Overview and Findings 1

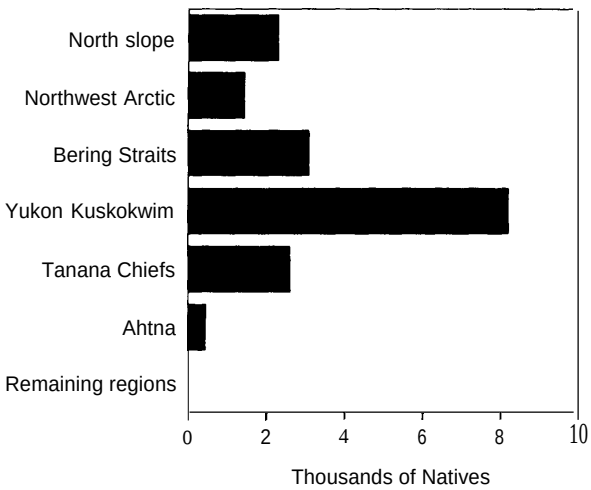
NATIVE VILLAGES OF RURAL ALASKA: THEIR SETTING AND SANITATION PROBLEMS

About one-fourth of Alaska's 86,000 Native residents live without running water and use plastic buckets for toilets+ euphemistically called '*honey buckets" (figure l–l). This report examines the status of waste sanitation among Native villages of rural Alaska, identifies the socio-economic factors contributing to sanitation inadequacy, and discusses the technological solutions that have been used and proposed to date. Honey buckets are the predominant means of sanitation for Native residents in 89 villages in the Ahtna, Bering Straits, North Slope, Northwest Arctic, Tanana Chiefs, and Yukon-Kuskokwim regional areas (figure 1-2) (127). [1]

Throughout rural Alaska, but particularly in the Yukon-Kuskokwim Delta and the Northwest Arctic, the outbreak of diseases, including hepatitis A, bronchitis, impetigo, and sometimes meningitis, is believed to be partially attributed to the exposure to human waste caused by inadequate sanitation facilities. Because of the frequent spillage of human waste that occurs on community roads and boardwalks during its transportation to disposal sites or sewage lagoons, the exposure of residents, particularly children,

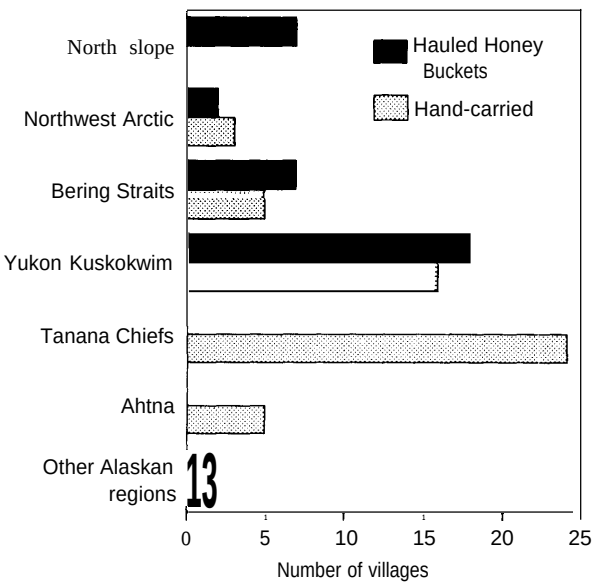
[1] As many as 239 total Alaskan villages have been reported in the past; the actual number, however, is generally difficult to quantify. In its 1992 directory, for example, the Bureau of Indian Affairs, Juneau Area Office, listed a total of219 village governments. For the purpose of this report, OTA focused on only the 191 Native villages on the Indian Health Service's database.

FIGURE 1–1: Native Population in Alaskan Rural Villages Being Served by Honey Bucket Systems



SOURCE Jim Crum, Director, Diwsion of Sanitation Facilities, Alaska Area Native Health Service, personal cornmunication, November 9, 1993

FIGURE 1–2: Rural Alaskan Native Villages in Which Honey Buckets are the Predominant Waste Sanitation Technology*



* This figure does not include villages (about 13) in which only a few homes use honey buckets

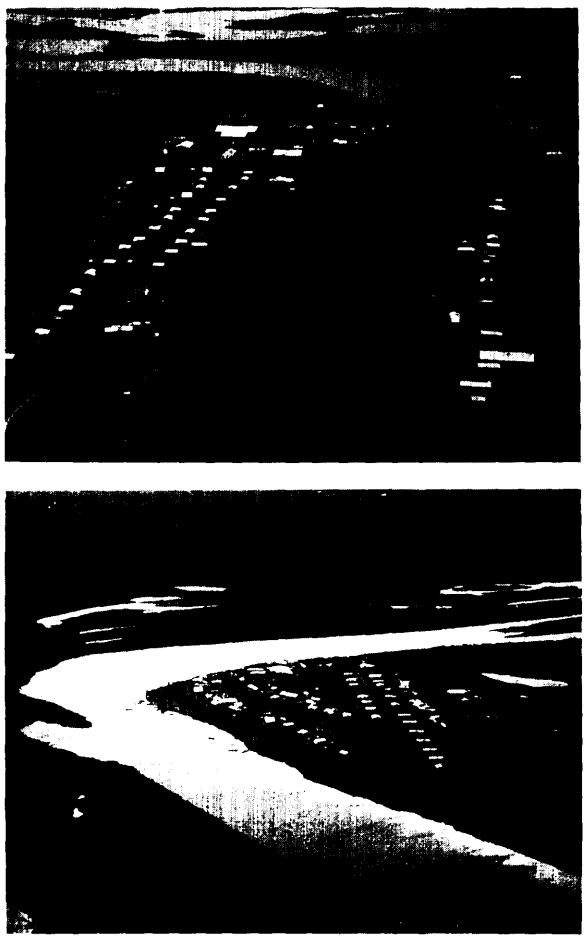
SOURCE Jim Crum, Dirctor, Division of Sanitation Facilities, Alaska Area Native Health Service, personal communication, Nov. 9, 1993

to such waste is frequent. The fact that diseases such as hepatitis A occurs in epidemics has raised questions about both their exact mechanism of transmission and the overall level of disease eradication that can be achieved with sanitation technologies.

The Native villages with the most frequent outbreaks of disease are those in which running water is difficult to obtain and the principal method of disposal is the honey bucket. In many cases, the honey bucket system consists simply of a 5-gallon plastic bucket lined with a plastic bag, with a toilet seat on top of it. Once filled, the plastic bag is sealed and the bucket is hand carried and emptied into a haul container or sewage lagoon or sometimes dumped at a convenient location. In these communities, honey buckets are used in homes, by local governments, in commercial buildings, and even in medical clinics.

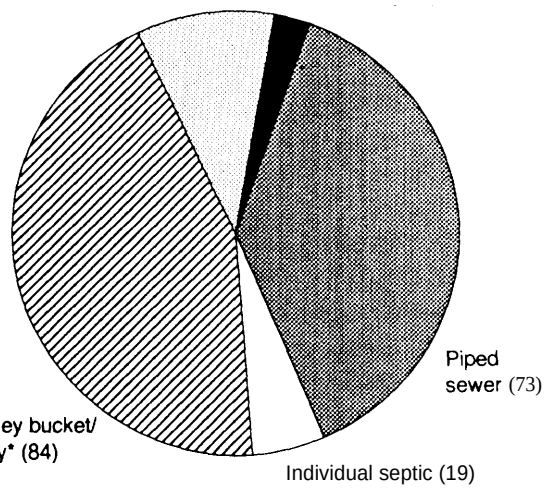
Despite Alaska's abundance of water, it is often extremely difficult to obtain water for drinking and sanitation in rural areas. According to recent estimates, at least 73 of the 191 Native villages comprising the study area of this report have been provided piped water and sewer projects to meet their sanitation needs (figure 1-3). Flush toilets are also found in communities operating truck haul and septic tank systems, which number 10 and 24, respectively. Because in about 95 of the 191 Native villages, piped water systems do not exist inside homes, most of the domestic water used by residents must be hauled by hand from the central watering point, a water well, or a washeteria[2] in the villages. The work involved in hauling water, usually by means of a 5-gallon pail, is burdensome and time consuming; thus, water use in these Native villages tends to be minimal. In the

[2] A building in which people can shower and do their laundry.



Almost all Native *villages are geographically isolated from Alaska's* major *urban centers. Access by road is virtually impossible due to the extensive wetlands found in the region.*

FIGURE 1–3: Types of Sanitation Technologies Operating Among the 191 Native Communities of Rural Alaska Identified by the Indian Health Service



● includes 26 honey bucket haul, 19 honey bucket bunkers, and 39 privy systems.

SOURCE Jim Crum, Director, Division of Sanitation Facilities, Alaska Area Native Health Service, personal communication, Nov 9, 1993

winter, ice is often chopped from lakes and rivers, and stored in 30-gallon plastic trash cans. The plastic cans are placed inside the home to melt the chopped ice. Box 1-1 describes briefly some of the difficulties encountered by Native Alaskans in obtaining the water needed to maintain good sanitation and to prevent disease. More details are presented in chapter 3.

The lack of adequate water supplies often increases the risk of disease because it reduces the ability of Natives to maintain good personal hygiene. Because epidemic waves of diseases such as hepatitis A are expected every 15 to 20 years, a great number of casualties might occur if proper measures are not taken in advance. However, prevention of an epidemic does not seem possible unless communities are provided with sufficient water to ensure adequate sanitation, personal hygiene, and safer sewage handling methods. In 1988, more than 70 percent of all hepatitis A cases reported throughout the State of Alaska occurred in Native villages with honey bucket systems.

MISSION AND ACCOMPLISHMENTS OF AGENCIES RESPONSIBLE FOR SANITATION

Federal participation in health care for Native Americans dates as far back as 1802. The formal delineation of this responsibility, which began with the signing of the 1854 treaty with the Rogue River Indians (southwest Oregon), is found today in numerous constitutional documents, historical events, and statutes. Federal funding to support Indian health care activities of the Department of

BOX 1-1: Despite the Large Bodies of Water Throughout Alaska, the Amount of Water Suitable for Drinking and Sanitation in Native Villages is Limited

Alaska is a land of contradiction. When traveling in western Alaska or the North Slope, one is conscious of lakes, tundra ponds, and rivers seemingly without number. However, acquiring water in areas with continuous or discontinuous permafrost can be a challenging proposition.

Permafrost on the North Slope can be several hundred feet deep, effectively preventing or making extremely difficult the drilling of wells. At the same time, permafrost also forms a watertight barrier, which may exist as liquid soil-water in the summer. The upper layers of soil will typically melt seasonally to form what is called the "active layer. " Water that melts in the active layer has essentially no place to go and remains perched above the frozen permafrost layers. This is results in surface water that dissolves a broad range of organic and inorganic materials, and becomes highly colored with a heavy burden of total dissolved solids.

Rivers are often used as sources of water. Unfortunately, Arctic rivers often freeze solid, leaving only a small meandering flow somewhere beneath the ice of the riverbed. Locating this perennial stream beneath the frozen river is often a matter of luck and persistent searching.

River water availability may not even be improved by construction of in-stream impoundments. During spring breakup, ice jamming, high rates of flow, and flooding result in extreme forces from ice moving downstream. Structures designed to withstand such forces would be both expensive and impractical to install.

Seasonal water intakes are often constructed on lakes and rivers for use during the ice-free period and in the winter, Intake lines are frequently floated to an intake point and held in place by an appropriate flotation device. Similarly, after freeze-up in winter, lines are used to pump water through holes cut in the ice. Problems arise because of the decreasing water quality in winter caused by the freeze exclusion of solutes and dramatic increases in the total amount of dissolved solids. Also, subsurface water sources maybe inaccessible for several weeks during the onset of ice cover in the fall and breakup in the spring. More detailed information on Alaska's limited drinking water sources for maintaining good sanitation and preventing disease is provided in chapter 3.

SOURCE John A. Olofsson and H P Schroeder, University of Alaska Anchorage, *Sanitation alternatives For Rura/Alaska,* report prepared for the Congressional Office of Technology Assessment, Washington, DC, Aug. 15, 1993.

the Interior's Bureau of Indian Affairs was first authorized with the passage of the Snyder Act of 1921.[3] In 1955, the responsibility for Indian health care was transferred to the U.S. Department of Health, Education, and Welfare, now the Department of Health and Human Services (248).

As a response to documented health problems among Native communities, and recognizing the need to develop formal solutions to the waste sanitation problem, Congress passed the Indian Sanitation Facilities Act in 1959,[4] giving the Indian Health Service (IHS) the authority to plan, design, and construct water and sewerage projects in Native communities. Since passage of the Act, IHS has provided water and waste sanitation services to more than 182,000 Native residents in the lower 48 States and Alaska, and improved sanitation systems in over 58,000 homes (248).

To further improve the health conditions of American Indian and Alaskan Natives, Congress enacted the Indian Health Care Improvement Act in 1976.[5] Under this Act, IHS is responsible for,

[3] 25 U.S.C. 13.

[4] P.L. 86-1 21; 42 U.S.C. 2004a.

[5] 25 U.S.C. 1601 *et seq.*

Lakes, tundra ponds, and rivers in Alaska are seemingly without number. Despite this abundance, it is often extreme/y difficult for many Native villages to obtain water suitable for drinking and sanitation purposes.

among other things, increasing the number of health professionals serving Native communities, upgrading hospitals and other IHS health facilities including 172 Alaskan village clinics, and building potable water and waste disposal facilities (258). As part of its efforts to improve the overall health of Natives, since 1960 IHS has invested more than $350 million in the construction and upgrade of nearly 700 sanitation projects in roughly 180 Alaskan communities. Currently, IHS is carrying out the construction of 407 new sanitation projects in rural Alaska at a cost of $152 million.[6]

The Indian Sanitation Facilities Construction Act of 1959 and the Indian Health Care Improvement Act of 1976 limited their focus to construction activities. Federal funds were ***not*** authorized for operation and maintenance (O&M) of the facilities that were built. Because Native communities lack outside O&M funding and have poor local economies, many have had extreme difficulties with proper operation and adequate maintenance of these systems. Recognizing this deficiency, Congress amended the Indian Health Care Improvement Act with the Indian Health Amendments of 1992,[7] authorizing IHS to share up to 80 percent of the costs incurred by Native communities in operating, managing, and maintaining safe water and waste sanitation projects. For Native communities with fewer than 1,000 residents, the Act further adds that". . . the non-Federal portion of the costs of operating, managing, and maintaining such facilities may be provided, in part, through cash donations or in kind property, fairly evaluated" (167).

IHS has not sought funds from Congress to carry out the O&M tasks stipulated under this statute because of efforts to first define the nature of congressional intent. Preliminary IHS estimates suggest, however, that an annual contribution of $80 million to $120 million would be needed to implement the mandate of the Act nationwide. Adoption of measures to comply with new waste disposal and drinking water regulations issued by the U.S. Environmental Protection Agency (EPA) could further increase this amount to at least $150 million annually. According to some preliminary estimates, implementation of the 1992 Indian Health Amendments in rural Alaska alone would cost about $15.1 million (122,151 ,204,206,303).

The Village Safe Water (VSW) Program within the Alaska Department of Environmental Conservation (ADEC) is the principal State agency responsible for improving water and sewer systems in Alaskan communities. The VS W program has a small staff (about 12 out of more than 450 ADEC employees). However, as of July 1993, VSW was carrying out projects in almost 60 Native villages throughout rural Alaska. Other agencies with programs relevant to Native communities are discussed in chapter 4.

The Indian Health Service works with VSW in ensuring data reliability, coordinating activities, and sometimes matching funds. When IHS and VSW agree that a proposed sanitation project

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[6] The status of these facilities or projects ranges from just initiated, to partially completed, to fully operational.

[7] P.L. 102-573.

should be undertaken, they cooperate on planning, design, and ultimate construction of the facility. In 1993 alone, the two agencies cooperated on 17 different projects.

To date, efforts by IHS and VSW have provided safe water and adequate waste sanitation service to more than 300 Alaskan urban and rural communities. Of the 191 rural Native village communities relevant to IHS sanitation efforts, more than 70 have already been provided with modern pressurized potable water and gravity sewerage systems. Twenty-six others have received septic or leach field systems, and about a dozen villages (including Galena, Bethel, Barrow, South Point Lake, and Katorik) operate a truck haul system for both potable water delivery and wastewater disposal. A pilot demonstration project of-a small-vehicle haul system is also under way in the village of Mekoryuk. Box 1-2 briefly describes the characteristics of the major waste sanitation systems used in rural Alaska. A more detailed discussion of waste sanitation technologies including the Mekoryuk system is provided in chapter 5.

CAPITAL CONSTRUCTION FOR SANITATION FACILITIES

Despite Federal and State efforts to build water and sewer projects to date, lack of adequate sanitation remains a serious health problem for at least 67 of the 89 Alaskan Native villages operating the most rudimentary sanitation system found in the State: the honey bucket system. Protection of public health is of particular concern because of waste spillage on streets, boardwalks, and backyards that occurs throughout these communities.

Providing safe water and waste sanitation systems to Native villages of Alaska, however, is difficult, expensive, and time consuming. Planning and building such facilities there are more difficult and expensive than in any other region of the United States because of the unusual technical constraints (see ch. 3 and 4) that must be overcome. These constraints include limited drainage; poor soil conditions; extreme variations in temperature; the limited quantity and quality of water; and the high costs of electricity, fuel, and transportation. It is not unusual to find that IHS or VSW must delay project schedules to repair structural damage caused by spring floods or winter ice floes. To avoid some delays, agencies must order supplies up to a year in advance from distant locations, such as Seattle, to fit delivery schedules of barge transport.

Once a final design plan is adopted and supplies are purchased, the pace of construction must be rapid, to take advantage of the short construction season—3 to 4 months-typical of rural Alaska. Building sanitation facilities in rural Alaska seems to some to rank in complexity with a wartime construction project. Fortunately, construction can proceed around the clock in summer as a result of the long days.

This fast pace is sometimes interrupted by the erratic barge schedules typical of the region and the absence of adequate roads in most communities. According to the Governor's Sanitation Task Force,[8] a group of experts convened in January 1992 to develop strategies to improve sanitation in rural Alaska, nearly 100 Native villages lack adequate roads, and at least $100 million will be required to upgrade them. Costly construction delays can also be caused by the slowness and uncertainty of the funding process at both Federal and State levels.

Most communities naturally want the contractor to employ as much local labor as possible when building a new sanitation facility. Training these workers and negotiating mutually acceptable wage scales, working hours, and hirin\firing practices can sometimes delay actual construc-

[8] The Alaska Sanitation Task Force consisted of 45 experts from 27 organizations assigned to participate in one of 12 separate working groups. Each group was responsible for developing issue-specific strategies to address the sanitation problem; some of these issues included enforcement, education, utility management, operator training, research and development, housing, and subsidies (63). Although a brief working document was issued in October 1992, lack of funds has precluded publication of this important report.

tion. Establishment of labor agreements to ensure employment of local residents (generally known as "force accounts") has proved a useful tool in addressing these concerns in many Native villages.

The opportunities provided for the Indian Health Service to incorporate these factors satisfactorily in its efforts to deliver sanitation projects to Native communities are limited. One of the major limiting factors is the Federal funding process. Identifying and building sanitation facilities in rural Alaska represents a time-consuming task, sometimes requiring several years. Yet, because Federal funds must be obligated within the same fiscal year (FY) in which they are appropriated, IHS often has difficulty in allowing sufficient time to evaluate project proposals and to involve village officials and residents. Further constraints are imposed by the relatively small staff available to IHS and VSW for this task.

One additional factor hindering IHS from delivering sanitation technologies more rapidly to Native communities is the regulatory framework within which it functions. According to IHS, about 20 percent of the time spent by agency engineers on project construction is devoted to securing environmental review and permits required by existing regulations. In some cases, it has taken IHS up to 39 months to prepare all the documentation needed to obtain a single construction permit from the U.S. Army Corps of Engineers. The time between submission of permit application and permit approval is viewed by many as incongruous with conditions in rural Alaska, as well as unnecessarily costly. According to the Governor's Sanitation Task Force, additional adverse effects are expected from the recent promulgation of Federal regulations for drinking water and solid waste disposal in Alaska.

Building new sanitation facilities in Native villages will be both time consuming and costly. According to IHS projections, providing piped sanitation systems to all rural Native communities now operating honey buckets will require several decades. The current projection for providing both piped and non-piped systems to all rural Alaskan villages is that $125 million will be required annually for 20 years (204).

Funding an Alaska program at $125 million per year in the future appears to be difficult to achieve, especially since IHS'S FY 1993 national appropriated budget was only about $85 million. Although an additional $40 million is being currently provided by agencies such as VSW ($25 million), EPA ($6 million), and the Farmers Home Administration (about $6 million), future funding appears much more problematic. A long-term budgetary commitment by IHS and other agencies to capital construction projects in rural Alaska remains largely undetermined.

FACTORS CONTRIBUTING TO INADEQUATE OPERATION AND MAINTENANCE OF EXISTING SANITATION FACILITIES

Operation and maintenance of existing and planned sanitation facilities were recently recognized by the Governor's Sanitation Task Force as the most vital factor in ensuring long-term project success. Under the current system, Native villages are responsible for the operation, maintenance, and management of sanitation projects provided by Federal and State agencies.

Carrying out these responsibilities has been difficult in many Native villages, particularly those in which an adequate economic base does not exist or funds are not available. Although capital funds are essential for constructing new facilities or repairing existing systems, the current Federal—and State—system does not provide funds to maintain the completed facilities. In the past, State agencies sometimes provided financial support for the operation of secondary sewage treatment plants in many Native communities. These efforts, however, were unorganized and modest, generally not exceeding $20,000 per village. Today, this practice has virtually been eliminated. Greater O&M assistance will be required to prevent the water and sanitation projects already built by IHS in small rural Native communities—as

BOX 1-2: Major Existing Waste Sanitation Technologies Considered for Native Villages in Rural Alaska

Piped Systems

Piped sewerage systems include gravity, vacuum, and pressure sewage.

The gravity piped system is the most common type of piped technology employed to deliver water and waste sanitation services to Native villages in rural Alaska to date. It is presently installed in 69 of the 191 Alaskan Native villages identified by the Indian Health Service, primarily in villages of the Aleutians, Kodiak, North Pacific Rim, and Southeast regional corporations In most villages, piped sanitation projects are also equipped with lift stations and force mains.

Building gravity sewer pipes in rural Alaska is not always possible because of the harsh environmental conditions typically found throughout the State. As a consequence, technologies such as pressure and vacuum sewers are considered feasible conventional alternatives for improving waste sanitation in affected communities.

Pressure sewage systems, so called because of their reliance on pressure provided by pumps, are considered highly efficient in removing sewage through smaller pipelines. Although essentially similar to gravity piped systems, the pressure-type technology requires a power source to heat service lines and maintain the pressure needed to ensure transport of sewage through the pipes. The use of specialized plumbing fixtures in homes connected to this type of sewer system is also necessary,

Vacuum sewer collection technology is designed to use a central vacuum to draw raw sewage from connected homes into a central unit or facility. The use of a vacuum environment not only permits the use of smaller water volumes compared to gravity and pressure piped systems, but also enables the placement of service lines on any type of terrain with little concern for slope. The installation and operation of vacuum systems are generally more expensive than for gravity and pressure sewer services. With the exception of a few industrial camps, Noorvik (Northwest Arctic) and Emmonak (Yukon-Kuskokwim) are the only two Native villages of rural Alaska now operating vacuum sewer systems.

Septic Systems

Although they represent the most popularly used waste disposal technology in most rural areas of the world, the installation of septic tanks in rural Alaska is often impractical because of the limited soil drainage, ice-rich soil, and periodic flooding characteristic of these high-latitude regions. According to IHS, only 26 Native villages were operating community or individual septic tank systems in January 1994 to treat the raw sewage discharged from flush toilets in the home. These villages were located almost entirety in the vicinity of the southwestern coastal region of Alaska. Use of septic systems under less favorable conditions has often been associated with, among other problems, frozen or plugged drain fields, high groundwater tables, limited soil percolation, frozen tanks, and overflowing sewage appearing on the surface or discharging into receiving waters.

Truck Haul

Conventional truck haul systems are designed primarily to collect and transport to the community's disposal area, wastewater discharged from flush toilets and stored in tanks outside the home. Under this approach, vehicles are equipped with an insulated tank capable of holding—sometimes under pressure—up to 1,000 gallons of waste at a time, The decreased neec for pipe handling associated with pressure-type truck haul systems often results in an additional reduction in exposure to human waste. Although the initial capital expense is considerably lower for piped sanitation systems, the operation, replacement, and main-

tenance of the conventional truck approach are often costlier because of the shorter useful life of haul vehicles and the need to ensure road accessibility. Seven of the 10 Alaskan villages operating truck haul systems are located in the North Slope Borough, Two of the remaining three (Galena and Fort Yukon) use the vacuum-type haul system,

A promising small-vehicle haul system, recently developed by Cowater International of Canada, has undergone field testing in Mekoryuk, Alaska. The Cowater technology requires only the use of all-terrain vehicles (ATVS) (during the summer) and snowmobiles (in winter) equipped with a tow trailer and a small vacuum/pressure tank to remove wastewater from home holding tanks (see ch. 5 for more information), Opportunities for future installation in other rural Native communities are being explored by the Department of Environmental Conservation Village Safe Water, Alaska's agency responsible for delivering sanitation services to Native communities in the State,

Honey Bucket System

As of January 1994, nearly 20,000 Natives scattered throughout 89 rural Alaskan villages were operating the *honey bucket system* as their main waste sanitation technology. Consisting only of a 5-gallon plastic bucket lined with a plastic bag and a toilet seat on top, the honey bucket system continues to be the most rudimentary and health threatening means available to Natives for the collection and disposal of human waste. Honey buckets are emptied on the ground, in nearby pit bunkers, on frozen rivers, in the ocean, on tidal plains, in tundra ponds, or in sewage lagoons. Honey bucket waste can also be carried to nearby central collection points called honey bucket bins. These bins are then hauled to the community sewage lagoon by snowmobile, ATV, or truck. Although the latter methods represent an improvement, they have thus far failed to eliminate the potential for direct human contact with the waste. In addition, there are costs associated with the purchase, operation, and maintenance of the equipment needed to make hauling of waste possible. Honey buckets continue to be the waste collection/disposal technology most likely to be found among Native communities characterized by having very few economic resources to operate more improved sanitation systems,

Small-Vehicle Haul System

For communities in which the filled plastic bag is disposed in a centrally located plastic collection bin, a transport system based on the use of small ATVS has been designed to improve the disposal of honey bucket wastes. ATV-based systems were developed mainly to minimize the high operational costs of the much larger conventional truck design. In spite of its relatively simple design, relative ease to manage, and ability to operate throughout the year, the ATV-based approach has thus far failed to eilminate the potential for direct human contact with waste.

Comporting Toilets

Certain comporting toilet designs were tried in several rural Alaskan communities with little success for the last 20 years. Common reasons for failure included, among others, offensive odors, overflow, inability of the units to handle liquid overload, and the high energy costs necessary to evaporate accumulated liquids Another reason commonly mentioned IS the failure of technology manufacturers and design/project engineers to consult with villagers on the type of improvements needed. This failure to employ a participatory approach contributed to the indifference to, and ultimate rejection of, composting toilets by homeowners Among the villages with firsthand experience in early comporting toilet designs are Selawik, Kivalina, Barrow, and Deeding

(continued)

BOX 1-2: Major Existing Waste Sanitation Technologies Considered for Native Villages in Rural Alaska (cont'd)

Although modern comporting toilets operate on the same basic principle, they incorporate a series of design improvements to avoid the failures of older models. Formal field testing in individual homes has not been accomplished to date, and validated results with which to determine the degree of applicability of comporting toilets in rural Alaska are not available. Several efforts to demonstrate these composting technologies (discussed in ch. 5) are now under way.

SOURCES Arctic Slope Consulting Group, Inc. (ASCG), *Water and Sewer Utilities Master Plan Report Selawik,* Alaska, prepared for Cityof Selawik, Alaska, Jan 1992, Canadian Society for Civil Engineering, *Cold Climate Utility Manual* (Montreal, Canada Beauregard Press Ltd , 1986), Crum, Jim, Alaska Area Native Health Service, Alaska Arctic Cornrnunity Sanitation Construction, document presented at the Environmental Protection Agency Cold Climate Research Seminar, Washington, DC, 1990; Crum, Jim, Director, Division of Sanitation Facilites, Alaska Area Native Health Service, Anchorage, information provided during a briefing of Off Ice Technology Assessment staff, Aug. 3, 1993, Environment Canada, Environmental Protection Service, *Co/d* Climate Utilities De//very Design *Manual,* Report No EPS 3-WP-79-2 (Edmonton, Canada Environment Canada, March 1979), Nelson, Doug, University of Alaska Anchorage, School of Engineering, personal communicatlon, Nov. 23 1993; John A Olofsson and H P Schroeder, Universityof Alaska Anchorage, *Sanitation Alternatives For Rural Alaska,* report prepared for the Congressional Office of Technology Assessment, Washington, DC, Aug. 15, 1993

well as those currently under construction—from failing prematurely due to inadequate maintenance. Figure 1-4 shows the estimated O&M costs associated with each sanitation technology now in operation; the total annual O&M cost for rural Alaska—$] 5.1 million—is also shown.

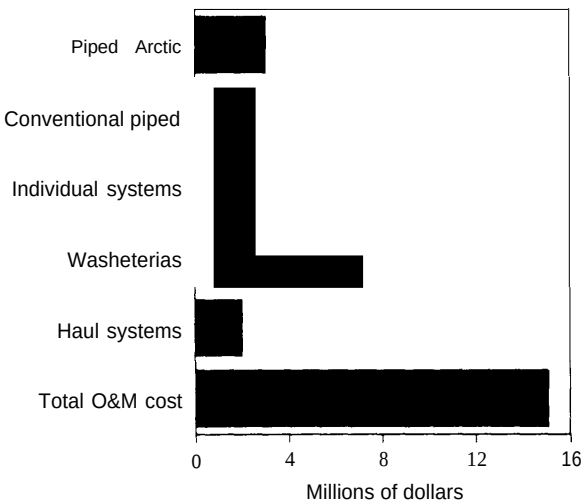
Many communities have employed fund-raising strategies—such as bingo, tax ordinances, and user fees—with varying degrees of success to provide operational support for sewage systems. Operational procedures and disconnection policies have also been instituted by some to make sure that fees are collected. Many Native leaders expect that the current difficulty in obtaining O&M funds can only increase as costs rise and the State economy continues to suffer. As a recent Department of Community and Regional Affairs report (43) concludes, the decline in State revenue sharing programs will have serious adverse economic consequences for small Native villages because these represent their only available source of discretionary funds.

With relatively few exceptions, the inability of remote villages to fund a public works department or hire a full-time, certified water and sewerage operator is often the result of poor local economies. According to the Governor's Sanitation Task Force, sanitation facilities in villages with few resources are often run by part-time operators or volunteers, who are generally ill-trained. As a consequence, the level of oversight is inadequate to respond to system malfunctions.

The frequency of repair needs is expected to increase. Although specific cost figures do not exist, the Governor Sanitation Task Force estimated in its 1992 draft report (63) that the overall toll for repairing all facilities that are inoperative, or are operating with difficulty due to equipment malfunc - tion, will be about $750 million. Although comparisons were not made between the Task Force's one-time cost and the total annual O&M estimate of $15.1 million, many believe that the prompt authorization of O&M funds to IHS would prevent unnecessary expenditures and, would reduce the $750 million figure considerably.

In addition to their poor economy, many Native village governments seem to lack the level of leader-ship required to take on the administrative responsibility for large, complex sanitation projects. Village governments often have little interest in managing sanitation projects and subsequently transfer this responsibility to city managers and facility operators who often lack the authority to

FIGURE 1–4: Estimated Federal Subsidy Needed by Alaskan Native Villages with Fewer Than 1,0000 Residents to Ensure Adequate Operation and Maintenance of Existing Sanitation Projects



SOURCE Jim Crum, Alaska Area Native Health Service, communication with Martha Knight, Department of Housing and Urban Development, Anchorage, AK, May 7, 1993, Jim Crum, Director, Division of Sanitation Facilites, Alaska Area Native Health Service, Anchorage, personal commumication, Nov 9, 1993, John A Olofsson and H P Schroeder, University of Alaska Anchorage, *Sanitation Aternatives For Rural Alaska,* report prepared for the Congressional Off Ice of Technology Assessment, Washington, D C, Aug. 15, 1993 John A Olofsson, University of Alaska Anchorage, School of Engineering, personal communication, Sept. 28, 1993, and Steve Weaver, Indian Health Service, Public Health Service, Rockville MD, personal communication, Jan 24, 1994

set or enforce related policies within the community. According to the Sanitation Task Force, this deficiency has thus far contributed to making the protection of village residents' health and the success of sanitation projects even more problematic. Unfortunately, Federal agencies involved with sanitation projects in rural Alaska have very few programs to strengthen management by local Native governments; a particular exception is the IHS training program, in which technical training services are provided to Natives at an annual cost of about $300,000. The implementation of this IHS program is coordinated with State training efforts.

CONGRESSIONAL OVERSIGHT CONSIDERATIONS OR OPTIONS

Inadequate sanitation facilities in many rural Alaskan Native villages have resulted in a high prevalence of disease caused by a limited potable water supply and the use inefficient technologies such as the honey bucket system. For more than three decades, there has been an insistent demand for the installation of modem, safe facilities. In recent years, Federal and State agencies have built many conventional sanitation systems in roughly half the villages found in Alaska. These systems are costly to build and operate, however, and have unique features designed to meet the harsh environmental conditions typical of the region. Consequently, many villages cannot easily provide the funding needed for proper operation and maintenance of these projects.

Despite the considerable cost—more than $1.3 billion—and the progress made to date in building new sanitation systems, over half of the 191 rural Native villages listed in the Indian Health Service database still lack piped water and waste sanitation service. Addressing the sanitation needs of these communities will take time since the technologies traditionally favored-piped systems—are costly and difficult to build, and face technical constraints not common in other areas of the United States. Unfortunately, the Native villages in rural Alaska operating honey buckets today have almost no basic economy and, in many cases, a relatively limited potential for economic improvement in the future.

Despite the increasing demand for new sanitation projects, the serious economic difficulties faced by many Native villages with existing systems make it necessary to carefully evaluate the installation of similarly complex technologies in communities with few economic or technical resources to operate them. Consequently, to address the waste sanitation problem in Alaska's Native communities, Congress could establish programs to:

- provide safe and healthy alternatives to honey buckets,
- identify and test more cost-effective alternatives to piped systems,
- provide adequate support for O&M-including technical, administrative, operational, and personal hygiene training—to offset the operational costs of sanitation systems.

Interim Option for Improving Sanitation Among Native Villages

Replacing honey buckets under the current system takes time even when the receiving community has a strong local economy. Time is required by Federal and State agencies to coordinate activities and identify available funding among relevant agencies (e.g., Housing and Urban Development, Village Safe Water, Farmer's Home Administration); to develop the community's institutional capability to operate the technology; and to build a system that will solve the sanitation needs within the community's economic reality.

Unfortunately, the majority of Native communities in rural Alaska now operating honey buckets do not have healthy economies. They rely almost completely on transfer payments and subsidies to operate their programs. In fact, per capita income below the State average has been reported in at least half of these communities—particularly in the Northwest Arctic, Bering Straits, and Yukon-Kuskokwim regions. The possible decline in the State's economy might further reduce the revenue sharing funds available to these communities, thus rendering the continued construction of conventional sanitation facilities highly unlikely.

Better interim measures could be adopted by existing Federal and State agencies or programs to reduce the health risk posed by honey buckets, while work to identify more affordable, innovative solutions continues. These interim measures could take various forms, depending on the type of agency program and the community's immediate needs. Measures might involve steps such as improving existing honey bucket systems, delivering existing self-contained sanitation technologies where appropriate, and investing in certain promising technology demonstration projects. The relevant Federal and State agencies could support these measures and incorporate them into their long-term mission and programs.

Improvement of Existing Honey Bucket *Haul Systems*

One measure that could be supported immediately is an improvement program for the existing honey bucket haul systems still used extensively in many Native villages. For communities in which limited funds prevent the installation of a more advanced technology or where such an installation is not immediately feasible, there are many opportunities to improve current haul systems. Examples include improvements in the design of honey bucket trailers and collection bins along with compliance with proper operational procedures (125).

The Indian Health Service plans to continue supporting the use of honey bucket systems in villages with little economic potential to acquire and maintain more sophisticated technologies. Improving the design of honey bucket systems is considered crucial by Indian Health Service to protect public health in these villages and in those for which delivering an improved sanitation system may require several years.

In the view of IHS, new methods are needed for collecting and transporting the waste contained in honey buckets. Improvements to disposal systems might include improved lids and hauling systems, alternatives to plastic bags as honey bucket liners, freeze-resistant containers, and ways to dislodge frozen wastes from haul containers. As the Office of Technology Assessment (OTA) observed during site visits, hauling practices with existing honey bucket collection bins inevitably results in spillage. Human contact with spillage on community boardwalks is also inevitable, particularly because children often play there.

A *honey bucket is simply a 5-gallon plastic bucket lined with* a *plastic bag, with a toilet* seat *on top of it—sometimes they are enclosed in a wooden box for* aesthetic and *venting purposes*

Means to haul sewage in sealed containers by someone other than individual homeowners are also needed. If a limited number of people in a village are involved with sanitary waste collection and transport, exposure to the waste and access to the waste repository will most likely be restricted to a few individuals; establishment of a coordinated community system will require the training of these personnel. Provision of adequate salaries will also be essential.

Interim solutions can give communities additional time to decide on more suitable long-term sanitation options. OTA staff found during their visit to rural Alaska that many villages would like to have advanced waste transport systems, but believed they were not yet ready to manage them. For those communities, improved interim disposal systems other than honey buckets are particularly attractive.

IHS is currently carrying out a project with prototype haul trailers and waste lids in the villages of Kasigluk, Kipnuk, Napakiak, and Nunapitchuk in the Yukon-Kuskokwim region. After thorough testing and evaluation of the information, this improved system will be provided to the nearly 30 Native Alaskan communities currently operating honey bucket haul systems. This small program, however, should not be envisioned as the solution to the sanitation problems of rural Alaska but ***only*** as an interim step while these Native communities identify more appropriate and affordable sanitation technologies. A summary of possible improvements to the honey bucket system is shown in box 1–3.

Coordinating the development and implementation of short-term measures is important. To avoid disrupting their long-term mission, primary agencies, such as the Indian Health Service and Village Safe Water, could also work cooperatively with other institutions in the development or delivery of interim measures. Some of the institutions already involved that might play a larger cooperative role are the University of Alaska Anchorage (research, field demonstrations, educational and training programs), Alaska Science and

Plastic bags facilitate the transport and disposal of waste, but because wastes remain sealed, their degradation is slow, making the sewage disposal area another potential health concern

Technology Foundation (funding of research and demonstration projects), regional native corporations, and Alaska's Native Health Board (technology application, institutional cooperation, and community involvement). Another institution potentially beneficial to this effort is the Federal Field-Alaska Rural Sanitation Work Group being convened by a congressional request to identify and coordinate rural sanitation goals between Federal and State agencies.

Congressional Options for Solving the Waste Sanitation-Problems of Alaskan Natives

For more than three decades, the Federal, State, and local government health care system in rural Alaska has focused on incrementally building complex infrastructure to provide adequate sanitation facilities in each Native village. This emphasis on capital construction, based on legislative authorities, is viewed by some as a barrier to the ability of IHS to support operation and maintenance costs and other direct operational needs.

In addition to capital construction, some believe the historical preference for installing community-wide piped sanitation technologies rather than individual, self-contained ones, has directed attention away from the testing and demonstration of technological alternatives. In the long term, the Federal Government could evaluate the feasibility of the following steps to eliminate the health risks associated with honey bucket use and to improve overall waste sanitation among Alaskan native communities:

OPTION I—Authorize the establishment of a Sanitation Technology Demonstration *Work Group to identify recommend, and demonstrate suitable sanitation technologies and improvements*

While more affordable, permanent alternatives to piped sanitation systems are developed, Congress could assist Alaskan Native villages that rely on honey buckets by establishing a work group responsible for identifying and recommending suitable, interim sanitation improvements or technologies. Such a program could be established in the Indian Health Service, the Environmental Protection Agency[9], or other appropriate Federal agencies. The work group could be composed of engineers from Federal and State sanitation and construction agencies, maintenance experts, village operators, and representatives of Native corporations and village leaders in communities where honey buckets are still in use.

The work group could be responsible primarily for identifying the type of sanitation improvement most suitable for a particular v ill age and for locat-

9 Section 113 of th, Clean Water Act requires EPA to enter into agreement with the State of Alaska, and in coordination with the Department Human Health Services, to carry out demonstration projects *to provide for central community facilities for safe water and elimination or control of pollution in those native villages of Alaska without such facilities.* Expanding this section to include sanitation technologies whose design is home-specific rather than community-wide could support demonstration programs involving alternative technologies to conventional pipe systems. EPA is also instructed to *provide technical, financial and management assistance of such demonstration projects* (Sections 113 (a), (b), and (f); 33U.S.C. 1263).

ing future technology demonstrations. Programs might start with demonstration projects in a small number of communities, followed by the addition of other villages as the demonstration program grows and new technologies are developed. [10] Areas in which the work group's participation would be highly beneficial to the delivery of 1ong-term Federal sanitation assistance include the following:

- identifying Native villages in which honey bucket systems are currently inadequate due to inappropriate equipment selection,
- working with State and Federal agencies to promote demonstration pilot projects,
- disseminating the results of field tests involving improvements to honey bucket systems, and educating village residents about the benefits of adopting such improvements while a better and more suitable technology is identified and installed;
- ensuring the commitment of local Native governments both to adopt improved honey bucket systems, as a means of reducing the health risk of village residents and to participate actively in efforts to identify better sanitation systems; and
- identifying within a reasonable time the criteria needed for selecting, installing, and operating the next level of waste sanitation service in those communities now operating honey bucket systems.

The IHS estimated that the cost of implementing a Sanitation Technology Demonstration Work Group in at least four Native villages would total about $100,000 annually. Ensuring its funding for a reasonable period of time could help project a sense of stability and commitment among the work group's participants, other State and Federal agencies, and Native community leaders and residents.

OPT/ON 2—Provide operation and maintenance assistance to needed Alaskan Native communities through the implementation of the Indian Health Amendments of 1992 (Section 302), or other relevant federal statute such as the C/can Water Actor the Safe Drinking Water Act.

In the past, Federal and State agencies have not funded direct O&M costs for the piped sanitation systems constructed in Native Alaskan villages. At one time, State agencies supported O&M for sewerage and water utilities in many communities, but this practice, although limited in extent, was virtually eliminated in 1992. As a consequence, communities receive only a small amount of municipal and State revenue sharing for this purpose. These funds are insufficient to support O&M needs, especially for the complex sanitation facilities being operated in many villages. Today, it is not rare to find a multimillion dollar sanitation project in need of preventive maintenance due to improper O&M and limited funding.

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[10] Section 201 (g)(5) of the Clean Water Act currently prohibits EPA from making grants to . . . *any State, municipality, or intermunicipal or interstate agency for the erection, building, acquisition, alteration, remodeling, improvement, or extension of treatment works unless the grant applicant has satisfactorily demonstrated . . .* that the particular new or improved method of treating municipal waste is effective in preventing water or other environmental pollution. EPA's participation in technology improvement and demonstration efforts would be helpful in expediting their application or use, particularly because Native villages continue to lack adequate resources to demonstrate alternative technologies as required by the Act. EPA could also assist in studying the effectiveness of alternative technologies as required in Section 517.

BOX 1–3: Possible Improvements to the Honey Bucket Haul System

The honey bucket haul system is still used extensively in many Native villages. For communities in which limited funds prevent the installation of a more advanced technology, or such installation is not immediately feasible, there appear to be many opportunities for improvement in the current haul system. The following are examples of such opportunities, some of which are already being considered by the Indian Health Service (IHS):

- Improved honey *bucket trailers—IHS is* currently developing and testing, with the assistance of a private engineering firm, an improved honey bucket haul trailer.
- Improved lids *on the honey bucket collection* bin—One of the most Immediate needs of the honey bucket haul system is to find a more adequate lid design to prevent further spillage of human waste on village streets or boardwalks during transport.
- An *improved honey bucket collection tub orbin*— Redesign is needed of the more than 800 black plastic tubs[1] used throughout rural Alaska to collect and subsequently transport human waste to disposal locations. These tubs are held in the metal holding frames of the carriage system (four-wheel) and transported to the sewage lagoon for disposal. According to IHS, however, no improvements to the tub system are scheduled at this time.
- Modified *transmission on the transport* system--Human sewage gathered from collection tanks inside the house, or from stationary tubs located at certain points in the village, is carried to a sewage lagoon by a four-wheel vehicle. Vehicles are sometimes unable to prevent spillage of human waste when turning corners or driving over inadequately maintained roads. Modification of the transmission system of all-terrain vehicles to preclude them from traveling at faster speeds to and from dump sites is needed.
- *Providing a water source at the disposal site—One* additional means of helping to reduce the risk of exposure to human waste, and thereby preventing enteric disease, consists of providing a source of water at the disposal site so that operators, at least during the summer, can rinse and remove sewage particles attached to plastic collection tubs, lids, and other parts of the carriage before returning them to the village. Adequate measures should be adopted early in the planning and engineering phases to prevent this water source from becoming a watering point and, therefore, an additional health hazard for the community.

IHS is currently carrying out a project with prototype haul trailers and waste lids in the villages of Kasigluk, Kipnuk, Napaklak, and Nunapitchuk in the Yukon-Kuskokwim region. One of the goals of the IHS effort IS to develop and test considerably lighter lids made of aluminum, preferably with a continuous weld around the lid to prevent spillage. Strapping systems (bungie cords, cinch straps, and C-clamps) are also being tested to Identify the strap, or combination of straps, most capable of preventing sewage from seeping out of the waste haul carriage onto streets and boardwalks.

According to an IHS communication of October 5, 1993, tests of the aluminum-made lid in Napakiak were successful in reducing waste spills and identifying better clamp systems. The lids developed as part of this field demonstration project are being sent to the three other communities participating in this research effort for further field evaluation. After the system has been thoroughly tested and the information evaluated, this improved system will be provided to other Native Alaskan communities currently operating honey bucket haul systems.

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[1] Tubs are made of high-denstty polyethylene

SOURCE. U S Public Health Service, Alaska Area Native Health Service, Office of Environmental Health and Engineering, "Updateon Honey Bucket Haul Equipment Improvements," Oct 5, 1993

Recognizing this deficiency, Congress amended the Indian Health Care Improvement Act of 1976[11] by passing the Indian Health Amendments of 1992.[12] Section 302 of the Amendments authorizes the Indian Health Service to fund up to 80 percent of the costs incurred by Native villages and Indian Tribes for the operation, maintenance, and management of their water and sewer systems.[13] One relevant aspect of the Act is that it encourages IHS to help make up the difference, particularly in those Native communities whose O&M costs exceed revenues collected from user fees and taxation, so as to keep the facilities in good operating condition and in compliance with Federal regulations. By providing Native communities with O&M funding, not only can premature wearing out of system components—which now appears routine—be reduced or virtually eliminated, but the installation of sanitation technologies in communities with few resources for maintenance may be more feasible.

To date, no funds have been appropriated under section 302 of the Indian Health Amendments of 1992. The IHS has yet to request funds because of staff and budget constraints, and because of lack of guidance in the legislative intent as to how to implement such a program. Although coverage of the existing level of sanitation services in rural Alaskan Native communities is estimated to cost approximately $15 million annually, current budgetary priorities make funding of these activities under Section 302 extremely difficult or unlikely.

IHS could, however, fund a pilot program to assess O&M needs in a selected number of villages, for example, 25. Funding could also be provided by other relevant Federal agency, such as EPA, with the approval of Congress. A pilot program would require only limited initial funding and would enable IHS and other relevant Federal agencies to determine more clearly implementation plans, procedures, and total needs for future O&M economic assistance. It could also help to develop the criteria by which such assistance might be extended to Native communities not included in the initial pilot program on a priority basis.

OPTION 3—Improve the level of support to technical assistance programs as a means to ensure the proper operation and maintenance of sanitation projects in Alaska's rural Native communities

Another measure that could be adopted is to increase O&M technical assistance funding.[14] The bulk of O&M technical assistance provided to Native communities of Alaska originates with three major agencies: the Indian Health Service, Alaska Department of Environmental Conservation (ADEC), and the Department of Community and Regional Affairs (DCRA). Whereas the major emphasis of the IHS and ADEC programs is to provide operators with the technical skills needed to keep their utilities operational and in compliance with environmental regulations, DCRA focuses on improving government operations and

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[11] 25 U.S.C. *et seq.*

[12] P. L. 102-573, October 29, 1992; 106 STAT. 4526-4592.

[13] 106 STAT. 4560-61.

[14] Examples of instruments Congress could use to increase technical assistance to Native communities include: (1) Section 104 of the Clean Water Act since it requires EPA *to "finance pilot programs, in cooperation with State and interstate agencies, municipalities, educational institutions, and other organizations, and individuals, of manpower development and training and retraining of persons in, on entering into, the field of operation and maintenance of treatment works and related activities* (Section 104 (g)(1)); and (2) Section 109 of the Clean Water which directs the EPA to make grants for training or upgrade of waste treatment works operation and maintenance personnel. Additional technical support might also be sought through the Clean Water Act's State Revolving Fund program (Sections601 -603); the Indian Environmental General Assistance Program Act of 1992 (42 U.S.C.4368b; P.L. 102-497, Oct. 24, 1992; 106 STAT. 3259); the Rural Development Administration's Technical Assistance and Training Grant Program; the Housing Community Development Act of 1974; and the recently introduced Water Quality Act of 1994 (H. R. 3948) and Safe Drinking Water Act Amendments of 1993 (S. 1547).

the financial and managerial skills of utility operators. In complimenting State efforts, IHS also funds several maintenance specialists who deliver O&M assistance and training directly to the villages. Federal support is also provided through the U.S. Environmental Protection Agency (EPA).

Initially tailored primarily to help local utility operators, most O&M technical assistance programs have benefited the entire village by ensuring proper operation of sanitation projects, adequate response to emergencies, and minimization of the adverse effects associated with operator turnover. IHS is currently investing more than $300,000 in technical training services annually; however, this amount is insufficient to support O&M technical assistance to the increasing number of villages that need such support (83,177, 219)

To ensure the availability of this additional technical assistance and to prevent the premature deterioration of existing sanitation projects in rural Alaskan villages, Congress could:

- increase the level of non-construction funds available to Federal agencies such as EPA and IHS for training facility operators and providing O&M technical assistance to Native villages;
- provide EPA and IHS with the necessary funds to coordinate and support State O&M technical assistance programs, such as ADEC'S Remote Maintenance Worker Program and Local Utility Matching Program and DCRA'S Rural Utility Business Advisor Program, as a means of further ensuring proper and safe operation of sanitation projects in rural Alaska; and
- increase the level of funding available to Federal agencies such as IHS to address emergency situations relating to sanitation facilities.

OPTION 4—Establish a research, development, and demonstration program for innovative sanitation technologies

Technology selection decisions to date have been hindered by a capital planning process that focuses on adapting conventional sanitation technologies to a generally unconventional environment, rather than finding novel and appropriate solutions. The current technology selection process does not allow for a comparison of approaches based on total life cycle costs and potential savings to the communities. Only minimal attempts have been made to formally incorporate existing alternative sanitation systems into the technology selection process currently in place.

Many conditions in Alaska's Native villages (i.e., inadequate water supply, poor soil drainage, permafrost, unacceptable topography, high seasonal flooding potential, and weak local economies) appear to favor the application of less costly and complex approaches than piped sanitation systems. However, to date, few alternative methods have benefited from field demonstration tests to determine their actual performance in cold climate regions. Consequently, adopting alternative technologies without first exploring the factors that will make their application in Alaskan Native villages successful appears subject to failure.

Development of a more comprehensive technology evaluation and selection approach capable of supporting demonstration, applied research, and application of innovative technologies is still needed. Congress could facilitate the research, development, and demonstration of innovative sanitation technologies by taking the following steps:

- Directing the Environmental Protection Agency, Indian Health Service, or another appropriate Federal agency to:
  a. establish a program for research, development, and demonstration (RD&D) of innovative sanitation technologies considered potentially appropriate for application in Arctic regions, such as rural Alaska;[15]
  b. advocate the application of those innovative technologies successfully demonstrated under the RD&D program; and
  c. support the establishment of a forum in which cooperative technology research and demonstration activities are carried out with the participation of, among others, Native communities and national and international programs or institutions (e.g., the University of Alaska, Alaska Science and Technology Foundation, U.S. Army's Cold Regions Research Engineering Laboratory, National Aeronautics and Space Administration, National Academy of Sciences' Polar Research Board, and National Science Foundation).
- Providing the Environmental Protection Agency, Indian Health Service, or the Federal agency under which an RD&D program is established, with the necessary funds to successfully carry out the program's objectives. Additional funds might subsequently be sought by requiring other Federal agencies with programs relevant to Native villages to identify funds or funding opportunities that could be utilized to support the RD&D program.
- Establishing a technology advisory group or commission to further enhance and support the RD&D program and policies. Composed of technology experts from state, national, international, and Native governments, as well as private organizations, the advisory group could be beneficial to the agency responsible for the RD&D program in the identification of, for example, priorities and opportunities for research and development.
- Funding, as part of the RD&D program and through a Federal research agency, research and field demonstrations of potentially beneficial engineering systems or concepts that require substantial RD&D before they can be considered for application in Native village homes. One example of this type of system is the Antarctica Analog Project[16] king developed and tested by NASA and the National Science Foundation for use at the South Pole station.

Option 5-Hold oversight hearings on the report on sanitation issues, problems, and solutions to be submitted to the Congress by the Federal Field Work Group led by the U.S. Environment/ Protection Agency. Ho/d

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15 Under Section 104 of the Clean Water Act, for example, Congress requires EPA, in cooperation with other Federal, State, and local agencies, *to conduct and promote the coordination and acceleration of, research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, prevention, reduction, and elimination of pollution (Section 104; 33 U.S. C. 1254).* As part of carrying out the objectives of this section, EPA is directed to:

- *develop effective and practical processes, methods, and prototype devices for the prevention, reduction, and elimination of pollution (Section* 104 (b)(7));
- *develop and demonstrate under varied conditions (including conducting such basic and applied research, studies, and experiments) . . . practicable means of treating municipal sewage, and other waterborne wastes* (Section 104 (d); Section 104 (d)[ ));
- *establish, equip, and maintain field labor-awry and research facilities, including . . . one in the State of Alaska, for the conduct of research, investigations, experiments, field demonstrations and studies, and training, relating to the prevention, reduction and elimination of pollu-*//on (Section 104 (e)), and
- *conduct a comprehensive program of research and investigation and pilot project implementation into new and improved methods of preventing, reducing, storing, collecting, treating, or otherwise eliminating pollution from sewage in rural and other areas where collection of sewage in conventional, community wide sewage collection systems is impractical, uneconomical, or otherwise infeasible, or where soil conditions or other factors preclude the use of septic tank and drainage field systems* (Section 104 (q)(1)). As part of achieving this goal, EPA is allowed to make grants and to encourage the used of improved methods by disseminating relevant information and results *(Section 105 (e)(2)).*

16 This project involves the use of advanced food production, water recycling methods, and human waste processing technologies.

Although their ideal is to someday have piped sanitation systems in their homes, many Native leaders, in meetings with OTA staff, recognize that this might be economically prohibitive and call for the development of more affordable sanitation alternatives

periodic oversight hearings to review plans *and programs adopted by federal agencies to implement the report's recommendations.*

Problems surrounding sanitation in rural Alaska are complex, and their successful elimination often demands participation by Federal and State agencies. In addition to the Indian Health Service and its State counterpart, Village Safe Water, various Federal and State agencies implement programs that are relevant to Alaskan Native communities. And even though individual agency missions are pursued with vigor and dedication by generally well-qualified and motivated staff, there does not appear to be an overarching rural village policy to coordinate all these agency functions.

Several encouraging efforts by Federal and State agencies to identify better methods for more effectively implementing their programs in rural Alaskan Native villages are now under way. Of great significance is the Federal Field-Alaska Rural Sanitation Work Group convened under congressional mandate to prepare, under the leadership of the U.S. Environmental Protection Agency[17] (253), a report identifying means to improve the coordination of policies and programs among Federal agencies.[18] The participation of State and Native agencies and organizations in the Work Group is also considered highly beneficial.

Starting in May 1993, and building on the work of the Governor's Rural Sanitation Task Force, the Federal Work Group delineated three major tasks: 1) to examine the status of water and waste sanitation projects in operation in rural Alaska; 2) to evaluate all agency programs responsible for delivering sanitation services to Native communities; and 3) to identify barriers that may still impede relevant agencies from providing adequate sanitation to all Native villages of rural Alaska. In

17 In addition to EPA, leadership in the Work Group is shared by representatives of the Alaska Department of Environmental Conservation and Alaska Native Community.

18 Among the Federal agencies participating in the Federal Field-Alaska Rural Sanitation Work Group are the Army Corps of Engineers, Bureau of Indian Affairs, Department of Transportation, Department of Education, Environmental protection Agency, Farmers Home Administration, Department of Energy, Department of Labor, Department of Housing and Urban Development, Indian Health Service, National Oceanographic and Atmospheric Administration, and Soil Conservation Service.

its interim report of January 1994, the Work Group identified several possible recommendations for congressional action (253).[19]

Although the Federal Field-Alaska Rural Sanitation Work Group report identifies opportunities for policy coordination among Federal agencies, the actual level of commitment and support by each agency to the report's recommendations is still unclear. Prior to directing each Federal agency to implement the relevant recommendations of the report, congressional oversight hearings could be held to provide relevant agencies with opportunities to inform the Congress about:

- the process used for gathering and evaluating data, and for formulating the recommendations set forth in the final Work Group report affecting each particular agency;
- the time and type of resources that would be needed by each particular agency to carry out the recommendations of the Work Group report;
- the opportunities for enhancing the agency's mission in case a particular agency cannot carry out a given recommendation because of limited authority; and
- the time within which updates on the progress made in implementing of the Work Group's recommendations should be submitted to Congress and published.

Periodic oversight hearings could be then held in the future to review the plans and programs adopted by relevant Federal agencies to implement the recommendations reported by the Federal Field Work Group.

CONCLUSION

Approximately 20,000 of the estimated 86,000 Natives living in rural Alaska do not have running water in their homes and use plastic buckets-euphemistically called '*honey buckets' '—for toilets. As a result of this inadequate sanitation technology, the outbreak of diseases (e.g., hepatitis A, impetigo, and sometimes meningitis) is frequent among Native villages that employ this system.

To eliminate the prevalence of disease resulting from a limited potable water supply and the use of honey buckets, Federal and State agencies have built sanitation systems capable of withstanding the harsh environmental conditions typical of the region. Because Federal and State agencies fund only capital construction, most Native villages face serious difficulties in raising the funds needed for proper operation and maintenance of these facilities. The only direct source of funding to Natives for O&M expenses is municipal and State revenue sharing—minimal funding that is not always available. As a result, it is not uncommon to find a multi million dollar sanitation project in rural Alaska in need of preventive maintenance.

Despite the considerable progress made to date, nearly half of the 191 Native villages identified by IHS continue to have inadequate sanitation. Because of the inability of many Native villages in which piped systems have already been built to provide proper O&M, serious concerns are being raised about installing similar sanitation technologies in the remaining communities—-the majority of which have few economic and technical resources, as well as a limited potential for economic development. Under existing practices, however, the responsible Federal agencies could continue to implement inappropriate remedies.

OTA's analysis supports the need to adopt both short- and long-term measures to provide adequate sanitation and thus improve the health and well-being of tens of thousands of Alaska Natives living in small, remote villages. In the short-term,

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[19] Examples of these preliminary recommendations include: 1) approving a new State Revolving Fund under the Safe Drinking Water Act, capable of setting aside 1.5 percent of annual appropriated funds for direct grants to Alaska Native and Indian tribal communities, 2) increasing the Indian set-aside from 0.5 percent to 1.5 percent of the Wastewater State Revolving Fund; and 3) providing special funds under the Housing and Community Development Act of 1974 to support sanitation activities in rural Alaska.

existing honey bucket systems could be made safer and more effective, and the O&M support required could be provided. In the long-term, the development and application of more cost-effective alternatives could be supported through a directed research and development program. OTA has presented the following actions that Congress and the Administration could take: 1) improve existing honey bucket haul systems while better alternatives are identified or developed; 2) provide O&M funds for special cases in which villages cannot ensure proper operation of sanitation projects; 3) provide additional funds to expand the current O&M technical assistance program so as to prevent premature deterioration of the sanitation facilities now in operation; and 4) establish a comprehensive Federal research, development, and testing program for innovative sanitation technologies. To ensure that these steps are coordinated effectively, Congress could hold oversight hearings on the report requested from the Federal Field-Alaska Rural Sanitation Work Group, and could direct Federal agencies to adopt the report recommendations as a means of coordinating more effectively their functions and activities relating to Native villages in rural Alaska.