparison to community

Exhibit 7: Total 20-Year Need for Not-for-Profit Noncommunity Water Systems by Project Type (in millions of January 2003 dollars)



water systems, noncommunity water systems typically have limited distribution networks; therefore, a higher percentage of their needs are storage needs.

The needs of not-for-profit noncommunity systems comprise a small proportion of the total national need. This reflects the limited infrastructure required for a noncommunity system. In spite of their modest contribution to the total national need, noncommunity water systems are important. Approximately half of the nontransient[15] noncommunity systems are schools and daycare centers serving water to sensitive populations. For this reason, the Agency believes that investing in the infrastructure of these systems is an important contribution to public health.

American Indian and Alaska Native Village Water System Need

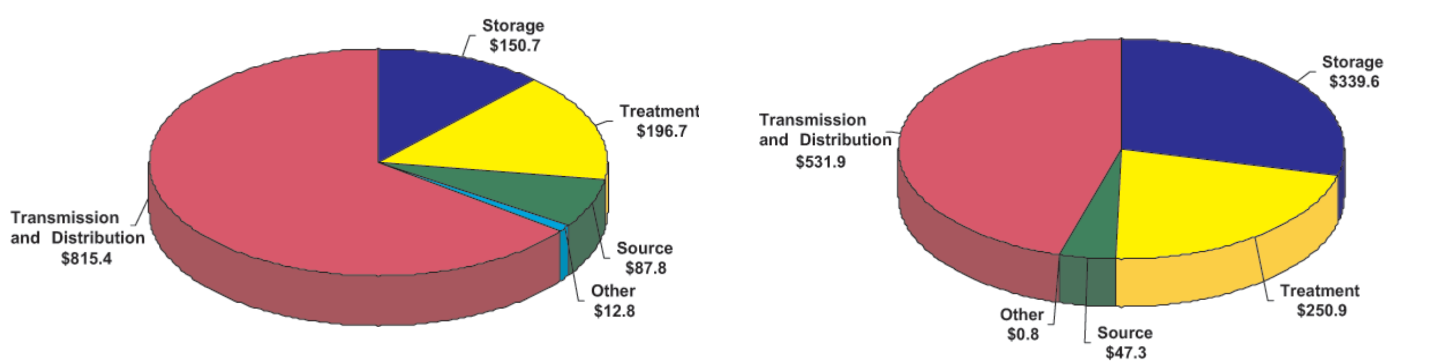
Because of the effort made in the 1999 Needs Assessment, and the high confidence level in the data from that effort, EPA did not resurvey the American Indian and Alaska native village water systems for the 2003 Needs Assessment. Instead, the need established in 1999 was adjusted to 2003 dollars and used as an estimate for the 2003 need.

According to the 2003 Needs Assessment, the American Indian and Alaska native village water systems need to invest an estimated $2.4 billion in capital improvements over the next 20 years. Of this total, $2.3 billion is identified as current needs to ensure the continued provision of safe drinking water. Exhibit 8 presents the total need by project type for American Indian and Alaska native village systems.

> The 2003 Needs Assessment indicates that of the estimated $2.4 billion total needs, American Indian water systems need to invest $1.3 billion and Alaska native village water systems need to invest $1.2 billion in capital improvements. (Note: Numbers do not total due to rounding.) EPA estimates that American Indian and Alaska Native water systems will need to invest $14.7 million to comply with the recently promulgated Arsenic Rule.

Exhibit 8: Total American Indian and Alaska Native Village Water System Need by Project Type (in millions of January 2003 dollars)

American Indian Water System Need **Alaska Native Village Water System Need**



Note: Numbers may not total due to rounding.

[15] There are two types of noncommunity water systems: those that serve transient populations (e.g., restaurants, roadside rest areas) and those that serve the same populations more than 6 months of the year (e.g., schools, factories, and office buildings). The second type are called “nontransient” noncommunity systems.

For American Indian systems, the widely dispersed and remote location of many communities and the limited availability of water resources are among the logistical challenges that account for high per-household needs. Alaska native village water systems face higher costs because of their remote arctic locations and the unique design and construction standards required in permafrost conditions.

Exhibit 9: Total 20-Year Need by Project Type for American Indian Water Systems (in millions of January 2003 dollars)

Categories of Need	Current Need	Future Need	Total Need
Distribution and Transmission	$758.5	$56.8	**$815.4**
Treatment	$172.4	$24.3	**$196.7**
Storage	$116.6	$34.1	**$150.7**
Source	$71.1	$16.7	**$87.8**
Other	$12.8	$0.0	**$12.8**
Total Need	**$1,131.4**	**$131.9**	**$1,263.3**

Note: Numbers may not total due to rounding.

American Indian water system needs were adjusted from 1999 Needs Assessment findings to January 2003 dollars.

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

American Indian Water System Needs

The total 20-year need for American Indian systems is $1.3 billion. Of this total, approximately $1.1 billion is identified as current needs to provide safe drinking water. Exhibit 9 presents the total need by project type for American Indian systems. Exhibit D-6 presents the American Indian need by EPA Region.

Alaska Native Village Water System Needs

The total 20-year need for Alaska native village systems is $1.2 billion. Of this total, approximately $1.1 billion is identified as current needs to ensure the continued provision of safe drinking water. Exhibit 10 shows the total Alaska native village need by project type. The Alaska native village need contributes a disproportionately large share to the total national need on a per-household basis. The need for Alaska native villages differs from other community water systems in that costs for storage in Alaska native villages exceed those for treatment needs.

Exhibit 10: Total 20-Year Need by Project Type for Alaska Native Village Water Systems (in millions of January 2003 dollars)

Categories of Need	Current Need	Future Need	Total Need
Distribution and Transmission	$528.5	$3.5	**$531.9**
Treatment	$232.5	$18.4	**$250.9**
Storage	$320.9	$18.8	**$339.6**
Source	$38.0	$9.3	**$47.3**
Other	$0.8	$0.0	**$0.8**
Total Need	**$1,120.6**	**$49.9**	**$1,170.5**

Note: Numbers may not total due to rounding.

Alaska native village water system needs were adjusted from 1999 Needs Assessment findings to January 2003 dollars.

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

Total Need Compared to Previous Needs Assessments

The total need of $276.8 billion established by the Agency from the 2003 Needs Assessment substantially exceeds the 1995 Needs Assessment estimate of $167.4 billion and the 1999 Needs Assessment estimate of $165.5 billion.[16]

The 2003 Needs Assessment workgroup identified several factors that came into play in capturing what is believed to be a more accurate representation of total national need for this assessment, as follows:

- First, this was the third Drinking Water Infrastructure Needs Survey and Assessment. Most states had a much better understanding of how the assessment was conducted than in 1995 as well as in 1999.

- For each assessment, questionnaires were sent to all of the largest water systems; therefore, many of the utilities were also familiar with the process.

- For the 2003 Needs Assessment, the questionnaire included several pages prompting systems to more closely examine the current condition of the entire system inventory, and to better consider their replacement and rehabilitation needs for aging infrastructure.

- Criteria for replacement of domestic water meters was modified and the requirement for documentation of system ownership of backflow prevention devices and service lines was removed.

- The interactive Web-based database enabled states to more easily and clearly submit additional information to EPA.

- EPA conducted extensive state training for the 2003 Needs Assessment at several regional locations to help states understand the questionnaire itself and the process to be followed, and to underscore the importance of cooperating with the 2003 Needs Assessment and accurately representing total water system needs.

Needs Assessment Tools

- The Needs Assessment Guide
- The toll free helpline
- The Needs Survey Web site
- Direct access to contractor support

One comparison between the 1999 and the 2003 Needs Assessments is the number of projects submitted. In 2003, the projects submitted for large and medium systems alone totaled 128,600. In 1999, the total projects received for medium and large systems was 61,400. This underscores the effort by states and systems to provide information on infrastructure needs.

Other differences include the following:

- The 1995 Needs Assessment included the $6.3 billion capital need associated with dams and untreated water reservoirs.[17] After EPA completed the first Needs Assessment, these needs were determined to be ineligible for DWSRF assistance and were consequently excluded from the 1999 and 2003 Needs Assessments.

[16] The 1995 and 1999 total needs have been converted to January 2003 dollars for comparison purposes. The 1995 need in 1995 dollars was $138.4 billion. The 1999 need in 1999 dollars was $150.9 billion.

[17] Costs adjusted to 2003 dollars for comparison purposes. Costs were originally $5.2 billion in 1995 dollars.

- Unlike the 1995 Needs Assessment, the 1999 and 2003 Needs Assessments each included \$3.4 billion[18] in needs for not-for-profit noncommunity water systems that are eligible for DWSRF funding.

- The varying estimates of costs associated with the proposed and recently promulgated regulations also contribute to the difference between the assessments.

Despite these variations, the fundamental methods used to collect and evaluate needs in 2003 remained largely unchanged from the 1995 and 1999 Needs Assessments. Most importantly, the 2003 Needs Assessment retained the stringent documentation and eligibility requirements of the previous assessments.

This photograph shows the installation of a new raw water line to the water treatment plant in Bartlesville, Oklahoma. This DWSRF-funded project was constructed to correct a deficiency in flow to the water treatment plant.

[18] Costs adjusted to 2003 dollars for comparison purposes. Needs for not-for-profit noncommunity water systems were \$3.1 billion in 1999 dollars.

APPENDIX A—PAYING FOR AND FINANCING INFRASTRUCTURE IMPROVEMENTS

Paying for Infrastructure Improvements

The 2003 Drinking Water Infrastructure Needs Survey and Assessment shows that the nation's public drinking water systems need to invest $276.8 billion over the next 20 years to continue providing water that is safe to drink. Investments of $165 billion are required to meet current needs. Given the size of the estimated needs, how will utilities pay for these infrastructure improvements?

Although much of a water system's needs are met through consumer's rates, this funding does not always cover the full cost of major capital investments. For this reason, local, state and federal programs have been developed to help fill the gap.

The 1996 Safe Drinking Water Act (SDWA) Amendments created the Drinking Water State Revolving Fund (DWSRF). The purpose of this program is to provide low-cost loans to drinking water systems. Federal assistance to systems regulated by states comes in the form of "capitalization grants" to the states. This "capital" is used by the states to start the revolving loan funds. As loans are paid off, money becomes available for re-lending. Congress has appropriated more than $6.96 billion for the DWSRF from FY1997 through FY2004.

In addition to EPA, other federal agencies have low-interest loan or grant programs. The largest of these programs is provided by the Department of Agriculture through its Rural Utilities Service (RUS), which received appropriations of $1.3 billion in FY2003 for both water and wastewater projects. The second-largest program is provided by the Department of Housing and Urban Development (HUD) through its Community Development Block Grants; total disbursements for both water and wastewater in FY2003 amounted to $479 million. Finally, the Economic Development Administration (EDA) in the Department of Commerce provides funds for physical infrastructure, including water and wastewater systems.

Many states also provide loans and grants to water utilities from monies that their own legislatures have appropriated. Some of these are coordinated with DWSRF capitalization grants. State funds (through matching appropriations, leveraged bonds, principal loan repayments, or interest) account for 42 percent of the funds available through the DWSRF. Other loans and grants may be coordinated with other available federal assistance (including RUS, HUD, and EDA).

As the Congressional Budget Office (CBO) noted, "Ultimately, society as a whole pays 100 percent of the costs of water services, whether through ratepayers' bills or through federal, state, and local taxes."[19]

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[19] Congressional Budget Office, *op. cit.*, page ix.

Reducing the Cost of Infrastructure

In 2002, EPA issued a report identifying that over the next 20 years a significant funding gap could emerge between clean water and drinking water infrastructure investment needs and current levels of spending. The following year, a national meeting was held entitled, "Closing the Gap: Innovative Responses for Sustainable Water Infrastructure," where participants recognized that current spending and operational practices would need to change in order to avoid the emergence of a funding gap that would hamper efforts to provide future safe drinking water. The participants further recognized that federal funding is and will remain limited; initiatives to adequately address the potential emerging gap will need to be based on improved management and water conservation as methods for reducing the cost of infrastructure.

The concept of "sustainable infrastructure," announced at the January 2003 meeting, consists of "four pillars":

- **Full Cost Pricing of Water.** There are strong economic arguments for shifting more of the cost of water from taxes to rates, and they are closely linked with smart water use. If consumers pay the full cost of water, and if this results in higher rates, then the rate will send an appropriate "price signal" to consumers and encourage conservation. The CBO recently estimated that future infrastructure investment needs could be paid by ratepayers, and that this investment would increase water bills from 0.5 percent of income to 0.9 percent of income, on average.[20] If these rate increases create problems for low-income or fixed-income households, a wide variety of mechanisms are available to mitigate the impacts, such as rate reductions or local subsidies to these households in the form of "life-line" water rates.

- **Better Management.** There are proven management methods to reduce the cost of providing safe drinking water and improving performance. One of these is **asset management**. This is a data-driven approach to prioritizing investments in infrastructure so that they meet customer expectations. Armed with detailed information on the age, condition, and performance of infrastructure, systems would be able to replace infrastructure as needed to meet performance standards. This would optimize investment. Savings from asset management approaches are estimated to be 10 percent of the capital investment. Ten percent of the estimated infrastructure needs in this assessment ($276.8 billion) would be $27.7 billion over 20 years, or $1.38 billion per year—more than the current federal contribution in capitalization grants through the DWSRF. A related concept is **environmental management systems** (EMS). These are comprehensive assessments of the utility's operations for continual improvement in operations, resulting in better performance and lower cost.

- **Efficient Water Use.** Much of the needed investment reported in EPA's Needs Assessment consists of installing new distribution pipe, treatment, or storage to meet the needs of the existing U.S. population. These projects are sized to accommodate reasonably anticipated growth. Decreasing water use, however, might reduce the projected increase in design capacity, thereby reducing investment needs. EPA estimates that there could be a 20 percent reduction in water use if simple conservation methods were introduced. This may translate to smaller capacity plants, which in turn would have reduced capital and operating costs.

[20] *Ibid.*, page xvi.

- **Watershed Approach.** There is great potential for cost savings in what EPA has broadly described as the “watershed approach” to management. This term refers to policies that include broad stakeholder involvement, hydrologically defined geographic boundaries, and coordinated management across all policies that affect water. Specific practices may include incentives for pollutant reduction, purchase of easements to minimize or eliminate pollutant sources, and conversion of land uses where such approaches are cost effective.

No single initiative will answer the question of how to pay for the infrastructure needs identified in this assessment. Yet, each has great potential, and none has been fully exploited. Taken together, and used in a coordinated fashion with the significant levels of financial assistance available at the federal and state levels, they provide an outline of how to pay for these infrastructure needs.

Montana Department of Environmental Quality

Regional water systems serving rural areas require long lengths of mains per household served. The Fort Peck-Dry Prairie Regional Water System in northwest Montana serves a population of 25,000, but will have over 3,200 miles of pipe.

APPENDIX B—METHODS: SAMPLING AND COST MODELING

Survey Design

EPA's 2003 Needs Assessment relied on a survey to determine the needs for medium and large water systems. The survey is based on a random sample of water systems. This section provides an overview of the survey design. A detailed description of the design is in "2003 Drinking Water Infrastructure Needs Survey, EPA ICR #2085.01."

Sample Frame

The first step of the sample design is to develop the sample frame. The sample frame is a list of all members (sampling units) of a population from which a random sample of members will be drawn for the survey. The sample frame is the basis for the development of a sampling plan to select a random sample. To ensure that the survey accounted for all community water systems in the nation, the universe of water systems (from which the samples were drawn) was obtained from the federal Safe Drinking Water Information System (SDWIS-FED). SDWIS-FED is EPA's centralized database for information on public water systems. It includes the inventory of all public water systems in the states and territories from which the states verify information regarding population served, water sources, and other important variables for their systems. For the 2003 Needs Assessment's sample frame database, systems were categorized by source water and population served. Some systems sell water to other water systems; for purposes of the survey, the population of the purchasing systems is included in the seller's population.

EPA sent the sample frame, with the population served and the water sources, to the states for their review and updated it based on the states' comments. The 2003 Needs Assessment excluded systems serving populations of 3,300 or fewer, so these systems were dropped from the list. A sample of systems was then selected from this updated sample frame.

Sample Design

EPA drew separate samples for each of the 50 states, the District of Columbia, and each of the trust territories. The sampling design for the survey was stratified random sampling within each state. In stratified samples, the population is divided into nonoverlapping subpopulations called strata and a simple random sample is taken in each stratum. Stratification may increase the precision of the estimates when the population is divided into subpopulations with similar characteristics within each stratum. Some water systems, as a group, will have different needs than other groups of water systems. For example, large water systems generally require much greater investment than do small systems, and systems that utilize surface water require more treatment (and therefore incur more costs) than systems that utilize ground water. In this assessment, water systems were stratified by source water type and system size based on the population served in each system.

- **Water Source.** Systems were classified as either surface water or ground water systems. Systems that use surface water, even if they also use ground water sources, were classified as a surface water system. All other systems were classified as ground water systems. Systems that rely exclusively on purchasing treated water have very few treatment needs; therefore, their needs are more similar to ground water systems than systems using and treating surface water sources. For this reason, systems that solely purchase water were included in the ground water strata.

- **System Size.** Systems were further stratified by the size of the population served. The size categories varied by state and water source. In some cases, systems were divided into four size categories: 3,301 to 10,000, 10,001 to 40,000, 40,001 to 50,000, and more than 50,000. In other cases, they were divided into five categories: 3,301 to 10,000, 10,001 to 25,000, 25,001 to 40,000, 40,001 to 50,000, and more than 50,000. Five size categories were used if it resulted in smaller sample sizes than four size categories. (Note that the population of purchasing systems was included when systems were assigned to size categories, as described above.) Exhibit B-1 shows the size categories used by different EPA drinking water programs.

Exhibit B-1: Size Category Definitions

Programs	Size Categories				
	Extra Small	Small	Medium	Large	Very Large
2003 Needs Assessment	N/A	≤ 3,300	3,301 - 50,000	> 50,000	N/A
Public Water System Supervision Program	≤ 500	501 - 3,300	3,301 - 10,000	10,001 - 100,000	>100,000
Drinking Water State Revolving Fund	N/A	≤ 10,000	N/A	N/A	N/A

For systems serving populations of 3,301 to 40,000, EPA selected a random sample of systems from each stratum. The target precision for the estimate of the need for each state determined the number of systems selected in each stratum, as described below. The survey sample included 2,553 community water systems serving populations of 3,301 to 40,000 out of the national inventory of 7,337 systems.

Systems serving more than 40,000 people were sampled with certainty. There is a relatively small number of these systems in many states, but they serve a large share of the population and account for a large share of the need. The survey included all of the nation's 1,342 systems serving populations of more than 40,000. At the direction of the workgroup, it was assumed that systems serving more than 40,000 that do not respond to the survey (approximately 4 percent) have no need and do not contribute to the needs of their state.

States were given the option of sampling with certainty the full set of systems serving populations of 3,301 to 40,000, rather than using a random sample of these systems. One state chose this method.

Sample Size Determination

The 2003 Needs Assessment workgroup determined the sample size for each state to achieve the target precision of 95 percent ± 10 percent for each state's estimate of need. The sample size for each state was determined to achieve the target precision set for each state's estimate of need. The sample size was selected so that the state's need would be estimated within 10 percent of the amount of the true need with 95 percent confidence. For example, if the survey estimates indicate a need of $2.0 billion, then there is a 95 percent probability that the interval of $1.8 to $2.2 billion includes the true need. Data from the 1999 Needs Assessment were used to estimate the average need and standard deviation of the need for each state, by stratum. These estimates were then used to calculate the sample size required for each state to meet the precision target. Systems serving populations of 3,301 to 40,000 were oversampled to account for system nonresponse. EPA assumed the response rate would be 90 percent, based on data from the 1999 Needs Assessment. Once the sample size was selected for each state, the number of samples for each stratum was allocated in a way that minimizes the sampling error of the estimate. See Exhibit B-2 for the sample sizes for each state.

Weighting the Systems

EPA weighted the systems serving populations of 3,301 to 40,000 to account for variable probabilities of selection and differential response rates. Weighting the data allows inferences to be made about all systems, not just those included in the sample, but also those not included in the sample or those that did not respond to the survey. For instance, in a given stratum in a given state, one system may be given a base weight of 10. This means that only 1 in 10 systems in this stratum is included in the survey, and the needs of this system represent its own and those of nine other systems.

The base weights and nonresponse adjustments reflect the probability of selection for each system and adjustments for system level nonresponses, respectively. Systems serving more than 40,000 people received a weight of one because they were selected with certainty.

Data Collection

The 3,895 medium and large systems in the survey were mailed a questionnaire package. Systems were asked to identify capital projects needed to protect public health for current customers and for households without access to safe drinking water. The questionnaire prompted systems to provide:

- A description of the infrastructure need
- Documentation explaining why the project is needed
- An indication of whether the project is a current or future need
- An indication of whether the project involves installing new or rehabilitating existing infrastructure
- An indication of whether the project is triggered by a Safe Drinking Water Act (SDWA) regulation
- A documented cost estimate, if available
- Design capacities of projects without costs for cost modeling

Exhibit B-2: Community Water System Sample Sizes

State	Total Number of Systems in Inventory			Number of Systems Selected in Sample		
	Population Served			Population Served		
	3,301-40,000	>40,000	Total	3,301-40,000	>40,000	Total
Alabama	293	45	338	134	45	**179**
Alaska	14	2	16	10	2	**12**
Arizona	77	18	95	26	18	**44**
Arkansas	145	16	161	74	16	**90**
California	432	224	656	32	224	**256**
Colorado	84	19	103	21	19	**40**
Connecticut	42	17	59	11	17	**28**
Delaware	17	6	23	6	6	**12**
District of Columbia	0	1	1	0	1	**1**
Florida	295	92	387	25	92	**117**
Georgia	175	39	214	26	39	**65**
Hawaii	28	3	31	23	3	**26**
Idaho	36	4	40	17	4	**21**
Illinois	402	58	460	71	58	**129**
Indiana	181	19	200	97	19	**116**
Iowa	115	13	128	31	13	**44**
Kansas	72	10	82	16	10	**26**
Kentucky	225	11	236	129	11	**140**
Louisiana	192	17	209	102	17	**119**
Maine	31	1	32	17	1	**18**
Maryland	39	13	52	5	13	**18**
Massachusetts	205	39	244	46	39	**85**
Michigan	245	47	292	33	47	**80**
Minnesota	139	21	160	57	21	**78**
Mississippi	185	6	191	99	6	**105**
Missouri	152	14	166	44	14	**58**
Montana	28	3	31	7	3	**10**
Nebraska	41	3	44	31	3	**34**
Nevada	26	6	32	7	6	**13**
New Hampshire	33	2	35	9	2	**11**
New Jersey	189	35	224	40	35	**75**
New Mexico	46	6	52	12	6	**18**
New York	300	62	362	300	62	**362**
North Carolina	211	29	240	76	29	**105**
North Dakota	25	4	29	19	4	**23**
Ohio	281	34	315	91	34	**125**
Oklahoma	139	11	150	54	11	**65**
Oregon	87	15	102	34	15	**49**
Pennsylvania	259	74	333	55	74	**129**
Puerto Rico	99	23	122	19	23	**42**
Rhode Island	19	8	27	8	8	**16**
South Carolina	131	14	145	66	14	**80**
South Dakota	40	2	42	25	2	**27**
Tennessee	235	51	286	140	51	**191**
Texas	697	99	796	72	99	**171**
Utah	77	17	94	11	17	**28**
Vermont	30	2	32	15	2	**17**
Virginia	110	31	141	110	31	**141**
Washington	140	25	165	36	25	**61**
West Virginia	95	8	103	58	8	**66**
Wisconsin	147	16	163	80	16	**96**
Wyoming	22	4	26	17	4	**21**
American Samoa	0	1	1	0	1	**1**
Guam	3	1	4	3	1	**4**
Northern Mariana Is.	4	1	5	4	1	**5**
Virgin Islands	2	0	2	2	0	**2**

Systems returned the completed questionnaires to the states for review, along with the supporting need and cost documentation. The states reviewed each questionnaire to ensure that systems thoroughly identified their needs and that all projects were documented and described correctly. The states had the option of providing supplemental information if documentation of need or cost was inadequate. In many instances, the states contacted the systems to obtain additional information. The states then forwarded the questionnaires to EPA for final review. EPA reviewed each project for Drinking Water Infrastructure Needs Survey and Assessment eligibility criteria, conformance to workgroup policies, adequacy of documentation of need, and documentation of reported costs. EPA accepted or edited project information accordingly and coded each deficiency or change made to each project. Once EPA's review was completed, the questionnaires were entered into a database. This database was made available on the Internet to provide states with a final opportunity to review their systems' data and provide additional information regarding the changes or deficiencies recorded by EPA.

EPA's review process in 2003 has evolved from the procedures used in 1995 and 1999. Although some states were involved in data collection for the 1995 Needs Assessment, EPA assumed primary responsibility for reviewing needs and, whenever necessary, contacting systems to obtain further documentation. The greater involvement of the states—with their familiarity with the systems—accounts in part for the larger number of projects received for the 1999 Needs Assessment. In 2003, the states were given more extensive training by EPA and more responsibility for the review of the surveys. For this assessment, the number of projects as well as total need increased significantly. This increase is believed to be a much more complete and accurate representation of the nation's total water system capital needs.

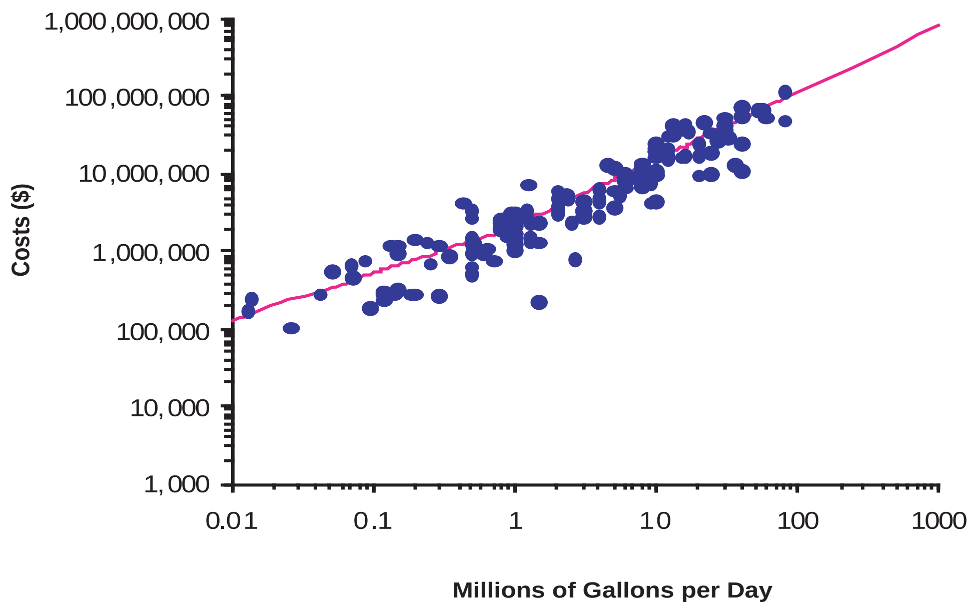
Estimating Needs of Water Systems

Estimating Needs for Large and Medium Community Water Systems

Each system that responded to the survey provided information regarding each of its investment needs. The sample included data on 128,600 infrastructure projects. Some of the medium and large drinking water systems provided capital improvement plans or engineering reports to document the costs of their infrastructure projects. However, approximately 82 percent of the projects lacked cost estimates. EPA used models to assign costs to these projects. For the most part, EPA developed the cost models from the 1999 Needs Assessment and adjusted the costs to 2003 dollars to estimate current costs. EPA developed two new models for the cost of installing and rehabilitating pipe and a third model for installation of domestic meters. New models were needed for pipe installation and rehabilitation because the models had not been updated since the 1995 Needs Assessment. A new model was needed for service meters because generally accepted technology had changed from manual-read to radio-read meters. All costs provided by systems or modeled by EPA were converted to January 2003 dollars.

Exhibit B-3 provides an example of a cost curve used to apply costs to a new conventional treatment plant project. A cost model would have been used if a system knew that it needed to rehabilitate a conventional filtration treatment plant that no longer met performance standards but did not have documentation of cost. If the system provided the design capacity of the plant on the questionnaire, EPA would have applied the specific cost model for rehabilitating this type of plant.

Exhibit B-3: Conventional Treatment Plant Project Cost Curve



The investment need for each system in the sample was estimated based on the reported and modeled costs of each project in the sample. The total need for medium and large systems was then estimated for each state by applying the sample weights to the total need for each system. The need for each system was multiplied by the sample weights; this product was then summed across all systems to produce the total need for medium and large systems in each state.

Estimating Needs for Small Community Water Systems

EPA estimated small system need based on the findings of the 1999 Needs Assessment. The 1999 Needs Assessment collected data on a national sample of small systems. These needs were adjusted to January 2003 dollars using a factor of 1.097 and apportioned among the states based on the inventory of small systems. EPA believes that the 1999 data are credible because they were collected through EPA site visits by water system specialists who had extensive experience working with small systems, and who received training in the project eligibility and documentation criteria established for the survey.

Estimating Needs for American Indian, Alaska Native, and Not-for-Profit Noncommunity Water Systems

EPA estimated needs for American Indian, Alaska native village, and not-for-profit noncommunity water systems based on the findings of the 1999 Needs Assessment. In 1999, EPA conducted site visits or provided assistance in completing the questionnaire to all American Indian systems, Alaska native village systems, and to a sample of approximately 100 not-for-profit noncommunity water systems. Data collection and cost modeling were completed using the same methods applied to small community water systems. The needs calculated from the 1999 data were adjusted to January 2003 dollars for the 2003 Needs Assessment effort.

Estimating Costs for Proposed and Recently Promulgated Regulations

A portion of the needs collected in the 2003 Needs Assessment are attributable directly to SDWA regulations. Systems were able to identify projects needed for compliance with existing regulations. However, most systems had not yet identified the infrastructure needed to comply with proposed and recently promulgated regulations. Consequently, the need for complying with these regulations was based on the Economic Analysis (EA) that EPA presents when proposing or finalizing each regulation. The 2003 Needs Assessment did not include the costs of regulations that were proposed after August 2003.

The costs associated with most future and recently promulgated regulations are included in the total national need only, not allocated at the state level. In general, the use of EAs to allocate these costs to each state is problematic, given that the cost of a regulation is not necessarily a direct function of the number of systems in each size and source category. The cost of compliance with a new regulation will vary significantly from state to state if the contaminant occurs mostly in specific regions of the country. Allocating costs based solely on the inventory of systems would fail to capture this variation.

However, the recently promulgated Arsenic Rule is somewhat different in that many states did have occurrence data for the number of systems with arsenic over 10 parts per billion. Therefore, the total national cost of complying with the recently promulgated Arsenic Rule was taken from the EA and allocated to each state based on these occurrence data.

APPENDIX C—SUMMARY OF QUALITY ASSURANCE PROCEDURES

Information Quality

The 2003 Needs Assessment followed the Agency's Guidelines for Ensuring and Maximizing Information Quality.[21] EPA's goal is to ensure the quality, objectivity, utility, and integrity of information disseminated by the Agency. The Agency developed the guidance document to incorporate the government-wide guidelines issued by the Office of Management and Budget (OMB) pursuant to section 515 of the Treasury and General Government Appropriations Act of 2001.[22] Information quality is particularly important when the Agency disseminates the results of research, and where those research results lead to policy decisions. Because the results of the 2003 Needs Assessment will be used to allocate Drinking Water State Revolving Fund (DWSRF) capitalization grants, data quality is critical.

Quality Systems: The cornerstone for maximizing information quality is the Agency's Quality System. All EPA Offices, and all contractors working for EPA, have Quality Management Plans (QMPs) that outline detailed procedures for quality assurance and quality control. The specific procedures required for each project are documented in a quality assurance project plan (QAPP). The plan outlines all of the steps that the project team will follow to ensure that quality is built into the project from the start. Since the 2003 Needs Assessment was similar to the Needs Assessments of 1999 and 1995, the QAPP included all lessons learned from the previous research.

The most important task at the start of each project is the definition of data quality objectives (DQOs). These define the policy decisions that will result from the research and the precision targets for data collection. The DQOs for this project were established for the 1995 Needs Assessment and, with some slight modifications, these DQOs remained the same for the 2003 Needs Assessment. The primary DQO for the 2003 Needs Assessment was to maximize precision of the estimates of state needs. The specific precision requirement for each state was that the maximum half-width of the 95 percent confidence interval estimate of the total need was to be no more than ± 10 percent of the total need for each state. Since the 2003 Needs Assessment relied on a survey of a random sample of systems, the precision target for the survey was defined in terms of acceptable sampling error. For more information on the sample design and the quality assurance procedures for the sample frame, see Appendix B.

A distinctive feature of the Needs Assessments is that important questions are decided by a state/EPA workgroup that meets regularly throughout the project. At the start of the 2003 Needs Assessment, the workgroup met to review the lessons learned from the last assessment. The workgroup reaffirmed the DQOs, and made suggestions for improvements in data collection for 2003. One problem identified in 1995 and 1999 was an apparent underreporting of needs. This was addressed explicitly in the 2003 Needs Assessment approach. The workgroup recommended:

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[21] U.S. Environmental Protection Agency, Guidelines for Ensuring and Maximizing the Quality, Objectivity, and Integrity of Information Disseminated by the Environmental Protection Agency, EPA/260r-02-008 (October 2002).

[22] *Federal Register*, Vol. 67, No. 36, February 22, 2002, pp. 8452-8460.

- Changes in the questionnaire that would force systems to think more comprehensively about their needs, including those not covered in existing capital improvement plans (CIPs), and

- Revised and enhanced training for state coordinators for their increased role in 2003 (assisting systems, reviewing questionnaires, and tracking questionnaires through the review process).

In addition, the 2003 Needs Assessment workgroup used quality assurance techniques that had worked well in previous surveys. Recognizing that one of the largest potential sources of error in a sample survey is nonresponse, EPA took steps to ensure high response rates. These steps included the following:

- Questionnaires were shipped with a prepaid return envelope via Federal Express,[23] enabling EPA to track the shipments.

- EPA made available a toll-free telephone helpline (operated by an EPA contractor) to answer questions about the questionnaire.

- The contractor electronically tracked all questionnaires and provided lists of nonrespondents to the states for follow-up.

- EPA contacted utility organizations and specific systems, as requested by states, to encourage participation.

The result of these efforts was a 96 percent response rate to a mail survey.

EPA designed several procedures to ensure quality control of the data collected by the questionnaires.

- The first step was intensive training of all professionals who were involved in the review of questionnaires. It was critical that all personnel (EPA, state, and contractor) have a shared understanding of the objectives of the data collection. All personnel also needed detailed training in the completion of the questionnaires and use of the project coding.

- Systems sent their completed questionnaires to their state coordinators. This gave the states an opportunity to review the questionnaires, request additional information, and make corrections based on their knowledge of the systems.

- The states then sent the questionnaires to EPA's contractor, The Cadmus Group, Inc., who also had provided technical support to the Needs Assessments in 1995 and 1999. Cadmus professional staff reviewed the questionnaires to ensure that they met agreed-upon survey policies and quality standards. One critical objective of this review was to eliminate all unallowable or undocumented needs. Another was to ensure data were coded correctly and were consistent with each project's documented purpose, scope and cost. Changes made at this stage of review were coded so that states could see the rationale for these changes.

[23] In response to an inquiry in 1995, EPA calculated the costs and benefits of using Federal Express versus the U.S. Post Office. Given the rate structure that EPA had negotiated with Federal Express, EPA demonstrated that this was cheaper and more effective.

- After this initial contractor review, the questionnaires were forwarded to a senior Cadmus professional. The purpose of this level of review was to ensure quality control of all contractor work.

- Cadmus personnel also did in-depth reviews of the first five questionnaires submitted by each state, including a telephone conference call with state personnel. This enabled Cadmus to talk through any problems with the questionnaires so that corrections could be made in state review processes. These interactions with states were enhanced by regular telephone conference calls with the state/EPA workgroup where state concerns could be resolved in a collaborative process.

After the review, the contractor entered the information from the questionnaires into a data system. The data entry process used an automated program keyed to the questionnaire, which precluded any invalid entry for each question. To further assure quality, the program included 100 percent verification using double key entry.

During all of these steps, the contractor used an electronic tracking system to track the progress of the questionnaires. Each time the questionnaire changed hands, from the time it was mailed out through each review step and data entry, the contractor knew exactly who had the document. This information also was shared with the states though a dedicated Web site. The states knew the status of each questionnaire. They could see changes that had been made during the review process, and they had an opportunity to modify project information through the Web site, by fax, or by mail. All modifications made by reviewers were coded to create a record that explained all changes.

Quality control of the database consisted of several steps. The first step was automated computer edits looking for out-of-range values for any variable. The second step was automated logic edits. Some of these tests looked for extreme values for specific variables (e.g., a small system that reported it needed to replace 10,000 miles of distribution pipe, probably meant to report 10,000 feet of pipe). Other automated tests focused on relationships between variables. For example, if a system purchased all of its water, it would be unlikely to have a major treatment plant.

Variables that failed any of these tests were identified in a report, and a data supervisor was able to examine the original questionnaire to determine whether the anomaly occurred in the original data. If the anomaly was in the questionnaire, then questions could be posed to the state.

As in past assessments, EPA clearly defined the concept of “eligible infrastructure” in the questionnaires and training. EPA also used quality control procedures to rigorously enforce that definition when reviewing project documentation. For a project to be included in the 2003 Needs Assessment, documentation describing its purpose and scope had to accompany each need. The documentation was reviewed by EPA to determine whether the projects submitted for the 2003 Needs Assessment met the eligibility criteria for DWSRF funding and allowability criteria set for the 2003 Needs Assessment. The state/EPA workgroup established the documentation requirements so that uniform criteria were applied to all questionnaires. These requirements not only lent credibility to the findings, they also addressed the issue of fairness in using the results to apportion DWSRF funds.

Of the 128,600 projects submitted to the survey, EPA deleted 18 percent that failed to meet the documentation criteria or appeared to be unallowable based on workgroup criteria or ineligibility for DWSRF funding. EPA adjusted the projects to correct a variety of measurement problems: overlaps between two projects (raising the issue of double-counting), inconsistency with project documentation, and use of overly aggressive infrastructure life cycles by states where system planning documents were not used or available.

To adjust for the use of aggressive infrastructure life cycles in estimating need, EPA made technical adjustments to individual projects based on engineering literature and benchmarks of engineering practices. The adjustments were tailored to the unique assumptions implemented by each state and were negotiated with state officials. The general direction of these adjustments was to place a cap on the state's assumptions about the rate of rehabilitation and replacement of pipe, unless there was project-specific documentation of a need provided by the water system.

Internal and External Review: A June 7, 1994 EPA policy makes it clear that peer review should be part of the design of any research project. In fact, the policy states that "peer review at the planning stages can often be extremely beneficial." The 2003 Needs Assessment is the third in a series of assessments that EPA performed (every 4 years) since 1995. Peer review has been part of the planning process from the very beginning. Continued external review, provided by the state/EPA workgroup, was essential in ensuring that the research met its intended quality objectives.

EPA sought external review of its approach to the first Needs Assessment in 1995. Since the 2003 Needs Assessment was a major data-collection project that required substantial efforts from water systems and states, EPA distributed its study approach to industry and professional associations. These organizations provided helpful criticism of the approach, which led to changes in the study design. Because the results of the assessments have a direct impact on states (through the allocation of DWSRF capitalization grants), the Agency has consulted regularly with a workgroup composed of federal and state personnel. Since 1995, state personnel have provided technical reviews of each study's approach, data collection methods, and analysis.

EPA developed the statistical design for the assessment in 1995, in consultation with the workgroup. The workgroup specifically reviewed the critical decision on the proposed level of statistical precision. States, especially, were consulted about their preferences for the level of precision of the state-specific estimates that EPA would use to determine the allocation of DWSRF capitalization grants among them. Upon receipt of the precision targets, EPA developed a statistical design, using the Neyman allocation formula, which would most efficiently achieve those objectives. The entire design was subjected to internal review by statisticians in the Office of Water (OW) and the Office of Regulatory Management and Information (now the Office of Information Analysis and Access in the Office of Environmental Information). The statistical design was further reviewed by specialists in the OMB during the evaluation of the Information Collection Request (ICR) for the study. The statistical design has remained basically the same since 1995; any changes to the design have been noted in the ICRs, which are reviewed by statisticians in EPA and at OMB.

Closely related to the technical approach and statistical design is the QAPP. Consistent with Agency policy on quality assurance, the QAPP is reviewed by an independent quality specialist in OW before work can proceed. The quality assurance process is also the subject of audit by EPA Quality Staff, thereby providing additional internal peer review by experts in quality assurance methods. The QAPP is updated completely at the start of each assessment cycle, and it is amended as necessary during the assessment period.

The results of the 1995 and 1999 Needs Assessments have been critically reviewed by external parties, especially those in the water utility industry[24] and government accounting offices.[25,26] These reviews have been instrumental in the changes to the study design. For example, past Assessments had been criticized for underestimating infrastructure needs, so EPA changed the research design for the 2003 Needs Assessment to correct that problem. Such external reviews, coupled with the ongoing input from the external members of the state/EPA workgroup, provide a continuous source of ideas for improving the quality of each assessment.

Transparency and Reproducibility: EPA's Guidelines on Information Quality explain that influential information (such as this report) "should be subject to a higher degree of quality (for example, transparency about data and methods). Such transparency facilitates reproducibility of this information, and reproducibility should meet commonly accepted standards." The Information Quality guidelines emphasize the importance of transparency in information that is disseminated to the public and used to make policy decisions. EPA believes that transparency is also useful during the research process, especially when state officials are important stakeholders.

The 2003 Needs Assessment (like its predecessors) maintained high standards of transparency. Since 1995, the Needs Assessments have been guided by a state/EPA workgroup that meets regularly throughout the study period. These face-to-face meetings are supplemented by telephone conference calls. Every important decision about the assessments—from the technical approach, questionnaires, data collection methods, and statistical design, to the cost models, analysis of data, and, after submission to Congress, the Report to Congress—is discussed by the workgroup. Decisions generally are made by consensus. A central concern of the workgroup is fairness to all stakeholders.

At the beginning of each new assessment, EPA summarized the lessons learned from the previous assessment. All lessons are rigorously analyzed, including follow-up research to establish a solid record of evidence. These lessons provide a basis for making changes in the technical approach or assessment design. The most important lesson learned in 1999 was an apparent underreporting of needs due in part to limitations of system planning documents. This lesson was addressed by the workgroup and resulted in major changes in the assessment.

EPA has developed and enhanced the methods by which states can review the projects submitted and action taken to ensure its quality during the 2003 Needs Assessment itself. The Agency improved this process for the 2003 Needs Assessment and facilitated states' ability to review information from their systems and to provide comments on those data. The objective was greater transparency in the assessment process.

One area of weakness in the first two Reports to Congress was the lack of sufficient details on the methodology. The details provided in those reports were similar to the information found in the Reports to Congress that had been prepared by the Clean Watersheds Needs Surveys (CWNSs) for two decades. With the issuance of EPA guidelines on information quality, however, it is appropriate for EPA to change the Agency's

[24] American Water Works Association Water Industry Technical Action Fund, Dawn of the Replacement Era: Reinvesting in Drinking Water Infrastructure (Denver, CO: May 2001).

[25] Congressional Budget Office: Future Investments in Drinking Water and Wastewater Infrastructure (Washington, DC: November 2002). This report is particularly useful because it provide a comparative analysis of the methodologies of all studies of infrastructure needs.

[26] United States General Accounting Office: Key Aspects of EPA's Revolving Fund Program Need to be Strengthened, GAO-02-135 (January 2002).

approach and provide greater detail. The ultimate goal is to provide enough information so that a reader who had access to the Needs Assessment database could reproduce the results of the 2003 Needs Assessment.

To ensure that level of transparency, EPA has provided additional detail on the research methods in this Report to Congress. EPA also has referenced, and will make available via the EPA Web site, the technical approach document. That document provides detailed background information on every important research design decision, as well as full details on the statistical methods used to draw a representative sample, and the methods used to create sample weights for data analysis.

APPENDIX D—SUMMARY OF FINDINGS

Needs for Water Systems in the States[27,28]
(community water systems and not-for-profit noncommunity water systems)

Exhibit D-1—Total Need for Water Systems in the States by Project Type

Exhibit D-2—Current Need for Water Systems in the States by Project Type

Exhibit D-3—Total Need for Water Systems in the States by System Size

Exhibit D-4—Current Regulatory Need for Water Systems in the States

Exhibit D-5—Total Existing Regulatory Need for Water Systems in the States

Needs for American Indian and Alaska Native Village Water Systems

Exhibit D-6—Total Need for American Indian and Alaska Native Village Systems by EPA Region

Exhibit D-7—Total Need by Project Type for American Indian and Alaska Native Village Water Systems

Exhibit D-8—Total Existing Regulatory Need for American Indian and Alaska Native Village Water Systems

Needs Attributable to Future Drinking Water Regulations[29]

Exhibit D-9—Total Proposed and Recently Promulgated Regulatory Need

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Note: Numbers in Exhibit D-1 through D-9 may not total due to rounding.

[27] Exhibits D-1 through D-5 do not include needs for American Indian or Alaska native village water systems. These needs are reported separately in Exhibits D-6 through D-8.

[28] Exhibits D-1, D-3, and D-5 through D-8 include costs associated with the recently promulgated Arsenic Rule but do not include costs associated with other proposed or recently promulgated SDWA regulations.

[29] Exhibit D-9 includes costs associated with proposed or recently promulgated SDWA regulations for waters systems in the states, American Indian communities, and Alaska native villages.

Exhibit D-1: Total Need for Water Systems in the States by Project Type (20-year need in millions of January 2003 dollars)

State	Transmission and Distribution	Treatment[1]	Storage	Source	Other	Total
Alabama	917.6	415.2	302.9	48.3	4.9	**1,688.9**
Alaska	444.2	63.2	126.4	45.1	2.6	**681.5**
Arizona	7,262.9	1,114.2	483.5	216.8	42.5	**9,119.8**
Arkansas	2,296.3	727.5	346.3	156.1	12.5	**3,538.7**
California	18,052.7	4,830.1	3,005.5	1,704.3	278.8	**27,871.5**
Colorado	3,472.8	996.3	452.2	370.8	31.5	**5,323.5**
Connecticut	336.2	176.5	96.3	40.1	4.0	**653.1**
Delaware	143.2	36.9	39.3	20.3	1.1	**240.8**
District of Columbia	132.5	0.0	15.5	0.0	1.3	**149.4**
Florida	10,387.3	2,595.5	983.4	936.6	137.9	**15,040.7**
Georgia	6,911.1	1,073.3	573.5	318.5	141.2	**9,017.6**
Hawaii	630.5	48.7	94.5	34.7	4.2	**812.5**
Idaho	430.7	126.9	111.8	52.1	5.6	**727.0**
Illinois	8,353.3	2,463.0	1,170.3	1,284.7	225.5	**13,496.8**
Indiana	2,503.6	741.4	477.2	284.4	25.2	**4,031.8**
Iowa	2,602.5	373.4	328.4	170.7	28.9	**3,503.9**
Kansas	1,303.9	238.8	256.4	115.0	16.8	**1,930.9**
Kentucky	2,162.0	318.0	254.8	53.4	20.6	**2,808.8**
Louisiana	2,923.6	576.7	317.0	242.2	47.2	**4,106.8**
Maine	547.8	110.8	120.6	47.2	5.4	**831.8**
Maryland	2,562.8	800.2	453.2	115.4	31.7	**3,963.2**
Massachusetts	6,611.0	877.1	622.1	318.2	126.2	**8,554.7**
Michigan	7,937.4	1,985.5	834.6	371.5	182.0	**11,311.1**
Minnesota	3,362.3	1,179.7	566.0	274.6	77.8	**5,460.5**
Mississippi	914.5	291.6	270.3	160.1	7.9	**1,644.5**
Missouri	4,625.5	686.9	463.9	171.7	10.3	**5,958.2**
Montana	469.0	152.7	115.8	48.2	3.6	**789.3**
Nebraska	737.3	371.0	125.8	107.8	12.2	**1,354.0**
Nevada	564.0	152.9	134.6	53.5	7.0	**912.1**
New Hampshire	321.2	109.3	114.7	47.5	2.9	**595.6**
New Jersey	5,081.1	703.5	736.2	322.7	72.1	**6,915.6**
New Mexico	498.9	261.8	112.7	46.2	2.7	**922.2**
New York	10,664.8	2,408.1	1,166.6	449.1	124.0	**14,812.5**
North Carolina	7,502.5	1,889.9	950.3	478.6	158.9	**10,980.2**
North Dakota	282.8	180.7	77.1	60.5	5.7	**606.8**
Ohio	7,084.6	1,330.5	827.0	371.0	71.1	**9,684.1**
Oklahoma	3,714.3	653.6	267.2	162.3	6.8	**4,804.2**
Oregon	2,519.6	659.9	842.7	230.6	14.8	**4,267.6**
Pennsylvania	7,838.9	1,550.9	1,090.1	457.5	52.9	**10,990.3**
Puerto Rico	1,593.3	471.9	154.5	45.6	13.5	**2,278.8**
Rhode Island	290.1	71.8	28.0	9.3	3.4	**402.6**
South Carolina	970.3	108.6	105.6	50.9	10.2	**1,245.6**
South Dakota	704.4	151.4	92.9	37.8	3.3	**989.8**
Tennessee	2,131.3	313.0	242.5	63.6	20.0	**2,770.4**
Texas	19,423.0	5,631.7	1,941.9	1,033.5	139.6	**28,169.6**
Utah	481.2	97.0	92.6	34.4	1.7	**706.9**
Vermont	229.4	77.7	60.3	24.1	3.3	**394.8**
Virginia	1,986.7	403.4	324.0	133.5	17.5	**2,865.0**
Washington	4,382.3	785.3	1,077.3	382.6	44.2	**6,671.7**
West Virginia	478.8	166.7	159.8	48.5	8.1	**861.9**
Wisconsin	3,948.4	1,054.7	575.0	337.7	22.3	**5,938.1**
Wyoming	193.4	45.7	42.7	15.1	1.3	**298.2**
Subtotal	**181,920.0**	**42,650.9**	**24,223.6**	**12,604.8**	**2,296.7**	**263,696.1**
American Samoa	12.1	5.3	11.1	2.7	1.2	**32.3**
Guam	204.8	8.1	27.7	32.2	6.3	**279.0**
North Mariana Is.	69.8	78.1	35.9	9.2	4.8	**197.8**
Virgin Islands	77.1	36.8	53.7	11.6	1.2	**180.4**
Subtotal	**363.8**	**128.3**	**128.3**	**55.7**	**13.5**	**689.5**
Total	**182,283.8**	**42,779.2**	**24,351.9**	**12,660.5**	**2,310.2**	**264,385.6**

[1]Does not include needs associated with proposed or recently promulgated regulations, except for the recently promulgated Arsenic Rule.

Exhibit D-2: Current Need for Water Systems in the States by Project Type (20-year need in millions of January 2003 dollars)

State	Transmission and Distribution	Treatment	Storage	Source	Other	Total
Alabama	304.7	48.3	44.7	13.0	3.1	**413.8**
Alaska	257.3	21.6	48.3	19.8	1.4	**348.4**
Arizona	6,346.6	624.8	272.7	119.8	41.0	**7,404.8**
Arkansas	1,539.0	291.6	149.8	77.5	10.1	**2,068.0**
California	11,819.4	3,252.8	1,860.6	1,134.0	183.7	**18,250.6**
Colorado	1,672.8	513.3	241.3	315.5	29.6	**2,772.4**
Connecticut	242.1	94.7	34.2	20.5	2.6	**394.2**
Delaware	112.1	18.6	16.1	10.8	0.9	**158.3**
District of Columbia	69.5	0.0	8.1	0.0	1.3	**78.9**
Florida	9,495.0	1,809.7	720.0	599.0	117.1	**12,740.8**
Georgia	6,331.4	625.0	381.9	266.4	134.4	**7,739.1**
Hawaii	286.4	33.5	56.1	29.8	2.5	**408.2**
Idaho	318.1	50.2	44.4	30.2	4.9	**447.7**
Illinois	4,653.1	908.1	513.1	236.0	139.0	**6,449.3**
Indiana	1,588.6	343.0	225.7	140.1	22.6	**2,320.0**
Iowa	1,935.5	136.5	158.9	70.4	19.1	**2,320.4**
Kansas	847.1	98.6	151.5	71.3	10.6	**1,179.2**
Kentucky	1,379.1	155.2	154.6	25.1	14.8	**1,728.8**
Louisiana	2,267.1	272.0	182.1	147.7	42.4	**2,911.4**
Maine	381.6	49.1	67.6	25.4	3.9	**527.5**
Maryland	2,217.6	662.8	353.8	71.4	29.8	**3,335.4**
Massachusetts	4,737.4	290.0	365.3	118.7	50.7	**5,562.1**
Michigan	5,447.1	1,097.1	341.9	154.2	125.9	**7,166.2**
Minnesota	1,759.0	619.0	216.4	101.8	45.1	**2,741.3**
Mississippi	730.6	139.1	130.9	96.0	5.5	**1,102.2**
Missouri	2,166.2	171.8	142.8	68.1	6.9	**2,555.8**
Montana	405.8	39.8	50.1	25.7	3.2	**524.6**
Nebraska	441.4	262.1	47.0	49.2	6.9	**806.6**
Nevada	284.3	17.3	54.2	18.8	2.0	**376.6**
New Hampshire	201.1	35.5	41.5	24.1	2.4	**304.5**
New Jersey	2,641.7	442.3	408.5	222.1	42.4	**3,757.0**
New Mexico	375.4	31.5	34.2	20.1	2.2	**463.6**
New York	9,078.0	2,066.4	687.0	248.0	115.2	**12,194.6**
North Carolina	2,987.0	636.2	309.7	186.8	109.1	**4,228.8**
North Dakota	201.2	74.2	37.8	39.7	4.6	**357.4**
Ohio	2,934.5	824.1	337.2	177.6	51.3	**4,324.8**
Oklahoma	1,524.1	128.7	86.0	51.3	5.6	**1,795.7**
Oregon	2,242.3	499.6	660.4	142.0	14.0	**3,558.3**
Pennsylvania	6,297.0	1,186.9	674.5	345.1	41.9	**8,545.3**
Puerto Rico	1,003.3	294.6	97.9	31.5	9.4	**1,436.7**
Rhode Island	234.6	25.0	10.7	4.6	2.2	**277.1**
South Carolina	573.1	39.8	47.8	29.3	7.1	**697.1**
South Dakota	220.7	60.5	38.9	20.7	2.7	**343.4**
Tennessee	1,014.6	111.3	112.3	27.4	10.2	**1,275.9**
Texas	9,974.2	2,981.6	656.8	376.2	51.3	**14,040.1**
Utah	382.1	31.7	64.5	14.9	1.4	**494.7**
Vermont	157.3	34.9	24.9	14.1	2.2	**233.5**
Virginia	997.0	174.2	130.5	59.4	13.4	**1,374.6**
Washington	3,198.7	285.2	579.1	211.3	22.2	**4,296.7**
West Virginia	336.2	86.3	66.5	28.4	5.4	**522.7**
Wisconsin	1,708.3	529.3	215.0	198.7	17.4	**2,668.6**
Wyoming	96.8	15.0	17.3	8.7	1.1	**138.8**
Subtotal	**118,414.9**	**23,240.9**	**12,372.9**	**6,538.0**	**1,595.9**	**162,162.5**
American Samoa	11.4	4.1	10.9	2.6	1.1	**30.0**
Guam	204.6	7.7	27.6	32.1	6.3	**278.5**
North Mariana Is.	56.2	64.8	12.2	7.5	2.9	**143.6**
Virgin Islands	70.7	24.1	33.7	10.5	1.2	**140.1**
Subtotal	**342.9**	**100.7**	**84.4**	**52.7**	**11.4**	**592.2**
Total	**118,757.8**	**23,341.5**	**12,457.3**	**6,590.7**	**1,607.4**	**162,754.7**

Exhibit D-3: Total Need for Water Systems in the States by System Size (20-year need in millions of January 2003 dollars)

State	Large CWSs	Medium CWSs	Small CWSs [1]	NPNCWSs [1]	Recently Promulgated Arsenic Rule [2]	Total
Alabama	615.2	782.4	288.1	3.2	0.0	**1,688.9**
Alaska	163.6	264.4	187.0	51.0	15.4	**681.5**
Arizona	5,556.5	2,988.3	467.1	15.5	92.5	**9,119.8**
Arkansas	778.7	2,187.3	566.6	6.1	0.0	**3,538.7**
California	19,828.6	5,823.3	2,016.7	84.6	118.2	**27,871.5**
Colorado	2,664.7	2,022.8	627.0	1.1	7.9	**5,323.5**
Connecticut	165.0	121.5	328.5	22.9	15.0	**653.1**
Delaware	72.1	7.4	157.9	2.7	0.8	**240.8**
District of Columbia	149.4	0.0	0.0	0.0	0.0	**149.4**
Florida	7,903.1	6,011.5	1,018.2	106.6	1.2	**15,040.7**
Georgia	4,825.6	3,411.1	768.6	11.5	0.8	**9,017.6**
Hawaii	477.7	213.0	115.4	0.8	5.5	**812.5**
Idaho	83.4	169.8	408.9	31.5	33.3	**727.0**
Illinois	6,095.0	5,835.5	1,450.9	92.0	23.4	**13,496.8**
Indiana	1,064.1	2,157.4	662.7	147.3	0.4	**4,031.8**
Iowa	716.3	1,953.9	792.6	15.4	25.7	**3,503.9**
Kansas	475.1	716.1	729.7	2.9	7.1	**1,930.9**
Kentucky	656.9	1,878.8	272.2	0.9	0.0	**2,808.8**
Louisiana	1,143.6	2,175.8	757.5	12.5	17.4	**4,106.8**
Maine	76.3	429.2	287.7	28.8	9.9	**831.8**
Maryland	2,947.0	640.4	292.7	82.0	1.2	**3,963.2**
Massachusetts	2,808.7	5,459.5	248.7	27.5	10.3	**8,554.7**
Michigan	5,994.0	3,840.8	1,012.2	394.4	69.7	**11,311.1**
Minnesota	1,453.9	3,018.2	743.3	224.1	21.0	**5,460.5**
Mississippi	65.2	664.5	906.0	8.0	0.8	**1,644.5**
Missouri	1,027.1	3,889.0	1,005.5	32.7	4.0	**5,958.2**
Montana	121.1	246.2	373.0	42.3	6.7	**789.3**
Nebraska	484.1	472.4	375.5	13.4	8.7	**1,354.0**
Nevada	522.8	171.4	172.8	11.9	33.3	**912.1**
New Hampshire	22.4	121.5	369.9	51.7	30.1	**595.6**
New Jersey	2,887.6	3,486.3	370.9	170.0	0.8	**6,915.6**
New Mexico	369.8	159.8	358.8	12.8	21.0	**922.2**
New York	10,130.4	2,517.6	2,003.0	105.4	56.2	**14,812.5**
North Carolina	4,632.5	4,997.2	1,035.8	308.8	5.9	**10,980.2**
North Dakota	35.6	343.8	209.8	4.5	13.1	**606.8**
Ohio	4,189.1	4,186.2	1,054.0	235.7	19.0	**9,684.1**
Oklahoma	1,060.7	2,857.8	854.0	18.6	13.1	**4,804.2**
Oregon	1,409.0	2,122.5	674.2	46.4	15.4	**4,267.6**
Pennsylvania	5,733.7	3,495.3	1,520.7	235.3	5.1	**10,990.3**
Puerto Rico	1,094.5	707.1	471.0	1.0	5.1	**2,278.8**
Rhode Island	234.9	116.7	36.0	13.5	1.6	**402.6**
South Carolina	451.7	498.6	280.2	13.5	1.6	**1,245.6**
South Dakota	11.1	722.2	243.5	4.3	8.7	**989.8**
Tennessee	530.0	1,820.4	396.0	24.1	0.0	**2,770.4**
Texas	15,212.5	9,896.8	2,964.2	39.8	56.2	**28,169.6**
Utah	154.3	300.5	231.4	10.8	9.9	**706.9**
Vermont	2.2	107.9	274.6	0.1	9.9	**394.8**
Virginia	1,203.5	872.3	709.1	76.6	3.6	**2,865.0**
Washington	2,299.6	2,764.2	1,404.8	96.9	106.1	**6,671.7**
West Virginia	43.6	209.1	568.3	40.2	0.8	**861.9**
Wisconsin	1,895.3	2,834.7	776.6	403.8	27.7	**5,938.1**
Wyoming	16.2	122.3	144.7	10.2	4.8	**298.2**
Subtotal	**122,555.0**	**102,812.6**	**33,985.1**	**3,397.5**	**945.8**	**263,696.1**
American Samoa	0.0	13.2	18.7	0.0	0.4	**32.3**
Guam	221.6	50.2	7.2	0.0	0.0	**279.0**
North Mariana Is.	75.0	96.9	25.1	0.0	0.8	**197.8**
Virgin Islands	0.0	44.6	135.4	0.0	0.4	**180.4**
Subtotal	**296.7**	**204.8**	**186.4**	**0.0**	**1.6**	**689.5**
Total	**122,851.7**	**103,017.4**	**34,171.5**	**3,397.5**	**947.4**	**264,385.6**

[1] 1999 Drinking Water Infrastructure Needs Survey and Assessment findings were used to calculate the need for systems serving 3,300 and fewer people (smalls) and not-for-profit noncommunity water systems (NPNCWSs). 1999 Needs Assessment results were adjusted to January 2003 dollars.

[2] Data did not allow allocation of costs by system size for the recently promulgated Arsenic Rule.

Exhibit D-4: Current Regulatory Need for Water Systems in the States (20-year need in millions of January 2003 dollars)

State	SWTR/ IESWTR	TCR	Nitrate/ Nitrite	Lead and Copper Rule	TTHMs	Other	Total
Alabama	15.9	0.0	0.0	3.8	0.0	4.8	**24.6**
Alaska	16.2	6.8	0.1	0.6	0.0	2.2	**26.0**
Arizona	353.7	0.4	0.2	9.1	1.0	11.9	**376.3**
Arkansas	210.9	0.2	0.1	3.9	0.0	3.0	**218.2**
California	3,023.2	261.2	72.7	14.5	16.4	233.5	**3,621.4**
Colorado	436.5	0.9	0.2	6.7	0.0	0.8	**445.1**
Connecticut	72.5	0.2	0.3	1.0	0.0	0.4	**74.4**
Delaware	7.2	0.0	0.1	0.4	0.0	0.4	**8.2**
District of Columbia	0.0	0.0	0.0	1.4	0.0	0.0	**1.4**
Florida	64.9	4.4	0.5	146.7	40.0	11.1	**267.8**
Georgia	483.0	0.1	0.5	53.3	2.5	1.5	**540.9**
Hawaii	14.5	0.0	0.0	0.7	13.3	0.4	**28.9**
Idaho	36.7	0.3	0.3	1.3	0.0	0.5	**39.1**
Illinois	423.6	55.0	6.1	181.0	0.0	172.3	**838.1**
Indiana	179.6	1.5	0.2	30.6	0.0	2.3	**214.3**
Iowa	31.6	21.3	173.5	8.1	0.0	27.1	**261.6**
Kansas	39.8	0.0	11.7	16.6	0.0	2.0	**70.1**
Kentucky	145.5	22.3	0.0	40.8	2.7	0.9	**212.3**
Louisiana	137.3	1.2	0.2	3.3	2.2	2.6	**146.9**
Maine	32.9	33.3	0.1	2.4	0.4	2.1	**71.3**
Maryland	504.0	1.4	0.1	27.5	0.6	2.7	**536.4**
Massachusetts	253.3	64.5	0.1	88.8	0.0	46.1	**452.9**
Michigan	885.7	547.4	0.4	255.0	9.6	24.1	**1,722.3**
Minnesota	54.6	4.0	1.8	40.4	0.0	39.3	**140.1**
Mississippi	20.5	0.2	0.1	4.3	0.0	3.7	**28.9**
Missouri	97.2	0.8	0.4	13.6	0.0	2.7	**114.6**
Montana	22.8	0.4	0.2	1.4	0.0	0.5	**25.3**
Nebraska	226.8	0.1	51.0	3.7	0.0	16.4	**298.0**
Nevada	7.1	0.1	0.1	0.7	0.0	0.4	**8.5**
New Hampshire	14.8	0.5	0.3	1.5	0.0	0.5	**17.5**
New Jersey	295.1	3.5	0.1	91.2	0.0	27.1	**417.1**
New Mexico	10.2	0.1	0.2	1.3	0.0	0.7	**12.6**
New York	1,987.0	4.6	5.7	81.3	10.2	15.3	**2,104.1**
North Carolina	505.3	105.0	2.4	17.4	0.0	25.9	**655.9**
North Dakota	38.3	3.1	0.1	0.8	0.0	0.8	**43.1**
Ohio	712.2	44.0	39.1	158.0	20.9	5.5	**979.7**
Oklahoma	91.4	0.2	0.2	13.6	0.0	1.9	**107.4**
Oregon	521.2	0.9	0.3	15.5	0.0	2.5	**540.4**
Pennsylvania	848.2	3.4	9.3	65.1	0.3	15.5	**941.8**
Puerto Rico	338.2	0.0	0.1	4.5	0.0	0.5	**343.2**
Rhode Island	16.8	0.1	0.0	32.9	0.0	0.1	**49.9**
South Carolina	25.4	2.8	0.1	3.0	0.0	0.8	**32.1**
South Dakota	27.7	0.0	0.1	0.6	0.0	0.5	**28.9**
Tennessee	76.9	0.2	0.1	3.4	1.5	1.9	**84.0**
Texas	2,421.0	15.7	0.9	26.7	1.4	34.2	**2,500.0**
Utah	15.5	0.1	0.1	0.8	0.0	0.6	**17.1**
Vermont	27.9	0.1	0.1	2.3	0.0	0.3	**30.8**
Virginia	140.3	15.6	0.4	4.5	0.4	20.6	**181.8**
Washington	97.5	42.3	0.9	15.1	0.0	2.3	**158.2**
West Virginia	66.1	0.4	0.1	5.6	0.0	1.8	**74.0**
Wisconsin	116.0	11.0	21.9	124.7	0.0	299.7	**573.3**
Wyoming	9.5	0.1	0.1	1.1	0.0	0.2	**11.0**
Subtotal	**16,200.0**	**1,282.4**	**404.1**	**1,632.6**	**123.5**	**1,075.1**	**20,717.8**
American Samoa	0.4	0.0	0.0	0.0	0.0	0.0	**0.4**
Guam	7.6	0.0	0.0	0.0	0.0	0.0	**7.6**
North Mariana Is.	40.7	0.0	0.0	0.0	0.0	0.0	**40.7**
Virgin Islands	40.2	0.0	0.0	0.7	0.0	0.0	**40.9**
Subtotal	**88.9**	**0.0**	**0.0**	**0.7**	**0.0**	**0.1**	**89.6**
Total	**16,288.9**	**1,282.4**	**404.1**	**1,633.3**	**123.5**	**1,075.2**	**20,807.4**

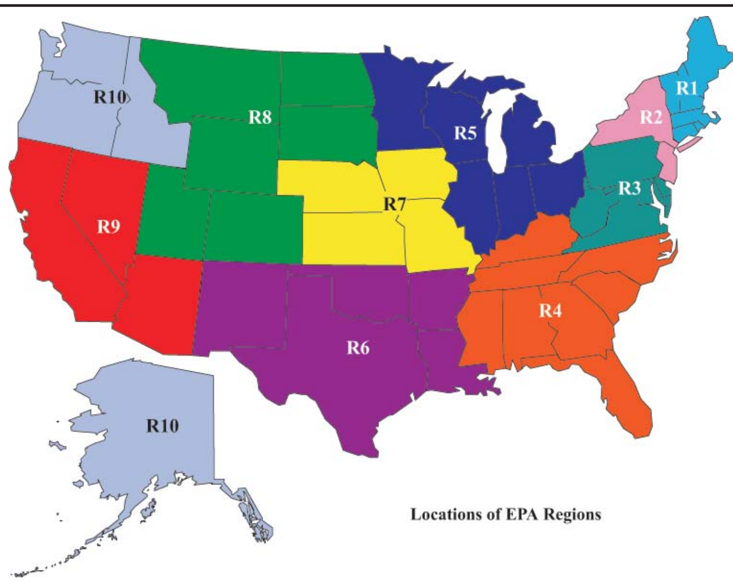
Exhibit D-5: Total Existing Regulatory Need for Water Systems in the States (20-year need in millions of January 2003 dollars)

State	SWTR/ IESWTR	TCR	Nitrate/ Nitrite	Recently Promulgated Arsenic Rule	Lead and Copper Rule	TTHMs	Other	Total
Alabama	313.7	0.1	0.0	0.0	4.0	0.1	4.8	**322.7**
Alaska	19.3	7.2	0.1	15.4	0.6	0.0	51.5	**94.2**
Arizona	678.7	1.8	0.2	92.5	9.1	1.0	12.2	**795.4**
Arkansas	472.6	0.5	0.1	0.0	4.9	0.0	4.2	**482.3**
California	3,911.1	399.0	119.3	118.2	34.3	18.9	258.8	**4,859.5**
Colorado	865.0	1.6	0.2	7.9	6.9	0.0	0.8	**882.5**
Connecticut	87.1	1.0	0.3	15.0	1.0	0.0	0.4	**104.8**
Delaware	7.2	0.3	0.1	0.8	0.4	0.0	1.8	**10.7**
District of Columbia	0.0	0.0	0.0	0.0	21.9	0.0	0.0	**21.9**
Florida	101.2	18.6	0.5	1.2	146.9	40.0	11.1	**319.6**
Georgia	723.2	1.6	0.5	0.8	53.3	2.5	1.5	**783.4**
Hawaii	15.5	0.1	0.0	5.5	0.7	13.3	0.4	**35.5**
Idaho	41.7	1.2	0.3	33.3	1.5	0.0	1.7	**79.6**
Illinois	1,857.2	285.0	7.8	23.4	246.3	0.9	226.8	**2,647.4**
Indiana	221.4	2.0	0.2	0.4	34.4	0.0	2.3	**260.8**
Iowa	68.4	23.8	173.5	25.7	8.4	1.7	33.8	**335.4**
Kansas	60.2	0.7	24.8	7.1	16.6	0.0	18.9	**128.3**
Kentucky	260.6	32.5	0.0	0.0	60.1	3.2	0.9	**357.4**
Louisiana	285.9	1.9	0.2	17.4	3.3	2.2	10.8	**321.7**
Maine	59.8	44.7	0.1	9.9	2.4	0.4	2.1	**119.6**
Maryland	524.7	1.9	0.5	1.2	27.5	0.6	2.7	**559.2**
Massachusetts	721.8	68.0	0.1	10.3	99.0	0.0	46.1	**945.4**
Michigan	1,222.3	992.2	0.4	69.7	327.3	16.1	36.6	**2,664.7**
Minnesota	133.7	4.9	1.8	21.0	65.6	0.0	42.2	**269.2**
Mississippi	34.3	0.6	0.1	0.8	4.3	0.0	3.7	**43.9**
Missouri	338.9	2.1	0.4	4.0	13.8	0.0	2.7	**361.9**
Montana	91.7	1.2	0.2	6.7	1.5	0.0	0.5	**101.7**
Nebraska	240.3	0.7	72.0	8.7	3.9	0.0	19.6	**345.2**
Nevada	93.0	0.4	0.1	33.3	19.5	0.0	0.4	**146.7**
New Hampshire	18.6	1.3	0.3	30.1	1.5	5.3	0.5	**57.6**
New Jersey	346.3	3.9	0.1	0.8	125.9	0.0	31.3	**508.4**
New Mexico	186.8	0.8	0.2	21.0	1.4	0.0	0.7	**210.8**
New York	2,057.8	8.5	13.4	56.2	94.3	13.8	23.7	**2,267.8**
North Carolina	1,517.9	107.4	2.4	5.9	18.8	1.4	37.8	**1,691.8**
North Dakota	107.3	5.8	0.1	13.1	3.8	0.0	0.8	**130.9**
Ohio	966.2	465.1	39.1	19.0	185.8	70.9	5.9	**1,752.1**
Oklahoma	537.4	3.4	0.2	13.1	13.9	0.0	1.9	**569.9**
Oregon	597.8	1.9	0.3	15.4	16.9	0.0	2.5	**634.9**
Pennsylvania	1,037.6	5.4	9.3	5.1	65.2	2.9	15.5	**1,141.1**
Puerto Rico	500.9	0.2	0.1	5.1	4.6	0.0	0.5	**511.3**
Rhode Island	41.7	0.9	0.0	1.6	32.9	0.0	0.1	**77.1**
South Carolina	67.7	6.1	0.1	1.6	4.3	0.0	0.8	**80.6**
South Dakota	53.2	0.4	0.1	8.7	14.1	0.0	0.5	**77.1**
Tennessee	224.8	0.6	0.1	0.0	3.4	1.5	1.9	**232.3**
Texas	4,501.7	18.7	0.9	56.2	26.9	1.4	49.1	**4,654.9**
Utah	48.9	0.4	0.1	9.9	0.8	0.0	0.6	**60.8**
Vermont	42.9	0.5	0.1	9.9	2.5	0.0	0.3	**56.2**
Virginia	283.0	23.7	0.4	3.6	5.3	0.4	32.2	**348.7**
Washington	221.1	57.1	0.9	106.1	16.8	0.0	2.3	**404.5**
West Virginia	108.0	0.8	0.1	0.8	9.1	0.0	3.0	**121.8**
Wisconsin	308.5	22.4	28.7	27.7	133.8	0.0	319.0	**840.1**
Wyoming	23.0	0.3	0.1	4.8	3.0	0.0	0.2	**31.5**
Subtotal	**27,250.0**	**2,631.5**	**501.4**	**945.8**	**2,004.5**	**198.7**	**1,330.6**	**34,862.5**
American Samoa	0.5	0.0	0.0	0.4	0.0	0.0	0.0	**0.9**
Guam	7.6	0.0	0.0	0.0	0.0	0.0	0.0	**7.6**
North Mariana Is.	40.7	0.0	0.0	0.8	0.0	0.0	0.0	**41.5**
Virgin Islands	48.0	0.0	0.0	0.4	0.7	0.0	0.0	**49.1**
Subtotal	**96.8**	**0.0**	**0.0**	**1.6**	**0.7**	**0.0**	**0.1**	**99.1**
Total	**27,346.8**	**2,631.5**	**501.4**	**947.4**	**2,005.2**	**198.7**	**1,330.6**	**34,961.7**

Exhibit D-6: Total Need for American Indian and Alaska Native Village Systems by EPA Region (20-year need in millions of January 2003 dollars)

EPA Region	Total Need[1]
Region 1	4.3
Region 2	6.6
Region 3[2]	0.0
Region 4	19.5
Region 5	172.5
Region 6	166.7
Region 7	15.7
Region 8	146.3
Region 9[3]	602.0
Region 10[4]	129.8
Alaska Native Systems	1,170.5
American Indian and Alaska Native Need to Comply with the Recently Promulgated Arsenic Rule	14.7
Total	**2,448.5**

[1] 1999 Drinking Water Infrastructure Needs Survey and Assessment findings converted to January 2003 dollars. Includes costs associated with the recently promulgated Arsenic Rule.
[2] There are no American Indian water systems in EPA Region 3.
[3] Navajo water systems are located in EPA Regions 6, 8, and 9, but for purposes of this report, all Navajo needs are shown in EPA Region 9.
[4] Needs for Alaska native village water systems are not included in the EPA Region 10 total.



Locations of EPA Regions

Exhibit D-7: Total Need by Project Type for American Indian and Alaska Native Village Water Systems (20-year need in millions of January 2003 dollars)

Project Type	Current Needs	Future Needs	Total Need[1]
Transmission and Distribution	1,287.0	60.3	**1,347.3**
Treatment[2]	404.9	57.3	**462.2**
Storage	437.4	52.9	**490.3**
Source	109.1	26.0	**135.1**
Other	13.6	0.0	**13.6**
Total	**2,252.0**	**196.5**	**2,448.5**

[1] 1999 Drinking Water Infrastructure Needs Survey and Assessment findings converted to January 2003 dollars. Includes costs associated with the recently promulgated Arsenic Rule.
[2] Treatment category includes needs for the recently promulgated Arsenic Rule.

Exhibit D-8: Total Existing Regulatory Need for American Indian and Alaska Native Village Water Systems (20-year need in millions of January 2003 dollars)

Regulation	Current Needs	Future Needs	Total Need
Regulations for Contaminants with Acute Health Effects	175.3	5.1	**180.4**
Regulations for Contaminants with Chronic Health Effects	0.2	14.7	**14.9**
Total	**175.5**	**19.8**	**195.3**

1999 Drinking Water Infrastructure Needs Survey and Assessment findings converted to January 2003 dollars. Includes costs associated with the recently promulgated Arsenic Rule.

Exhibit D-9: Total Proposed and Recently Promulgated Regulatory Need (20-year need in millions of January 2003 dollars)

Regulation	Range of Costs		Estimate Included in the 2003 Needs Assessment
	Low Estimate	High Estimate	
Stage 1 Disinfectants/Disinfection Byproducts Rule			2,582.7
Long-Term 1 Enhanced Surface Water Treatment Rule			193.1
Filter Backwash Recycling Rule			157.8
Ground Water Rule	936.8	1,150.2	1,150.2
Stage 2 Disinfectants/Disinfection Byproducts Rule			491.7
Long-Term 2 Enhanced Surface Water Treatment Rule	1,290.9	1,685.7	1,685.7
Radon Rule	144.8	5,794.2	2,782.8
Radionuclides Rule[1]	167.2	883.3	883.3
Total[2]			**9,927.4**

[1] The high and low estimates represent the two approaches presented in the November 2000 "Economic Analysis of the Radionuclides National Primary Drinking Water Regulations." The total capital costs were determined by averaging the total capital costs for compliance with the maximum contaminant level (MCL) set at 20 micrograms per liter (ug/L) and 40 ug/L for each of the two approaches. The final rule set the MCL at 30 ug/L

[2] In calculating the $9.9 billion need associated with proposed and recently promulgated regulations, EPA used the lead option, unless one was not available in which case EPA used the more conservative estimate. These estimates include only the capital costs (i.e., excludes operation and maintenance costs). Costs for the recently promulgated Arsenic Rule are not included in this table.

APPENDIX E—SUMMARY OF FINDINGS FOR SYSTEMS SERVING 10,000 AND FEWER PEOPLE

Needs for Water Systems in the States [28] (community water systems)

Exhibit E-1—Total Need for Systems Serving 10,000 and Fewer People

Note: Numbers in Exhibit E-1 may not total due to rounding.

[28] Exhibit E-1 does not include costs associated with proposed or recently promulgated SDWA regulations, including the recently promulgated Arsenic Rule.

Exhibit E-1: Total Need for Systems Serving 10,000 and Fewer People (20-year need in millions of January 2003 dollars)

State	CWSs Serving 10,000 and Fewer People Current Need	Future Need	Total Need	CWS Need (All Sizes) Total Need	Percent of Need for CWSs Serving 10,000 and Fewer People
Alabama	265.2	258.3	**523.5**	1,685.7	**31.1%**
Alaska	302.9	148.5	**451.4**	615.0	**73.4%**
Arizona	1,076.2	281.2	**1,357.5**	9,011.9	**15.1%**
Arkansas	1,044.0	581.1	**1,625.0**	3,532.6	**46.0%**
California	2,213.2	1,743.3	**3,956.5**	27,668.6	**14.3%**
Colorado	773.4	668.1	**1,441.5**	5,314.5	**27.1%**
Connecticut	234.4	122.4	**356.8**	615.1	**58.0%**
Delaware	108.4	49.5	**157.9**	237.3	**66.5%**
District of Columbia	0.0	0.0	**0.0**	149.4	**0.0%**
Florida	2,159.3	415.9	**2,575.2**	14,932.9	**17.2%**
Georgia	1,859.4	358.7	**2,218.1**	9,005.3	**24.6%**
Hawaii	130.2	51.2	**181.4**	806.1	**22.5%**
Idaho	335.7	155.7	**491.4**	662.2	**74.2%**
Illinois	2,128.4	1,180.1	**3,308.5**	13,381.4	**24.7%**
Indiana	1,122.1	477.9	**1,600.0**	3,884.2	**41.2%**
Iowa	871.9	389.6	**1,261.5**	3,462.8	**36.4%**
Kansas	712.4	302.9	**1,015.3**	1,920.9	**52.9%**
Kentucky	658.1	292.5	**950.6**	2,807.9	**33.9%**
Louisiana	1,244.7	470.4	**1,715.1**	4,076.9	**42.1%**
Maine	309.9	156.4	**466.3**	793.1	**58.8%**
Maryland	250.2	123.2	**373.3**	3,880.0	**9.6%**
Massachusetts	1,206.3	482.0	**1,688.3**	8,516.9	**19.8%**
Michigan	1,296.0	976.3	**2,272.3**	10,847.0	**20.9%**
Minnesota	930.2	950.9	**1,881.1**	5,215.4	**36.1%**
Mississippi	967.9	410.2	**1,378.1**	1,635.7	**84.3%**
Missouri	1,455.7	1,573.3	**3,029.0**	5,921.6	**51.2%**
Montana	290.2	150.6	**440.8**	740.3	**59.5%**
Nebraska	360.5	275.3	**635.7**	1,332.0	**47.7%**
Nevada	178.1	140.1	**318.2**	867.0	**36.7%**
New Hampshire	250.8	132.4	**383.2**	513.8	**74.6%**
New Jersey	809.8	485.2	**1,295.0**	6,744.8	**19.2%**
New Mexico	308.9	131.1	**440.0**	888.4	**49.5%**
New York	1,862.8	1,013.4	**2,876.2**	14,650.9	**19.6%**
North Carolina	1,326.7	1,491.6	**2,818.4**	10,665.4	**26.4%**
North Dakota	258.9	94.2	**353.1**	589.3	**59.9%**
Ohio	1,517.2	1,016.8	**2,534.0**	9,429.4	**26.9%**
Oklahoma	1,121.4	917.9	**2,039.3**	4,772.5	**42.7%**
Oregon	1,054.9	301.5	**1,356.5**	4,205.7	**32.3%**
Pennsylvania	2,215.8	592.2	**2,808.1**	10,749.8	**26.1%**
Puerto Rico	613.9	181.4	**795.2**	2,272.7	**35.0%**
Rhode Island	24.3	20.8	**45.1**	387.6	**11.6%**
South Carolina	246.2	165.6	**411.8**	1,230.5	**33.5%**
South Dakota	222.8	244.7	**467.5**	976.9	**47.9%**
Tennessee	804.0	653.0	**1,457.0**	2,746.4	**53.1%**
Texas	3,667.3	2,668.3	**6,335.6**	28,073.5	**22.6%**
Utah	416.7	93.6	**510.3**	686.2	**74.4%**
Vermont	217.5	129.3	**346.8**	384.7	**90.1%**
Virginia	665.0	403.5	**1,068.5**	2,784.9	**38.4%**
Washington	1,841.9	746.9	**2,588.8**	6,468.7	**40.0%**
West Virginia	476.4	219.4	**695.8**	820.9	**84.8%**
Wisconsin	1,035.2	677.8	**1,713.0**	5,506.6	**31.1%**
Wyoming	117.5	81.7	**199.2**	283.2	**70.3%**
Subtotal	**45,560.9**	**25,647.8**	**71,208.6**	**259,352.7**	**27.5%**
American Samoa	16.8	1.9	**18.7**	31.9	**58.7%**
Guam	25.9	0.5	**26.4**	279.0	**9.5%**
North Mariana Is.	97.0	25.0	**122.0**	197.0	**61.9%**
Virgin Islands	115.2	21.0	**136.2**	180.0	**75.7%**
Subtotal	**254.9**	**48.5**	**303.4**	**687.9**	**44.1%**
Total	**45,815.8**	**25,696.2**	**71,512.0**	**260,040.6**	**27.5%**

1999 Drinking Water Infrastructure Needs Survey and Assessment findings were used to calculate the need for systems serving 3,300 and fewer people. 1999 Needs Assessment results were adjusted to January 2003 dollars.

APPENDIX F—GLOSSARY

Acute health effects: health effects resulting from exposure to a contaminant that causes severe symptoms to occur quickly—often within a matter of hours or days. Examples include gastrointestinal illness and “blue baby syndrome.”

Capital improvement plan (CIP): a document produced by a local government, utility, or water system that thoroughly outlines, for a specified period of time, all needed capital projects, the reason for each project, and their costs.

Chronic health effects: health effects resulting from long-term exposure to low concentrations of certain contaminants. Cancer is one such health effect.

Coliform bacteria: a group of bacteria whose presence in a water sample indicates the water may contain disease-causing organisms.

Community water system: a public water system that serves at least 15 connections used by year-round residents or that regularly serves at least 25 residents year-round. Examples include cities, towns, and communities such as retirement homes.

Current infrastructure needs: new facilities or deficiencies in existing facilities identified by the state or system for which water systems would begin construction as soon as possible to avoid a threat to public health.

Engineer’s report: a document produced by a professional engineer that outlines the need and cost for a specific infrastructure project.

Existing regulations: drinking water regulations promulgated under the authority of the Safe Drinking Water Act by EPA; existing regulations can be found in the Code of Federal Regulations (CFR) at 40 CFR 141.

Finished water: water that is considered safe and suitable for delivery to customers.

Future infrastructure needs: infrastructure deficiencies that a system expects to address in the next 20 years because of predictable deterioration of facilities. Future infrastructure needs do not include current infrastructure needs. Examples are storage facility and treatment plant replacement where the facility currently performs adequately but will reach the end of its useful life in the next 20 years. Needs solely to accommodate future growth are not included in the Needs Assessment.

Ground water: any water obtained from a source beneath the surface of the ground, which has not been classified as ground water under the direct influence of surface water.

Growth: needs planned solely to accommodate projected future growth are not included in the 2003 Needs Assessment. Eligible projects, however, can be designed for growth expected during the design life of the project. For example, the 2003 Needs Assessment would allow a treatment plant identified as a current need and expected to treat water for 20 years. Such a plant could be designed for the population anticipated to be served at the end of the 20-year period.

Infrastructure needs: the capital costs associated with ensuring the continued protection of public health through rehabilitating or building facilities needed for continued provision of safe drinking water. Categories of need include source development and rehabilitation, treatment, storage, and transmission and distribution. Operation and maintenance needs are not considered infrastructure needs and are not included in this document.

Large water system: in this document, this phrase refers to a community water system serving more than 50,000 people.

Medium water system: in this document, this phrase refers to a community water system serving from 3,301 to 50,000 people.

Microbiological contamination: the occurrence of protozoan, bacteriological, or viral contaminants in a water supply.

Noncommunity water system: a public water system that is not a community water system and that serves a nonresidential population of at least 25 individuals or 15 service connections daily for at least 60 days of the year. Examples of not-for-profit noncommunity water systems include schools and churches.

Potable water: water that is fit to drink.

Public water system: a system that provides water to the public for human consumption through pipes, other constructed conveyances, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year.

Regulatory need: a capital expenditure required for compliance with regulations.

Safe Drinking Water Act (SDWA): a law passed by Congress in 1974 and amended in 1986 and 1996 to ensure that public water systems provide safe drinking water to consumers. (42 U.S.C.A. §300f to 300j-26)

Small water system: in this document, this phrase refers to a community water system serving 3,300 people or fewer.

Source rehabilitation and development: a category of need that includes the costs involved in developing or improving sources of water for public water systems.

State: in this document, this term refers to all 50 States of the United States, Puerto Rico, the District of Columbia, American Samoa, Guam, the Northern Mariana Islands, and the Virgin Islands.

Storage: a category of need that addresses finished water storage needs faced by public water systems.

Supervisory Control and Data Acquisition (SCADA): an advanced control system that collects all system information for an operator and allows him/her, through user-friendly interfaces, to view all aspects of the system from one place.

Surface water: all water that is open to the atmosphere and subject to surface run-off, including streams, rivers, and lakes.

Transmission and distribution: a category of need that includes replacement or rehabilitation of transmission or distribution lines that carry drinking water from the source to the treatment plant or from the treatment plant to the consumer.

Treatment: a category of need that includes conditioning water or removing microbiological and chemical contaminants. Filtration of surface water sources, pH adjustment, softening, and disinfection are examples of treatment.

Watering point: a central source from which people without piped water can draw drinking water for transport to their homes.