EPA
United States
Environmental Protection
Agency

Drinking Water Infrastructure Needs Survey and Assessment

Fifth Report to Congress




Cover photos (left to right): Water Supply Revolving Loan Account funded water treatment plant and storage in Deshler, OH, Ohio EPA; Child Drinking Water, Julie Blue; Bolted steel drinking water storage tank in the Alaska Native Village of Atka, Dennis Wagner, EPA Region 10; Laying water line in rural Arizona for Congress Domestic Water Improvement District, Water Infrastructure Finance Authority of Arizona

Office of Water (4606M)
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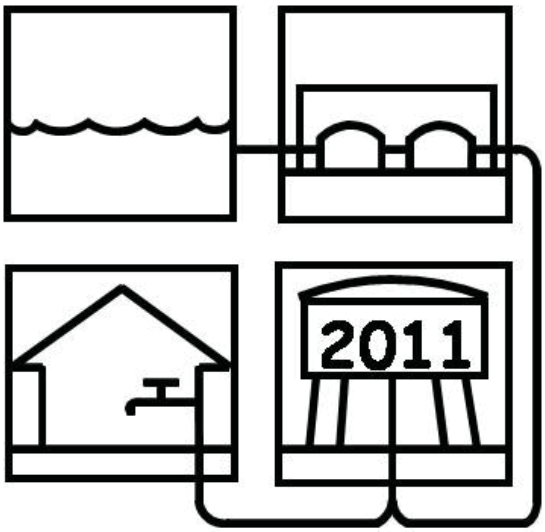

U.S. Environmental Protection Agency
Office of Water
Office of Ground Water and Drinking Water
Drinking Water Protection Division
Washington, D.C. 20460

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Exhibits

Acknowledgments

Many dedicated individuals contributed to the 2011 Drinking Water Infrastructure Needs Survey and Assessment. We would like to thank the states and Navajo Nation for their active participation and continuing interest in the project. And most importantly, we would like to thank the operators and managers of the thousands of water systems who spent their valuable time completing the questionnaires sent to them.

Ohio EPA

Water Supply Revolving Loan Account funded project in Woodville, OH.

Executive Summary

Total National Need

The U.S. Environmental Protection Agency's (EPA's) fifth national assessment of public water system infrastructure needs shows a total twenty-year capital improvement need of $384.2 billion. This estimate represents infrastructure projects necessary from January 1, 2011, through December 31, 2030, for water systems to continue to provide safe drinking water to the public. The national total comprises the infrastructure investment needs of the nation's approximately 52,000 community water systems and 21,400 not-for-profit noncommunity water systems, including the needs of American Indian and Alaska Native Village water systems, and the costs associated with proposed and recently promulgated regulations. The findings are based on the 2011 Drinking Water Infrastructure Needs Survey and Assessment (DWINSA or Assessment) which relied primarily on a statistical survey of public water systems (approximately 3,165 responses).

$384.2 Billion is Needed

The nation's drinking water utilities need $384.2 billion in infrastructure investments over the next 20 years for thousands of miles of pipe as well as thousands of treatment plants, storage tanks, and other key assets to ensure the public health, security, and economic well-being of our cities, towns, and communities.

Authority, Purpose, and History

The 1996 Safe Drinking Water Act Amendments mandated that EPA conduct an assessment of the nation's public water systems' infrastructure needs every four years and use the findings to allocate Drinking Water State Revolving Fund (DWSRF) capitalization grants to states. The DWSRF was established to help public water systems obtain financing for improvements necessary to protect public health and comply with drinking water regulations. From 1997 to 2011, states loaned $21.7 billion to water systems for 9,188 projects.

The estimate covers infrastructure needs that are eligible for, but not necessarily financed by, Drinking Water State Revolving Fund (DWSRF) monies (note - DWSRF is designed to supplement, not replace, investment funding by states and localities as well as rate payers). Projects eligible for DWSRF funding include the installation of new infrastructure and the rehabilitation, expansion, or replacement of existing infrastructure. Projects may be needed because existing infrastructure is deteriorated or undersized, or to ensure compliance with regulations. Cost estimates assume comprehensive construction costs including engineering and design, purchase of raw materials and equipment, construction and installation labor, and final inspection.

EPA recognizes that there are legitimate and significant water system needs that are not eligible for DWSRF funding, such as raw water dams and reservoirs, projects related primarily to population growth, and water system operation and maintenance costs. However, because the Assessment is directly associated with the allocation of DWSRF capitalization grants to states and tribal set-aside funds to EPA Regions, needs ineligible for DWSRF funding are not included in the estimate.

National Need Compared to Previous Needs Assessments

Exhibit ES.1: DWINSA Comparison of 20-Year National Need (in billions of January 2011 dollars)

Year	1995	1999	2003	2007	2011
National Need	$227.3	$224.8	$375.9	$379.7	$384.2

EPA conducted four previous Assessments, in 1995, 1999, 2003, and 2007. Exhibit ES.1, which adjusts the findings to 2011 dollars, shows the 2011 Assessment's total national need to be comparable to the findings of previous surveys since 2003, indicating that we have continued our success in better capturing longer term needs that were underreported in the two earliest surveys. Outside of some clarifications of the factors considered in a weight of evidence determination for project acceptance (see Appendix C), the 2011 Assessment shared the same statistical and policy approach as the 2007 Assessment with similar total national need findings. Although there was no significant change in total need, the 2011 survey of American Indian and Alaska Native Village water systems is the first one conducted since 1999 (the 2003 and 2007 Assessments adjusted the 1999 findings to account for inflation in construction costs) and employed survey methods and policies substantially different than those used in 1999, reflecting the evolution in EPA's assessment methods.

Individual State Need

The 2011 Assessment shows significant changes in some states' needs from previous Assessments. These changes will result in modifications to individual states' DWSRF allotments. Most shifts in states' needs can be attributed to expected changes in the status of projects from one survey to the next.

Regulatory Need

The findings of the 2011 Assessment indicate that the need associated directly with Safe Drinking Water Act (SDWA) regulations remains a small percentage, 10.9 percent, of the total national need. Most water system needs are not directly related to violations of, or compliance with, SDWA regulations. Most needs are ongoing investments that systems must make to continue delivering safe drinking water to their customers.

Small System Need

The 2011 Assessment indicates a total national need of $64.5 billion for small systems in the states, Puerto Rico, and the U.S. Territories. Small systems are defined as serving 3,300 persons or fewer. For the 2011 Assessment, EPA estimated the infrastructure investment needs for these systems by adjusting the findings from the small system field survey which was done for the 2007 Assessment. In making the adjustment, EPA applied 2011 cost models using the current inventory of small systems.

Needs of American Indian and Alaska Native Village Water Systems

The needs of water systems serving American Indians and Alaska Native Villages total $3.3 billion. The findings presented in this report are based on a survey of these systems conducted for the first time since the 1999 Assessment. This need represents a small percentage of the nation's total drinking water infrastructure need. This need is, however, associated with higher average per household costs due to unique challenges that

many of these water systems face. These public water systems are almost all small and often located in remote rural areas, some in areas with permafrost, and the communities served may have households that lack access to the public water supply. These conditions present special challenges for providing drinking water service.

Water Industry Capital Investment Planning and Documentation of Needs

Systems submitted a variety of planning documents and excerpts of documents in support of projects reported for the 2011 Assessment. These documents made clear that as our nation's infrastructure continues to age and deteriorate many water systems are using asset management strategies to better understand and address their infrastructure rehabilitation and replacement challenges. However, for many other systems, the information and documentation provided indicates that a significant gap still exists between information about their inventory of infrastructure and their knowledge of that infrastructure's condition or remaining useful life.

Water Infrastructure Finance Authority of Arizona

Constructing a solar array to power the city of Somerton's drinking water treatment facility in southwestern Arizona.

Chapter 1: Findings - National Need

2011 Total National Need

The 20-year national infrastructure need estimated by the 2011 Assessment is $384.2 billion. The breakout of the national need by system size and type is presented in Exhibit 1.1.

The assessment addressed community water systems[1] (CWSs) and not-for-profit noncommunity water systems[2] (NPNCWSs). The results for CWSs were derived from the responses to a probability sample of approximately 3,165 water systems including 220 American Indian and 86 Alaska Native Village water systems. The results for the NPNCWSs in states, Puerto Rico, and U.S. Territories were extrapolated from a similar assessment conducted in 1999. The total national need also includes the costs associated with meeting recently proposed or promulgated regulations that are too new to be a consideration in water systems' investment plans; those costs are derived from EPA's economic analyses (EAs) supporting each regulation.

Exhibit 1.1: Total National 20-Year Need (in billions of January 2011 dollars)

System Size and Type	Need
Large Community Water Systems* (serving over 100,000 persons)	$145.1
Medium Community Water Systems* (serving 3,301-100,000 persons)	$161.8
Small Community Water Systems (serving 3,300 and fewer persons)†	$64.5
Not-for-Profit Noncommunity Water Systems‡	$4.6
Total State Need	**$376.0**
Alaska Native Village Water Systems	$0.6
American Indian Water Systems	$2.7
Costs Associated with Proposed and Recently Promulgated Regulations	$4.9
Total National Need	**$384.2**

Note: Numbers may not total due to rounding.

* "Large" and "Medium" community water systems are defined the same as for the 2007 Assessment but are different than in the 2003 and previous Assessments. See Appendix A for more information.

† Based on 2007 Assessment findings adjusted to 2011 inventory and cost models.

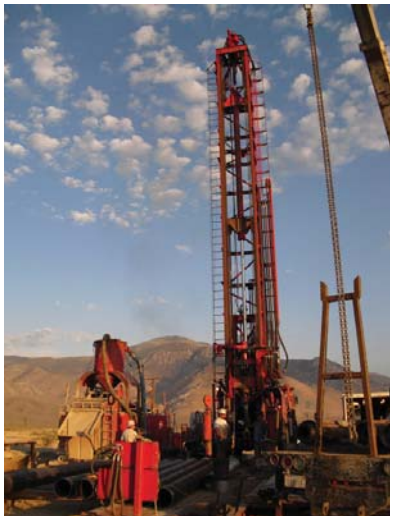
‡ Based on 1999 Assessment findings adjusted to 2011 dollars.

Super Pulsator Water Treatment Plant at the Davis Municipal Authority in Oklahoma.

Oklahoma Department of Environmental Quality

[1]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 small communities such as retirement homes are examples of community water systems.

[2]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 daily for at least 60 days of the year. Schools and churches are examples of noncommunity water systems.



John Taylor, Farr West Engineering

Construction of new municipal well in Hawthorne, NV.

The need reported in the Assessment includes projects for expanding, replacing, or rehabilitating existing infrastructure. It also includes projects to construct new infrastructure in order to preserve the physical integrity of water systems and to convey drinking water to existing residential, commercial, and industrial customers. Projects vary greatly in scale, complexity, and cost—from rehabilitating a small storage tank, to replacing an entire treatment plant, to constructing a high-capacity pipeline.

The results presented in this report will determine the allocation of DWSRF capitalization grants and also factor into the allocation of the tribal set-aside funding to EPA Regions for federal fiscal years 2014 through 2017. Therefore, the need does not include projects that are ineligible for DWSRF funding. The approach and methodologies for discerning needs are further detailed in Appendix A. A summary of the types of projects included in the Assessment, as well as specific types of unallowable projects, is presented in Appendix B. EPA recognizes that projects not eligible for DWSRF funding can be significant, if not critical, water system needs, but they are outside the scope of this Assessment. In addition, the Assessment does not seek to capture information on the financing alternatives being pursued or considered by systems for individual projects. The DWSRF is in fact intended as a supplement to, not a replacement for, funding by states, localities, and rate payers.

The $384.2 billion represents the need associated with thousands of miles of pipe, thousands of treatment plant and source projects, and billions of gallons of storage. Investments in water systems not only provide assurances of continued delivery of safe drinking water to our homes, schools, and places of business, they are key to local economies across our nation.

As stated in the 2008 report by the U.S. Conference of Mayors:

> "The estimates exhibit a wide range, but the consensus is that public infrastructure investment yields positive returns, and investment in water and sewer infrastructure has greater returns than most other types of public infrastructure.
>
> - A recent study estimates that one dollar of water and sewer infrastructure investment increases private output (Gross Domestic Product, GDP) in the long-term by $6.35.
> - With respect to annual general revenue and spending on operating and maintaining water and sewer systems, the US Department of Commerce's Bureau of Economic Analysis estimates that for each additional dollar of revenue (or the economic value of the output) of the water and sewer industry, the increase in revenue (economic output) that occurs in all industries is $2.62 in that year.
> - The same analysis estimates that adding one job in water and sewer creates 3.68 jobs in the national economy to support that job."

The U.S. Conference of Mayors. *Local Government Investment in Municipal Water and Sewer Infrastructure: Adding Value to the National Economy*. Richard A. Krop, Ph.D., Charles Hernick, and Christopher Frantz. The Cadmus Group, Inc. August 14, 2008.

Additional Source:
Pereira, A.M. "Is all public capital need created equal?" *Review of Economics and Statistics*, 82:3 (2000): 513–518.

2011 Total National Need Compared to EPA's Previous Assessments

The 2011 total national need of $384.2 billion is comparable to the 2007 estimate of $379.7 billion and the 2003 estimate of $375.9 billion (all adjusted to 2011 dollars), continuing those earlier Assessments' success in better capturing previously underreported longer term needs for infrastructure rehabilitation and replacement. All three Assessments clearly point to the nation's water systems having entered a "rehabilitation and replacement era" in which much of water utilities' existing infrastructure has reached or is approaching the end of its useful life.

Exhibit 1.2 compares the need from this Assessment to past Assessments. Cost indices were used to adjust previous needs to the 2011 Assessment's year. Although there are numerous cost indices available, EPA used the Construction Cost Index (CCI) compiled by McGraw Hill Construction because it includes adjustments for labor rates as well as the cost of materials. It is worth noting that the CCI shows cost increases of approximately 3 percent per year from 1995 through 2003, approximately 5 percent per year from 2003 through 2007, and approximately 3.4 percent per year from 2007 to 2011.

Exhibit 1.2: Total National 20-Year Need Comparison to Previous DWINSA Findings (in billions of dollars)

	1995	1999	2003	2007	2011
Total National Need (as listed in Assessment Year's Report to Congress)	$138.4	$150.9	$276.8	$334.8	$384.2
Cost adjustment factor to January 2011 dollars (based on Construction Cost Index)	64.2%	49.0%	35.8%	13.4%	—
Total National Need (adjusted to January 2011 dollars)	**$227.3**	**$224.8**	**$375.9**	**$379.7**	**$384.2**

The 2011 Assessment shares a similar approach and total national finding with the 2003 and 2007 Assessments. The 2011 effort clarified for survey participants the elements to be considered in a weight of evidence determination of project acceptance (see Appendix C) with the intent of facilitating project submittal and review rather than actually changing what projects were submitted and accepted into the Survey.

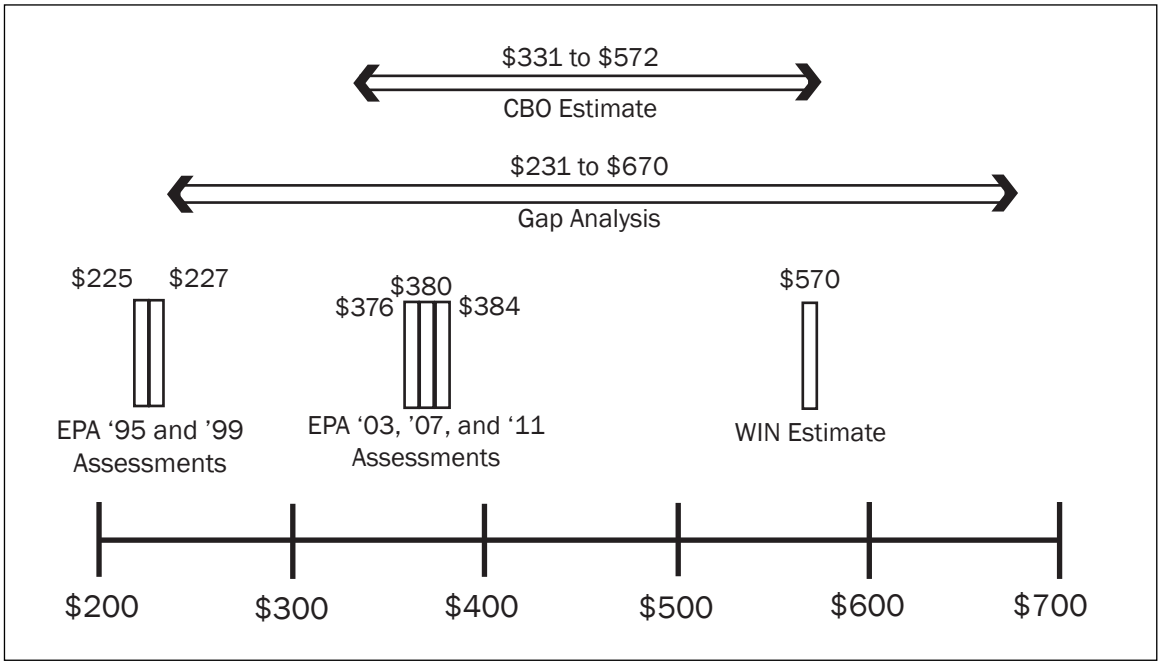
Exhibit 1.3 compares the EPA Assessments to other important assessment efforts. All estimates are presented in 2011 dollars. EPA's DWINSA continues to estimate a need within the range identified in these reports:

- The Congressional Budget Office (CBO) report "Future Investment in Drinking Water and Wastewater Infrastructure," which estimates annual water system needs of $16.6 billion to $28.6 billion. This extrapolates to a 20-year need in the range of $331.2 to $571.7 billion.[3]

[3]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 January 2011 dollars for comparison purposes.

- EPA's "Clean Water and Drinking Water Infrastructure Gap Analysis," which estimated drinking water systems' 20-year capital needs in the range of $231 billion to $670 billion with a point estimate of $412 billion.[4]
- The Water Infrastructure Network's (WIN's) "Clean and Safe Water for the 21st Century - A Renewed National Commitment to Water and Wastewater Infrastructure," which estimates water system needs of $28.5 billion annually. This extrapolates to $570.4 billion over 20 years.[5]
- The American Water Works Association (AWWA) report "Buried No Longer: Confronting America's Water Infrastructure Challenge" recently estimated at least $1 trillion will be required over a 25 year period through 2035 in order to restore existing water system pipe that has reached the end of its useful life and to expand pipe networks to meet growing populations. This estimate is significantly higher than the transmission and distribution total for EPA's 2011 DWINSA, as it is based on a different set of assumptions about pipe replacement and investment and covers a longer period of time.[6]

Exhibit 1.3: Total 20-Year Need Comparison to Other Assessments (in billions of January 2011 dollars)

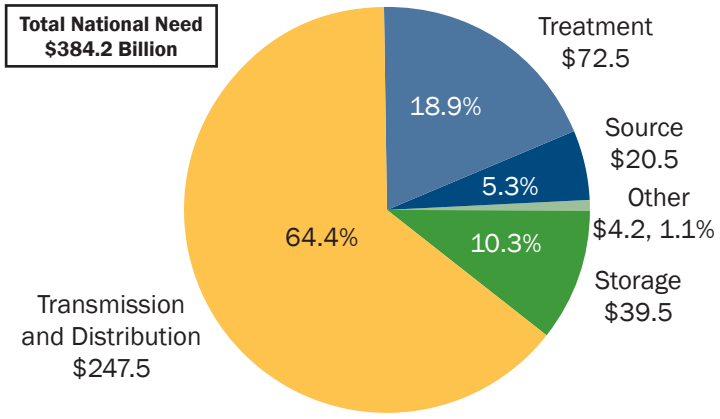


[4]U.S. Environmental Protection Agency, "Clean Water and Drinking Water Infrastructure Gap Analysis," (September 2002), p. 5. Needs were assumed to be in 1999 dollars based on the date of the report and planning period used. Needs have been adjusted to January 2011 dollars for comparison purposes.
[5]Water 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 January 2011 dollars for comparison purposes.
[6]American Water Works Association "Buried No Longer: Confronting America's Water Infrastructure Challenge," (February 2012), p. 9. Needs were reported in 2010 dollars and have been adjusted to January 2011 dollars for comparison.

Total National Need by Project Type

Infrastructure needs of water systems can be grouped into four major categories based on project type. These project types are source, transmission and distribution, treatment, and storage. Each category 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 composed of projects that do not fit into one of the four categories. Exhibit 1.4 shows the total national need by project type. Exhibit 1.5 shows the total national need by water system size and type, as well as by project type.

Exhibit 1.4: Total 20-Year Need by Project Type (in billions of January 2011 dollars)



Note: Numbers may not total due to rounding.

Exhibit 1.5: Total 20-Year Need by System Size and Type and Project Type (in billions of January 2011 dollars)

System Size and Type	Distribution and Transmission	Treatment	Storage	Source	Other	Total Need
Large Community Water Systems (serving over 100,000 persons)**	$98.0	$27.5	$11.2	$6.7	$1.7	$145.1
Medium Community Water Systems (serving 3,301 to 100,000 persons)**	$108.1	$28.6	$16.2	$7.1	$1.9	$161.8
Small Community Water Systems (serving 3,300 and fewer persons)†	$38.7	$10.0	$9.5	$5.6	$0.7	$64.5
Not-for-Profit Noncommunity Water Systems‡	$0.6	$0.9	$2.2	$0.9	$0.0*	$4.6
Total States and U.S. Territories Need	**$245.4**	**$67.1**	**$39.1**	**$20.3**	**$4.2**	**$376.0**
American Indian Water Systems	$1.8	$0.3	$0.3	$0.2	$0.1	$2.7
Alaska Native Village Water Systems	$0.3	$0.2	$0.1	$0.0*	$0.0*	$0.6
Costs Associated with Proposed and Recently Promulgated Regulations§		$4.9				$4.9
Total National Need	**$247.5**	**$72.5**	**$39.5**	**$20.5**	**$4.2**	**$384.2**

Note: Numbers may not total due to rounding. *Actual "Other" need $1.04 million for NPNCWS; Alaska Native Village water system "Other" need $4.9 million and "Source" need $39 million.
** "Large" and "medium" community water systems are defined differently for this Assessment than in the 2003, 1999, and 1995 Assessments. See Appendix A for more information.
† Based on 2007 Assessment findings adjusted to 2011 inventory and cost models.
‡ Based on 1999 Assessment findings adjusted to 2011 dollars.
§ Taken from EPA economic analyses.

Transmission and Distribution Needs

Transmission and distribution projects are the largest category of need at $247.5 billion over the next 20 years (64.4 percent of the total need). This category of need increased the most since the 2007 Assessment.

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. Even small rural systems may have several hundred miles of pipe. In larger cities, replacement or rehabilitation of even small segments of the extensive underground networks of water supply pipes can be costly, both from the perspective of the cost of construction and the costs related to disruption to the city's commerce. Regardless of water system size, projects dealing with water mains and related infrastructure present challenges. Pipe projects are typically driven by a utility's need to continue providing potable water to its customers while preventing contamination of the water prior to delivery.

The majority of this $247.5 billion need is for replacing or refurbishing aging or deteriorating transmission and distribution mains. These projects are critical to the delivery of safe drinking water and can help ensure compliance with many regulatory requirements. Failures in transmission and distribution lines can interrupt the delivery of water and possibly allow contamination of the water.

Michelle Stamates, Nevada Division of Environmental Protection

Installation of 450 linear feet of 24-inch fusible PVC below existing utilities in Carson City, NV.

The rate at which water mains require replacement or rehabilitation varies greatly by pipe material, age of the pipe, soil characteristics, weather conditions, and construction methods. Systems that have been unable to rehabilitate or replace mains may have proportionally more aged infrastructure, and therefore a higher level of need. In addition, some pipe materials tend to degrade prematurely; galvanized pipe is particularly susceptible to corrosion in certain soils, and unlined cast iron pipe is susceptible to internal corrosion. Furthermore, health concerns associated with asbestos during pipe repair make asbestos cement pipe undesirable for some systems. Many water suppliers are replacing these types of mains with ductile iron or polyvinyl chloride pipe.

Other projects in the transmission and distribution category are: installing new pipe to loop dead end mains to avoid stagnant water, installing water mains in areas where existing homes do not have a safe and adequate water supply, and installing or rehabilitating 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 repairs, hydrants to flush the distribution system to maintain water quality, backflow-prevention devices to avoid contamination, and meters to record flow and water consumption.

Top Photo: State of Kentucky Department of Environmental Protection
Bottom Photo: Chad Kolstad, Minnesota Department of Public Health

Top: Filter controls from Madisonville, KY
Bottom: New surface water treatment plant in Fairmont, MN. The current plant was constructed in 1926 and needed to be replaced. The new plant will have biologically active GAC filters to help with taste and odor complaints.

Treatment Needs

The total 20-year national need for treatment is estimated to be $72.5 billion. This category includes the construction, expansion, and rehabilitation of infrastructure to reduce contamination through various treatment processes (e.g., filtration, disinfection, corrosion control). A large percentage of the regulatory need is in this category. Treatment facilities vary significantly depending on the quality of their source water and type of contamination present. Treatment systems range from a simple chlorinator for disinfection to a complete conventional treatment system with coagulation and flocculation (processes that cause particles suspended in the water to combine for easier removal), sedimentation, filtration, disinfection, laboratory facilities, waste handling, and computer automated monitoring and control devices.

Treatment technologies are used to remove or inactivate disease-causing organisms, or to remove or prevent the formation of harmful chemicals.

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 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 affordable sources of water.

Source Needs

The total 20-year national need for source water infrastructure is estimated at $20.5 billion. The source category includes needs for constructing or rehabilitating surface water intake structures, drilled wells, and spring collectors. Needs for dams and raw water reservoirs are excluded from DWSRF funding and this Assessment.

Drought

An emerging need encountered in the 2007 Assessment, and now reiterated in the 2011 Assessment, is new source water infrastructure with associated piping and treatment to offset existing and anticipated drought conditions. In the past several years, water systems across the United States have been adversely affected by drought. EPA does not question that water systems are being affected by drought conditions. However, only a small percentage of the systems participating in the Assessment have completed plans to address drought impacts. When documentation was lacking or nonexistent, EPA had to decide whether a permanent solution or a less costly temporary solution should be considered for inclusion in the Assessment. EPA also investigated the drought-related projects to ensure they were primarily to provide drinking water to existing consumers and not for projected growth demand. EPA believes the drought-related needs reported in the 2007 and 2011 Assessments capture only a portion of the drought-related needs water utilities may face in the future.

Dave Westbrook

A leaking water tower in the city of Upper Sandusky, OH.

Drinking water comes from either ground water or surface water sources. Wells typically are considered ground water sources. Rivers, lakes, other open bodies of water, and wells under the 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 extensive treatment facilities. Many source water needs involve construction of new surface water intake structures or drilling new wells to obtain higher quality raw water.

A water source should provide an adequate supply to enable the water system to maintain minimum pressures. Low water pressure may result in the intrusion of contaminants into the distribution system. The 2011 Assessment includes projects to expand the capacity of intake structures and add new wells to address supply deficiencies facing existing customers.

Storage Needs

The 20-year national need estimated for storage projects is $39.5 billion. This category includes projects to construct, rehabilitate, or cover finished water storage tanks, but it excludes dams and raw water reservoirs (unless the raw water basins are onsite and part of the treatment process) because they are specifically excluded from DWSRF funding. It is critical that water systems have sufficient storage to provide adequate supplies of treated water to the public, particularly during periods of peak demand. This storage enables the system to maintain the minimum pressure required throughout the distribution system to prevent the intrusion of contaminants into the distribution network.

Other Needs

Needs not included in the previous four categories are grouped as "other" needs. These needs account for $4.2 billion of the total 20-year national need. Examples of "other" projects are system-wide telemetry, supervisory control and data acquisition (SCADA) systems, and water system security measures that were not assigned to another category.

Need by System Size

Exhibit 1.6 shows the relationship between infrastructure need, population served, and the number of community water systems by size category in the states, the District of Columbia, Puerto Rico, and the U.S. Territories. As this exhibit demonstrates, large systems account for a small portion of the number of community water systems in the states, District of Columbia, Puerto Rico, and U.S. Territories, but they serve 46 percent of the population receiving water from community water systems and account for 39 percent of the drinking water infrastructure investment need. Small systems cannot take advantage of economies-of-scale like large systems and so have higher costs per customer. Small systems represent, by far, the largest number of systems, but they account for only 8 percent of the population served. In relation to population

Exhibit 1.6: State Community Water System 20-Year Need by Size and Population* (in billions of January 2011 dollars)

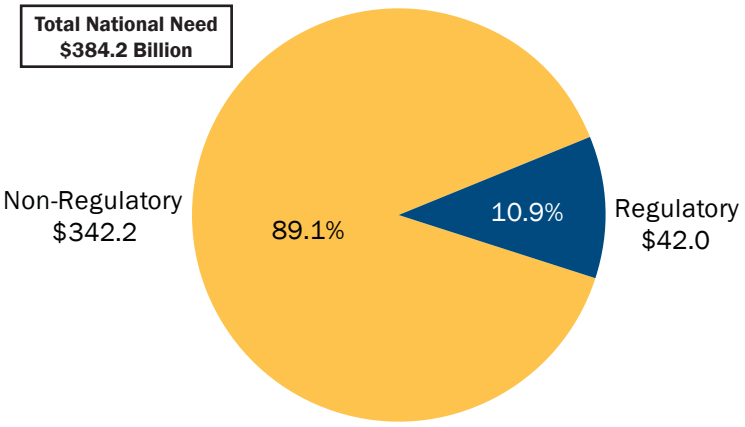
System Size	Need		Water Systems		Population Served	
	$ Billions	% of Need	Number of Systems‡	% of Water Systems‡	Population (millions)§	% of Population Served§
Large Community Water Systems (serving over 100,000 persons)**	$145.1	39.1%	611	1.2%	137.4	46.3%
Medium Community Water Systems (serving 3,301 to 100,000 persons)**	$161.8	43.6%	8,063	16.0%	135.2	45.6%
Small Community Water Systems (serving 3,300 and fewer persons)	$64.5	17.4%	41,801	82.8%	24.0	8.1%

Note: Numbers may not total due to rounding.
* This exhibit reports the need for community water systems in the states, Washington D.C., Puerto Rico, and the U.S. Territories. It does not discuss findings for not-for-profit noncommunity systems, needs associated with proposed or recently promulgated regulations, or needs for American Indian or Alaska Native Village water systems.
‡ Based on the DWINSA sample frame as discussed in Appendix A of this report.
§ Data on population served from EPA's *Annual Trends data, including summary inventory, violations and GPR*. June 2011 http://water.epa.gov/scitech/datait/databases/drink/sdwisfed/pivottables.cfm#summary. Does not include populations for systems defined as "Federal Systems" or "Native American," but does include populations served by Alaska Native Village Water Systems. Database distinguished system sizes for "very small," "small," "medium," "large," and "very large," allowing direct comparisons to system size in the Assessment.
** "Large" and "medium" community water systems are defined differently for this Assessment than in the 2003, 1999, and 1995 Assessments. See Appendix A for more information.

served, they account for a disproportionate 17 percent of the community water system need. Medium systems represent the largest portion of the need, and their need is more proportional to the population served.

American Indian and Alaska Native Village communities are not included in Exhibit 1.6; those systems serve primarily small communities. For example, approximately 90 percent of the 791 American Indian water systems serve fewer than 3,300 people. Similarly, no Alaska Native Village systems serve over 10,000 people and all but 4 of the 165 systems serve 3,300 or fewer people.

Exhibit 1.7: Total Regulatory vs. Non-Regulatory 20-Year Need (in billions of January 2011 dollars)



Note: Numbers may not total due to rounding.

Needs Associated with SDWA Regulations

As shown in Exhibit 1.7, 10.9 percent of the total national need, $42.0 billion, is for compliance with the SDWA regulations. This need includes existing regulations as well as regulations which are proposed or recently promulgated (see below). Although all of the projects in the Assessment are needed to further the goals of the SDWA, most needs are not for obtaining or maintaining compliance with a specific regulation. Most infrastructure projects are needed to ensure continued provision of potable water to a utility's customers. Projects that are directly attributable to specific SDWA regulations are collectively referred to as the "regulatory need." Most of the regulatory need involves the upgrade, replacement, or installation of treatment technologies.

The Assessment divides the regulatory need into existing regulations and proposed or recently promulgated regulations. These needs are further identified as either microbial or chemical regulations. Exhibit 1.8 provides a matrix of the regulatory needs by these categories.

Exhibit 1.8: Total 20-Year National Regulatory Need (in billions of January 2011 dollars)

Regulation Type	Microbial Regulations	Chemical Regulations	Total Regulatory Need
Existing Regulations	$26.1	$10.9	$37.1
Proposed or Recently Promulgated Regulations	$1.1	$3.8	$4.9
Total Regulatory Need	**$27.3**	**$14.7**	**$42.0**

Note: Numbers may not total due to rounding.

Assigning Arsenic Needs to Small Systems in the 2011 Assessment

For the 2011 Assessment, small systems were not resurveyed, and therefore EPA adjusted the 2007 small system needs to 2011 dollars. Because EPA has information that some number of small systems have not yet addressed capital improvement needs related to meeting the arsenic standard, the needs associated with arsenic compliance have been carried over from the 2007 Assessment and adjusted to 2011 dollars. While this likely overestimates the need for small systems by continuing to include those that have addressed infrastructure needs since 2007 to achieve compliance with the arsenic standard, EPA's analysis indicates any overestimation is well within the 2011 Assessment's statistical margin of error with insignificant impact on either the total national need or the relative needs between states.

Existing Regulations

Microbial Contaminants.

The surface water treatment regulations (Surface Water Treatment Rule, Interim Enhanced Surface Water Treatment Rule, Filter Backwash Recycling Rule, Long Term 1 Enhanced Surface Water Treatment Rule, and Long Term 2 Enhanced Surface Water Treatment Rule), the Total Coliform Rule, and the Ground Water Rule are existing SDWA regulations that address microbial contamination. The Stage 1 Disinfectants/Disinfection Byproducts Rule regulates the maximum disinfectant and disinfection byproducts levels in distribution systems and is commonly grouped with the microbial rules.

Projects for compliance with existing regulations were reported by systems in the Assessment and account for almost 90 percent of the total regulatory need and almost all of the microbial contaminant-related need. This reflects the fact that the majority of the nation's large municipal systems use surface water sources. Under all of these regulations, systems using surface water sources must provide treatment to minimize microbial contamination. In most cases, this means installing, upgrading, or rehabilitating treatment plants to control pathogens such as the bacterium *E. coli*, the virus Hepatitis A, and the protozoans *Giardia lamblia* and *Cryptosporidium*. Disinfection also helps protect the system from Total Coliform Rule violations.

Chemical Contaminants.

This estimate includes projects attributable to the Nitrate/Nitrite Standard, the revised Arsenic Standard, the Lead and Copper Rule, and other regulations that set maximum contaminant levels (MCLs) or treatment techniques for organic and inorganic chemicals. Examples of projects are infrastructure that aerates water to remove volatile organic compounds such as tetrachloroethylene, or ion exchange units that remove contaminants from the water. This category includes regulations governing more than 80 inorganic or organic chemicals for which infrastructure projects may be needed.

Stew Thornley

New reverse osmosis plant in the city of St. Peter, MN to treat for nitrate, iron, manganese and hardness.

Proposed or Recently Promulgated Regulatory Needs

In general, water systems can readily identify the infrastructure needs required for compliance with existing regulations, but most systems have not determined the infrastructure needed to comply with proposed or recently promulgated regulations. Therefore, relying on systems to report the infrastructure needs for proposed or recently promulgated regulations might misstate the true need. Consequently, EPA derived the capital infrastructure estimates from the EA that the Agency published when proposing each regulation, or from the final EA if the regulation has been recently promulgated.

However, since the EAs rely on regional data, they are not appropriate predictors of state-specific needs. Therefore, the costs associated with the proposed or recently promulgated regulations are allocated at a national level, not apportioned to each state.

The proposed or recently promulgated regulations included in the 2011 Assessment are:

- Proposed Radon Rule
- Final Stage 2 Disinfectants/Disinfection Byproducts Rule
- Proposed Revisions to the 1989 Total Coliform Rule

The total cost of complying with these regulations is included in the 2011 Assessment as future regulatory needs. The capital cost estimates for the Proposed Radon Rule and the Final Stage 2 Disinfectants/Disinfection Byproducts Rule are provided in Exhibit 1.9. No capital costs are associated with the Proposed Revisions to the 1989 Total Coliform Rule, which would result in enhanced maintenance and operations rather than new infrastructure investments.

Exhibit 1.9: Total National 20-year Need for Proposed and Recently Promulgated Regulations (in billions of January 2011 dollars)

Proposed or Recently Promulgated Regulation*	Estimated Total Regulatory Need†
Stage 2 Disinfectants/Disinfection Byproducts Rule	$1.1
Radon Rule‡	$3.8
Total Proposed or Recently Promulgated Regulatory Need	**$4.9**

* The Economic Analysis for the Proposed Revisions to the 1989 Total Coliform Rule did not report capital costs.
† Estimates obtained from the appropriate Final or Proposed Rule "Economic Analysis." These estimates include only capital costs (i.e., they exclude operation and maintenance costs).
‡ The total capital costs were determined by averaging the capital costs from the Economic Analysis for the proposed Radon Rule.

Security Needs

Since the September 11, 2001 attacks, 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 required any community water system that serves a population of more than 3,300 to prepare a vulnerability assessment. For many water systems, particularly the large systems, security measures have become fully integrated into the capital costs of major infrastructure improvements.

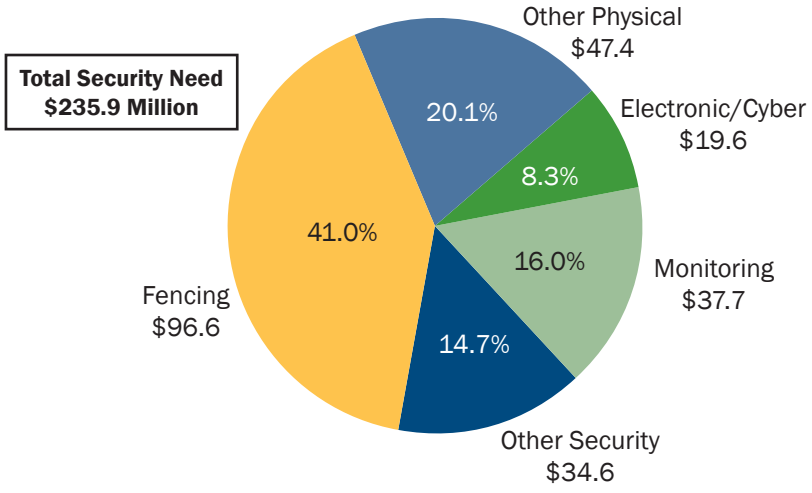
Projects in the 2011 Assessment that were specifically listed as security need account for $235.9 million. However, the total cost that systems incur to protect their infrastructure and their customers' water quality is likely far greater because many of these costs are now commonly incorporated into the construction cost of infrastructure projects rather than considered separately. The majority of security needs are mostly "hidden" in the other needs reported by this Assessment.

Exhibit 1.10 shows the breakdown of the stand-alone security needs by type of project, including fencing, electronic or cyber security, other physical security measures, monitoring equipment, and other projects listed as having multiple types of security needs. Note that these categories are the same as the 2007 Survey but slightly different from those reported in the 2003 Assessment. They were changed to align with the categories now used within the water supply industry.

EPA Region 9

Storage tanks are equipped with caged ladders for safety and are secured to deter trespassers.

Exhibit 1.10: Total National 20-Year Security Needs (in millions of January 2011 dollars)



Note: Numbers may not total due to rounding.

American Indian and Alaska Native Village Water System Needs

The combined American Indian and Alaska Native Village water system need estimated by the 2011 Assessment is $3.3 billion in capital improvements over the next 20 years. This need includes drinking water infrastructure to increase access to safe drinking water through compliance with EPA's drinking water regulations and connection of homes without piped water to existing public water systems. These infrastructure needs are based on surveys of statistically-selected water systems. The prior 2003 and 2007 Assessments estimated the need by adjusting the findings of the 1999 Assessment to current dollars.

As shown in Exhibit 1.11, the combined need of $3.3 billion for the 2011 Assessment is comparable to the $3.3 billion of the 1999 Assessment (adjusted to 2011 dollars); however, the mix of needs between the American Indian and the Alaska Native Village water systems has shifted significantly. These estimates are discussed further in Chapter 3.

Exhibit 1.11: American Indian and Alaska Native Village Reported Needs by Survey Year (20-year need in millions of 2011 dollars)

	1995 Results in 2011 Dollars	1999 Results in 2011 Dollars	2011 Results
American Indian Systems	$920.6	$1,715.8	$2,695.6
Alaska Native Village Systems	$1,267.7	$1,589.8	$593.4
American Indian and Alaska Native Village Total	**$2,188.3**	**$3,305.6**	**$3,296.4**

Sara Ziff, EPA Region 9

The Whiteriver Surface Water Treatment Plant allows the White Mountain Apache Tribe to supplement a declining well field with water from the White River. The innovative design of the treatment plant will annually save 85 million gallons of water.

Sara Ziff, EPA Region 9

This water main connects the village of Sikul Himatk on the Tohono O'odham Nation to a nearby community with an arsenic treatment plant. The Sikul Himatk well exceeded the EPA maximum contaminant level for arsenic, and the project provides water with arsenic meeting the EPA standard.

Climate Readiness

The drinking water industry has increased efforts dedicated to anticipating and proactively addressing the potential effects of climate change at the water utility level. For the 2011 Assessment, EPA did not create a new category of need, but captured voluntary, additional information to estimate, in very general terms, the extent to which projects that are included in the survey are also related to climate change adaptation – referred to as climate readiness. Identifying a project as related to climate readiness did not affect project allowability for the DWINSA.

What is Climate Readiness?

For the purposes of this report, climate readiness refers to adapting to and addressing climate change impacts on drinking water system infrastructure.

The method used for capturing data on DWINSA projects that are related to climate readiness is described in Appendix A. For the DWINSA, EPA has not defined what constitutes a climate readiness project or what is appropriate rationale or data to support the consideration of climate readiness during the planning of a project. EPA has captured data on climate readiness projects to report the findings to the industry and others to help facilitate communications on this emerging issue.

The 2011 DWINSA found few climate readiness projects, with just 164 projects from 44 systems related to climate readiness – less than 1.5 percent of the responding systems. Respondents cited climate change data from a variety of sources including state-specific models, region-specific models, state environmental agencies, National Oceanic and Atmospheric Administration (NOAA), energy companies, supply contracts, and the condition of current infrastructure.

Survey responses that reported needs with climate readiness considerations are summarized in Exhibit 1.12. As shown in the exhibit, one state accounts for over half the reported climate readiness needs. The low level of identification of climate readiness projects may have been due to such identification being voluntary, not having any bearing on estimating infrastructure needs, and lack of definition of climate readiness. However, this aspect of the survey served to increase dialogue within the DWINSA regarding climate readiness and could serve as baseline data for future surveys.

Exhibit 1.12: Climate Readiness Needs by State (As a percentage of Total Reported Climate Readiness Need)

State	Percent of Total Reported Climate Readiness Need*
North Carolina	50.8%
Connecticut	17.8%
Tennessee	6.9%
Iowa	4.1%
West Virginia	3.5%
Colorado	3.1%
South Carolina	3.1%
California	2.8%
Kentucky	2.5%
Texas	1.4%
Indiana	1.4%

*In addition to the states listed above, systems in Florida, Georgia, Maine, Michigan, Delaware, Oklahoma, Massachusetts, Illinois, and American Indian systems in EPA Region 8 reported climate readiness need which totaled less than 1 percent of the total reported climate readiness need.

Green Projects

Similarly, while EPA did not create a new category of need, the survey questionnaire requested responders to voluntarily identify projects that included green components for the 2011 DWINSA. While EPA did not specifically define green projects, a guide to identifying projects that might include a green component was provided with the questionnaire package (see Appendix A). The Assessment did not collect information on the specific cost of the green component, and identifying a project as including a green component did not affect project allowability for the DWINSA.

What is Green Infrastructure?

Green infrastructure includes products, technologies, and practices that use natural systems – or engineered systems that mimic natural processes – to enhance overall environmental quality and provide utility services. Categories of green infrastructure include water efficiency, energy efficiency, and environmentally innovative projects.

Exhibit 1.13: Entities with More Than 5 Percent of Total Reported Green Need

State	Percentage of Total Reported Green Need
California	28.7%
Georgia	8.4%
Illinois	7.0%
North Carolina	5.3%
Oregon	5.6%
Puerto Rico	5.6%

As with climate readiness, few "green" projects were reported in the survey (3,137 projects, or about 3.2 percent of the total number of projects that were submitted). Like "climate readiness" projects, the low level of identification of "green" projects is likely due to such identification being voluntary and not having any bearing on estimating infrastructure needs. However, this aspect of the survey served to increase dialog within DWINSA regarding "green" projects being considered and could serve as baseline data for future studies.

Of the reported projects, 55 percent were for water efficiency, 42.4 percent for energy efficiency, and the remaining 2 percent were identified as either "other green infrastructure" or environmentally innovative or a combination of these categories.

The total cost of projects that included a green component or purpose is estimated at $4.79 billion. Relatively few states and systems reported such information. Exhibit 1.13 shows all entities (five states and Puerto Rico) which accounted for more than 5 percent of the total reported green projects. These six entities account for 61 percent of the reported green projects.

Data collected by the 2011 DWINSA indicate that systems are considering diverse applications for green initiatives. Exhibit 1.14 presents the most common types of need that included green applications.

Exhibit 1.14: Top Five Project Types Representing Green Need (As a percentage of Total Reported Green Need)

Project Type	Percentage of Total Reported Green Need
Meters	69.4%
Pump Stations	9.9%
Distribution Mains	3.2%
Well Pumps	2.6%
Conventional Filter Plants	2.6%

Chapter 2: Findings - State Need

State-Specific Needs

Since federal fiscal year 1998, the SDWA has required EPA to allot DWSRF grants to each state based on the findings of the most recent DWINSA. Because of this Assessment's role in determining DWSRF capitalization grant allocations, obtaining highly credible and statistically valid estimates of each state's need is crucial. Exhibits 2.1 and 2.2 show the total DWSRF-eligible need for states, Puerto Rico, the District of Columbia, and the U.S. Territories by project type and system size. Exhibit 2.3 is a map indicating each state's 20-year total need.

DWSRF capitalization grants for fiscal years 2014 through 2017 will be allocated to states based on the findings of the 2011 Assessment. The funding is allocated by first setting aside a percentage allotment, recently 2.0 percent, to American Indian and Alaska Native Village water systems and a percent allotment, recently 1.5 percent, to the U.S. Territories (the U.S. Virgin Islands, Guam, the Commonwealth of the Northern Mariana Islands, and American Samoa); the Assessment findings are used to help divide these set-asides among these entities. The remaining funds are then divided among the states, Puerto Rico, and the District of Columbia based on the Assessment's determination of each state's relative percentage of the total "state need" with each receiving no less than the one percent minimum allotment.

States that received the minimum allocation of one percent in the most recent allocation were given the option of a lower level of participation in the Assessment. These states' needs are reported as one group referred to as "partially surveyed" states. This option is explained later in this chapter.

The state need does not include costs associated with proposed or recently promulgated regulations or the need of American Indian or Alaska Native Village water systems.

Partnership for Determining State Need

The substantial effort involved in collecting data and calculating water systems' 20-year needs relies on a partnership between EPA, the states, and the utilities themselves. Each partner makes a valuable contribution to estimating the DWSRF-eligible needs of drinking water systems.

Water System. Operators and managers of water utilities have on-the-ground knowledge of their system's infrastructure and condition. These personnel are in the best position to assess their infrastructure needs.

States. State personnel often have considerable knowledge of the systems in their state, and states have the staffs that are trained to assist systems in completing this Assessment. The states work with EPA towards consensus development of Assessment policies and methods to ensure consistency across the states.

EPA. EPA's primary roles are to serve as the quality assurance agent for the data collection effort, to ensure that survey policies and methodologies are met, and to serve as a technical resource to assist with capturing complete and accurate 20-year needs. EPA provides oversight for survey submittals to encourage full reporting, to ensure consistency and fairness between states, and to control for any state bias.

Gordon Cole, Shaw Engineering

Installation of more than 35,000 linear feet of new 14-in PVC transmission line in Tonopah, NV.

Exhibit 2.1: State 20-year Need Reported by Project Type (in millions of January 2011 dollars)

State	Transmission and Distribution	Source	Treatment	Storage	Other	Total
Alabama	$6,115.2	$142.7	$918.8	$639.8	$133.2	$7,949.8
Arizona	$4,974.6	$334.7	$1,416.9	$684.9	$29.6	$7,440.7
Arkansas	$4,391.6	$195.5	$857.0	$574.3	$79.9	$6,098.4
California	$26,752.1	$2,564.5	$8,467.3	$6,403.9	$325.3	$44,513.0
Colorado	$4,136.4	$223.6	$1,915.4	$816.5	$32.2	$7,124.0
Connecticut	$2,584.3	$146.6	$545.1	$267.3	$35.0	$3,578.3
District of Columbia	$1,448.7	$0.0	$43.3	$104.4	$10.2	$1,606.7
Florida	$10,153.6	$1,348.2	$3,561.8	$1,060.5	$346.8	$16,471.0
Georgia	$6,732.1	$297.0	$1,371.8	$813.8	$53.5	$9,268.2
Illinois	$12,673.7	$1,575.5	$2,786.2	$1,551.1	$398.4	$18,984.9
Indiana	$4,522.3	$334.5	$1,036.7	$618.2	$35.3	$6,546.9
Iowa	$4,189.7	$294.9	$900.1	$509.6	$35.9	$5,930.2
Kansas	$3,066.7	$190.7	$572.9	$351.8	$12.5	$4,194.7
Kentucky	$4,848.5	$96.8	$708.6	$524.3	$50.4	$6,228.6
Louisiana	$3,458.2	$279.7	$1,084.7	$455.1	$45.0	$5,322.6
Maine	$737.6	$73.8	$190.7	$165.8	$11.9	$1,179.7
Maryland	$4,895.0	$180.8	$1,199.4	$469.1	$168.7	$6,913.1
Massachusetts	$5,641.4	$276.4	$981.0	$737.5	$64.6	$7,701.0
Michigan	$9,504.6	$639.3	$2,511.8	$1,073.8	$84.4	$13,813.9
Minnesota	$4,603.3	$457.7	$1,383.5	$845.6	$72.5	$7,362.6
Mississippi	$2,110.6	$279.0	$780.2	$499.5	$17.2	$3,686.6
Missouri	$6,120.3	$316.5	$1,269.3	$752.4	$22.2	$8,480.7
Nevada	$2,880.7	$1,043.5	$1,291.7	$331.1	$44.2	$5,591.3
New Jersey	$5,025.2	$377.5	$1,595.4	$842.9	$73.4	$7,914.5
New York	$13,760.4	$1,779.8	$3,814.2	$2,531.2	$155.6	$22,041.1
North Carolina	$6,673.5	$482.0	$1,803.9	$936.0	$150.4	$10,045.8
Ohio	$8,057.5	$548.5	$2,194.5	$1,169.3	$221.3	$12,191.1
Oklahoma	$4,380.4	$366.7	$1,202.2	$513.1	$31.3	$6,493.8
Oregon	$3,189.9	$285.9	$1,031.2	$1,001.8	$54.3	$5,563.0
Pennsylvania	$9,290.8	$610.7	$2,498.5	$1,645.6	$181.7	$14,227.3
Puerto Rico	$2,058.3	$84.3	$665.6	$379.7	$25.2	$3,213.2
Tennessee	$1,816.4	$78.1	$550.4	$218.1	$29.0	$2,692.0
Texas	$22,181.6	$1,353.3	$6,663.4	$3,266.5	$427.0	$33,891.8
Utah	$2,225.7	$242.5	$588.0	$649.0	$20.4	$3,725.6
Virginia	$4,490.9	$207.8	$1,239.2	$715.2	$62.6	$6,715.7
Washington	$5,770.4	$628.2	$1,607.5	$1,252.0	$261.9	$9,520.0
Wisconsin	$4,381.3	$433.1	$1,436.7	$850.3	$39.5	$7,140.8
Partially Surveyed States*	$15,255.4	$1,431.4	$4,276.5	$2,697.3	$301.8	$23,962.4
Subtotal	**$245,099.1**	**$20,201.7**	**$66,961.4**	**$38,918.3**	**$4,144.4**	**$375,325.0**
American Samoa	$48.0	$7.0	$11.3	$15.4	$0.3	$81.9
Guam	$125.1	$30.8	$6.8	$48.6	$24.1	$235.4
North Mariana Is.	$62.4	$29.6	$42.1	$40.2	$3.5	$177.7
Virgin Islands	$99.0	$0.0	$34.5	$39.0	$2.0	$174.6
Subtotal	**$334.5**	**$67.4**	**$94.7**	**$143.1**	**$29.9**	**$669.7**
Total	**$245,433.6**	**$20,269.1**	**$67,056.2**	**$39,061.4**	**$4,174.4**	**$375,994.7**

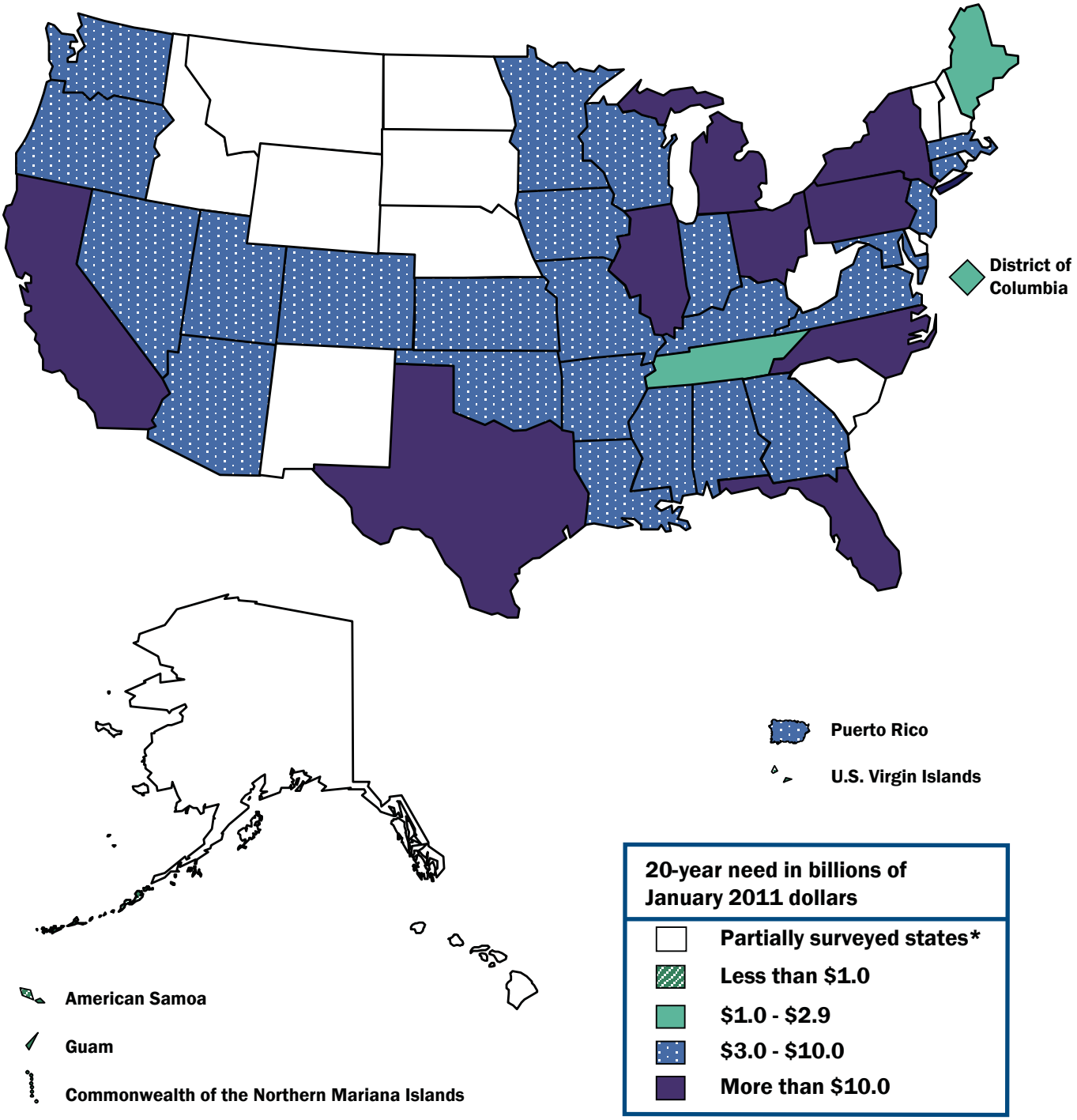
*The need for states that opt out of the medium system portion of the survey is presented cumulatively and not by state. The list of 15 partially surveyed states can be seen in Exhibit 2.4.

Exhibit 2.2: State 20-year Need Reported by System Size (in millions of January 2011 dollars)

State	Large	Medium	Small	NPNCWSs	Total
Alabama	$1,570.2	$5,951.9	$423.3	$4.3	$7,949.8
Arizona	$3,987.1	$2,463.9	$968.7	$21.0	$7,440.7
Arkansas	$696.0	$4,354.9	$1,039.2	$8.3	$6,098.4
California	$27,369.9	$13,317.8	$3,710.3	$115.0	$44,513.0
Colorado	$2,708.2	$3,222.5	$1,191.8	$1.5	$7,124.0
Connecticut	$1,735.3	$1,137.7	$674.1	$31.2	$3,578.3
District of Columbia	$1,606.7	$0.0	$0.0	$0.0	$1,606.7
Florida	$8,258.6	$6,147.8	$1,919.7	$144.8	$16,471.0
Georgia	$3,283.0	$4,197.4	$1,772.2	$15.6	$9,268.2
Illinois	$8,640.7	$7,135.7	$3,083.7	$124.9	$18,984.9
Indiana	$1,791.2	$3,416.3	$1,139.3	$200.0	$6,546.9
Iowa	$447.9	$3,821.2	$1,640.3	$20.9	$5,930.2
Kansas	$1,045.3	$1,762.7	$1,382.8	$3.9	$4,194.7
Kentucky	$1,206.2	$4,662.0	$359.1	$1.2	$6,228.6
Louisiana	$1,196.1	$2,713.7	$1,395.9	$16.9	$5,322.6
Maine	$149.6	$501.6	$489.4	$39.1	$1,179.7
Maryland	$5,276.1	$939.7	$585.8	$111.4	$6,913.1
Massachusetts	$2,106.2	$5,104.4	$453.0	$37.3	$7,701.0
Michigan	$5,796.9	$5,649.7	$1,831.6	$535.6	$13,813.9
Minnesota	$738.7	$4,798.4	$1,521.1	$304.3	$7,362.6
Mississippi	$147.0	$1,648.5	$1,880.2	$10.9	$3,686.6
Missouri	$2,055.4	$4,365.6	$2,015.3	$44.4	$8,480.7
Nevada	$4,555.2	$726.3	$293.6	$16.2	$5,591.3
New Jersey	$3,402.9	$3,600.3	$680.5	$230.9	$7,914.5
New York	$13,801.7	$4,144.4	$3,951.9	$143.1	$22,041.1
North Carolina	$2,831.3	$4,983.4	$1,811.7	$419.4	$10,045.8
Ohio	$4,719.4	$5,432.9	$1,718.8	$320.1	$12,191.1
Oklahoma	$1,507.7	$3,418.8	$1,542.0	$25.3	$6,493.8
Oregon	$1,274.4	$3,088.8	$1,136.8	$63.1	$5,563.0
Pennsylvania	$5,065.4	$6,052.3	$2,790.0	$319.6	$14,227.3
Puerto Rico	$779.9	$1,823.6	$608.3	$1.4	$3,213.2
Tennessee	$259.6	$1,971.5	$428.3	$32.7	$2,692.0
Texas	$12,746.6	$15,172.7	$5,918.4	$54.1	$33,891.8
Utah	$861.3	$2,286.2	$563.4	$14.7	$3,725.6
Virginia	$2,531.6	$2,738.1	$1,342.0	$104.0	$6,715.7
Washington	$2,538.9	$4,272.3	$2,577.2	$131.7	$9,520.0
Wisconsin	$1,733.9	$3,386.8	$1,471.8	$548.4	$7,140.8
Partially Surveyed States*	$4,424.7	$11,043.7	$8,096.6	$397.5	$23,962.4
Subtotal	**$144,847.0**	**$161,455.5**	**$64,408.1**	**$4,614.4**	**$375,325.0**
American Samoa	$0.0	$52.1	$29.8	$0.0	$81.9
Guam	$235.4	$0.0	$0.0	$0.0	$235.4
North Mariana Is.	$0.0	$118.5	$59.2	$0.0	$177.7
Virgin Islands	$0.0	$174.6	$0.0	$0.0	$174.6
Subtotal	**$235.4**	**$345.2**	**$89.0**	**$0.0**	**$669.7**
Total	**$145,082.4**	**$161,800.8**	**$64,497.1**	**$4,614.4**	**$375,994.7**

*The need for states that opt out of the medium system portion of the survey is presented cumulatively and not by state. The list of 15 partially surveyed states can be seen in Exhibit 2.4.

Exhibit 2.3: Overview of 20-Year Need by State



* The list of the 15 partially surveyed states can be seen in Exhibit 2.4.

- Does not include needs for American Indian and Alaska Native Village water systems.
- The needs for American Samoa, Guam, the Commonwealth of the Northern Mariana Islands, and the U.S. Virgin Islands are less than $1 billion each.

States that received the minimum DWSRF allotment of one percent in the most recent allocation were given the option of surveying only the large systems in their state, and not collecting data for medium-sized systems. (Small system data were collected by EPA in the 2007 Assessment.) This option was provided to reduce the burden on these states and allow for resources to be focused on the large systems. Of the 22 states (including the District of Columbia and Puerto Rico) that received the minimum allocation based on the 2007 DWINSA findings, 15 chose this "partially surveyed" option. For these states, the medium system need was estimated based on data from fully surveyed states. Because this method does not meet the Assessment's stringent data quality objectives at the state level, the needs of these states contribute to the estimate of the total national need but are not reported individually by state. Exhibit 2.4 shows the large and small system need estimated by state, and the total medium system need for the partially surveyed states.

Exhibit 2.4: State 20-year Need Reported for Partially Surveyed States (in millions of January 2011 dollars)

State	Large CWSs	Medium CWSs*	Small CWSs	NPNCWSs †	Total
Alaska	$311.7		$392.6	$69.3	$773.7
Delaware	$73.5		$291.6	$3.7	$368.8
Hawaii	$898.5		$154.6	$1.1	$1,054.2
Idaho	$142.1		$776.9	$42.8	$961.8
Montana	$72.0		$755.8	$57.5	$885.3
Nebraska	$713.3		$888.7	$18.1	$1,620.2
New Hampshire	$56.7		$708.0	$70.2	$834.9
New Mexico	$427.2		$720.0	$17.4	$1,164.7
North Dakota	$0.0		$443.6	$6.0	$449.7
Rhode Island	$49.5		$80.3	$18.3	$148.2
South Carolina	$1,260.8		$560.3	$18.4	$1,839.4
South Dakota	$212.9		$519.4	$5.8	$738.1
Vermont	$0.0		$510.6	$0.2	$510.8
West Virginia	$206.4		$898.1	$54.7	$1,159.2
Wyoming	$0.0		$396.1	$13.9	$409.9
Total	**$4,424.7**	**$11,043.7**	**$8,096.6**	**$397.5**	**$23,962.4**

* The medium community water system need was estimated cumulatively based on data from fully surveyed states.

† The non-for-profit noncommunity system need is based on 1999 Assessment findings adjusted to 2011 dollars.

More of the need of the partially surveyed states is for small and medium systems than among the rest of the nation. Large system need makes up a relatively small share of the total among partially surveyed states because these states generally do not have as many systems serving more than 100,000 persons as other states.

Unique Needs of Water Systems in U.S. Territories

Under SDWA and through appropriations, 1.5 percent of DWSRF monies is allocated to the U.S. Territories (American Samoa, the Commonwealth of the Northern Mariana Islands, Guam, and the U.S. Virgin Islands) to be used as grants for water systems. For the 2011 Assessment, EPA mailed questionnaires to all large systems and to a probability sample of medium-sized systems in the U.S. Territories to assess the needs of water systems on these islands.

Exhibit 2.5: 20-Year Need Reported by U.S. Territories (in millions of January 2011 dollars)

Territory	Total Need
American Samoa	$81.9
Guam	$235.4
Commonwealth of the Northern Mariana Islands	$177.7
U.S. Virgin Islands	$174.6

Exhibit 2.5 shows the 20-year need reported for each of the U.S. Territories in millions of January 2011 dollars. The DWINSA Assessments have consistently demonstrated that water systems in the territories face unique challenges in providing safe drinking water to their citizens. While drinking water issues can vary from island to island, the overall challenges for all of the U.S. Territories include:

- **Rapidly Deteriorating Infrastructure**. In many island climates, corrosive soils and years of delivering previously untreated water have contributed to a prematurely deteriorated distribution system. Inadequate storage and lack of redundancy in the water systems make it difficult to take infrastructure off line for required maintenance or replacement.
- **Seasonal, Transient Customers**. A high volume of tourists creates considerable fluctuations in seasonal water demand that are difficult to design for. Cruise ships and other forms of tourism present huge peak demands on water systems already working at capacity.
- **Limited Source Options**. The ability to serve existing homes as well as a growing population is limited by a lack of quality sources of water. The islands' water supplies are dependent upon limited fresh water sources, ground water aquifers which are susceptible to contamination, and the use of rainwater catchments.
- **Ground Water Contamination**. Aquifer contamination from waste and sediment runoff, on-site wastewater treatment systems, illegal dumping, and salt water intrusion threatens the quality and quantity of water pumped from aquifers.

Changes in State-Specific Need through Assessment Cycles

As shown in Exhibit 2.6, the state-specific results of the 2011 Assessment, when compared to previous Assessments, show that states' needs change, and some change more significantly than others during the four-year intervals between Assessments. Changes in relative needs of states from one Assessment to the next can be attributed to two primary factors:

Exhibit 2.6: Historic State Need Reported for Each DWINSA (20-year need in millions of 2011 dollars)

State	1995	1999	2003	2007	2011
Alabama	$2,724.6	$1,610.2	$2,293.7	$4,649.8	$7,949.8
Alaska	$1,266.4	$871.8	$925.5	$921.4	*
Arizona	$2,222.9	$2,416.8	$12,386.1	$8,405.6	$7,440.7
Arkansas	$3,324.4	$2,285.2	$4,806.1	$5,987.2	$6,098.4
California	$30,894.6	$26,053.0	$37,853.7	$44,288.8	$44,513.0
Colorado	$3,200.6	$3,769.5	$7,230.1	$7,259.4	$7,124.0
Connecticut	$2,227.8	$1,499.7	$887.0	$1,581.1	$3,578.3
Delaware	$610.2	$452.9	$327.1	*	*
District of Columbia	$216.1	$616.8	$202.9	$991.6	$1,606.7
Florida	$7,119.0	$5,548.0	$20,427.6	$14,544.8	$16,471.0
Georgia	$5,410.4	$3,584.7	$12,247.2	$10,137.8	$9,268.2
Hawaii	$707.6	$218.5	$1,103.5	*	*
Idaho	$969.2	$768.5	$987.3	*	*
Illinois	$8,784.8	$9,160.8	$18,330.7	$17,033.4	$18,984.9
Indiana	$2,750.0	$2,522.8	$5,475.9	$6,742.6	$6,546.9
Iowa	$3,704.4	$4,240.5	$4,758.9	$6,933.8	$5,930.2
Kansas	$3,245.6	$2,451.8	$2,622.5	$4,571.3	$4,194.7
Kentucky	$3,652.4	$2,635.6	$3,814.8	$5,646.5	$6,228.6
Louisiana	$3,207.9	$1,896.1	$5,577.6	$7,826.5	$5,322.6
Maine	$1,421.2	$742.7	$1,129.7	*	$1,179.7
Maryland	$2,109.6	$2,489.2	$5,382.7	$6,174.2	$6,913.1
Massachusetts	$9,762.5	$8,753.9	$11,618.6	$7,701.7	$7,701.0
Michigan	$7,285.7	$10,112.4	$15,362.2	$13,432.9	$13,813.9
Minnesota	$4,002.8	$4,617.1	$7,416.1	$6,792.4	$7,362.6
Mississippi	$2,588.1	$2,027.0	$2,233.5	$3,678.8	$3,686.6
Missouri	$3,085.4	$3,247.2	$8,092.2	$8,037.0	$8,480.7
Montana	$1,088.1	$1,298.8	$1,072.0	*	*
Nebraska	$1,564.8	$1,239.5	$1,839.0	$2,015.1	*
Nevada	$861.9	$897.4	$1,238.8	$3,052.7	$5,591.3
New Hampshire	$1,177.4	$744.0	$808.9	*	*
New Jersey	$5,933.3	$5,450.5	$9,392.4	$9,030.6	$7,914.5
New Mexico	$1,712.2	$1,552.2	$1,252.5	*	*
New York	$16,556.6	$19,597.0	$20,117.6	$30,780.9	$22,041.1
North Carolina	$4,456.8	$4,032.7	$14,912.7	$11,405.3	$10,045.8
North Dakota	$963.8	$729.7	$824.2	*	*
Ohio	$8,056.7	$7,387.2	$13,152.4	$14,290.6	$12,191.1
Oklahoma	$3,335.8	$3,487.0	$6,524.8	$4,664.2	$6,493.8
Oregon	$3,527.6	$4,035.6	$5,796.0	$3,159.3	$5,563.0
Pennsylvania	$7,809.9	$7,832.9	$14,926.5	$12,907.2	$14,227.3
Puerto Rico	$3,701.3	$2,937.4	$3,095.0	$2,878.2	$3,213.2
Rhode Island	$1,078.4	$859.7	$546.8	*	*
South Carolina	$2,398.8	$1,222.3	$1,691.7	$1,846.9	*
South Dakota	$933.9	$655.0	$1,344.4	*	*
Tennessee	$3,072.7	$2,100.6	$3,762.7	$4,023.9	$2,692.0
Texas	$20,304.0	$19,465.9	$38,258.5	$29,639.2	$33,891.8
Utah	$1,716.7	$765.5	$960.1	*	$3,725.6
Vermont	$754.2	$457.2	$536.2	*	*
Virginia	$4,834.2	$3,061.9	$3,891.2	$6,875.8	$6,715.7
Washington	$6,619.0	$5,880.2	$9,061.2	$11,065.9	$9,520.0
West Virginia	$1,790.2	$1,519.4	$1,170.7	*	*
Wisconsin	$3,066.1	$4,615.0	$8,064.9	$7,016.6	$7,140.8
Wyoming	$641.6	$658.8	$405.0	*	*
Partially Surveyed States*				$19,500.7	$23,962.4
Subtotal	**$224,450.4**	**$207,076.3**	**$358,139.3**	**$367,491.8**	**$375,325.0**
American Samoa	$36.9	$54.2	$43.8	$105.3	$81.9
Guam	$175.2	$170.8	$378.9	$299.4	$235.4
North Mariana Is.	$57.6	$111.4	$268.7	$328.1	$177.7
Virgin Islands	$366.4	$240.8	$245.0	$287.4	$174.6
Subtotal	**$636.0**	**$577.3**	**$936.4**	**$1,020.1**	**$669.7**
Total	**$225,086.4**	**$207,653.6**	**$359,075.7**	**$368,511.9**	**$375,994.7**

*For the 2007 and 2011 DWINSA, the need for paritally surveyed states that opted out of the medium system portion of the survey is presented cumulatively and not by state.

- **Changes in Projects Planned, Initiated, and Completed.** Congress specified that the DWINSA be repeated at 4-year intervals to capture changes in system infrastructure needs. Changes in the reported needs of individual systems from one survey period to the next can have a significant effect on the overall state need. For instance, in one Assessment a state may have a large system that has identified a project with very substantial costs. During that Assessment cycle, that state's need may be increased due to this large project. However, if construction of this project begins prior to the next Assessment cycle, those needs would no longer be included, and this state's need may be lower. In addition, conditions within a state may change significantly over a four-year period and have an impact on that state's need.
- **Changes in National and State Assessment Approaches**. State-specific needs will be affected by how the Assessment has evolved since the first Assessment was conducted in 1995. The Assessment's "bottom-up" approach of submitting and accepting documented needs on a project-by-project basis for each individually sampled system has remained essentially unchanged. However, since the first effort in 1995, significant changes that can have an impact on individual states needs have been implemented regarding the parties responsible for data collection, the type of documentation required to support acceptance of an identified need, and policies and approaches implemented to ensure complete and quality data collection by the states. While these changes in survey processes and policies likely had significant impacts on states' relative needs in the 2003 and 2007 Assessments, the 2011 Assessment was conducted with little difference from that of the previous 2007 effort (the exception being the surveying of American Indian and Alaska Native Village water systems) and impacts on relative state needs are likely insignificant. The 2011 Assessment provided some clarifications of the weight of evidence determination for accepting certain types of needs (see Appendix C), but these clarifications were intended only to facilitate the processing of project submissions and approvals, and were not intended to alter a project's allowability.

Water Infrastructure Finance Authority of Arizona

Drilling a well for the city of Winslow in northern Arizona.

Continuing Evolution of the DWINSA

Each DWINSA's approach, policies, and guidelines influenced the total national need and individual state needs reported for that effort. In all cases, specific project documentation requirements and data quality objectives were set by a workgroup including states and other stakeholders and maintained by EPA. If the 2003 Assessment represented a success in better capturing longer term needs than the 1995 and 1999 efforts, the 2007 Assessment's achievement was in helping guide states toward

a more consistent methodology in assessing those types of needs. The 2011 Assessment maintains the improvements made in 2003 and 2007; EPA believes any changes in results reflect actual changes in needs rather than any change in surveying approaches or policies (note the exception being the first survey since 1999 of water systems serving American Indians and Alaska Native Villages). EPA's quadrennial Assessment will continue to evolve, with each cycle providing valuable input as to how the next Assessment can be improved. In addition, it is possible that challenges which were not significant in previous Assessments may arise and affect water utilities. EPA will work with the states to improve each survey while maintaining the integrity of the Assessment.

HUB Engineering

Tahlequah Water Treatment Plant in Oklahoma

City of Somerton, AZ

Solar array powering the city of Somerton's drinking water treatment facility in southwestern Arizona.

Key Observations on Each Assessment's Approach

1995

For the first survey, conducted in 1995, the DWSRF was not yet in existence and EPA worked directly with many utilities to complete the survey with limited involvement from the states. A state/EPA workgroup helped plan and design the Assessment. Some states participated in data collection; however, many were unable to invest resources beyond encouraging system cooperation. In addition, the 1995 Assessment included needs for raw water dams and reservoirs, projects that were later determined to be DWSRF-ineligible for future Assessments. (Note – while needs for dams and reservoirs were included in 1995 Assessment, these needs were removed in the calculation for the 1998 through 2001 DWSRF allotments.)

1999

For the 1999 Assessment, the federal DWSRF program had been established and project-eligibility criteria were defined that specifically excluded raw water dams and reservoirs. Therefore these infrastructure needs were not included in the 1999 Assessment. The DWINSA workgroup established Assessment policies regarding water meters, backflow-prevention devices, and service lines. Although these needs were considered allowable for the Assessment, constraints were placed on documentation of ownership and whether projects for their replacement could be included. New to the 1999 Assessment was the inclusion of the need of not-for-profit noncommunity water systems. Also, state programs were expected to participate in data collection for this Assessment.

2003

Refinements made to the survey instrument in 2003 encouraged systems and states to think more broadly about systems' existing infrastructure condition and deficiencies, particularly in regard to long-term needs for replacing or rehabilitating their existing infrastructure assets. Considerable effort was invested in promoting a comprehensive approach to inventorying existing assets and estimating the needs for likely rehabilitation or replacement over the next 20 years. EPA provided flexibility to surveyed water systems and their states to forecast these longer term needs. In the 2003 Assessment, states and systems responded with varying means of determining asset inventories and with different assumptions about the life cycles of those assets (e.g., estimates of when buried pipe would need to be replaced or rehabilitated). In addition, the workgroup amended policies regarding the replacement of water meters as an allowable need. In 1999, meter replacements were allowed only if documentation was provided indicating that the system owned the meter. In 2003, documentation of ownership was not required. These changes resulted in a significant increase in the total national need and an increase in most states' individual state needs. EPA's objective to better capture the true 20-year need was met, but the states and EPA agreed that a more consistent methodology should be pursued in the next Assessment effort.

2007

For the 2007 Assessment, EPA and the states came to a consensus that more consistency was needed across the states in regard to both methods for determining needs and each state's approach to capturing those needs. Building on the methods and approaches used by the states in the 2003 effort, consensus was reached on consistent policies regarding replacement and rehabilitation assumptions and documentation requirements to support survey-allowable projects. EPA's quality assurance reviews included significant efforts to ensure the policies were followed by all states.

2011

In planning for the 2011 Assessment, EPA and the states came to a consensus that the 2007 Assessment's weight of evidence approach used to determine the acceptance of needs for more unique and often large-scale projects needed more clarification and definition to better facilitate project submission and review. The weight of evidence approach was further defined as having three elements which must be supported by documentation: necessity, feasibility, and an indication of commitment to the project. Special emphasis was given to these terms, and examples from the 2007 Assessment were used in training provided to state and EPA Regional survey coordinators in preparation for the 2011 Assessment. These elements of the weight of evidence determinations are further described in Appendix C.

Chapter 3: Findings - American Indian and Alaska Native Village Need

American Indian and Alaska Native Village-Specific Needs

The 2011 Assessment is based on a statistically-designed survey of American Indian water systems and Alaska Native Village water systems. It is the first actual survey of these systems since 1999 and incorporates the many changes to EPA's approach and policies for estimating infrastructure needs that have evolved for the survey of non-tribal systems in 2003 and 2007.

Sara Ziff, EPA Region 9

The new elevated water storage tank at the Shungopavi village on the Hopi Tribe reservation. The community experienced water shortages prior to construction of the new tank.

Data were submitted for the American Indian and Alaska Native Village portion of the survey by tribal water systems in coordination with the Navajo Nation, EPA Regions, and Indian Health Service (IHS) Areas. Exhibit 3.1 presents the American Indian and Alaska Native Village water system need by EPA Region and by type of need.

Exhibit 3.1: 20-Year Need for American Indian and Alaska Native Village Systems by EPA Region (in millions of January 2011 dollars)*

EPA Region	Transmission and Distribution	Source	Treatment	Storage	Other	Total Need
Region 1	$2.5	$0.6	$0.9	$0.8	$0.4	$5.2
Region 2	$18.2	$1.4	$1.9	$2.4	$1.3	$25.2
Region 3†	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Region 4	$25.2	$4.7	$7.8	$5.6	$2.2	$45.4
Region 5	$111.2	$14.1	$25.2	$22.8	$11.0	$184.2
Region 6	$105.9	$11.4	$26.6	$24.1	$8.6	$176.6
Region 7	$21.4	$1.9	$4.3	$4.1	$1.7	$33.5
Region 8	$284.6	$22.2	$57.1	$63.9	$9.5	$437.3
Region 9‡	$1,185.8	$68.8	$153.2	$135.3	$53.4	$1,596.6
Region 10§	$118.3	$13.3	$27.4	$22.4	$10.3	$191.7
Alaska Native Village Systems	$272.0	$39.0	$170.7	$106.8	$4.9	$593.4
Total	**$2,145.1**	**$177.4**	**$475.1**	**$388.1**	**$103.3**	**$3,289.0**

* Numbers may not total due to rounding.
† There are no American Indian water systems in EPA Region 3.
‡ Navajo water systems are located in EPA Regions 6, 8, and 9, but for purposes of this report, all Navajo water system needs are reported in EPA Region 9.
§ Needs for Alaska Native Village water systems are not included in the EPA Region 10 total.

Exhibit 3.2 presents the historic need by EPA Region for the three Assessments in which data were collected for the American Indian and Alaska Native Village systems.

Exhibit 3.2: American Indian and Alaska Native Village Needs Reported by Survey Year (20-year need in millions of 2011 dollars)*

EPA Region	1995 Results in 2011 Dollars	1999 Results in 2011 Dollars	2011 Results
Region 1	$0.5	$5.9	$5.2
Region 2	$3.0	$8.9	$25.2
Region 3†	$0.0	$0.0	$0.0
Region 4	$25.6	$26.5	$45.4
Region 5	$67.7	$234.3	$184.2
Region 6	$56.7	$226.3	$176.6
Region 7	$9.4	$21.3	$33.5
Region 8	$156.8	$198.7	$437.3
Region 9‡	$526.3	$817.6	$1,596.6
Region 10§	$74.7	$176.2	$191.7
American Indian Subtotal	**$920.6**	**$1,715.8**	**$2,695.6**
Alaska Native Village Systems	$1,267.7	$1,589.8	$593.4
American Indian and Alaska Native Village Total	**$2,188.3**	**$3,305.6**	**$3,289.0**

* Numbers may not total due to rounding.
† There are no American Indian water systems in EPA Region 3.
‡ Navajo water systems are located in EPA Regions 6, 8, and 9, but for purposes of this report, all Navajo water system needs are reported in EPA Region 9.
§ Needs for Alaska Native Village water systems are not included in the EPA Region 10 total.

The 2011 DWINSA estimated 20-year needs are based on data that included asset inventories and planned infrastructure projects. Approximately 14 percent of the total projects submitted and approved in the survey were taken from the Indian Health Service (IHS) Sanitation Deficiency System (SDS). The SDS is a cumulative inventory of the sanitation deficiencies of American Indian and Alaska Native communities; IHS updates this inventory annually. These annual updates result in new projects and revisions to previous years' unfunded projects. The total weighted need associated with the SDS projects included in the 2011 DWINSA was $882 million or approximately 27 percent of the total American Indian and Alaska Native Village need. SDS projects were reviewed for acceptance to the survey based on the requirements of the Drinking Water State Revolving Fund (DWSRF) program and the policies of the 2011 DWINSA; no projects were removed from the survey data based on IHS's economic feasibility unit cost per home thresholds. However, some SDS projects submitted were not included because they were for a public water system not included in the survey sample, were for wastewater facilities, or no project description was provided. Projects were also removed if the need did not meet the eligibility criteria of the DWSRF program (e.g., if a project was deemed primarily for growth or for surface water intake impoundment construction).

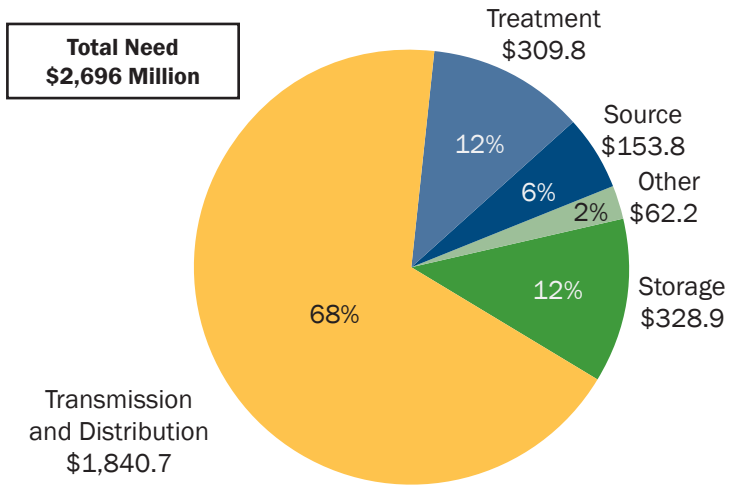
American Indian Needs

The total 20-year need for American Indian water systems is estimated to be $2.7 billion, significantly higher than the 1999 estimate of $1.7 billion. The increased American Indian water system need is most attributable to the changes in the survey methods and policies to better capture long term need underreported in previous surveys, primarily rehabilitation and replacement of distribution system piping based on infrastructure inventory. The 2011 American Indian water system survey also included a large regional project need on Navajo lands that was not yet planned during the 1999 survey. These results are an indication of likely improved asset inventory and project data from American Indian Tribes and other federal agencies, including IHS and the Bureau of Reclamation.

Additionally, this 2011 need includes more infrastructure to increase access to safe drinking water though connection of homes without water to existing public water systems. In 2011, according to the Indian Health Service data, while 91 percent of American Indian and Alaska Native Village homes had access to safe drinking water, 28,537 of the 32,900 (86.7 percent) tribal homes without access to safe drinking water were associated with American Indian Tribes. The remaining 4,356 of the 32,900 (13.3 percent) were located in the Alaska Native Villages.

Exhibit 3.3 shows the total American Indian water system need by project type. As would be expected for these systems, transmission and distribution is the largest category of need, representing 68 percent of the total need. This high percentage reflects the significant infrastructure and logistical challenges associated with American Indian water systems that must serve widely dispersed populations in remote locations.

Exhibit 3.3: Total 20-Year Need by Project Type For American Indian Water Systems (in millions of January 2011 dollars)



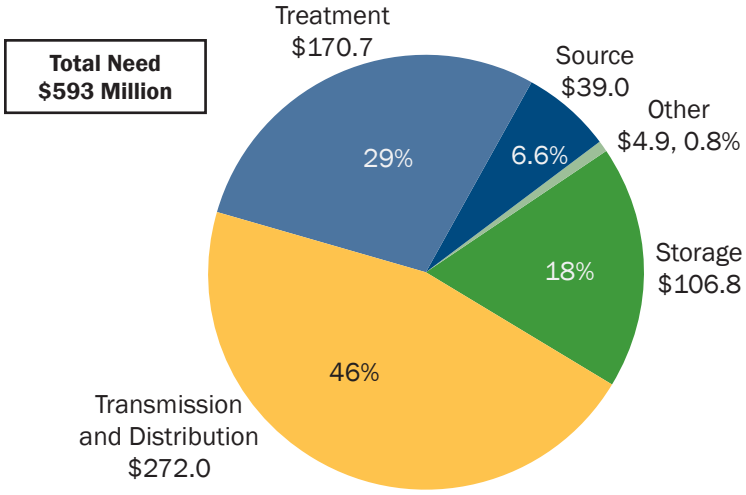
Note: Numbers may not total due to rounding.
(Excludes needs for proposed and recently promulgated regulations)

Alaska Native Village Needs

The 2011 total 20-year need for Alaska Native Village water systems is estimated to be $0.59 billion, significantly lower than the previous 1999 estimate of $1.59 billion. This difference is attributable in part to investments (an estimated $680 million in federal funding) that have been made over a fourteen year period (1999 to 2012) in Alaska Native Villages to improve access to safe drinking water.

Exhibit 3.4 shows the total Alaska Native Village water system need by project type. The need for Alaska Native Village water systems differs from more typical community water systems in that costs for piping in Alaska Native Village water systems make up less than half the need, with storage and treatment comprising a greater percentage of the total. These smaller communities with homes in close proximity typically have lower relative costs for piping and face higher treatment and storage costs. Both types of costs are higher than typical because of their remote or arctic conditions.

Exhibit 3.4: Total 20-Year Need by Project Type For Alaska Native Village Water Systems (in millions of January 2011 dollars)



Note: Numbers may not total due to rounding.
(Excludes needs for proposed and recently promulgated regulations)

Appendix A - Survey Methods

Chad Kolstad, Minnesota Department of Public Health

New surface water treatment plant in Fairmont, MN. The current plant was constructed in 1926 and needed to be replaced. The new plant will have biologically active GAC filters to help with taste and odor complaints.

The 1996 Safe Drinking Water Act (SDWA) Amendments direct the U.S. Environmental Protection Agency (EPA) to assess the needs of water systems and to use the results of the quadrennial Assessment to allocate Drinking Water State Revolving Fund (DWSRF) monies. The DWSRF monies are allocated based on each state's share of the total state need with a minimum of 1 percent of the state allotment guaranteed to each state, Puerto Rico, and the District of Columbia. The results of the Assessment are also used to allocate the percentage (recently 1.5 percent) of the DWSRF appropriation designated for the U.S. Territories. Therefore, the Assessment was designed to generate separate estimates of need for the U.S. Virgin Islands and the Pacific island territories (Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands). Further, the results of the Assessment are used, in part, to allocate the DWSRF appropriation (recently 2 percent) designated for the American Indian and Alaska Native Villages to nine EPA Regional Offices for grants to these water systems (EPA Region 3 does not have any federally recognized tribes). The DWINSA estimates the need for both community water systems and not-for-profit noncommunity systems.

The 20-year period captured by the 2011 Drinking Water Needs Survey and Assessment (DWINSA) runs from January 1, 2011, through December 31, 2030. The Assessment is based on a survey of approximately 3,165 water systems including 2,859 in states, Puerto Rico, the District of Columbia, and U.S. Territories and 306 American Indian and Alaska Native Village water systems. The 2011 Assessment also included an adjustment of findings from the 2007 Assessment for small water systems in states and the 1999 Assessment for the needs of not-for-profit noncommunity water systems in states. The survey of American Indian and Alaska Native Village water systems was conducted for the first time since the 1999 Assessment.

The assessment was developed in consultation with a workgroup consisting of the states, EPA regional coordinators and the Navajo Nation. The workgroup met several times by conference call and in person and reached a final consensus on the assessment's policies and processes. EPA also consulted with the Indian Health Service and through a consultation process provided the opportunity to all federally recognized American Indian Tribes and Alaska Native Villages to comment on the process for conducting the survey of public water systems in Indian Country.

Chad Kolstad, Minnesota Department of Health

10 Million Gallon Dale Street Reservoir for St. Paul Regional Water Service in Minnesota. The reservoir is a wire wrapped reservoir. Once the base was poured, the elaborate framing for forming the roof was done by local carpenters. Then the wall panels, which were poured on site, were set into place followed by the pouring of the roof. Finally, wire is wrapped around the wall panels and shotcrete is applied to the outside to protect the wires and waterproof the reservoir. The old reservoir was demolished and used as base material and fill for the project site.

Except where noted, the basic statistical and survey methodologies of the 2011 Assessment are nearly identical to those used in previous Assessments. Of particular note, the 2011 Assessment utilized the same survey method for the large and medium size systems as the 2007 Assessment, which is described in more detail later in this Appendix. The questionnaire used in the 2011 Assessment was essentially the same as the 2003 and 2007 Assessments' questionnaires.

In compliance with the Paperwork Reduction Act (PRA) (44U.S.C. 3501 et seq.), the survey design and instrument were reviewed and approved by the Office of Management and Budget (OMB). The Information Collection Request (ICR) for the survey can be accessed in the Federal Register/Vol. 76, No.45/Tuesday, March 8, 2011/Notices p12728.

Assessing the Needs of Water Systems in States and U.S. Territories

Frame

The frame is a list of all members (sampling units) of a population from which a sample will be drawn for a survey. For this Assessment, one frame consisted of all large and medium community water systems in each state, Puerto Rico, the District of Columbia, and the U.S. Territories. As discussed below, this Assessment used the result of the 2007 Assessment for small community water systems and therefore these were not included in this survey's sample frame. Also, separate sample frames were used for systems serving American Indians and for those serving Alaska Native Villages.

To ensure that the survey accounted for all community water systems in the nation, the universe of water systems was obtained from the federal Safe Drinking Water Information System (SDWIS-FED). SDWIS-FED is EPA's centralized database of public water systems. It includes the inventory of all public water systems and provides information regarding population served and whether a system uses ground water, surface water, or both.

Each state was asked to review the frame and verify or correct all information on each system's source water type and population served. EPA used this updated information to create a database of the universe of community water systems. A sample of systems was then selected from this updated frame.

Stratified Sample

Because there are thousands of medium and large community water systems in the nation, EPA must rely on a random sampling of these systems identified in the frame. EPA set a precision target of ± 10 percent with 95 percent confidence. To meet this target, all large systems were surveyed and a random sample of medium systems was selected in each fully surveyed state.

To determine aggregated needs, water systems are grouped (stratified) by size (population served) and by source (surface or ground water). Exhibit A.1 shows the possible population and source water strata for the state survey.

Exhibit A.1: Stratification of the State Community Water System Survey

<table>
<tr><th></th><th colspan="2">Population</th><th>Surface Water</th><th>Ground Water</th></tr>
<tr><td>Large</td><td colspan="2">> 100,000</td><td colspan="2">Sampled with certainty - All systems receive questionnaire</td></tr>
<tr><td rowspan="4">Medium</td><td colspan="2">50,001 - 100,000</td><td rowspan="3"></td><td rowspan="3">State-specific samples for fully surveyed states</td></tr>
<tr><td>25,001 - 50,000</td><td rowspan="2">or 10,001 - 50,000*</td></tr>
<tr><td>10,001 - 25,000</td></tr>
<tr><td colspan="2">3,301 - 10,000</td><td></td><td></td></tr>
<tr><td colspan="5">*In some states, systems serving 10,001 - 50,000 can be considered one stratum and precision targets can be met. The most efficient sample is drawn from each state.</td></tr>
</table>

For the purposes of assigning a population to each system, consecutive populations are included in the system population because of the assumption that, in general, critical infrastructure of the selling-system would need to be sized to accommodate the demand of the population directly served by the system and the consecutive population.

Systems are categorized as surface water if they have at least one source that is surface water or ground water under the direct influence of surface water (GWUDI). Systems are categorized as ground water if they do not have a surface water or GWUDI source. The ground water category includes ground water systems and systems that do not have a source of their own and purchase finished water from another system (regardless of whether the purchased water comes from a surface water or ground water source). The decision to include purchased water systems in the ground water systems category was based on the 1995 Assessment's findings that, in general, indicated the needs of purchased water systems more closely resemble those of ground water systems than of surface water systems with source water treatment.

Conducting the Survey of Large Systems

For the 2011 Assessment, a large system is defined as serving more than 100,000 persons, either through direct connections or as a wholesale water system. Because of the unique nature

of systems in this size category and because they represent a large portion of the nation's need, these systems are sampled with certainty, meaning that all systems receive a questionnaire. The 100,000 persons cut-off was the same as used in the 2007 Assessment; in the previous Assessments (1995, 1999, 2003), the large system category was defined as systems serving populations of more than 40,000 or 50,000.

Each large system was asked to complete the questionnaire and return it along with accompanying documentation to its state coordinator. The state coordinators reviewed the

Exhibit A.2: Medium and Large Community Water System Sample Size

State	Total Number of Systems in Inventory			Number of Systems Selected in Sample		
	Population Served			Population Served		
	3,301 - 100,000	More Than 100,000	Total Number Medium and Large Systems	3,301 - 100,000	More Than 100,000	Total Number Medium and Large Systems
Alabama	332	16	348	115	16	131
Alaska	-	1	1	-	1	1
Arizona	120	10	130	29	10	39
Arkansas	177	4	181	77	4	81
California	554	133	687	58	111	169
Colorado	148	11	159	48	11	59
Connecticut	51	6	57	30	6	36
Delaware	-	2	2	-	2	2
District of Columbia	-	1	1	-	1	1
Florida	307	49	356	73	49	122
Georgia	213	24	237	43	22	65
Hawaii	-	2	2	-	2	2
Idaho	-	1	1	-	1	1
Illinois	435	25	460	79	19	98
Indiana	205	9	214	73	9	82
Iowa	135	3	138	46	3	49
Kansas	109	6	115	56	6	62
Kentucky	252	5	257	134	5	139
Louisiana	223	8	231	57	8	65
Maine	34	1	35	24	1	25
Maryland	54	5	59	20	5	25
Massachusetts	244	9	253	63	9	72
Michigan	279	14	293	48	14	62
Minnesota	176	3	179	87	3	90
Mississippi	198	1	199	103	1	104
Missouri	204	9	213	110	8	118
Montana	-	1	1	-	1	1
Nebraska	-	2	2	-	2	2
Nevada	30	5	35	10	5	15
New Hampshire	-	1	1	-	1	1

questionnaires to ensure that the systems included all their needs, the information entered on the questionnaire was correct, and the projects were eligible for DWSRF funding. During their state reviews, states often contacted systems to obtain additional information. The states then submitted the questionnaire and all documentation to EPA for a final review.

Of the 606 large systems that received a survey for the 2011 Assessment, 598 completed the questionnaire—a response rate of 98.6 percent. Exhibit A.2 shows the number of large systems in the frame as well as the medium and large system sample size for each state.

Exhibit A.2: Medium and Large Community Water System Sample Size, cont.

State	Total Number of Systems in Inventory			Number of Systems Selected in Sample		
	Population Served			Population Served		
	3,301 - 100,000	More Than 100,000	Total Number Medium and Large Systems	3,301 - 100,000	More Than 100,000	Total Number Medium and Large Systems
New Jersey	225	17	242	45	16	61
New Mexico	-	1	1	-	1	1
New York	333	25	358	24	25	49
North Carolina	257	17	274	63	17	80
North Dakota	-	-	-	-	-	-
Ohio	305	15	320	75	15	90
Oklahoma	161	4	165	81	4	85
Oregon	109	5	114	43	5	48
Pennsylvania	326	23	349	58	23	81
Puerto Rico	101	5	106	48	5	53
Rhode Island	-	1	1	-	1	1
South Carolina	-	8	8	-	8	8
South Dakota	-	1	1	-	1	1
Tennessee	241	8	249	75	8	83
Texas	915	65	980	90	47	137
Utah	100	9	109	41	9	50
Vermont	-	-	-	-	-	-
Virginia	130	20	149	36	19	55
Washington	200	13	213	45	13	58
West Virginia	-	1	1	-	1	1
Wisconsin	175	6	181	52	6	58
Wyoming	-	-	-	-	-	-
Subtotal	**8,059**	**610**	**8,669**	**2,159**	**560**	**2,719**
American Samoa	1	-	1	1	-	1
Guam	-	1	1	-	1	1
North Mariana Is.	1	-	1	1	-	1
Virgin Islands	2	-	2	2	-	2
Subtotal	**4**	**1**	**5**	**4**	**1**	**5**
Total	**8,063**	**611**	**8,674**	**2,163**	**561**	**2,724**

*A dash indicates the state had no systems in that population category or was a partially surveyed state.

Conducting the Survey of Medium Systems

Medium systems, as defined for the 2007 Assessment, serve between 3,301 and 100,000 persons. Exhibit A.2 shows the number of medium systems in the frame and sample by state. States with a dash in the medium system sample column opted not to collect data for these systems.

For the 2011 Assessment, states that received the minimum one-percent DWSRF allotment in the 2007 Assessment were given the option of not participating in data collection for medium-sized systems. This option was provided in order to reduce burden on the small states that receive the same allotment regardless of the findings of the survey. Of the minimum allocation states, 15 chose not to participate in this portion of the survey. The medium system need for states that chose this option was estimated based on data from participating states. Because this method does not meet the Assessment's formal precision targets at the state level, the needs of these partially surveyed states contribute to the estimate of the total national need, but medium system need is not reported individually by state.

For states that participated in the medium system portion of the survey, the data collection process was similar to that of large systems with the system completing the survey, the state providing input, and the final review conducted by EPA.

Once the need for systems in the fully surveyed states was calculated, it was used to determine the need for the partially surveyed states. An average need per stratum from fully surveyed states was calculated and applied to the inventory of systems in the partially surveyed states.

Of the 2,234 medium systems that were randomly selected and received a survey, 2,159 completed the questionnaire for a response rate of 96.6 percent.

Conducting the Assessment for Small Systems

The infrastructure need reported for small systems serving 3,300 persons or fewer is based on the findings of the 2007 Assessment. Because of the high level of confidence in the findings from 2007 field survey of small water systems and resource constraints, EPA did not survey these systems again in 2011. Instead, EPA used the projects reported for the 2007 Assessment, applied the 2011 cost models, used the 2011 inventory of small systems, and converted all costs to 2011 dollars to estimate the 2011 needs for these systems.

System Weight

For the large and medium sized systems surveyed, the 2011 Assessment assigned weights to the findings from each surveyed water system to determine total state needs. Because all large systems are included in the survey, each large system has a weight of one. The state need for large systems was determined by summing the cost of each project for each system and then summing the need for each large system in the state. Systems were not re-weighted for non-response.

For medium systems, EPA determined the number of water systems that must be included in each stratum in order to achieve the desired level of precision. The surveyed systems were selected and assigned an initial weight for their specific state equal to the total number of systems in that stratum divided by the number of systems in that stratum's sample. A final weight was recalculated for each stratum with adjustments for non-response and systems changing stratum (population or source changes). Each fully surveyed state's need for medium systems was determined by summing the cost of each project for each system, and then multiplying each system's need by the system's final weight.

The number of medium sized water systems selected from each stratum was determined by the total number of systems in that stratum (shown in Exhibit A.1), the percentage of that state's need represented by that stratum in the most recent Assessment, and the relative variance of the need within that stratum in the most recent Assessment. The sample is allocated among the strata in a manner that lets the survey achieve the desired level of precision with the smallest sample size for each state.

Assessing the Need of Not-for-Profit Noncommunity Systems in the State Survey

Not-for-profit noncommunity water systems (NPNCWS) are eligible for DWSRF funding. The 2011 need for NPNCWSs was based on the findings of the 1999 Assessment in which a statistical survey of these systems was conducted. These findings were adjusted to January 2011 dollars using the Construction Cost Index (CCI).

During the 1999 Assessment, EPA collected data from a national sample of 100 NPNCWSs through site visits. Unlike the sampling design for community water systems, the NPNCWS sample was not stratified into size and source categories because EPA lacked the empirical information on variance necessary for developing strata. The sample used for the 1999 Assessment for NPNCWSs was designed to provide a 95 percent confidence interval that is within a range of ± 30 percent of the estimated need.

The national need for NPNCWSs was allocated among the states in proportion to the 1999 inventory of NPNCWSs in each state in a manner similar to that used for small systems.

EPA Region 2

Hydrants were recently upgraded in Seaford, DE along with the associated water mains, service lines, and meter pits.

Assessing the Need of American Indian and Alaska Native Village Water Systems

Frame

Similar to the state survey, a frame was established for all water systems identified as serving federally-recognized American Indian community and not-for-profit noncommunity water systems for which EPA and the Navajo Nation have primacy under SDWA. Another frame was established of community and not-for-profit noncommunity water systems serving Alaska Native Villages. The universe of water systems was obtained from SDWIS-FED, and EPA Regional Offices and the Navajo Nation primacy agency were asked to review the American Indian and the Alaska Native Village frames and verify or correct all information on these systems as well. EPA used this verified information to create a database of the universe for these two frames and a sample of systems for each of these frames was then selected for surveying.

Stratified Sample

Because there are hundreds of American Indian and Alaska Native Village water systems, EPA relied on a random sampling of the systems identified in the frame. EPA set a precision target of ± 10 percent with 95 percent confidence, the same as used for the state survey. To meet this target, all American Indian and Alaska Native Village systems serving a population of over 3,301 were surveyed. A national random sample of small (serving populations of 3,300 or fewer) American Indian systems was selected as well as a random sample of small Alaska Native Village systems.

To determine aggregated needs, water systems are grouped (stratified) by size (population served) and by source (surface or ground water). Procedures for defining population served and the source water categorization were the same as for the state survey. Exhibit A.3 shows the possible population and source water strata for the American Indian and Alaska Native Village water system survey. Exhibit A.4 shows the frame and sample size for the American Indian and Alaska Native Village water system surveys.

For the 2011 Assessment, the infrastructure needs reported for American Indian water systems were based on the statistically-determined sample of 220 water systems and needs for Alaska Native Villages were based on the statistically-determined sample of 86 water systems. Survey data were collected from 178 American Indian water systems for which EPA has primacy and 40 American Indian water systems for which the Navajo Nation has primacy for a response rate of 99 percent. Survey data were collected from 84 of the public water systems that have been designated as serving Alaska Native Villages, for a 98 percent response rate. The data collected from these systems were then used to estimate the overall need for the total 791 American Indian and 165 Alaska Native Village public water systems.

Exhibit A.3: Stratification of the American Indian and Alaska Native Village Survey

American Indian and Alaska Native Village Survey	Population	Surface Water	Groundwater
Medium	>3,301	Sampled with certainty - All systems receive a questionnaire	
Small	1,001-3,300	National Sample of American Indian Systems and Sample of Alaska Native Village Systems	
	501-1000		
	25-500		

Exhibit A.4: American Indian and Alaska Native Water System Sample Size

EPA Region	Total Number of Systems in Inventory			Number of Systems Selected in Sample		
	Population Served			Population Served		
	3,300 and Fewer	3,301 - 100,000	Total Number Small and Medium Systems	3,300 and Fewer	3,301 - 100,000	Total Number Small and Medium Systems
Region 1	6	-	6	-	-	-
Region 2	7	2	9	2	2	4
Region 3	-	-	-	-	-	-
Region 4	18	1	19	6	1	7
Region 5	80	11	91	16	11	27
Region 6	61	11	72	12	11	23
Region 7	13	-	13	6	-	6
Region 8	102	10	112	15	8	23
Region 9	333	35	368	71	34	105
Region 10	93	8	101	19	6	25
Alaska Native Systems	161	4	165	82	4	86
Total	**874**	**82**	**956**	**229**	**77**	**306**

Conducting the Survey

As with the systems surveyed by the states, these systems completed the survey questionnaire facilitated by the EPA Regional Office or by the Navajo Nation primacy agency. Assistance was also provided by the Indian Health Service Areas as described in Chapter 3. The EPA Regions and Navajo Nation primacy agency then submitted the questionnaire and all documentation to EPA Headquarters for a final review.

System Weight

The 2011 Assessment assigned weights to the findings from each surveyed water system to determine the total American Indian and the total Alaska Native Village needs.

Because all medium size systems (serving 3,301 or more) are included in the survey, each of these systems has a weight of 1. Their need was determined by summing the cost of each project for each system and then summing the need for each system in each survey. Medium systems were not re-weighted for non-response.

For small American Indian or Alaska Native Village systems, EPA determined the number of systems that must be included in each stratum in order to achieve the desired level of precision. These surveyed systems were selected and assigned an initial weight for their specific survey equal to the total number of systems in that stratum divided by the number of systems in that stratum's sample. A final weight was recalculated for each stratum with adjustments for non-response and systems changing stratum (population or source changes). The need for these systems was determined by summing the cost of each project for each system and then multiplying each system's need by the system's final weight.

After data collection, the needs of systems in the American Indian Survey were assigned to each EPA Region by multiplying the average small system need per stratum by the number of small systems in that stratum (from the inventory of small systems) and adding the medium system need that is specific to that EPA Region. It is important to note that conducting a survey in this manner allows for consistent estimation of project needs across all surveyed systems.

Climate Readiness

Although EPA did not create a new category of need to capture data for projects that are related to climate readiness, EPA provided a "Regulatory or Secondary Purpose" code that the system could enter on the survey questionnaire to identify a project as being related to climate readiness. For projects identified as related to climate readiness, the system was also asked to identify the concern (e.g. source water quality, source water quantity, and infrastructure vulnerability) and to describe the type of information driving the concern (e.g. meteorological models, scientific reports, staff analysis).

EPA requested this information to indicate the general extent to which water systems have currently incorporated climate change readiness strategies into their capital infrastructure projects. EPA did not specify criteria for identifying these projects; projects were identified as being related to climate readiness based on the professional judgment of the water system.

Green Projects

Similarly, although not a new category of need, to capture data for projects that include one or more components that are considered green, EPA provided multiple "Regulatory or Secondary Purpose" codes. Systems would enter the applicable code on each project that was identified as including a green component or purpose. Instructions to survey participants made clear that coding a project as having a green component or purpose will not affect current or future SRF eligibility or requirements.

A list of possible projects for each green category that was provided with the survey packages to participants is provided in Exhibit A.5.

Exhibit A.5: Examples of Project Components that may be Considered "Green"[1]

Green Infrastructure	• Pervious or porous pavement, bioretention, green roofs, rainwater harvesting/cisterns, and xeriscape that are included as part of a larger capital infrastructure project

Water Efficiency	• Installing any type of water meter in previously unmetered areas
	• Replacing existing broken/malfunctioning water meters or upgrading existing meters with:
	  ◦ Automatic meter reading systems (AMR) such as:
	  • Advanced metering infrastructure (AMI)
	  • Smart meters
	  ◦ Meters with built-in leak detection
	• Pressure reducing valves (PRVs)
	• Internal plant water reuse (such as backwash water recycling)

Energy Efficiency	• Renewable energy generation which is part of a larger capital infrastructure project • Energy efficient retrofits and upgrades to pumping systems and treatment processes • Pump refurbishment to optimize pump efficiency • Projects that result from an energy efficiency related assessment (such as an energy audit, energy assessment study, etc) • Installation of variable frequency drives (VFDs) • Automated and remote control systems (such as SCADA) that achieve substantial energy efficiency improvements • Upgrade of lighting to energy efficient sources for security or as part of a larger project
Environmentally Innovative Activities	• US Building Council LEED certified water system facilities that are part of an eligible DWSRF project.

[1]States may have included other types of green projects or components.

Cindy McDonald , State of Kentucky Department of Environmental Protection

Generator in Madisonville, KY.

Appendix B - Data Collection

To determine the scope of water systems' 20-year need, data are collected in the form of capital improvement projects. States and other agencies work with the surveyed systems to identify applicable projects. To be included in EPA's Assessments, each project had to meet each of the following four criteria:

- The project must be for a capital improvement.
- The project must be eligible for Drinking Water State Revolving Fund (DWSRF) funding.
- The project must be in furtherance of the public health protection goals of the Safe Drinking Water Act (SDWA).
- The project must be submitted with supporting information that documents the three other criteria are met.

Projects included in the Assessment generally fall into one of two categories that describe the reason for the project:

- Replacement or rehabilitation of existing infrastructure due to age or deterioration.
- New or expanded infrastructure to meet an unmet need for the current population or to comply with an existing regulatory requirement.

Projects for infrastructure generally expected to need rehabilitation or replacement in the 20-year period covered by the Assessment were accepted with minimal documentation describing their scope and the reason for the need. However, other types of projects required independently generated documentation that not only identified the need but also showed clear commitment to the project by the water system's decision-makers. Exhibit B.1 summarizes the types of projects that were included and the types that were unallowable.

For the purposes of assigning a cost to each need, the survey required that the water system either provide an existing documented cost estimate or the information necessary for EPA to assign a cost. This information was referred to as the "design parameter" and is discussed in more detail in this Appendix.

American Water Works Association

Survey Instrument

As with previous Assessments, the 2011 questionnaire was the survey instrument for reporting all needs. All large water systems and a random sample of medium systems were mailed a survey package, which included the questionnaire, instructions for completing the

Exhibit B.1: DWINSA Allowable and Unallowable Projects

DWINSA Allowable Projects	DWINSA Unallowable Projects
Criteria: • Eligible for DWSRF funding • Capital improvement needs • In furtherance of the public health goals of the SDWA • Within the Assessment time frame • Adequate documentation Project Types: • New or expanded/upgraded infrastructure to meet the needs of existing customers • Replacement or rehabilitation of existing undersized or deteriorated infrastructure	• Raw water reservoir- or dam-related needs • Projects needed primarily to serve future population growth • Projects solely for fire suppression • Projects for source water protection • Non-capital needs (including studies, operation and maintenance) • Needs not related to furthering the SDWA's public health objectives • Acquisition of existing infrastructure • Projects not the responsibility of the water system • Needs associated with compliance with proposed or recently promulgated regulations (Derived instead from EPA's economic analyses and added to the national total) • Projects or portions of projects started prior to January 1, 2011 • Projects or portions of projects needed after December 31, 2030

questionnaire, and a list of codes used to convert the information to a database format. These documents were also used by the site visitors for recording small system needs in the 2007 survey, as well as for all American Indian and Alaska Native Village water systems in the 2011 survey.

The instructions provided to the water systems included information on the background and purpose of the Assessment as well as how to identify projects that should be included in the questionnaire. In addition to infrastructure needs, the survey also requested basic information from the water systems such as the size of the population served, the number of service connections, the production capacity, the source water type, and the system's ownership type. This information was compared to the information used for the sample frame. Discrepancies in source and population were investigated to ensure accurate information was used for the statistical sample.

Project Documentation

Each project listed on the questionnaire was required to have accompanying written documentation of its scope and why it was needed. Written documentation included master plans, capital improvement plans, sanitary survey reports, and other sources of project information. Whether the documentation could be written for the 2011 Assessment or had to be pre-existing depended on the type of project that was described. All documentation for every project was reviewed by EPA to ensure that the project met the allowability criteria for the Assessment. See Appendix C for more information on the project allowability policies.

Cost Estimates and Modeling

As with previous Assessments, costs assigned to projects were obtained in one of two ways. If the system had an existing documented cost estimate that met the documentation criteria of the survey, this cost was adjusted to 2011 dollars and used for that system's need. This is the preferred approach for assigning a cost to a project. If no cost estimate was available, the system was asked to provide information (design parameters) necessary for EPA to model the cost of the project. Cost models were built from the documented cost estimates provided by other survey respondents.

Acceptable forms of documentation for cost estimates were capital improvement plans, master plans, preliminary engineering reports, facility plans, bid tabulations, and engineer's estimates that were not developed for the 2011 Assessment. Each project with an associated cost was required to provide the month and year of the cost estimate in order to allow an adjustment of the cost to January 2011 dollars.

Systems that had cost estimates were encouraged to submit design parameters regarding size or capacity of the infrastructure. For example, a tank is described in terms of volume in millions of gallons, treatment plants are based on capacity in millions of gallons per day, and pipe parameters are in diameter and length. Over 70 project types of need were used to describe projects and link design parameters to cost. This combination of the specific type of project, costs, and parameters was used as input to develop cost models. Prior to input to the cost models, the cost estimates were normalized for both time frame and location. Cost estimates prior to January 2011 were adjusted to January 2011 dollars using the Construction Cost Index (CCI). Regional variations in construction costs were normalized by location using the RS Means "Location Factors Index." RS Means is a subsidiary of Reed Construction which publishes an annual index used to calculate construction costs for a specific location. The factor multiplier is expressed as a relationship to the national average of one.

Although over 70 different types of need were used, a few project types could not be modeled. These types of need were unique to individual systems and did not lend themselves to modeling (examples include de-stratification of a surface water source, pump controls and telemetry, and security features other than fencing).

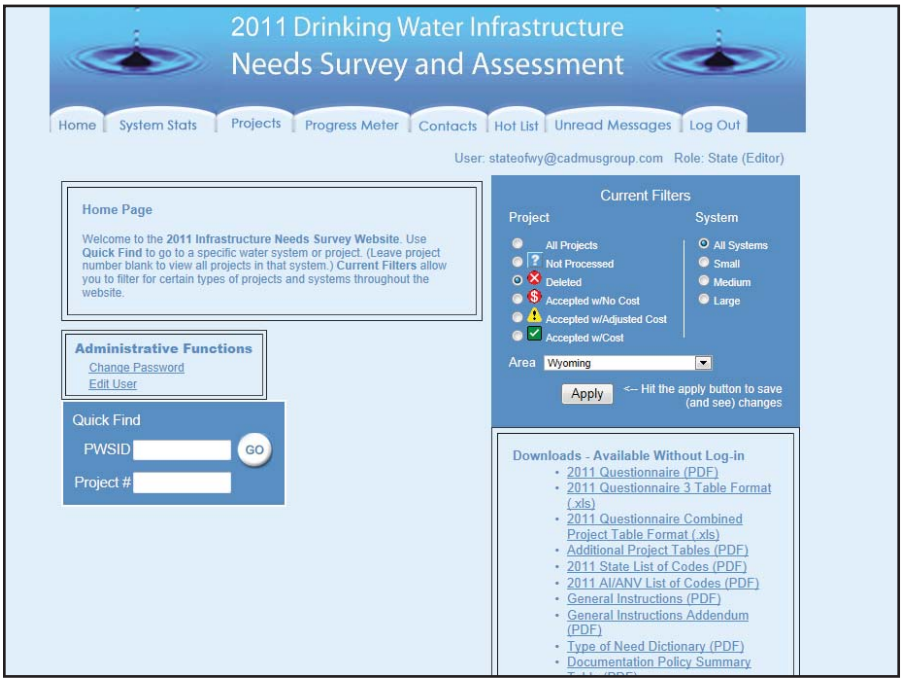
Ultimately some projects were not able to be assigned a cost because a cost estimate from the system was not provided and project information submitted on the survey did not include the necessary design parameters required for modeling.

American Water Works Association

Web Site and Database

EPA used a 2011 survey-specific Web site to provide an efficient method of tracking and monitoring questionnaire responses for survey coordinators. The Web site allowed controlled viewing of survey information and provided a means to provide additional project information if needed. Water systems, state contacts, Navajo Nation, and EPA had secure login access to the Web site. The Web site was a modification of the one used successfully for the 2003 and 2007 Assessments.

Once logged into the Web site, water systems had access to their own project data, states had access to all project data for the water systems in their state, and EPA regional offices had access to the project data of states within their region. Web site users were given "read only" or "read/write" access depending on whether information posted to the Web site could be changed by that entity. This created a transparent process and open communication between systems, states, and EPA while also maintaining a secure environment so that persons without reason to see the data did not have access.



A screen shot from the DWINSA Web site.

The Web site also served as a means of communication between survey coordinators and EPA. As EPA completed the quality assurance reviews of each questionnaire, the information was uploaded to the Web site database along with specific indications of any changes that had been made to the projects and why the changes were implemented.

Each survey coordinator was able to view all its systems' projects and submit additional information for projects that had been changed or deemed unallowable through EPA's quality assurance review.

Quality Assurance

As with all four earlier Assessments, the findings of the 2011 Assessment are reinforced by adherence throughout the project to the principles embodied in the EPA Guidelines for Ensuring and Maximizing Information Quality. The most fundamental assurance of the high degree of information quality is the implementation of the Agency's Quality System. EPA implements the system through the development of a quality assurance project plan (QAPP) for each project, which details the specific procedures for quality assurance and quality control.

Because the Agency uses the results of this Assessment to allocate DWSRF capitalization grants to states, this Assessment (like those that preceded it) sought to maximize the accuracy of the state-level and American Indian and Alaska Native Village estimates of infrastructure needs. Decisions about precision levels, policies, and procedures were established by a survey coordinators workgroup that met regularly during the 2011 Assessment.

Accuracy was maximized at the national, state, system, and project levels through the following steps. First, since this was a sample survey, the workgroup established targets for precision of estimates in the sampling to shape the national sample design. These precision targets are discussed in Appendix A.

Second, EPA used quality assurance procedures from the QAPP to ensure that "eligible infrastructure" was clearly defined and that documentation standards were rigorously enforced. As noted previously, for a project to be included in the 2011 Assessment, documentation had to be submitted describing the purpose and scope of each project. The documentation was reviewed by EPA to determine whether each project met the eligibility criteria. The workgroup established the documentation requirements so that uniform criteria were applied to all questionnaires.

Of the 97,092 projects submitted to the survey, EPA accepted 85 percent. The 15 percent that were not allowed 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, such as overlap between two projects (raising the issue of double-counting), inconsistency of recorded data with project documentation, and the use of overly aggressive (short) infrastructure life cycles by states where system planning documents were not used or available.

Third, after the survey review process, the project data were entered into a database using dual data entry procedures to ensure the information was correctly transferred. The uploaded data then went through a systematic verification process to identify any outliers or data-entry errors. Each project, the systems' source water type, total pipe length, population, and number of connections were reviewed for any unusual entries. The data were then compared at the state and national levels to identify any outliers in the data. EPA investigated the outliers by reviewing the system's project documentation. If the documentation did not provide enough information to verify the project, EPA contacted the survey coordinator or the system for confirmation.

Oklahoma Department of Environmental Quality

High Service Pump Station at Washington RWD #3 in Oklahoma.

Appendix C - Policies

EPA recognizes that it is critical to the credibility of the 2011 Assessment and fairness to the states that EPA work with the DWINSA workgroup to set clear and well-defined data collection policies and for EPA to apply these policies consistently to all systems. The policies are aimed at ensuring that the Assessment meets its Congressional intent, maintains the credibility of the findings, and establishes a level playing field. To this end, the policies developed ensure two essential criteria — that only allowable needs be included, and that all needs be adequately documented according to Assessment criteria.

Oklahoma Department of Environmental Quality

Clearwell at the Broken Arrow Municipal Authority in Oklahoma.

Project Allowability

Because the findings of the Assessment are used to allocate DWSRF monies, only needs associated with DWSRF-eligible projects are included in the findings. Eligibility criteria for the DWSRF are established in the Safe Drinking Water Act. SDWA Section 1452(a)(2) states that DWSRF funds may be used:

> *"only for expenditures (not including monitoring, operation, and maintenance expenditures) of a type or category which the Administrator has determined, through guidance, will facilitate compliance with national primary drinking water regulations applicable to the system under Section 1412 or otherwise significantly further the health protection objectives of this title...."*

Needs are submitted in the form of capital infrastructure projects. To be considered an allowable need, a project must be eligible for DWSRF funding, be in furtherance of the public health protection objectives of SDWA, fall within the prescribed 20-year time frame (January 1, 2011, through December 31, 2030), and be adequately documented.

Projects Must Be for a Capital Improvement Need

Projects that do not address a specific, tangible capital infrastructure need are not included. Non-capital needs include operational and maintenance costs, water rights or fee payments, conducting studies, computer software for routine operations, and employee wages and other administrative costs.

Projects Must Be Eligible for DWSRF Funding

Projects ineligible for DWSRF funding are identified in the DWSRF regulation and include:

- Dams or the rehabilitation of dams.
- Water rights.
- Raw water reservoirs or rehabilitation of reservoirs (except for finished water reservoirs and reservoirs that are part of the treatment process and are on the property where the treatment facility is located).
- Projects needed primarily for fire protection.
- Projects needed primarily to serve future population growth. (Projects needed to address a deficiency affecting current users must be sized only to accommodate a reasonable amount of population growth expected to occur over the useful life of the facility.)

Projects Must Be in Furtherance of the Public Health Goals of the SDWA

Projects that are driven by objectives not based on public health protection and the goals of the SDWA are not included in the survey. These needs can include projects for improving appearances, infrastructure demolition, buildings and parking facilities not essential to providing safe drinking water, acquisition of land for an unallowable project, and infrastructure needed to extend service to homes that currently have an adequate safe drinking water supply.

Projects Must Fall Within the 20-Year Period of the Assessment

Projects for which construction began prior to January 1, 2011, and projects that are not needed until after December 31, 2030, fell outside the time frame for the Assessment and were not included.

Projects Must Be Adequately Documented

Project documentation is a critical piece of the Assessment's credibility and fairness. It is described in more detail later in this Appendix.

Other Unallowable Needs

Besides the project criteria discussed above, other limitations established by the workgroup were:

- Infrastructure needs that occur more than once during the 20-year survey period could be listed only once on the survey.
- Multiple projects meeting the same need, such as rehabilitating a tank and later replacing the same tank, could not all be included.

- Projects for compliance with specific proposed or recently promulgated regulations were not accepted from water systems. These costs were instead estimated and added to the national total by EPA directly.
- Projects driven solely by a non-water-related issue such as highway relocation were not included.
- Projects to acquire existing infrastructure were not considered capital infrastructure costs.
- Most vehicles and tools were considered operation and maintenance costs.
- Projects that are not the responsibility of the public water system, such as homeowners' portions of service line replacements, were not included.

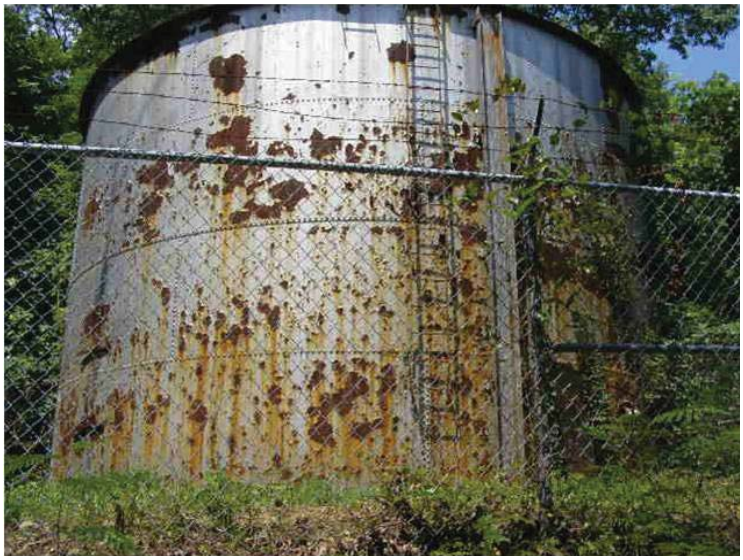
If projects associated with an unallowable need were submitted, they were excluded from the Assessment by EPA. EPA understands that these projects often represent legitimate and even critical needs that a water system must pursue to continue to provide service to its customers. However, because they do not meet the allowability criteria they are not the subject of the DWINSA.

Documentation Requirements

The 2011 Assessment essentially maintained the documentation requirements established for the 2003 Assessment and improved upon by the 2007 Assessment effort. In particular, EPA and the workgroup came to consensus to incorporate the same improvements used by the 2007 Assessment to ensure a consistent approach to data collection and to the assessment of need applied by each survey coordinator.

High-quality documentation is required to justify the need for a project, defend cost estimates provided by the water system, provide a defensible assessment of national need, and ensure fair allotment of DWSRF monies. The documentation of need and cost for each project was carefully reviewed to ensure that the criteria set in the DWINSA approach and established by consensus of EPA and the workgroup were met.

For the assessment of infrastructure needs for systems serving American Indian and Alaska Native Villages, it should be noted that the 2011 documentation requirements were considerably different than those employed in 1999, but were consistent with all other documentation requirements for the 2011 survey.



Cindy McDonald, Kentucky Division of Water

Deteriorated ground storage tank in Kentucky.

Types of Documentation

In an effort to ensure more consistency in each state's approach to the assessment of its water systems' needs, the workgroup defined for the 2007 Assessment, and retained for the 2011 effort, three types of documentation that could be provided to describe a need or provide a cost:

Independent Documentation. A document or report generated through a process independent of the Assessment. Because these documents were not generated specifically for the Assessment, it is assumed that there is no intentional bias of over reporting of need.

Survey-generated Documentation. A statement or document discussing the need for a project generated specifically for the Assessment by the system, the state, the EPA Region (for American Indian and Alaska Native Village water systems), or Navajo Nation.

Combination Documentation. A combination of independent and survey-generated documentation to justify project need or cost. Independent documentation does not always directly address the reason a project is being pursued by a system and therefore may not fully establish that the project meets the survey's allowability criteria. Systems often added survey-generated documentation to independent documents to clarify the need for the project.

Documentation of Need

Documentation explains the scope of the project, explains why the project is needed, and gives an indication of the public health need that would be addressed by the project. In order for the project to be accepted, the documentation of need must:

- Provide sufficient information for EPA to review the allowability of the project.
- Provide adequate data to check the accuracy of the data entered on the questionnaire.
- Be dated and be less than 4 years old.

The type of documentation required varied by the specific project type. Minimum requirements were set to

Weight of Evidence

Documentation must include adequate system-specific and project-specific details to verify that the project meets the allowability criteria and that the project is needed. For the 2011 Assessment, three specific weight of evidence criteria had to be supported by documentation. The project had to be shown to be:

- Necessary to meet the requirements of the Safe Drinking Water Act and for public health purposes;
- Feasible by being typical of today's water engineering standards and practices; and
- Committed to by relevant decision-makers as specified in supporting documents or by a standing history of such commitment to similar projects, as common practice by the industry, or made evident in the documentation as a standing policy by the specific water system, state, or other relevant authority.

allow a minor level of effort by states, EPA, Navajo Nation, and water systems to document straight-forward projects. Doing so made more resources available to identify and document projects for which allowability was more questionable. Projects fell into the following levels of documentation requirements:

- Projects that required independent documentation of need.
- Projects for which survey-generated documentation were permitted but to which a weight of evidence review was applied.
- Projects accepted with any forms of documentation.

The level of documentation required depended on the type of project and whether the project was for new infrastructure or for the replacement, rehabilitation, or expansion/upgrade of existing infrastructure. Any of the three forms of documentation were acceptable for projects to rehabilitate or replace infrastructure assumed to have a life-cycle of 20 years or less.

Projects likely to be driven by a need that is not DWSRF-eligible (such as to accommodate growth or meet fire suppression needs) generally required independent documentation. Most projects for the installation of new infrastructure fell into this category. For those projects, such as the construction of a new treatment system or new storage tank, the independent documentation was reviewed and EPA applied a "weight of evidence" approach to determine whether the project could be included in the Assessment.

Projects for Which Independent Documentation was Required

Generally, projects that required independent documentation of need were likely to be unallowable needs (such as projects to meet anticipated growth) or for infrastructure likely to have an expected life of more than 20 years (such as a water main). EPA and the workgroup assumed that systems pursuing needs in this category are often in the process of formal planning and therefore independent documents are likely to exist. Projects requiring independent documentation for the 2011 Assessment included:

- Sources – installation of new surface water intakes, off-stream raw water storage, or new aquifer storage and recovery wells.
- Treatment – installation, replacement, or expansion/upgrade of a complete treatment plant or new treatment components.
- Storage – installation of new elevated or ground level finished water or treated water storage.
- Pipe – installation of new water mains, rehabilitation and replacement of a substantial portion (in excess of 10 percent of the total) of the system's existing water mains.
- Pumping – installation of new pump stations.

Projects for Which Survey-Generated Documentation was Allowed, but a Weight of Evidence Review was Applied

Needs that were subject to a weight of evidence review included projects that were significant in scope or that may be for unallowable need (such as anticipated growth), but are not necessarily likely to be included in a planning document. For these projects, systems were asked to provide enough information for the reviewer to ascertain whether the project was for an allowable need. These projects included:

- Sources – construction of new wells or springs, new well pumps or raw water pumps, and replacement or rehabilitation of any source; new, rehabilitation, or replacement of a well house.
- Treatment – installation of a new treatment monitor or analytical device such as streaming current monitors, particle counters, or chlorine residual monitors.
- Storage – replacement of a finished water elevated or ground level storage tank or installation of a new hydropneumatic storage tank.
- Pipe – a significant amount of new water main appurtenances such as valves, hydrants, or backflow prevention devices, or replacement of over 10 percent of the existing inventory of those items.
- Pumping – replacement of an existing pump station or installation of a new finished water pump.
- Security and Emergency Power – motion detector, in-line monitoring devices, or other sophisticated security system components and new emergency power generators.

Projects for Which All Forms of Documentation Were Accepted

Projects for infrastructure that is generally expected to require rehabilitation or replacement within a 20-year period were accepted with minimum documentation of need. Survey-generated documentation was sufficient for these projects, which included:

- Sources – replacement or rehabilitation of well pumps, raw water pumps, and other miscellaneous source projects.
- Treatment – rehabilitation of a complete treatment plant, or rehabilitation or replacement of treatment components, or replacement of treatment monitors.

Sarah Hudson, Indiana DWSRF

Elevated storage tank in Greensburg, Indiana.

- Storage – rehabilitation of any finished water storage tank or cistern, cover of finished water storage tank, replacement of hydropneumatic tanks, and installation or replacement of cisterns.
- Pumping – replacement or rehabilitation of any pump, or rehabilitation of any pump station.
- Pipe – rehabilitation or replacement of water mains up to 10 percent of the system's existing total pipe inventory.
- Other infrastructure such as replacement of lead service lines and installation of control valves, backflow prevention, meters, controls, and replacement of emergency power.

Documentation of Cost

To estimate a 20-year national, American Indian, Alaska Native, and individual state need, every project must have an estimated cost. There were two primary methods for assigning costs to a project:

- Systems provided an independent cost estimate.
- Systems provided adequate information for EPA to estimate a cost using a cost model.

For systems that provided a cost estimate, the documentation must:

- Include the date the estimate was derived.
- Be generated through a process independent of the Assessment.
- Be no more than 10 years old (earlier than January 1, 2001).
- Not include loan origination fees, finance charges, bond issuance fees or costs, interest payments on a loan, or inflationary multipliers for future projects.

Since projects with adequately documented costs were the basis of the cost models, systems were encouraged to provide both cost and design parameters for as many projects as possible so that the data could be used to update existing 2007 Survey cost models.

If a cost was not provided, key information on design parameters and project type was required for EPA to assign a cost to the project using a cost model. However, EPA was unable to model a few types of infrastructure projects (e.g., projects that were too unique or site-specific). In those cases, a documented cost estimate was required in order for the cost to be included in the Assessment.

As with previous Assessments, EPA will publish a document detailing the costs models used in the 2011 Assessment. The publication should be available by mid-2013.

Appendix D - Accuracy, Precision, and Uncertainty

Uncertainty, precision, and bias affect the accuracy of an estimate based on a statistical sample. While a sample can be designed to meet certain precision targets, other sources of uncertainty and potential biases may diminish the accuracy of estimates.

Ohio EPA

Water Supply Revolving Loan Account funded clarifier cover in Fostoria, OH.

Uncertainty

There are two types of uncertainty at play in the DWINSA. Real uncertainties are created as survey respondents predict future needs. EPA is asking systems not only to provide their existing needs, but also to anticipate what their future needs will be. It is difficult to predict future needs. Since no one knows, for example, when a pump will fail or exactly what it will cost to fix or replace it when it does fail, there is real uncertainty about the accuracy of estimates of future investment needs.

A second source of uncertainty is the use of a probability sample to estimate need. Uncertainties are created due to the inherent limitations of statistical analyses. The use of a random sample and cost models create such stochastic (i.e., random or arising from chance) uncertainties in the survey. In assessing the impact that the sample has on the estimate, EPA distinguishes between two sources of stochastic uncertainty: precision and bias.

Precision

Precision is the degree to which additional measures would produce the same or similar results. Two factors affect the precision of sample-based estimates. First is the inherent variability of the data. If systems' needs are similar, the margin of error will be smaller than if needs vary greatly across systems. The second factor is the size of the sample. Larger samples produce more precise estimates than smaller ones.

The use of a random sample introduces uncertainty in the estimate. A different sample would lead to a different estimate of each state's need, since there will always be some variability among different systems selected in a sample. Because the DWINSA relies on a random sample, the sample should provide an unbiased estimate of the total need. The level of confidence in the estimate is reflected in the confidence interval.

EPA's goal is to be 95 percent confident that the margin of error for the survey is ± 10 percent of the total need for systems serving more than 3,300 persons for each fully surveyed

state and for all American Indian and Alaska Native Village public water systems, assuming that the data provided are unbiased. (The estimates for individual partially surveyed states do not meet these precision targets. DWINSA also has separate precision targets for systems in the state survey serving 3,300 or fewer persons.)

If the systems that responded to the survey reported the cost of their investment needs for all projects, sampling error would be the only stochastic source of uncertainty. But systems do not have cost estimates for most of the projects they reported. EPA imputed the cost of these projects using cost models based on cost estimates submitted for other projects. As with sampling, there is a degree of predictable error associated with such modeling.

Bias

Sampling error is random. It is as likely to lead to an estimate that is greater than the true value as it is lower than the true value. Bias, however, is not random. An estimator is biased if its expected value is different from the true value. An estimator is upwardly biased if it consistently leads to an estimate that is greater than the true value. It is downwardly biased if it consistently leads to an estimate that is less than the true value. The DWINSA has both upwards and downward biases. EPA implemented policies and procedures to mitigate the impact of these biases.

Downward bias

Past DWINSAs and studies of these Assessments have shown that systems are likely to underestimate their needs. There is little theory or empirical evidence to suggest that systems overstate their needs. This understatement is brought on for two primary reasons. One is that the bulk of a system's infrastructure is underground in the form of transmission and distribution mains. It is difficult to assess the need for addressing these out-of-sight assets. The second is that the survey assesses systems' 20-year need. Many systems have not undertaken the long-term planning necessary to identify future infrastructure needs.

Kentucky Department of Environmental Protection

Service line test in Hardinsburg, KY.

Upward bias

In part to help address the downward bias introduced by systems' underestimating their needs, EPA enlisted the help of states, EPA Regions, and the Navajo Nation in the data collection effort. However, because these entities are the recipients of the capitalization grants determined by the Assessment, there is an incentive for them to overestimate their systems' needs. This situation introduces a possible upward bias in the estimate of the needs generated by systems with this type of input.

This bias likely does not apply to the DWINSA estimate of small system need in the state survey. The small system survey is conducted by EPA, without states' direct involvement. For this reason, there is no upward bias in this portion of the survey. In addition, because these small system surveys are conducted by trained professionals, EPA expects very little downward bias.

Approximately 22 states, the U.S. Territories, and the District of Columbia have needs of less than one percent of the national need. These states receive the minimum DWSRF allocation regardless of the need reported (one percent for states, Puerto Rico, and the District of Columbia; 1.5 percent for U.S. Territories). For this reason, there is likely no upward bias in the allocation for these states, and only the downward bias discussed above influences need in these states.

With input from states, EPA Regions, and the Navajo Nation, as well as a peer-review process for the 2007 Assessment, EPA implemented policies to help address both upward and downward bias. These policies included:

- Projects to rehabilitate or replace infrastructure generally considered in need of attention within a 20-year period were allowed based on system- or other entity-signed statements and project descriptions. Systems were encouraged to consider their entire inventory and document all such needs if legitimate.
- Projects to rehabilitate or replace infrastructure not necessarily considered in need of attention within a 20-year period were allowed with documentation independent of the Assessment or a system or other entities' statement if it included additional project-specific information such as an assessment of age, current condition, and maintenance history.
- Projects that include the installation/construction of new infrastructure generally received a high degree of scrutiny to ensure that they met allowability criteria.
- Some infrastructure was only allowed if independent documentation was provided. This included new surface water sources, new treatment plants or components, the replacement or expansion of an existing treatment plant, new storage tanks, and widespread replacement or rehabilitation of the distribution system (defined as more than 10 percent of the existing pipe inventory).

Appendix E - Summary of Findings for State Systems Serving 10,000 and Fewer Persons

Community Water Systems in States Serving 10,000 People and Fewer

The SDWA requires that states use at least 15 percent of their DWSRF funding for financial assistance to community water systems (CWS) serving populations of 10,000 and fewer. Of the $ 371.4 billion in need for all CWS in states, those serving 10,000 and fewer persons represent 29.8 percent or approximately $110.5 billion of needs (includes CWSs in U.S. Territories). Exhibit E.1 presents the 20-year needs for these smaller community systems by state and project type. It also compares the reported need of these systems to the state's total community water system need. All data in Exhibit E.1 exclude needs related to not-for-profit noncommunity water systems.

Exhibit E.1: State Need Reported by Project Type for CWSs Serving a Population of 10,000 and Fewer (20-year need in millions of 2011 dollars)

State	CWSs Serving 10,000 or Fewer People						Total 20-Year Need of All CWS*	% of CWS Need Related to Systems Serving 10,000 or Fewer Persons.*
	Transmission and Distribution	Source	Treatment	Storage	Other	Total 20-Year Need of CWS Serving 10,000 or Fewer People*		
Alabama	$1,910.2	$57.8	$174.5	$221.2	$37.5	$2,401.2	$7,945.4	30.2%
Arizona	$921.0	$104.7	$267.4	$243.7	$9.6	$1,546.4	$7,419.7	20.8%
Arkansas	$1,630.4	$111.9	$280.5	$284.5	$29.2	$2,336.4	$6,090.1	38.4%
California	$3,035.5	$417.2	$1,012.6	$718.6	$63.2	$5,247.1	$44,398.1	11.8%
Colorado	$1,268.3	$126.4	$496.1	$361.8	$17.0	$2,269.7	$7,122.6	31.9%
Connecticut	$472.9	$87.1	$125.5	$114.0	$11.7	$811.2	$3,547.2	22.9%
District of Columbia	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$1,606.7	0.0%
Florida	$1,587.4	$442.6	$415.0	$338.6	$45.4	$2,829.0	$16,326.2	17.3%
Georgia	$2,245.0	$226.7	$403.7	$454.6	$27.1	$3,357.0	$9,252.6	36.3%
Illinois	$3,156.0	$333.7	$736.7	$702.3	$54.6	$4,983.3	$18,860.0	26.4%
Indiana	$1,513.8	$120.4	$279.5	$263.5	$13.1	$2,190.4	$6,346.9	34.5%
Iowa	$1,416.0	$193.0	$396.1	$322.7	$27.0	$2,354.8	$5,909.4	39.8%
Kansas	$1,725.3	$134.2	$296.7	$261.2	$12.5	$2,430.0	$4,190.7	58.0%
Kentucky	$1,117.5	$52.0	$115.8	$152.7	$13.6	$1,451.6	$6,227.4	23.3%
Louisiana	$1,812.9	$176.8	$393.5	$327.3	$18.4	$2,728.9	$5,305.7	51.4%
Maine	$395.0	$52.8	$106.7	$105.6	$10.0	$670.0	$1,140.6	58.7%
Maryland	$441.1	$78.5	$120.3	$117.2	$6.3	$763.4	$6,801.7	11.2%
Massachusetts	$743.6	$120.2	$192.2	$175.2	$14.9	$1,246.2	$7,663.7	16.3%
Michigan	$1,943.6	$254.5	$502.8	$364.2	$44.3	$3,109.3	$13,278.3	23.4%
Minnesota	$1,782.4	$189.2	$410.6	$344.8	$28.0	$2,754.9	$7,058.3	39.0%
Mississippi	$1,644.0	$216.8	$469.5	$390.0	$17.2	$2,737.3	$3,675.7	74.5%
Missouri	$2,985.7	$227.8	$553.6	$448.0	$20.6	$4,235.8	$8,436.3	50.2%
Nevada	$388.4	$39.1	$149.4	$92.1	$3.3	$672.4	$5,575.1	12.1%
New Jersey	$779.7	$102.0	$157.2	$174.5	$7.4	$1,220.8	$7,683.6	15.9%

* Excludes NPNCWS

Exhibit E.1: State Need Reported by Project Type for CWSs Serving a Population of 10,000 and Fewer (20-year need in millions of 2011 dollars)

State	CWSs Serving 10,000 or Fewer People						Total 20-Year Need of All CWS*	% of CWS Need Related to Systems Serving 10,000 or Fewer Persons.*
	Transmission and Distribution	Source	Treatment	Storage	Other	Total 20-Year Need of CWS Serving 10,000 or Fewer People*		
New York	$2,819.0	$381.0	$916.0	$680.2	$42.9	$4,839.2	$21,898.0	22.1%
North Carolina	$1,789.0	$242.9	$476.9	$422.6	$52.3	$2,983.6	$9,626.4	31.0%
Ohio	$1,876.8	$220.7	$585.1	$418.5	$51.7	$3,152.8	$11,871.1	26.6%
Oklahoma	$2,103.3	$142.8	$742.9	$342.8	$18.5	$3,350.3	$6,468.5	51.8%
Oregon	$1,069.7	$123.6	$404.8	$274.9	$18.0	$1,891.0	$5,500.0	34.4%
Pennsylvania	$2,629.3	$292.6	$829.2	$673.7	$59.6	$4,484.5	$13,907.7	32.2%
Puerto Rico	$898.3	$46.8	$221.7	$149.3	$7.6	$1,323.7	$3,211.8	41.2%
Tennessee	$545.1	$36.3	$98.2	$103.1	$6.6	$789.3	$2,659.3	29.7%
Texas	$7,906.2	$728.1	$1,994.4	$1,622.6	$164.7	$12,416.0	$33,837.7	36.7%
Utah	$628.9	$81.2	$167.4	$179.0	$6.6	$1,063.2	$3,710.9	28.7%
Virginia	$1,191.4	$129.9	$351.0	$301.9	$37.6	$2,011.9	$6,611.7	30.4%
Washington	$2,083.2	$355.5	$614.4	$506.7	$54.0	$3,613.7	$9,388.4	38.5%
Wisconsin	$1,249.0	$194.2	$447.7	$315.7	$15.4	$2,222.0	$6,592.4	33.7%
Partially Surveyed States**	$7,286.2	$900.5	$1,989.9	$1,590.5	$143.1	$11,910.2	$23,565.0	50.5%
Subtotal	**$68,990.9**	**$7,741.8**	**$17,895.6**	**$14,559.8**	**$1,210.4**	**$110,398.5**	**$370,710.6**	**29.8%**
American Samoa	$17.3	$2.3	$5.6	$4.3	$0.3	$29.8	$81.9	36.4%
Guam	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$235.4	0.0%
North Mariana Is.	$34.8	$5.7	$9.6	$8.4	$0.8	$59.2	$177.7	33.3%
Virgin Islands	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$174.6	0.0%
Subtotal	**$52.1**	**$8.0**	**$15.2**	**$12.7**	**$1.1**	**$89.0**	**$669.7**	**13.3%**
Total	**$69,043.1**	**$7,749.8**	**$17,910.8**	**$14,572.5**	**$1,211.4**	**$110,487.6**	**$371,380.3**	**29.8%**

* Excludes NPNCWS

** The need for states that opted out of the medium portion of the survey is presented cumulatively and not by state. The list of partially surveyed states can be seen in Exhibit 2.4

Glossary

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 the projects' costs.

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

Community water system (CWS): 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 by EPA under the authority of the Safe Drinking Water Act; existing regulations can be found at Title 40 Part 141, the Code of Federal Regulations (40 CFR 141).

Finished water: water that is considered safe to drink 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 DWINSA.

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: The expansion of a water system to accommodate or entice future additional service connections or consumers. Needs planned solely to accommodate projected future growth are not included in the Assessment. Eligible projects, however, can be designed for growth expected during the design-life of the project. For example, the Assessment would allow a treatment plant needed now 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 constructing facilities needed for continued provision of safe drinking water. Categories of infrastructure 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 category comprises community water systems serving more than 100,000 persons.

Medium water system: in this document, this category comprises community water systems serving from 3,301 to 100,000 persons.

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 daily for at least 60 days of the year. Examples of not-for-profit noncommunity water systems include schools and churches.

Public water system: a system that provides water to the public for human consumption through pipes or 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 Safe Drinking Water Act 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 category comprises community water systems serving up to 3,300 persons.

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, state refers to all 50 states of the United States plus Puerto Rico, the District of Columbia, American Samoa, Guam, the Commonwealth of Northern Mariana Islands, and the U.S. Virgin Islands.

Storage: a category of need that addresses finished water storage for public water systems.

Supervisory Control and Data Acquisition (SCADA): an advanced control system that collects all system information and allows an operator, 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 installation, 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 or chemical contaminants. Filtration of surface water, pH adjustment, softening, and disinfection are examples of treatment.

Watering point: a central source from which people who do not have piped water can obtain drinking water for transport to their homes.

Kentucky Department of Environmental Protection

Intake at the Licking River Dam in Salyersville, KY.