FINDINGS: AMERICAN INDIAN AND ALASKA NATIVE VILLAGE WATER SYSTEMS

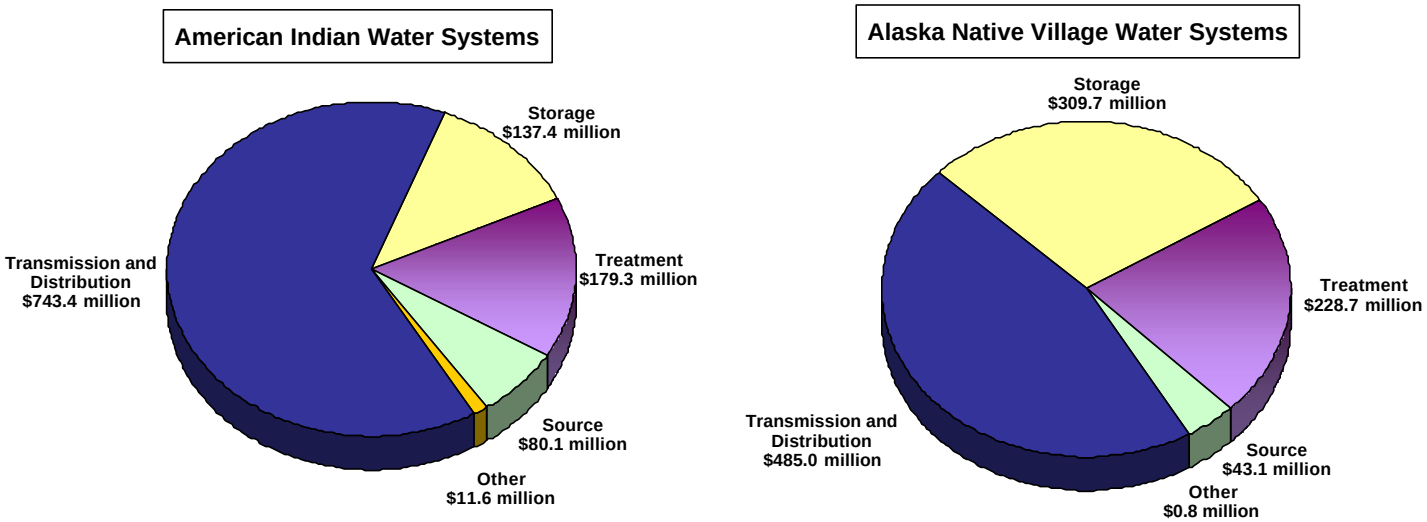
In 1999, EPA conducted a survey to estimate the 20-year capital needs of American Indian and Alaska Native Village water systems. This section of the report presents the total need for these systems. The section also describes the need by category and the existing regulatory need. Appendix B presents 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 9 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 7 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-households needs because most of these systems are small, serving between 25 and 3,300 people. Small systems lack the economies of scale that

> 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 9: 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.

reduce the per-household needs of larger systems.[1]

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 commu-

[1] For more discussion, see the earlier section, "Economic Challenges of Small Water Systems."

nities 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 10: 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 10 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.

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

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.

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 11 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.

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.

Exhibit 11: 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.

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 American Indian and Alaska Native Village Needs Compared to the 1995 Results. 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.

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.