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February 2001

Drinking Water Infrastructure Needs Survey

American Indian and Alaska Native Village Water Systems Survey

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Credits left to right from upper left: Navajo Nation EPA; Indian Health Service; Indian Health Service; Indian Health Service; and Alaska Department of Environmental Conservation

Pictured left to right from upper left: ground water supply, building a new treatment plant, building a ground-level storage tank, laying distribution mains, and collecting drinking water from a watering point.

Drinking Water Infrastructure Needs Survey

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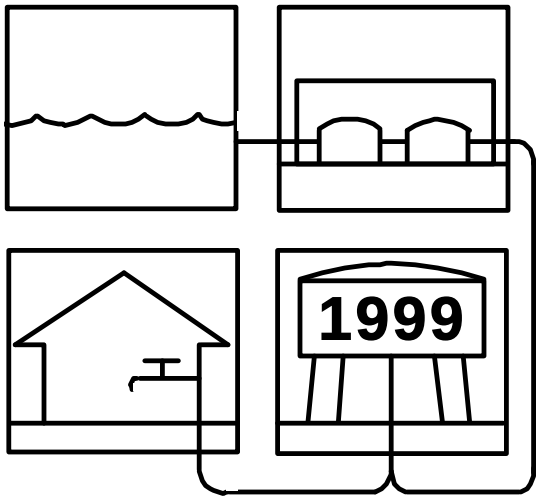

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Drinking Water Protection Division (4101)
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Indian Health Service

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

EXECUTIVE SUMMARY

In 1999, the U.S. Environmental Protection Agency conducted the second survey of the nation's infrastructure needs. The survey covers community water systems and not-for-profit noncommunity water systems. American Indian and Alaska Native Village systems represent $2.2 billion of the $150.9 billion total national need. The results of this survey support the findings of the first survey, conducted in 1995, by documenting the continued need to install, upgrade, and replace the infrastructure on which the public relies for safe drinking water.

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

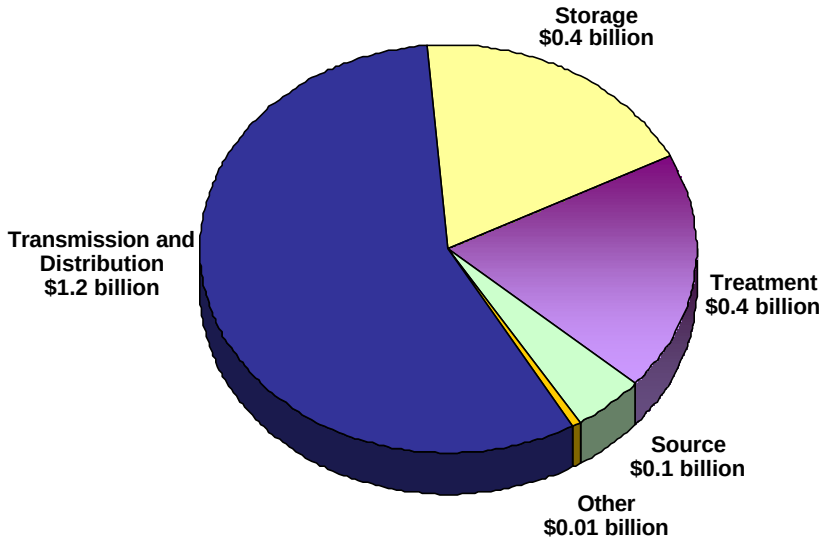
Despite the importance of these projects for protecting public health, water systems often encounter difficulties in obtaining affordable financing for such improvements. Recognizing this problem, Congress established the Drinking Water State Revolving Fund (DWSRF) in the 1996 Safe Drinking Water Act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

The Drinking Water Infrastructure Needs Survey is an important tool of the DWSRF program. The purpose of the survey is to estimate the documented 20-year capital investment needs of public water systems eligible to receive DWSRF funding—community water systems and not-for-profit noncommunity water systems.[1] The survey includes infrastructure needs that are required to protect public health, such as projects to preserve the physical integrity of the water system, convey treated water to homes, or ensure continued compliance with specific SDWA regulations.

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

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

Exhibit ES-1: Total 20-Year Need by Category (in January 1999 dollars)



Note: Numbers may not total due to rounding.

As required by the SDWA, EPA uses the survey as a tool for allocating the Tribal Set-Aside (up to 1.5 percent of the DWSRF annual appropriation) to American Indian and Alaska Native Village water systems.

Needs of American Indian and Alaska Native Village Water Systems

Total American Indian and Alaska Native Village Water System Needs. The total need for American Indian and Alaska Native Village systems is $2.2 billion over 20 years. Exhibit ES-1 presents the total need by category for these systems. The significance of this need in terms of public health is underscored by considering the per-household costs, which average $6,500 for American Indians and $51,500 for Alaska Natives. The difficulty in transporting materials to remote areas, the lack of economies of scale for small system projects, and the limited annual construction period in some regions contribute to the high per-household costs for these systems.

The survey includes only infrastructure needs that are required to protect the public health. It is important to emphasize, however, that most of the needs represent projects that systems would address as preemptive measures to ensure the continued provision of safe drinking water, rather than as remedial actions to correct an existing violation of a drinking water standard. In addition, the majority of the total need derives from the inherent costs of being a water system which involves the nearly continual need to install, upgrade, and replace the basic infrastructure that is required to deliver safe drinking water to consumers.

American Indian Needs. The total 20-year need for American Indian systems is $1.2 billion. Of this total, approximately $1.0 billion is currently needed to ensure the continued provision of safe drinking water.

Alaska Native Village Needs. The total 20-year need for Alaska Native Village systems is $1.1 billion. Of this total, approximately $1.0 billion is needed now to ensure the continued provision of safe drinking water.

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

- With $1.2 billion needed over the next 20 years, transmission and distribution projects constitute the largest category of need. The transmission and distribution category includes the installation and rehabilitation of raw and finished water transmission pipes, distribution water mains, replacement of lead service lines, flushing hydrants, valves, and backflow prevention devices. Failure of transmission and distribution lines can interrupt the delivery of water. Broken transmission lines also can disrupt the treatment process, and leaking distribution mains can lead to a loss of pressure causing back-siphonage of contaminated water.

- Storage projects represent the second largest category of need, $447.0 million over the next 20 years. This category includes projects to construct new or rehabilitate existing finished water storage tanks. A water system with inadequate storage capacity cannot always provide water at pressures sufficient to prevent back-siphonage of microbial contaminants. In addition, constructing new tanks is necessary if the system cannot meet peak demands. Many projects in this category involve rehabilitating existing tanks to prevent structural failures that can cause microbiological contamination.

- The total 20-year need for treatment projects is $408.1 million. This category consists of projects needed to reduce contaminants through, for example, filtration, chlorination, corrosion control, and aeration. $164.5 million is needed to address contaminants that pose acute health risks. The installation, upgrade, or rehabilitation of treatment infrastructure also is required to remove contaminants that can cause chronic health effects or taste, odor, and other aesthetic problems.

- The source category includes projects that are necessary to obtain safe supplies of surface or ground water. The infrastructure needs in this category include the installation and rehabilitation of drilled wells. The total 20-year need for source water projects is $123.2 million.

- Other needs account for an estimated $12.4 million. This category captures needs that cannot be assigned to one of the prior categories. Examples include emergency power generators, computer and automation equipment, and improvements for flood or earthquake protection.

Total Need by Current and Future Needs. About 93 percent of the total need, $2.0 billion, is needed now to continue to protect the public health and maintain existing distribution and treatment systems. Current needs are projects that a system would begin immediately.

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

water, but the plant's filters may require replacement due to their age and declining effectiveness, if the plant is to continue to provide safe water.

Future needs are projects that water systems expect to address in the next 20 years as part of routine rehabilitation of infrastructure or due to predictable events such as reaching the end of a facility's service-life. Approximately 7 percent of the total need, $165.8 million, is reported as future needs.

The Regulatory Need

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

The total regulatory need accounts for 7 percent, or $164.6 million, of the total Tribal need. This statistic reveals that most of the total need results from the costs of installing, upgrading, and replacing the basic infrastructure that is required to deliver drinking water to consumers—costs that are borne by water systems independent of the SDWA. For a need to be included in the survey, however, it must be required to protect public health. Therefore, if a system fails to address a need, then a health-based violation of a standard eventually may occur.

Microbial Contaminants. Projects to address microbiological contamination account for $164.5 million, of the total existing regulatory need. Under the SDWA, the Surface Water Treatment Rule (SWTR) and the Total Coliform Rule (TCR) are designed to reduce the amount of microbial contaminants in drinking water. Microbial contaminants, such as *Giardia* and *E. coli*, can cause acute gastrointestinal illness and, in extreme cases, death. The installation of a treatment plant to filter a surface water source and the installation of a disinfection system are examples of needs associated with this category.

Chemical Contaminants. Infrastructure needs to protect the public health from chemical contaminants comprise $0.1 million of the total existing regulatory need. This category includes projects necessary for compliance with the Nitrate/Nitrite Standard, Lead and Copper Rule, Total Trihalomethanes Standard, and other regulations that set maximum allowable limits for organic and inorganic contaminants. Examples of projects in this category are aerating water to remove volatile organic compounds and applying corrosion inhibitors to reduce the leaching of lead from pipes.

Households Not Served by Public Water Systems

Data from the 1990 census indicate that approximately 16 million households are not served by public water systems. This survey was restricted to public water systems eligible for DWSRF assistance. It therefore, was not designed to estimate the needs for households that use private wells, haul water from non-public systems, or lack running water. However, the survey addressed these needs in a limited

way by including projects to extend service from existing public water systems to homes that do not have access to safe drinking water.

Methods

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

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

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

Total Need Compared to the 1995 Drinking Water Infrastructure Needs Survey

The total need for American Indian systems and Alaska Native Village systems increased by $533.8 million and $216.2 million, respectively, compared to the 1995 findings. This increase results largely from refining the methods used to estimate the needs. For the American Indian survey, the sample size was increased to provide a more precise estimate of national need. Similarly, the use of a census for Alaska Native Village systems increased the precision of the need estimate compared to the sampling methods used in the first survey.

Conclusions

The 1999 Drinking Water Infrastructure Needs Survey, the second such national survey by EPA, estimates that American Indian and Alaska Native Village water systems need to invest $2.2 billion over the next 20 years to ensure the continued provision of safe drinking water to consumers. This finding lends support to the results from the previous survey which also identified a substantial need for infrastructure investments. The need to replace, upgrade, and install infrastructure will continue to increase as these systems age.

Indian Health Service

Completed in 1999, this new surface water treatment system serves the Standing Sioux Tribe in Wakpala, South Dakota. The previous plant lacked the treatment capacity to protect against microbial contamination during periods of high runoff in the spring months.

OVERVIEW OF SURVEY METHODS

The second Drinking Water Infrastructure Needs Survey involved the collective efforts of the American Indian and Alaska Native Village representatives, the Indian Health Service, EPA, and water systems–all of which participated in identifying and documenting infrastructure needs. This chapter provides an overview of the methods used by these participants to assess drinking water needs. It also describes the refinements made to the methods used in the 1995 survey to improve the accuracy of this survey's results.

Scope of the Survey

Goal and Purpose. The goal of the 1999 Drinking Water Infrastructure Needs Survey was to estimate the documented 20-year Tribal infrastructure need for the community and not-for-profit noncommunity public water systems eligible to receive DWSRF assistance.

The 1996 Safe Drinking Water Act (SDWA) Amendments direct EPA to use the results from the latest Needs Survey to allocate DWSRF funds. For American Indian and Alaska Native Village water systems, EPA calculated the total infrastructure need for each EPA Region. The results are used to allocate the Tribal Set-Aside of up to 1.5 percent of the DWSRF to the Regions based in part on each Region's share of the total American Indian and Alaska Native Village need.

Infrastructure Needs. To fulfill the survey's purpose as a tool for allocating DWSRF funds, all of the infrastructure needs in the survey were required to meet the basic eligibility criteria established under the DWSRF program.[1] In general, projects eligible for funding facilitate compliance with the SDWA's National Primary Drinking Water Regulations or otherwise significantly further the health protection objectives of the Act.

Categories of Need. The survey assigned each project to one of five categories of need: source, transmission and distribution, treatment, storage, and "other." This classification allowed for an understanding of where on a broad scale the nation's water systems need to make capital investments.

- The source water category comprises projects necessary to obtain sufficient supplies of surface or ground water. Examples include wells, surface water intakes, and spring collectors.

- The transmission and distribution category includes the pipes that transport water to consumers. This category represents the needs associated with installing or rehabilitating raw and finished water transmission pipes, distribution water mains, flushing hydrants, valves, and backflow prevention devices.

- The treatment category consists of projects needed to address problems such as the presence of microbial pathogens and chemical contaminants.

[1] The survey excluded DWSRF-eligible needs which do not involve the installation, replacement, or rehabilitation of infrastructure: for example, refinancing loans, conducting studies, and acquiring other water systems.

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

- The "other" category captures needs that cannot be assigned to one of the prior categories. Examples include laboratory equipment, emergency power generators, computer and automation projects, and improvements for flood or earthquake protection.

Current and Future Needs. The survey identifies current and future needs for the 20-year period from January 1, 1999 through December 31, 2018. Current needs address infrastructure projects which systems would implement as preventive measures to avoid water quality problems. An example of a current need is replacing an old and leaking section of distribution line that is susceptible to contamination.

Future needs are projects that a water system expects to undertake in the next 20 years. These include the routine rehabilitation of infrastructure and the replacement of a facility that performs adequately now, but will need to be replaced over the next 20 years to ensure the continued provision of safe drinking water. For example, a system may anticipate that it will need to replace its chlorinator within the next 10 years.

Credibility of the Findings. The survey required that documentation describing the purpose and scope of a project accompany each need. This requirement was necessary to verify that all of the projects submitted to the survey met the eligibility criteria for DWSRF funding. The survey established specific documentation requirements to ensure that uniform requirements would be applied to the Tribes in determining the adequacy of documentation and the eligibility of needs. These requirements not only lend credibility to the findings, but also address the issue of fairness when the results are used to apportion DWSRF funds.

Acceptable Documentation

The following types of documents were used to justify the need and/or cost of a project.

For Need and/or Cost Documentation

- Capital Improvement Plan or Master Plan
- Facilities Plan or Preliminary Engineering Report
- Grant or Loan Application Form
- Engineer's Estimate
- Intended Use Plan/State Priority List
- Indian Health Service Sanitation Deficiency System Printout

For Need Documentation Only

- Comprehensive Performance Evaluation (CPE) Results
- Sanitary Survey
- Source Water Protection Plan
- Monitoring Results
- Signed and dated statement from State, site visit contractor, or system engineer clearly detailing infrastructure needs.

For Cost Documentation Only

- Cost of Previous Comparable Construction

Documented Costs and Cost Models

In addition to developing requirements for documenting needs, the survey set rigorous documentation criteria for assessing the legitimacy and scope of project costs. EPA required that each project cost submitted to the survey be supported by documentation to indicate that the cost had undergone an adequate degree of professional review. The

documentation criteria also allowed EPA to review all of the components of a project that were included in a cost estimate. This enabled EPA to model portions of the project that might have been excluded from a cost estimate, or to delete DWSRF-ineligible portions of the submitted cost. For example, if a system identified a need to replace a section of old and leaking pipe, but lacked cost documentation, the system could supply the length and diameter of pipe to be replaced. Based on this information, the cost for this project could be modeled.

For the 1999 survey, 59 models were developed to assign costs to 95 different infrastructure needs, from replacing broken valves to building new treatment plants. The cost documentation submitted by water systems was the sole source of data for all but 19 of the cost models. Most documented costs were obtained from systems in the State portion of the survey, given the availablity of the planning documents for these systems. For some types of need, the survey data proved inadequate for generating a statistically significant model. Therefore, cost data from additional sources, including engineering firms and the Indian Health Service, were obtained to supplement the data submitted by survey respondents.

Developing the Methods

The methods for the 1999 survey were developed by a workgroup consisting of American Indian, Alaska Native Village, Indian Health Service, and EPA representatives. The workgroup decided to adopt the general design of the first survey in 1995. However, the workgroup refined some of the methods based on lessons learned in conducting the 1995 survey, findings from a 1997 follow-up study that EPA conducted to assess the first survey, and options made available by advances in Internet communications.

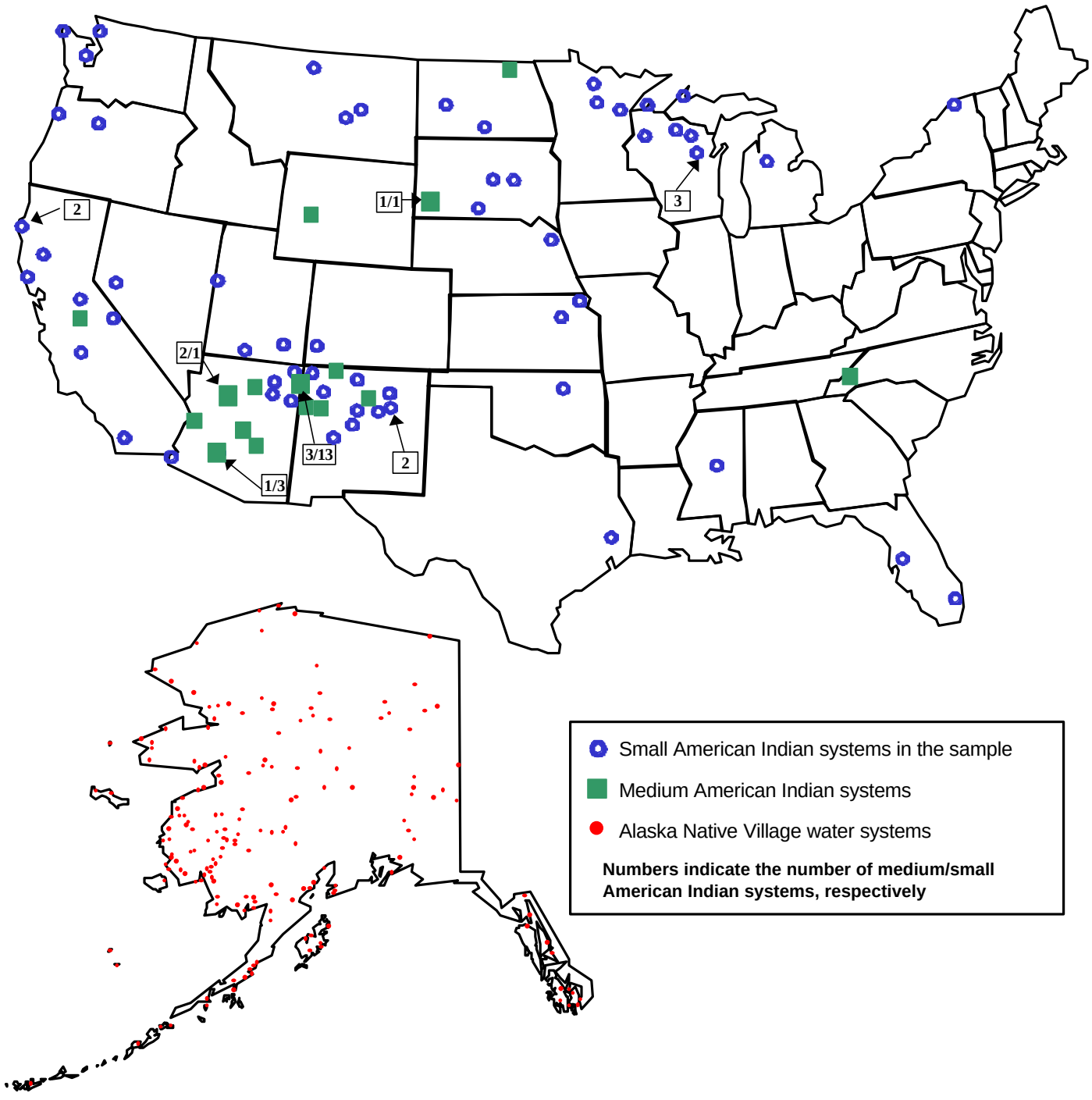
The workgroup developed the following improvements for the 1999 survey:

- The workgroup modified the design of the survey questionnaire by providing more examples and simplifying the forms.
- The 1999 survey created a user-friendly website that allowed the EPA Regions to readily identify which projects required additional documentation of need or cost.
- For the American Indian portion of the 1999 survey, the number of small systems selected to participate was increased to provide a more precise estimate of national need.
- The use of a census for Alaska Native Village water systems increased the precision of the need estimates compared to the sampling methods used for the first survey.

Conducting the American Indian and Alaska Native Village Surveys

Developing the American Indian Methods. The 1999 survey used the same tools (questionnaires and site visits) to estimate the needs of American Indian and Alaska Native Village water systems as were used for systems in the State portion of the survey. Exhibit 1 displays the location of the American Indian and Alaska Native Village water systems included in the survey.

Exhibit 1: Location of American Indian and Alaska Native Village Water Systems In the Needs Survey Sample



All 19 American Indian systems serving more than 3,300 people completed a questionnaire. EPA offered technical support to systems that requested assistance in identifying eligible needs and preparing documentation. The questionnaires for each system contained preprinted need and cost information derived from the Sanitation Deficiency System (SDS) of the Indian Health Service (IHS). The SDS provides information on specific needs and ranks communities' needs based on threats to public health. This information served as a baseline of needs to which the systems added projects for the survey.

The survey conducted 78 site visits to a random selection of small systems serving fewer than 3,300 people. Of the approximately 781 American Indian water systems, 762 systems are small.

All needs and costs submitted by American Indian systems were required to meet the documentation criteria established for the survey. To be considered adequate, documentation of need had to explain the purpose of the project, while documentation of cost had to indicate that the cost had been subject to professional review. If cost documentation was unavailable, the system was asked to provide information that enabled EPA to model the cost.

Developing the Alaska Native Village Methods. The availability of key personnel and data resources (e.g., aerial photographs) allowed EPA to use a census to assess the needs of Alaska Native Village water systems. A questionnaire was mailed to the two medium-sized systems serving more than 3,300 people. Infrastructure needs for 172 small systems were identified on questionnaires by representatives from the Alaska Native Village Health Consortia, IHS, and Village Safe Water with assistance from EPA.

A round-table of IHS and EPA engineers was convened to provide guidance on developing project costs. Villages were assigned to one of four geographical zones to account for distinct regional variations in costs. For most types of need, costs were established for each region. EPA developed these costs based on projects funded by IHS in Alaska Native Villages. However, the cost models that were developed from data provided by systems in the State and American Indian portions of the survey were used to assign costs to a few small-scale projects (e.g., flushing hydrants) for which IHS costs were unavailable.

Navajo Nation EPA

Many American Indians obtain their drinking water from watering points such as the one pictured here.

Dave Clark

The expense of burying pipe leads some systems to develop expedient but precarious solutions such as the one pictured here. Water service will be disrupted if pipes are not buried or otherwise adequately protected.

FINDINGS

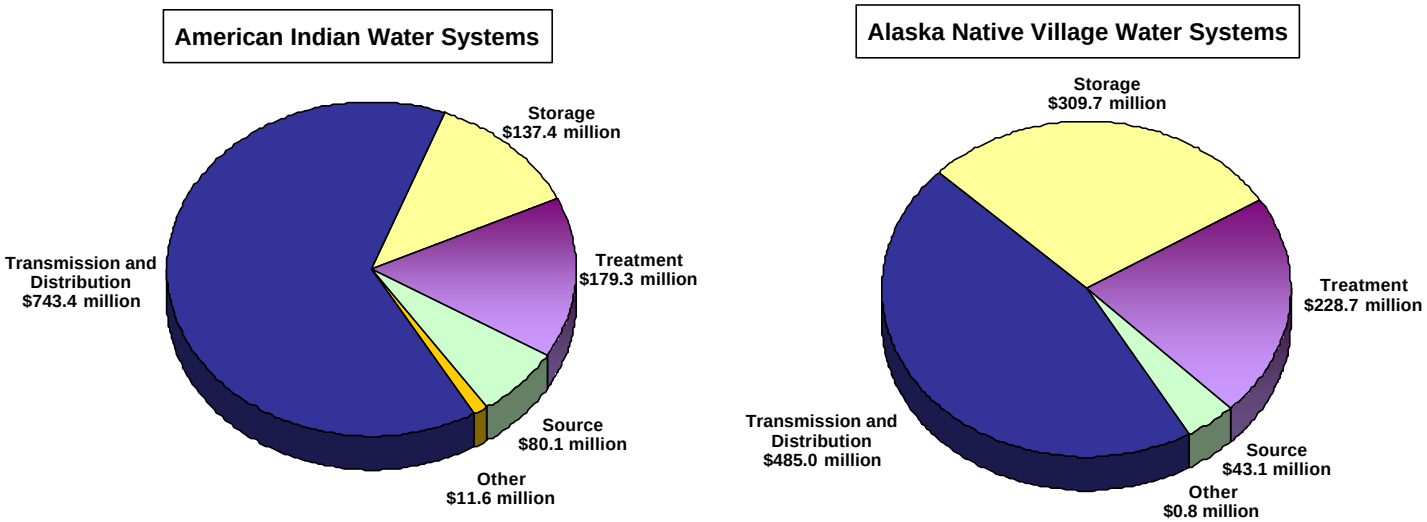
In 1999, EPA conducted a survey to estimate the 20-year capital needs of American Indian and Alaska Native Village water systems. This section of the report presents the total need for these systems. The section also describes the need by category and the existing regulatory need. Appendix B presents the American Indian need by EPA Region.

The survey estimates that American Indian and Alaska Native Village water systems need to invest $2.2 billion in capital improvements over the next 20 years. Of this total, $2.0 billion is needed now to ensure the continued provision of safe drinking water. Exhibit 2 presents the total need by category for American Indian and Alaska Native Village systems.

The public health significance of this need is underscored by considering the per-household needs of American Indian and Alaska Native Village water systems. As Exhibit 5 shows, these household needs are the highest in the nation–averaging $6,500 per-household for American Indians and $51,500 per-household for Alaska Native Villages. It is to be expected that American Indian and Alaska Native Village systems would have high per-household needs because most of these systems are small, serving between 25 and 3,300 people. Small systems lack the economies of scale that reduce the per-household needs of larger systems.

> The majority of American Indian systems, 762 of 781, are small systems serving between 25 and 3,300 people. The remaining 19 systems are of medium size serving between 3,300 and 50,000 people. A similar breakdown in size applies to the Alaska Native Village systems: 172 systems are small and 2 systems are of medium size.

Exhibit 2: Total American Indian and Alaska Native Village Water System Need by Category of Need (in millions of January 1999 dollars)



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

Indian Health Services

Workers install a section of water main on the Navajo reservation in Arizona. Many American Indian systems have disproportionately high distribution needs relative to their size, because they serve widely dispersed homes in remote locations.

However, American Indian and Alaska Native Village systems have substantially higher needs than the small systems in the State portion of the survey. For American Indian systems, the widely dispersed and remote location of many communities and the limited availability of water resources are among the logistical challenges that account for these high per-household needs. Alaska Native Village water systems face higher costs due to their remote arctic locations and the unique design and construction standards required in permafrost conditions.

The isolation of many American Indian communities and Alaska Native Villages makes it infeasible to obtain water from neighboring water systems. In less remote areas, water systems often find that consolidation with other systems can reduce or eliminate the needs associated with treatment and source development. Also, a group of homes lacking safe drinking water can connect to a nearby system without the expense of laying miles of pipe or creating a new water system. These options are not available to remote American Indian communities and Alaska Native Villages.

The problem of delivering safe water in these communities is compounded by their poor economic condition. According to the 1990 census, approximately 32 percent of American Indians and Alaska Natives live below the poverty line, compared to the national average of 13 percent. Also, the median household income of American Indians and Alaska Natives is just 66 percent of the national average. These communities, therefore, often lack the internal financial resources to invest in water infrastructure.

The Indian Health Service (IHS) estimates that approximately 20,000 households in American Indian communities and Alaska Native Villages lack potable water supplies. Some of these households must haul their drinking water from community watering points. In the course of being transported and stored, sometimes in unsanitary conditions, hauled water is vulnerable to microbial contamination. For example, in arctic areas of Alaska, the common practice of hauling buckets of human waste along the same walkways used for hauling drinking water poses significant public health risks. Households without access to a watering point must obtain their water from alternative supplies, such as untreated surface sources

that are subject to contamination from waterborne bacteria, viruses, and protozoa.

Irrespective of where these households obtain their water, a lack of running water tends to limit hand-washing and bathing. Consequently, these households face an increased risk from such communicable diseases as Hepatitis A, shigellosis, and Impetigo.

Although the risk of waterborne and water-related diseases remains an important public health concern, the occurrence of these diseases has declined in many American Indian communities and Alaska Native Villages. The construction of water systems and waste disposal facilities was a critical factor in this decrease. The challenge many American Indian communities and Alaska Native Villages now face is the lack of financial and technical resources necessary to operate and maintain these new water systems. The survey found that a disproportionately large number of these treatment facilities required replacement rather than rehabilitation. Without adequate operation and maintenance, water systems will cease to provide safe drinking water well before the end of their design life. Thus, in many American Indian communities and Alaska Native Villages, new water systems often deteriorate to an extent that premature replacement of the facilities is required.

Exhibit 3: Total 20-Year Need by Category for American Indian Water Systems (in millions of January 1999 dollars)

Categories of Need	Current Need	Future Need	Total Need
Distribution and Transmission	$691.6	$51.8	**$743.4**
Treatment	$157.2	$22.1	**$179.3**
Storage	$106.3	$31.1	**$137.4**
Source	$64.9	$15.2	**$80.1**
Other	$11.6	$0	**$11.6**
Total Need	**$1,031.5**	**$120.3**	**$1,151.8**

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

American Indian Water System Needs

The total 20-year need for American Indian systems is $1.2 billion. Of this total, approximately $1.0 billion is needed now to provide safe drinking water. Exhibit 3 presents the total need by category for American Indian systems.

Transmission and distribution projects account for 65 percent of the total American Indian need, a finding which reflects the long lengths of main often needed to transport water from a source to a treatment facility and from the facility to remote users. The cost of extending service to each home may be prohibitive in some communities given the distances involved. In these circumstances, more affordable options include drilling private wells to serve individual homes and constructing treated water stations from which water can be hauled and stored under sanitary conditions.

Treatment represents the second largest category of need at $179 million. Although some American Indian systems have surface water treatment facilities, many systems are located in dry regions where ground water is the only available source. The fact that approximately 93 percent of American Indian systems rely on ground water also reflects their small size, since most small systems in the country use ground water sources. The treatment needs of American Indian systems therefore are typical of ground water systems–with disinfection being the most common form of treatment.

Many American Indian systems are located in arid areas where the aesthetic quality of the ground water is poor. The survey estimates that $26 million is needed for projects to remove secondary contaminants that impart an unpleasant taste, odor, or color to the water.

Indian Health Service

A storage tank under construction in White Mountain, Alaska, is encased in insulation to prevent water in the system from freezing. Constructing water systems to withstand extreme weather conditions is one reason Alaska Native Village systems have high per-household needs.

Of the remaining categories of need, $137 million is needed to install or rehabilitate water storage tanks. Another $80 million is needed to develop and maintain adequate sources of water–a significant challenge for many American Indian systems due to the scarcity of water resources. Representing $12 million in needs, the "other" category comprises the remaining 1 percent of the total need. This category includes projects for installing emergency power generators and upgrading facilities to protect against floods and earthquakes.

Regulatory Need for American Indian Systems. Infrastructure needed for compliance with existing SDWA regulations comprise 5 percent, or $57 million, of the total 20-year American Indian need. The regulatory need category includes projects which are necessary to attain or maintain compliance with a maximum contaminant level (MCL) or treatment technique requirement. Approximately 98 percent of these projects involve the upgrade, replacement, or installation of treatment technologies required for compliance with the Surface Water Treatment Rule. Less than 2 percent of the regulatory need is for compliance with the Total Coliform Rule. The remainder is for compliance with the Lead and Copper Rule.

Alaska Native Village Water System Needs

The total 20-year need for Alaska Native Village systems is $1.1 billion. Of this total, approximately $1.0 billion is needed now to ensure the continued provision of safe drinking water. Exhibit 4 shows the total Alaska Native Village need by category. The Alaska Native Village need contributes a disproportionately large share to the total national need on a per-household basis.

The main reason for this high per-household need is that Alaska Native Village systems must contend with significantly higher transportation and construction costs. For communities located on the coast or near navigable rivers, equipment often must be transported by barge during the summer months. In the absence of navigable waterways or roads, communities must rely on helicopters or airplanes to transport equipment.

Exhibit 4: Total 20-Year Need by Category for Alaska Native Village Water Systems (in millions of Jan. '99 dollars)

Categories of Need	Current Need	Future Need	Total Need
Distribution and Transmission	$481.8	$3.2	**$485.0**
Treatment	$212.0	$16.8	**$228.7**
Storage	$292.5	$17.1	**$309.7**
Source	$34.6	$8.5	**$43.1**
Other	$0.8	$0	**$0.8**
Total Need	**$1,021.7**	**$45.5**	**$1,067.2**

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

Another factor contributing to the high per-household need is the unique construction standards required to accommodate arctic conditions. For example, storage tanks, treatment facilities, and other water system components must be placed on large gravel beds or support structures, called pilings, to prevent the transfer of heat from a water system component to the permafrost. Without these measures, the underlying permafrost would subside and destabilize the component.

Transmission and distribution projects comprise the largest category of need, representing $485 million, or 45 percent of the total need. Alaska Native Village water systems usually require only a modest amount of pipe to provide service to each residence, given the close proximity of the homes to each other. However, the transmission and distribution of water in many Alaska Native communities requires the use of supplemental infrastructure that is not needed in more temperate climates. In arctic areas, distribution networks consist of insulated, above-ground mains, known as utilidors. To prevent water in the system from freezing, the water in these mains is heated and the distribution network is looped to provide continuous circulation of water throughout the entire system–from the treatment plant and storage tank, to the homes and back to the plant.

With $310 million needed over the next 20 years, water storage projects represent the second largest category of need. Storage facilities in arctic systems require heavy insulation and the continuous circulation and heating of water to prevent freezing. In addition, the formation of ice renders many surface water sources inaccessible for most of the year. Consequently, many surface water systems must treat and store an entire year's supply of water within 8 to 12 weeks during the summer. These systems require treatment plant and storage capacities that greatly exceed what would normally be necessary for similarly sized systems in the lower 48 States.

Treatment comprises 21 percent of the need for a cost of $229 million. Although ground water systems are not subject to the seasonal limitations which require the over-sizing of facilities, the quality of the water often is poor. High levels of iron and manganese require these systems to install expensive treatment facilities to improve the taste and color of the water.

The total 20-year need for source projects is $43 million. Most of these projects are for drilling or rehabilitating wells. Alaska Native Village systems also included projects to install or upgrade surface water intake structures.

Regulatory Need for Alaska Native Village Systems. For Alaska Native Village systems, all of the projects directly attributable to the existing SDWA are for compliance with the Surface Water Treatment Rule (SWTR). These projects total $108 million, or 47 percent, of the entire Alaska Native Village need for treatment.

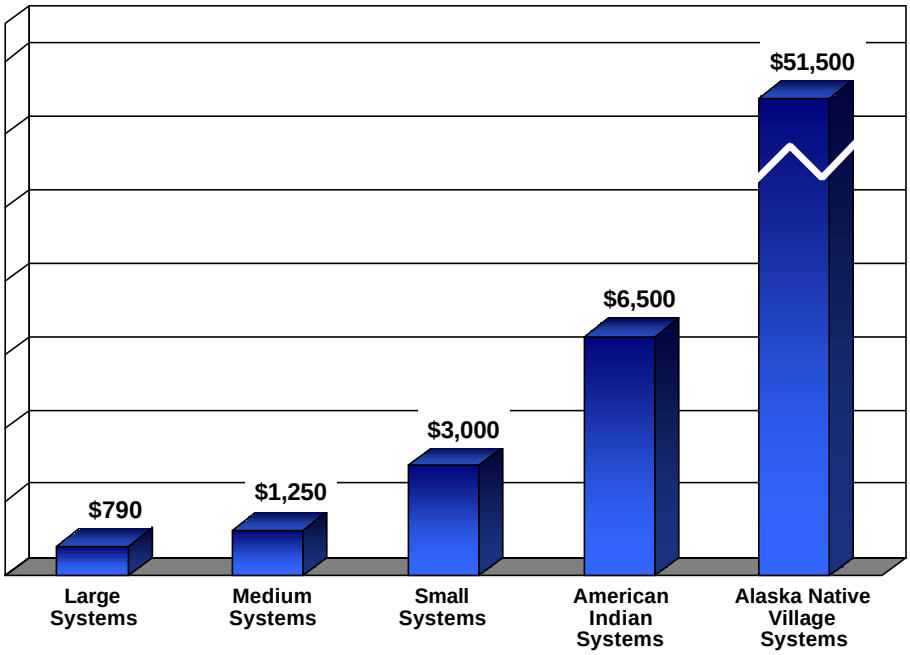
Total Need Compared to the 1995 Drinking Water Infrastructure Needs Survey

The total need for American Indian systems and Alaska Native Village systems increased by $533.8 million and $216.2 million, respectively, compared to the 1995 findings. This increase results largely from refining the methods used to estimate the needs. For the American Indian survey, the sample size was increased to provide a more precise estimate of national need. Similarly, the use of a census for Alaska Native Village systems increased the precision of the need estimate compared to the sampling methods used in the first survey.

Economic Challenges Faced by Small Water Systems

Most American Indian and Alaska Native Village systems are small, serving between 25 and 3,300 people. Small water systems vary widely in size and complexity. In general, systems serving more than 500 people have a configuration typical of larger public water systems: a water source, several miles of transmission and distribution piping, multiple storage tanks, and a treatment system. Systems serving fewer than 500 people are usually much simpler in design and consist of a ground water well, a small storage tank, and a few hundred feet of pipe. Some small systems purchase treated water from larger public water systems, and therefore lack the source water and treatment components of a complete water system.

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



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

Regardless of their size and configuration, small water systems face many unique challenges in providing safe drinking water to consumers. The substantial capital investments required to rehabilitate, upgrade, or install infrastructure represent one such challenge. Although small systems generally have fewer capital investment needs than larger systems, the per-household costs borne by small systems are significantly higher than those of larger systems. Exhibit 5 compares the average 20-year per-household need for water systems of different sizes and for American Indian and Alaska Native Village water systems.

Small systems lack the economies of scale that allow larger systems to spread the costs of capital improvements among their many consumers. For example, the installation of a new 1.2 MGD conventional treatment plant designed to serve a community of 1,000 people may cost approximately $2.5 million, whereas a 20 MGD plant serving 100,000 people may cost $30.3 million. The cost per-household is approximately 88 percent higher for the smaller community. Moreover, larger systems usually purchase material in quantities that result in significant savings on a unit basis.[1] In addition to facing the financial challenges typical of small systems, American Indian and Alaska Native Village systems also must contend with the other factors (e.g., remote location, limited supplies) discussed earlier.

[1] These estimates are derived from the cost models. See Appendix A—"Methods and Cost Modeling" for a discussion of how the cost models were developed.

Florida Department of Environmental Protection

The wells serving the city of Hollywood, Florida, had severe microbiological contamination which fouled the membrane treatment system. In addition, the combined output of the wells could not meet demand and the distribution system routinely failed to reach minimum pressure standards. With a $13 million DWSRF loan, the city drilled 12 new wells and added 1.5 miles of raw water lines.

HOUSEHOLDS NOT SERVED BY PUBLIC WATER SYSTEMS

EPA estimates that approximately 16 million households obtain their drinking water from sources other than public water systems. Of these households, nearly 15 million are served by private drilled or dug wells, while 1 million use untreated surface water such as lakes, rivers, and springs. The adequacy of these supplies in terms of quality and quantity cannot be comprehensively assessed on a national or even individual State level due to a lack of data. This owes largely to the fact that most private supplies are not subject to the same rigorous federal or state monitoring requirements as public water systems.

In addition, an unknown number of people live in homes without running water. This population faces an increased risk of waterborne diseases and related illnesses, because a safe supply of running water is essential to basic sanitation.

Needs Included in the Survey. For households without access to safe drinking water, two DWSRF-eligible options are available for addressing the problem. An existing public water system can extend service to these households or a new public water system can be constructed to provide drinking water.

Although systems had the opportunity to identify these DWSRF-eligible needs, the survey likely underestimates the true needs for households without access to safe drinking water. The lack of comprehensive data on the water quality at private wells obscures the extent of the problem for many water systems and States. Thus, respondents may have overlooked these needs for lack of public health data. Also, in responding to the survey, most water systems concentrated their efforts on identifying projects for their current, rather than potential, customers. Therefore, the survey estimate of $6.0 billion to extend service to homes without safe drinking water understates the true need.

Private Wells. A lack of monitoring data prevents a comprehensive assessment of the quality of water supplied by private wells. Although EPA believes that most of the households served by private wells likely receive safe drinking water, several studies have found that contamination rates in some areas are very high.

New York State Department of Health

Pipe is installed to provide safe drinking water to homes in Rensselear County, New York, that had previously used untreated water from a transmission line. The DWSRF contributed $4.9 million in funding assistance to this project.

- Based on data from six states, a 1997 General Accounting Office study reported bacterial and nitrate contamination as high as 42 and 18 percent, respectively, of the private wells tested.[1]

- A 1995 Centers for Disease Control and Prevention report found that total coliform bacteria exceeded the health-based standard in 46, 37, and 23 percent of the private wells tested in Illinois, Nebraska, and Wisconsin, respectively. The study also detected nitrate concentrations above the standard in 15, 15, and 7 percent of the wells sampled in these states, respectively.[2]

- Although data on pesticides, heavy metals, and volatile organic compounds are extremely limited, one study found that lead exceeded 15 ppb (an action level for public water systems) in 19 percent of the wells tested in Pennsylvania.[3]

Improper siting and construction is one of the main causes of contamination in older private wells. Because of land availability constraints, a lack of understanding of health implications, and a desire to minimize cost, some older private wells are located too close to septic systems or other potential sources of contamination. The length of the well casing also influences the susceptibility of wells to microbial contamination, with the probability of contamination increasing as casing length decreases.[4] Although all States now have well construction standards, an unknown number of private wells were constructed before these standards were established.

Hauled Water and Untreated Surface Water Sources. More than 1 million households obtain water directly from cisterns, springs, rivers, and lakes. Drinking water from untreated surface sources is often stored in barrels or cisterns which are susceptible to microbiological contamination. Census data show that 2 percent of American Indian households on federally recognized Tribal lands and 20 percent of mainland Alaska Native Village households obtain their water from untreated surface sources.

U.S. EPA

The proximity of this small ground water system to a gasoline station provides an example of a poorly sited well. Spills or leakage from underground gasoline storage tanks could contaminate the ground water. Wells such as this one should be replaced by new wells that are drilled away from potential sources of contamination or, alternatively, the source of contamination should be eliminated.

[1] *Well, Well, Well Water*. 1997. Environmental Health Perspectives 105(12):1290-1292.

[2] Center for Disease Control and Prevention, et.al. *A Survey of the Presence of Contaminants in Water in Private Wells in Nine Midwestern States*. Report in Draft.

[3] Swistock, B.R., W.E. Sharpe, and P.D. Robillard. *A Survey of Lead, Nitrate and Radon Contamination of Private Individual Water Systems in Pennsylvania*. 1993. Journal of Environmental Health 55(5):6-12.

[4] Tuthill A., D.B. Meikle, M. C.R. Alavanja. 1998. *Coliform Bacteria and Nitrate Contamination of Wells in Major Soils of Frederick, Maryland*. Journal of Environmental Health 60(8):16-20.

***Colonias* and Washeterias.** A significant number of consumers commonly use untreated sources of water or water hauled from unsanitary sources in areas called *colonias* along the Texas-Mexico border and in Alaska Native communities.

Colonias—Nearly 400,000 people live in communities, known as *colonias*, which extend along the border with Mexico. These communities have the largest concentration of people living without basic services in the nation. Most *colonias* do not have a safe supply of running water. Therefore, people must haul water from central watering points or untreated sources such as irrigation canals. The lack of water service to homes in *colonias* tends to limit hand-washing and bathing. Consequently, these households face an increased risk from communicable diseases including Hepatitis A, shigellosis, and Impetigo.

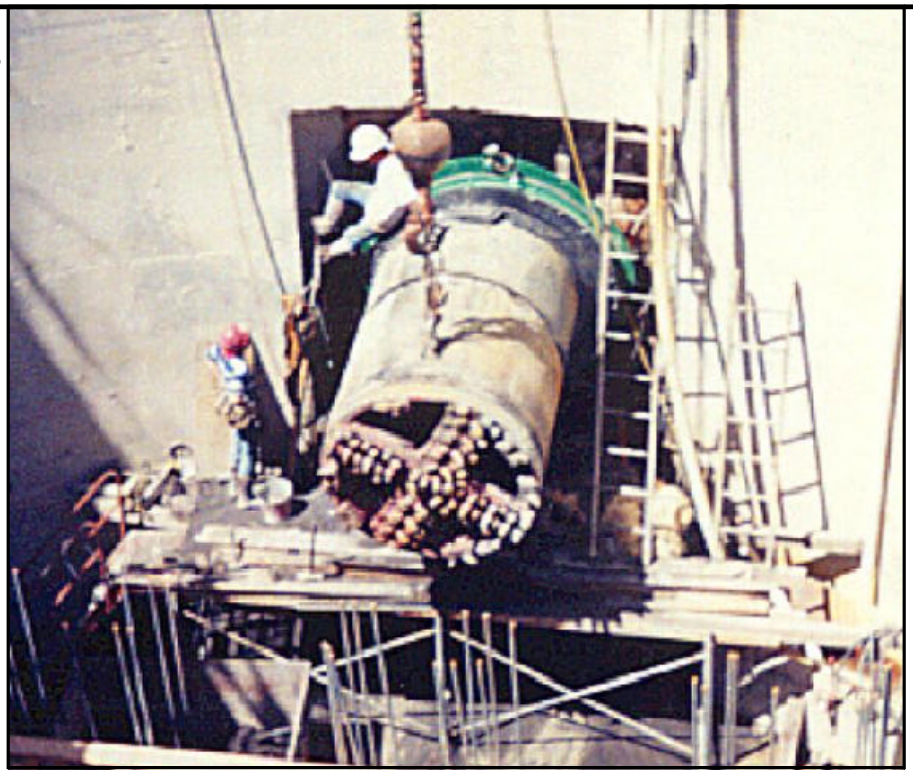
The Needs Survey includes the capital needs of *colonias* only to the extent that States have identified the water systems serving these communities. The survey likely underestimates the needs of *colonias*, as most States have yet to locate all of these systems for inclusion in their inventory.

Washeterias Serving Alaska Native Communities—Approximately 30,000 Alaskans, or 30 percent of the population, live in rural communities without adequate water and sewer facilities. The only drinking water available to many Alaska Natives is from the community washeteria, particularly during cold weather when snow and ice make alternative sources of water inaccessible. A washeteria is a single building with showers, toilets, and washing machines. The washeteria often doubles as a water treatment plant with heated water storage. Residents haul drinking water, usually by walking along a boardwalk, from a watering point at the washeteria. In most cases, the access boardwalk is also used to haul sewage to disposal sites. As sewage spills are not uncommon, there is a high risk of contaminating the drinking water. Other sources of water include rain, melting snow, rivers, lakes, individual wells, and individual storage tanks. In addition, container vehicles are used to transport water to, and sewage from, these communities.

Texas Water Development Board

The City of El Paso, Texas, received a $15 million loan from the Texas DWSRF program to expand the capacity of the Jonathan Rogers Treatment Plant. This project will provide water to colonias *that lack access to safe drinking water.*

Kimberlie Staheli, Bennett Staheli, Engineers



Workers retrieve a tunnel boring machine (TBM) used to excavate an underground passage for a transmission line. TBMs allow water systems to bore through rock at rates faster than conventional drilling and blasting methods. By avoiding the need to tear up streets and set underground explosives, TBMs also minimize traffic disruption and noise for the surrounding areas.

APPENDIX A— METHODS: SAMPLING AND COST MODELING

The sampling methods for the 1999 Needs Survey were developed by a workgroup consisting of American Indian, Alaska Native Village, Indian Health Service (IHS), and U.S. Environmental Protection Agency (EPA) representatives. The workgroup met four times to develop the survey methods.

The workgroup based the approach for the 1999 survey on the methods used in 1995, with refinements from the lessons learned in conducting the 1995 survey, findings of a follow-up study that EPA performed in 1997, and options made available by technological advances in database management and the Internet. Different data collection methods were used to account for the strengths and resource constraints of the different sized systems in the survey—with small systems receiving site visits and medium systems receiving questionnaires.

Estimating the Needs of American Indian and Alaska Native Village Water Systems

Inventory Verification. To ensure that the survey accounted for all community and not-for-profit noncommunity water systems for the Tribal survey, the universe of water systems (from which the samples were drawn) was obtained from the Safe Drinking Water Information System (SDWIS). SDWIS is EPA's centralized database for information on public water systems. It is an ideal choice for determining the inventory, because it is designed to identify all public water systems. EPA Regions verified information on population served, water sources, and other important variables for their systems.

Exhibit A-1: American Indian and Alaska Native Village System Sampling for the 1999 Needs Survey

	American Indian Small Systems	American Indian Medium Systems	Alaska Native Systems
Population Served	3,300 or fewer	3,301 - 50,000	All populations
Data Collection Method	Site Visits	Questionnaire	Questionnaire
Sample Size	78	19	174
Response Rates	100 Percent	100 Percent	100 Percent
Precision Target	95%±10% Precision Nationally	Systems Sampled With Certainty (Census)	

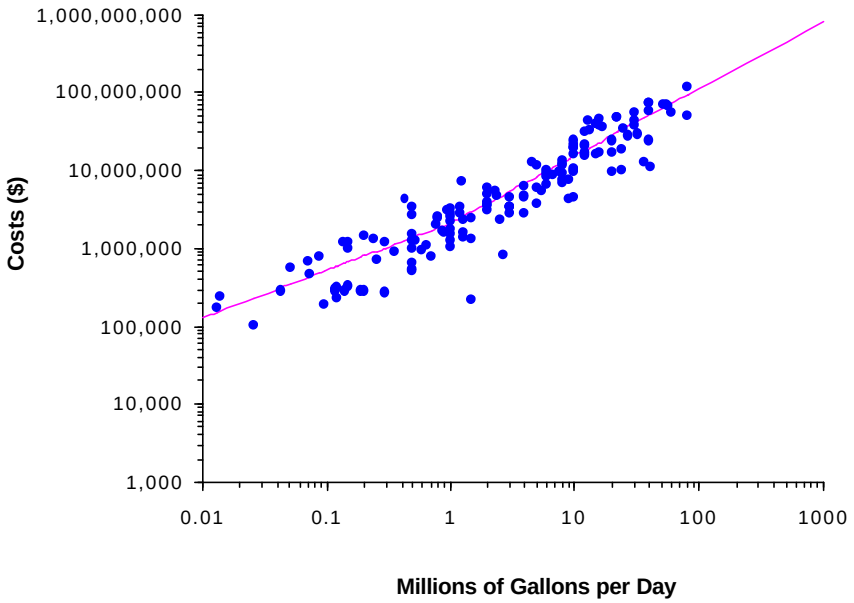
American Indian Water Systems. The 1999 survey estimated the infrastructure needs of medium-sized American Indian water systems using a census. Each of the 19 community water systems serving more than 3,300 people completed a questionnaire. EPA offered technical assistance to help these systems identify eligible needs and prepare documentation. In addition, drinking water projects from IHS's Sanitation Deficiency System (SDS) were pre-printed on each questionnaire. The SDS was not designed to capture the full extent of the needs allowable for the survey, so these data served as a baseline to which systems added projects. For example, SDS contains only current needs, while the survey asks for current and future needs. The systems returned the completed questionnaire and documentation to EPA for final review.

The Needs Survey workgroup agreed that small systems generally lack the planning documents and personnel to complete a mailed questionnaire. Therefore, needs data were collected through site visits. A sample of 78 small American Indian systems was randomly selected. Site visits were conducted by drinking water system specialists who had extensive experience working with small systems, had received special Needs Survey training, and had previous experience with American Indian water systems. In some cases, IHS and Tribal officials attended the site visits. EPA was responsible for completing the questionnaire and documenting needs and costs.

Stratification. The sample design for the survey of American Indian small systems was based on the concept of stratified random sampling. Stratification made the design more efficient by enabling it to meet precision targets with a smaller sample size than if the sample were not stratified. These efficiencies are achieved if the design accounts for the fact that some water systems, as a group, will have different needs than other water systems. For example, large water systems generally require much greater investments than do small systems.

Water systems were stratified using two source (surface and ground) and several population groups. Results from the 1995 survey indicated that systems purchasing treated water have needs more similar to ground water systems than systems using and treating surface water sources. Therefore, systems that solely purchase water were included in the ground water strata. Also, in assigning a system to a size category, the survey included the population served by other utilities which purchase water from the system. Systems that sell water must design their infrastructure, particularly treatment facilities, to serve the purchasing system populations.

Exhibit A-2: Cost Curve for New Conventional Filtration



Cost Modeling. Few of the water systems in the Tribal survey provided the capital improvement plans or engineering reports that were required to document the costs of their infrastructure projects. EPA used models to assign costs to these projects. Cost models were developed from documented cost estimates provided mostly by the systems from the State portion of the survey. For a limited number of infrastructure needs, the cost data collected were insufficient to develop a cost model. For these projects additional project cost information was obtained from the States, Indian Health Service, and engineering firms. All costs were converted to January 1999 dollars.

For example, a cost model would have been used if a system lacked cost documentation for rehabilitating a conventional filtration treatment plant that no longer met performance standards. If the system provided the design capacity of the plant on the questionnaire, EPA would have applied the specific cost model for rehabilitating this type of plant. Exhibit A-2 provides an example of a cost curve used to apply costs to a new conventional treatment plant project.

Alaska Native Village Water Systems. Current and future needs of Alaska Native Village water systems were identified through a census of water systems that serve predominantly Alaska Natives. The inventory consisted of 2 medium systems and 172 small systems. A list of projects needed for each small system was developed by EPA in consultation with Village representatives, Village Safe Water, IHS, and State officials. Site visits to 5 Alaska Native Village water systems were performed to confirm the need assessments.

Needs for the two medium Alaska Native Village water systems were obtained through phone interviews with the systems. Based on the responses from the water systems, EPA prepared the questionnaires and documentation.

Cost Modeling. Using cost models developed with data from systems in the State and American Indian portions of the survey would not reflect the unique construction challenges that face Alaska Native Villages. For example, in some areas, water tanks and treatment plants need to be elevated on pilings to prevent the heated facilities from subsiding into the permafrost. Therefore, a roundtable meeting of IHS and EPA engineers was held to provide guidelines for determining project costs. In assigning costs to projects, water systems were grouped into three geographic areas roughly corresponding to the northern, central, and southern parts of the State. These areas coincided roughly with the different factors that influence project costs, such as the means used to transport equipment. This process omitted water systems located on the North Slope, because they had prepared master plans and capital improvement plans that documented the costs of all of their needs. IHS provided cost documentation for projects constructed in Alaska Native Villages throughout the State. These costs were used to estimate the average costs of projects in each geographic area. Costs for some projects were derived from the cost models developed for the State and American Indian systems. The models were used to assign costs to small-scale projects (e.g., flushing hydrants) for which IHS costs were unavailable.

Precision Targets. Because all of the Alaska Native Village and medium-sized American Indian water systems were included in the survey, the needs of these systems were calculated with certainty. The estimates of need for small American Indian water systems have a national precision level of 95 percent ± 10 percent.

Dan Fraser

Filtration plants consist of a series of treatment stages, each of which is critical to the production of safe water. Shown is a filter bed that is clogged with mud and treatment chemicals. The clarifier that should have removed these particulates in the preceding stage is in poor condition and needs to be replaced.

APPENDIX B—SUMMARY OF FINDINGS

Needs for American Indian and Alaska Native Village Water Systems

Exhibit B-1—Total Need for American Indian and Alaska Native Village Systems by EPA Region

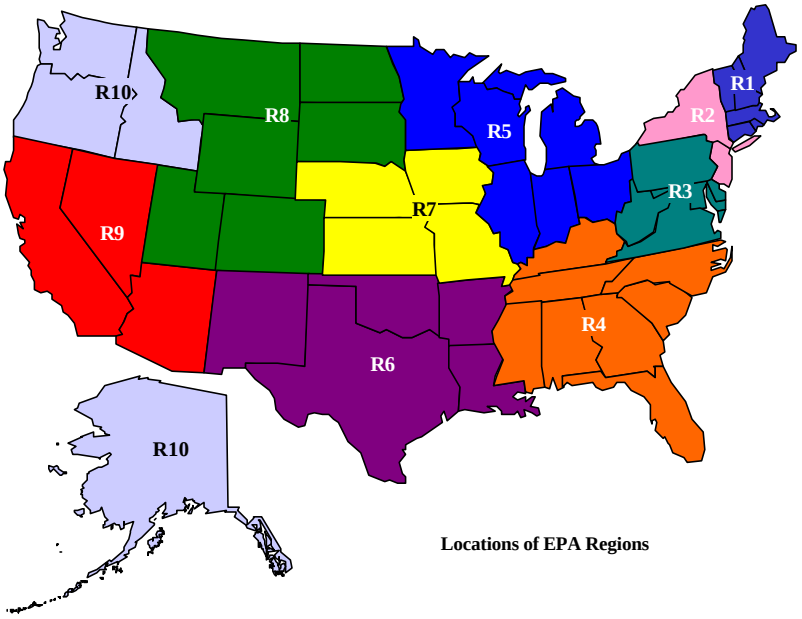
Exhibit B-2—Total Need by Category for American Indian and Alaska Native Village Water Systems

Exhibit B-3—Total Regulatory Need for American Indian and Alaska Native Village Water Systems

Exhibit B-1: Total Need for American Indian and Alaska Native Village Systems by EPA Region (20-year need in millions of January 1999 dollars)

Category of Need	Total Need
Region 1	3.9
Region 2	6.0
Region 3 [1]	0.0
Region 4	17.8
Region 5	157.3
Region 6	151.9
Region 7	14.3
Region 8	133.4
Region 9 [2]	548.9
Region 10 [3]	118.3
Alaska Native Systems	1,067.2
Total	**2,219.0**

[1] There are no American Indian water systems in EPA Region 3.
[2] Navajo water systems are located in EPA Regions 6, 8, and 9, but for purposes of this report, all Navajo needs are shown in EPA Region 9.
[3] Needs for Alaska Native Village water systems are not included in the EPA Region 10 total.



Locations of EPA Regions

Exhibit B-2: Need by Category for American Indian and Alaska Native Village Water Systems (20-year need in millions of January 1999 dollars)

Category of Need	Current Needs	Future Needs	Total Need
Transmission and Distribution	1,173.4	55.0	**1,228.4**
Treatment	369.2	38.9	**408.1**
Storage	398.8	48.2	**447.0**
Source	99.5	23.7	**123.2**
Other	12.4	0.0	**12.4**
Total	**2,053.2**	**165.8**	**2,219.0**

Exhibit B-3: Total Regulatory Need for American Indian and Alaska Native Village Water Systems (20-year need in millions of January 1999 dollars)

Category of Need	Current Needs	Future Needs	Total Need
Regulations for Contaminants with Acute Health Effects	159.8	4.7	**164.5**
Regulations for Contaminants with Chronic Health Effects	0.1	0.0	**0.1**
Total	**160.0**	**4.7**	**164.6**

Saint Joseph's College, Standish, Maine

Sebago Lake, in Maine, provides water to Portland and surrounding communities.

APPENDIX C—GLOSSARY

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

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

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

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

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

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

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

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

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

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

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

Growth: needs planned solely to accommodate projected future growth are not included in the survey. Eligible projects, however, can be designed for growth expected during the design-life of the project. For example, the survey 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 building facilities needed for continued provision of safe drinking water. Categories of need include source development and rehabilitation, treatment, storage, and transmission and distribution. Operation and maintenance needs are not considered infrastructure needs and are not included in this document.

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

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

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

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

Public water system: a system for the provision to the public of water for human consumption through pipes or, after August 5, 1998, other constructed conveyances, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year.

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

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

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

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

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

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

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

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

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

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

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