FINANCING WATER AND SEWER OPERATIONS AND MAINTENANCE IN RURAL ALASKA

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EXECUTIVE SUMMARY

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What is the Problem?

Many small rural communities scattered across Alaska need better water and sewer systems. In 1999, the Alaska Department of Community and Economic Development found that only about 45 percent of small rural communities had piped water and sewer systems, and that in about 15 percent the only public sanitation service was a truck or four-wheeler hauling away honey-bucket waste.

Clean water and adequate sanitation benefit not just individual utility customers but the larger community, as well as the state and the nation. Improved public health reduces the demand for health care services, decreases absenteeism at school and work, and increases productivity. Better water and sewer service broadens business opportunities. It improves the quality of life for residents. Taxpayers also benefit from improved operation and maintenance of local facilities, through decreased costs for facility repair and replacement.

But piped water and indoor plumbing come at a high price in rural Alaska. The federal and state governments have spent more than $700 million to build sanitation systems in small Alaska villages over the past decade. They spent more than $80 million in fiscal 2000 alone.

And construction costs are just the beginning: once the systems are built, the villages themselves have to pay to keep them going. The economic base of most rural villages with fewer than 1,000 residents is very limited. In 1990, the average annual per capita income of residents of small rural places (excluding regional centers) was less than half that of all Alaska residents—and we have no reason to believe that disparity has changed much in recent years.

It is hard for local utilities with small numbers of customers to raise enough money to cover operation and maintenance (O&M) costs. Rural communities use not only customer fees but also various combinations of state revenue sharing, taxes on local residents and businesses, revenues from gaming, and tribal funds to pay for operating and maintaining their sanitation systems.

Several agencies—the Alaska Native Tribal Health Consortium, the Alaska Department of Environmental Conservation, and the Alaska Department of Community and Economic Development—all provide technical assistance to help rural villages operate and maintain their water and sewer systems. Despite this help, small communities still struggle with a shortage of technical assistance, inadequate training, and a limited ability to find certified and trained personnel—all of which contribute to increased O&M costs.

As more and more federal and state money goes into building sanitation systems in small villages, the question of whether those communities can operate and maintain the systems over the long run is becoming more pressing. In a 1999 survey, the Department of Community and Economic Development (DCED) found that two thirds of the 134 small villages that charged for water or sewer service were operating at a loss. (Another 34 small villages—mostly those providing community facilities like central watering points or washeterias—don't charge user fees, but subsidize the costs with other money.)

Purpose of Report

Are existing sanitation systems simply too expensive for many Alaska villages? Or could small utilities operate in the black if they increased their charges and toughened collection policies? How much difference do village leadership and commitment to good sanitation make? Could alternative technologies provide adequate sanitation for less?

To help shed some light on these questions, the Institute of Social and Economic Research (ISER) at the University of Alaska Anchorage prepared this volume. It presents seven recent analyses, by various authors, of some aspects of financing water and sewer operations and maintenance in rural Alaska. We added an introductory chapter, a final chapter drawing some conclusions from the various analyses and discussing policy issues, and an executive summary. The analyses look at methods villages use to pay for O&M; the share of small sanitation systems operating in the red; the costs of selected closed-haul systems (one alternative to piped systems); the fiscal capacity of small rural communities; and steps that might help small sanitation systems meet their costs. These studies are not comprehensive, and in some cases they raise as many questions as they answer. But they provide valuable information on a public policy issue Alaska will continue to grapple with for the foreseeable future.

What is So Different About Rural Alaska?

Alaska is huge—375 million square acres—but its population is only about 650,000. Nearly half of all Alaskans live in or close to Anchorage, in southcentral Alaska. Most of the rest live in or around a handful of smaller cities in southeast, southcentral, and interior Alaska. The state's road system covers only a relatively small area, primarily in the southcentral and interior regions.

About 12 percent of Alaskans—mostly Alaska Natives—live in about 200 small villages scattered throughout Alaska, far from road systems and often far from other villages. Many villages have populations below 500, and dozens have fewer than 100 residents. A number of things contribute to the high costs and complexities of building and operating sanitation systems in these small, remote communities.

The geographic isolation, harsh climate, small size, and limited economies common to almost all Alaska's villages make the cost of everything higher to begin with. It's expensive and often complicated to get supplies and equipment to these communities, especially during the winter. As noted above, most villages have very small economic bases, jobs are scarce and often seasonal, and incomes are far below those in urban areas. Utilities and other businesses that might have only a few dozen customers can't take advantage of economies of scale.

Alaska's severe winter cold means that facilities operating almost anywhere in the state have to have special protections against freeze-up. The permafrost (frozen soil) underlying most of rural Alaska not only makes building and operating sanitation systems more expensive but also restricts the choices. In most of rural America, isolated communities or individual homes without access to piped water and sewer systems can rely on individual wells for water and septic tanks for sewage disposal. With a few exceptions (like certain coastal communities), Alaskan villages can't use household wells and septic tanks, because of permafrost. Especially in the most northerly areas, the layer of ice-free soil is very shallow and the layer of permafrost very thick.

And when the top layer of soil does melt, during warmer times of the year, the permafrost underneath forms a barrier that effectively prevents drainage. The combination of permafrost and lack of drainage means septic tanks won't work.[1]

The same permafrost that precludes wells and septic tanks in much of rural Alaska also restricts construction of sanitation systems in communities where the ice-free layer is too shallow to allow buried pipes. In those cases, sewer systems have to be above ground. And because they are above ground on generally flat terrain, they require technology that is more expensive and more difficult to maintain than the more conventional systems.

Current Sanitation Services in Village Alaska

The level of water and sewer service in small rural communities varies enormously. (See map.) At least 10 provide no public service at all, according to the 1999 DCED survey. (But that doesn't mean residents of all those places have no private sanitation systems; in a few places, the terrain is suitable for household wells and septic systems.) About 168 small communities with populations below 1,000 reported offering some public water or sewer service.

The service provided might be as basic as a central location where residents can get water or dump honey buckets, or it could be fully piped water and sewer systems. In a number of communities, especially those moving from older to newer systems, more than one system exists.

In DCED's 1999 survey, about 83 small villages reported having piped sewer and water systems. (This doesn't necessarily mean that all the households in these villages had full plumbing.) These piped systems require many adaptations to prevent them from freezing. Those can include—depending on the area of the state, the local topography, and other factors—insulating and wrapping the pipes, heating them, continuously circulating water through them, and using a vacuum system rather than gravity to move sewage through pipes. Pipes have to be above-ground in some communities. These adaptations for the Arctic mean the systems also have to have lift, pump, or pressure stations and boilers, among other things.

All these things add expense and make the systems more difficult to maintain. For vacuum sewage systems, special toilet valves or other devices have to be installed in individual homes—and problems with an individual household can cause problems for the whole system. A related issue in rural Alaska is that the sanitation systems require a substantial amount of electricity. Electricity is very expensive in rural Alaska—with the price per kilowatt hour several times the national average—and small electric utilities often experiences power outages that also can damage sanitation systems.

Another type of sanitation system some communities are experimenting with is what is known as "closed-haul." There are a number of variations in such systems, but basically they use holding tanks (one for water and one for sewage) in individual homes instead of pipes. Haul vehicles periodically deliver water and take away sewage. These systems also require some adaptations

[1] For a good description of how permafrost limits options for sanitation systems in remote Alaska, see Lynn Marino, "Alaskan Water and Sewer Systems: Confusions and Challenges in the Rural Arctic," in *Nepal Journal of Water Resources Development*, Volume 5, Number 2, 1997, pp. 45-52.

for severe weather. These systems have been in place only a few years, and we have little detailed information about their costs.

Dozens of villages still rely on central watering points, where residents come to haul away their own water. This system at least supplies a safe water source—but we know that because hauling water is time-consuming and often difficult and inconvenient, residents who have to haul water tend to use less water and to re-use it, increasing their exposure to disease. Many villages also still rely partly or exclusively on honey buckets for human waste. Some of these places have central sewage lagoons where residents can empty their honey buckets; in others, residents choose their own dumping areas. The health dangers of honey buckets are obvious. It's easy for residents to accidentally come in contact with human waste when they dump the buckets, and if there is no central dumping lagoon, residents have no choice but to dump the buckets near villages, in places where people will almost inevitably come into contact with the waste.

Federal and state agencies are working to bring better sanitation to all small Alaska communities. In 1999, for example, the Village Safe Water program of the Alaska Department of Environmental Conservation reported that 127 sanitation projects were underway in villages around Alaska—including everything from planning and design projects to actual construction.

Overview of Finances of Small Utilities

In a 1999 survey, the Rural Utility Business Adviser (RUBA) program of the Alaska Department of Community and Economic Development attempted to survey about 190 small villages with populations under 1,000. (A detailed discussion of the survey results is presented in Chapter II.) Some communities did not respond to the survey. About 168 said they did provide some level of public sanitation, with 134 charging for service.

The survey found that among the 134 small utilities that charged for services, 94—or two in three—were operating at deficits. Communities cover their revenue shortfalls with other funds—such as state or federal pass through funds, sales taxes, and gaming receipts—or incur long-term debt. About one quarter (27 percent) of communities said they have long-term debt for their utilities—but 89 percent of this debt is for operations, not capital expenses.

RUBA cites a number of reasons why so many small utilities aren't covering their costs:

- Twenty one percent (21%) of the surveyed utilities do not charge customers for services.
- Fifty three percent (53%) of the utilities that charge fees do not review or adjust fees to reflect costs. Many of them have never adjusted their fees since the utility was created.
- Forty two percent (42%) of those communities that charge customers do not attempt to collect past due accounts.
- Fifty-seven percent (57%) of the respondents never cut off service to customers with past due accounts.

Summary of Analyses

Here we summarize the main findings of the analyses presented in this report; refer to individual chapters for more detail.

Villages with Piped Water and Sewer Systems

About 83 small communities that answered the RUBA survey reported having piped water and sewer systems. In those places, households were charged on average about 1.5 percent of their incomes for sanitation service. That percentage of income going for sanitation fees ranged from zero (for utilities that don't charge individual users) to more than 4 percent. By comparison, households nationwide pay about half a percent of their income for water and sewer services, and Anchorage residents pay about 1 percent.

So customers in villages with piped water and sewer systems are, on average, already being charged as much or more than other Americans—and yet in most of these small communities, the fees collected don't cover the operating costs.

In a recent business plan prepared for Too'gha, the utility that operates in Tanana, WWG consultants analyzed the finances of nine sub-arctic village piped water and sewer systems. That analysis is detailed in Chapter III. In general, it found that among the utilities it assessed:

- Most of the utilities are running at a loss. This loss is compounded when deferred maintenance is calculated.
- Utility fees reflect management philosophy, not costs.
- The greatest collection problems occur in the communities with the lowest fees. The community with the highest fees experienced average collection rates.
- Labor is the most significant cost—almost half—followed by fuel oil, electricity, and maintenance.
- Smaller utilities do not calculate depreciation.
- No community has established a reserve to rebuild aging facilities. Outside funding agencies are bearing the total cost of replacements and system expansion.

In another assessment of piped systems, Steven Campbell of the University of Alaska Anchorage looked at systems in Nulato and Tanana. (The full analysis is in Chapter IV.) For Nulato's system he found, among other things:

- As of May 1999, half of all accounts were overdue; one third were more than 90 days overdue.
- Poor economic conditions were a factor.
- Administrative failure to send timely bills and overdue notices contributed to the problem.
- Labor and supply costs increased almost 30 percent over the period.
- Expenses and collections both vary by season. Collections are lowest during winter quarter (January to March); this is also when expenses are highest. The seasonal deficit is about 12 percent of annual revenues.

Closed-Haul Systems

Closed-haul systems are new and relatively few villages have such systems. Charles Woodlee analyzes (in Chapter V) the costs of closed-haul systems in three villages. He shows that the flush tank and haul system used in Mekoryuk, the pump and haul system used in Quinhagak, and the Microflush system used in Tuntuliak also operate—like many of the piped systems—in deficit. These are new technologies in rural Alaska and they are still being refined.

In Chapter VI, Stephen Colt of ISER re-analyzes Woodlee's cost data and supplements the analysis with data for Nunapitchuk and Buckland. For systems that use small vehicles for hauling water and sewage, the costs of delivery and haul (not including water production) per household per year range from less than $300 to nearly $1,000. The system in Buckland, which uses a larger haul vehicle, comes in around $1,000 per household per year, plus electricity costs for heating the water. (These household systems service two sinks and a toilet only; customers must still use community facilities for showers and laundry.)

Fiscal Capacity of Villages

The deficits so common among small sanitation facilities raise questions about the fiscal capacity of small communities. Assessing just how much villages could afford to pay, as compared with what they are paying, would require a major analysis with much more data than is available today. But Stephen Colt and Alexandra Hill of ISER looked at some aspects of the fiscal capacity of 254 villages that are eligible for sanitation construction projects under the state's Village Safe Water (VSW) program. (That analysis is presented in Chapter VII.) They found, among other things:

- The average per capita income in VSW-eligible communities is between 30 and 40 percent lower than the statewide average.
- Of the 118 communities that are both eligible for VSW grants and able (by virtue of being incorporated) to levy some sort of tax, 80 collect local taxes. On average, however, VSW communities collect only about $313 per capita, or 27 percent of the per capita tax revenue collected by larger, ineligible communities.
- Communities that receive VSW funding often contribute land and provide labor for facility construction at below-market rates.

Incentives for Improvement

In the early 1990s, the Northwest Arctic Borough and the Alaska Department of Environmental Conservation carried out a joint pilot program in a number of villages in the Northwest Arctic Borough (as described in Chapter VIII). That program provided some subsidies to help pay operation and maintenance costs of water and sewer systems—but linked those subsidies to improvements in system management. The program managers reported that with incentive-based subsidies, the project communities:

- increased collections an average of 20 percent
- reduced operator turnover 74 percent
- improved their water testing compliance from 64 percent to 100 percent

- improved facility maintenance, with 100 percent maintaining critical parts lists, daily/weekly/monthly operator logs, and monthly reporting to the council
- increased attention to operator training

The program managers also reported that their success required agency oversight, to assure that program requirements were being met, that the village bookkeeping system was acceptable, and that training was coordinated. Of course this was only one small project in a few villages, but it provides some data on how subsidies for O&M costs might work.

Conclusions from Analyses

From the analyses summarized above, we can draw and number of general conclusions:

- Rural water and sanitation revenues do not cover costs.
- Many factors make operating and maintaining Arctic piped systems very expensive, and based on the limited data available right now, operating and maintaining closed-haul systems appears to be no cheaper.
- Rural residents pay more of their income for water and sewer services than the average American does—about 1.5 percent of income, compared with half a percent nationwide**.**
- Fees and collections are insufficient to cover costs, at least partly because many small utilities don't adjust their fees to costs, don't enforce collections, and don't cut-off service.
- Poor economic conditions, unexpectedly harsh weather, lack of spare parts and contingency funds, and other factors contribute to deficits**.**
- The fiscal capacity of villages is limited, but many communities contribute land and provide labor at below-market rates to build sanitation systems.
- Community support and administrative capacity are critical to successful utilities.

Future Prospects

In most communities there is ample room for improvement in financial management, specifically in levying and collecting fees for service. At the same time, evidence in this report suggests that even with higher fees, effective collections and good management, some small rural utilities will not be self-supporting. Even if user fees can cover the day-to-day costs of operations, these utilities will not be able to build up the cash reserves required for routine repair and replacement of equipment. The shortfall is currently covered by a combination of poor service, local general funds, federal, state and regional assistance programs, and premature repair or replacement of facilities—paid for by the state's Village Safe Water program and the Alaska Native Tribal Health Consortium.

With some thoughtful policy attention and additional research—because good information is lacking in so many areas—we can craft a better solution. That solution could include working together to make a number of changes, outlined below.

- *Improve efficiency of operations*. Just as the state's weatherization program in the 1970s performed energy audits and upgraded the energy efficiency of homes, a systematic assessment of each utility's operations would find many opportunities to improve operating efficiency and cut O&M costs. Another approach to cost efficiency is providing customers with more information about how systems work so they can help prevent costly problems.

- *Develop lower-cost systems through planning and designing.* Possible means include developing alternative technologies with lower O&M costs; presenting the community with good information on the costs of various systems; promoting strong community involvement in system planning, to insure that agencies understand local concerns and that local residents understand the financial obligations they are undertaking.

- *Reduce administrative costs.* Most village water and sanitation systems are operated by municipal or tribal governments and share overhead (office space, management and accounting personnel) with other governmental functions. This is an important cost saving arrangement, but further improvements might be possible—creating regional utilities, contracting out billing, establishing a regional purchasing cooperative, or pooling risks.

- *Increase collections*. This is the current policy focus, and communities are trying various approaches. Possibilities for improving collections include expanding the technical assistance that the RUBA program provides—making it available to more communities and possibly holding regional conferences or workshops to allow small utilities to exchange information. Developing more effective customer education campaigns to show why it's important to pay bills could also help.

- *Provide subsidies (with appropriate oversight) to utilities*. Local governments currently subsidize water and sewer utilities from a wide range of other funds, but these sources are often inadequate, given the small local tax base and other factors. Possible new approaches could include a need-based subsidy program, based on local income and effort. (The state does in fact already subsidize electricity costs in many rural communities, recognizing the much higher costs of electricity in remote places.) A wage supplement for operators who earn certification might help reduce costly turnover.

- *Strengthen community support*. The sanitation system must be an integral part of the community's values and lifestyle. The values-based strategic planning process for small communities—as described in the *Community Strategic Plan Form and Guide*, produced by U.S. Department of Agriculture's Rural Development Office—is a step in this direction. There also needs to be institutional support and encouragement of community innovation.

- *Increase agency collaboration.* Small communities cannot solve their O&M finance problems without agency collaboration. Federal, state, and regional personnel provide needed information and institutional resources. Effective collaborative relations are time intensive: line personnel must be afforded the time and travel to support this style of work.

Further Research

Although the analyses in this volume provide some insights into the problems small communities face in financing O&M costs, existing data is sketchy in many areas. To focus and assess the policy options, we need more information. An agenda for further research might include:

- Collecting cost information—determining what it actually costs each village to operate its utilities.

- Gathering and analyzing revenue data—to show, among other things, seasonal variations and cash reserve requirements and to provide a basis for estimating the total O&M deficit.

- Learning more about the economics of flush-haul systems, to determine if they can be adequate substitutes for piped systems.

- Analyzing 2000 census data on household incomes and expenses and possibly supplementing that data with household surveys.

- Assessing the fiscal capacity of local governments and the practical ability of local residents to pay for operating sanitation systems.

- Comparing rural sanitation utilities to rural electric utilities, which seem to have fewer problems and are subsidized by the state.

- Examining how other jurisdictions deal with sanitation-related problems, including harsh climates, delinquent customers, and small local tax bases.

CHAPTER I.
INTRODUCTION AND BACKGROUND

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INTRODUCTION AND BACKGROUND

Hundreds of small rural communities scattered across Alaska need better sanitation systems. (See map.) Construction of water and sewer systems in rural Alaska is typically paid for with federal and state money. However, the communities have to bear the ongoing costs of operating and maintaining the systems once they are built. Many communities cannot afford to pay much to operate and maintain their systems. For decades, the state has struggled with the dilemma of how to bring small communities sanitation systems that are both adequate and affordable. Alaska's vision of eliminating honey buckets—and the health hazards they carry—brings with it the question of how to establish long-term, self-sustaining sanitation systems. These systems can only be self-sustaining if communities can find ways to pay the operation and maintenance (O&M) costs. The dimensions of this problem are not well understood; the financial capabilities of these communities have not been documented.

To help shed light on this issue, the Institute of Social and Economic Research (ISER) prepared this report, compiling in one volume the findings of seven recent analyses by various authors. The analyses examine several aspects of financing O&M costs, including how villages currently try to pay O&M costs, comparative costs of selected flush-haul systems, and community fiscal capacity. These analyses are not comprehensive, but they provide valuable information about a problem Alaska will be grappling with for the foreseeable future. ISER added this introductory chapter, a concluding chapter drawing generalizations and policy implications from the analyses, and an executive summary. The individual chapters are:

Chapter I. Introduction and Background, by Amy Wiita, research associate at the Institute of Social and Economic Research. To help readers understand sanitation problems and issues in rural Alaska, Chapter I in part summarizes and updates information presented in the Office of Technology Assessment's 1994 report, *Alaskan Challenge: Native Village Sanitation*. That report is a comprehensive look at the sanitation situation in rural Alaska in the mid-1990s. While some things have changed since then, the OTA report provides the most recent comprehensive description of rural sanitation, and much of the basic description remains unchanged. This introductory chapter also includes current information from the Alaska Department of Environmental Conservation's Village Safe Water (VSW) program and from the Alaska Native Tribal Health Consortium (ANTHC), as reported in the *Alaska Legislative Digest*, Local Supplement, March 31, 2000.

Chapter II. Financing Water and Sewer O&M in Rural Alaska, by Mike Black and Athena Logan of the Rural Utility Business Advisor (RUBA) program of the Alaska Department of Community and Economic Development. Chapter II was originally published by the Alaska Water and Wastewater Management Association. It discusses findings from the RUBA program's 1999 survey of small rural villages about utility management and financing sanitation services. It specifically looks at small utilities'

financial management philosophies and trends in the way communities manage and finance their sanitation services.

Chapter II. Addendum, by Amy Wiita, research associate at ISER. For this addendum, ISER did some additional analysis of the RUBA survey data, presenting the results in a number of graphics.

Chapter III. Comparative Financial Analysis, is excerpted from the *Business and Financial Plan* of Too'gha Inc., by Rocky Wilson of WW&G Consultants. The entire business plan was developed to estimate sanitation operating costs for Too'gha Inc., which operates the sanitation system in Tanana. The portion we excerpted is a comparative financial analysis of operating costs for eight similarly operated utilities in other rural communities. It presents survey findings and briefly discusses the trends and similarities found.

Chapter IV. A Fiscal Case Study of the Water and Sanitation Systems in Nulato and Tanana, by Steven Campbell, associate professor of accounting at the University of Alaska Anchorage. Chapter IV looks at how the communities of Nulato and Tanana maintain accounting records, whether their sanitation systems are breaking even, and what factors affect the profitability of the systems.

Chapter IV Addendum, by John Fisher, a rural utility business advisor. This is a brief commentary on Steven Campbell's fiscal case study. It also discusses ways to help small communities improve their sanitation systems, based on Mr. Fisher's broad experience in working with small sanitation utilities.

Chapter V. Cost Evaluation of Closed-Haul Systems, by Charles Woodlee, who was an intern with the U.S. Public Health Service when he wrote this evaluation for the Office of Environmental Health and Engineering of the Yukon-Kuskokwim Health Corporation in 1999. He is now an environmental health specialist with the Public Health Service. The chapter is a cost evaluation of the flush tank and haul, pump and haul, and microflush systems serving the Yukon-Kuskokwim Delta communities of Mekoryuk, Quinhagak, and Tuntutuliak. The author made some revisions for this volume.

Chapter VI. Cost Analysis of Selected Flush-Haul Water and Wastewater Systems in Rural Alaska, by Steve Colt, term assistant professor of economics with the Institute of Social and Economic Research. He originally prepared this paper for the Alaska Native Health Board. It estimates and compares the O&M costs of flush-haul systems in six small rural communities.

Chapter VII. Existing and Potential Local Contributions to Safe Water Projects, by Steve Colt (author of Chapter VI) and Alexandra Hill, a research associate at ISER. This work was originally prepared for the Alaska Department of Environmental Conservation. It discusses the contributions small communities already are or could potentially make to the costs of sanitation projects. Those include labor and land local communities

contribute to project construction, cash contributions they could potentially make, and local payment of operations and maintenance costs.

Chapter VIII. Local Utilities Matching Program (LUMP): Northwest Arctic Borough Demonstration Project, prepared by the Northwest Arctic Borough and the Alaska Department of Environmental Conservation. This paper reports on a joint pilot program funded in the early 1990s by the Alaska Department of Environmental Conservation and administered by the Northwest Arctic Borough. The pilot program in a number of villages in the Northwest Arctic Borough was aimed at finding ways of helping small communities improve operation and maintenance of their sanitation systems.

Chapter IX. Summary and Conclusions, by Sharman Haley, assistant professor of public policy at ISER. This final chapter summarizes the findings of the analyses presented in earlier chapters and draws conclusions about the ability of small communities to pay for operating and maintaining their own sanitation systems. It then looks at ways public policy could be altered to help communities meet O&M costs and how further research could shed more light on this important issue.

BACKGROUND[1]

What is the Problem?

Currently, about two thirds of the homes in rural Alaska have piped water and sewer systems. Honey buckets are still prevalent in many Alaskan villages. Village residents who still have to rely on honey buckets face high risks of disease, because they often have to carry their own honey buckets to disposal sites and can accidentally come into contact with the untreated waste. In 1988, more than 70 percent of all hepatitis A cases reported throughout Alaska occurred in rural villages with honey bucket systems. Many village residents also have to haul water from common water sources like community water wells or washeterias. And because they have to haul their own water, people tend to use less, and re-use it, also increasing their health risks.

The federal Indian Health Service (IHS), the Alaska Native Tribal Health Consortium (ANTHC), the State of Alaska, and the rural villages themselves are all working to improve sanitation facilities in rural Alaska. Sanitation improvements would reduce the incidence of disease and increase the general standard of living in rural communities. Federal and state funding has historically been available only for building sanitation systems. Once the systems are built, communities must operate and maintain them at their own expense. But most utilities in rural Alaska today are operating in the red.

In 1990, the average annual per capita income of residents of small rural places outside regional centers was less than half that of all Alaska residents—and we have no reason to believe that disparity has changed substantially in more recent years. This lack of cash income in rural villages poses a cyclical problem, with villages not having enough money to keep the systems properly maintained—which then leads to the need for even more

[1] This background section is based largely on information from several sources, cited fully under References at the end of the chapter.

expensive repairs and excessive outlays of money. In 1994, the Office of Technology Assessment estimated that the cost of necessary repairs to existing facilities would exceed $750 million.

Funding for Rural Sanitation

Since 1989, the federal and stage governments have spent an estimated $723 million building rural water and sewer systems in Alaska. A number of federal and state agencies are working to improve rural sanitation and water systems; they are also trying to coordinate state-federal efforts. Federal funding for constructing water and sewer systems was recently increased, so that state matching funds now generate three dollars of federal funding for every state dollar. In fiscal year 2000, approximately $82 million was allocated to water and sewer construction projects, including money not only for building but also for planning and design.

The economic base of most rural villages with fewer than 1,000 residents is very limited. It is hard for local utilities to raise enough money from the small number of customers to cover operation and maintenance (O&M) costs. In addition to customer fees, money to pay for operating and maintaining rural systems comes from a number of sources, including state revenue sharing, taxes on local residents and businesses, revenues from gaming, and tribal funds. The State of Alaska's revenues have been declining in recent years, which has meant less revenue sharing for communities—which further pinches available funds for O&M costs.

Section 302 of the Indian Health Amendments of 1992 authorized IHS to provide the villages with up to 80 percent of O&M costs. This is a potentially huge source of support for local communities. However, as far as we are able to determine, Congress has never appropriated funds for this purpose.

Technical Assistance for Communities

The Alaska Native Tribal Health Consortium (ANTHC), the Alaska Department of Environmental Conservation (DEC), and the Alaska Department of Community and Economic Development (DCED) all provide technical assistance to help rural villages operate and maintain their water and sewer systems. The Rural Utility Business Advisor (RUBA) program, which is administered by DCED and funded jointly by the State of Alaska and the federal Environmental Protection Agency, focuses primarily on improving government, financial, and managerial activities in rural communities. The Remote Maintenance Worker (RMW) program, through DEC, provides more direct help to rural communities in maintaining their water and sewer systems.

Water and sewer operators for utilities must earn state certification. This certification requirement creates an additional need for technical training. Despite the help several agencies provide, communities still struggle with a shortage of technical assistance, inadequate training, and a limited ability to find certified and trained personnel—all of which contribute to increased O&M costs.

Extra Costs of Arctic Systems

Alaska's climate and geography pose special challenges for water and sanitation engineering and for operating and maintaining systems. Gravity, pressure, or vacuum piped systems are used above ground, in areas where permafrost precludes underground systems. Pipes must be insulated and heated, and water circulated, to prevent freezing. This need to protect systems against intense cold increases their cost, by requiring boilers, circulating pumps, heat-tape, and heavily insulated, high-density polyethylene pipes that won't break if the water inside freezes and expands.

Permafrost also prevents soils from percolating, so septic systems don't work, and in some areas permafrost renders wells impractical as a source of water. In many coastal areas the groundwater is brackish. River intake systems are the most common alternative to wells, but they can't be used when water turbidity is very high, and they can be damaged by spring ice jams and floods.

Lift stations are used with gravity sewage systems where there is insufficient slope for the full run of pipe, or where the lagoon is higher than the collection main. Vacuum and pressure systems are used when there is insufficient slope for gravity to move water and sewage, or where the water and sewage must be circulated to prevent freezing. Vacuum systems use less water than pressure or gravity systems and can be constructed regardless of slope. Vacuum systems are expensive and complicated and require specialized toilets to ensure that the system functions properly. These systems place a burden on individual households to maintain the system properly and also increase the operation and maintenance costs.

Another factor that increases costs is that most rural communities are off the road system, which means that equipment, parts, and supplies typically have to be flown in, especially in the winter. State or federal agency personnel who supply technical assistance also have to come by air.

All these conditions contribute to increased complexity and cost of building and then operating and maintaining water and sewer systems in Alaska's rural communities. And as we noted earlier, the small customer base means that the high fixed costs of operations and maintenance are spread across just a few households.

Alternative Technologies

The Office of Technology Assessment noted in 1994 that less sophisticated water and sanitation systems might reduce overall system costs while still providing adequate sanitation. But the report also pointed out that federal and state agencies had not at that time provided much support for developing alternatives to conventional piped systems. Composting toilets have been tried in a few communities, but for a variety of reasons have not been successful to date.

In recent years, closed-haul systems have been built in a number of villages. Instead of moving water and sewage through pipes, these systems have holding tanks for water and

waste in individual homes. The tanks are emptied and filled as needed by vehicles that deliver water and take waste away to disposal sites.

There are two key problems with currently available closed-haul systems. The first is that these systems typically provide much less water than piped systems. Since water quantity is an important determinant of both health and quality of life, it is fair to say that closed-haul systems do not provide the same level of service that piped systems provide. The second problem with closed-haul systems is that while they cost far less than piped systems to build, they may cost *more* to operate. Therefore, while closed-haul systems probably have a lower total life cycle cost[2] than piped systems, they may actually *increase* the O&M burden local communities face. Chapters V and VI of this report provide some new data on the extent of this problem.

Village Participation and System Success

Economies in most villages rely on a combination of subsistence and cash. Many subsistence activities take place in the summer and fall. Year-round sanitation jobs may conflict with subsistence activities. Also, wages for sanitation jobs are lower than for occasional work in firefighting or construction. Village residents have to balance the importance of working during the summer—earning cash on sanitation jobs—or going hunting and fishing to get meat and fish for the winter.

The success of sanitation projects over the long run ultimately depends on the level of commitment of community leaders and residents.[3] Poor information and lack of involvement can detach local government officials and residents from O&M issues and result in a lack of leadership to resolve problems. Local residents need to be involved at all phases in the development of sanitation systems —not only to provide local expertise but to vest the community in the success of the system. ANTHC and VSW employ a phased planning and development process to provide communities time to develop a realistic strategy. Failure to involve community members in the planning, design, and construction of sanitation facilities may cost projects the leadership they need to succeed.

CONCLUSIONS

Since Alaska's oil boom days of the 1980s, government agencies have emphasized construction of facilities with little direct support for subsequent operation and maintenance. As a result, many facilities are breaking down, requiring costly repairs or replacement. Local fees, taxation, and fund-raising activities typically cannot keep up with the O&M costs, as the analyses in this volume will demonstrate. In a 1999 RUBA survey, 91 out of 134 small rural communities that charge for sanitation services reported they were not collecting enough revenue to cover O&M costs.

[2] By "total life cycle cost" we mean the sum of both the initial construction costs and the ongoing O&M costs.

[3] This is an important finding of ISER's evaluation of an O&M demonstration grant program funded in a number of rural communities by the Alaska Native Health Board. See References at the end of this chapter.

While federal, state, and local governments have made a lot of progress in bringing safe sanitation systems to rural Alaska over the past couple of decades, the problem of sustaining these systems over the long run is an ongoing and very real challenge.

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CHAPTER II.
FINANCING WATER AND SEWER O&M IN RURAL ALASKA

APRIL 2000

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Financing Water and Sewer O&M In Rural Alaska

Michael L. Black[1] and Athena J. Logan[2]

INTRODUCTION

Enormous efforts are being made to build adequate sanitation facilities for rural communities in Alaska. In State fiscal year 2000 the federal agencies along with the Department of Environmental Conservation's Village Safe Water program are receiving approximately $60 million in capital funds to provide sanitation facilities to approximately 127 rural communities. Typically these projects take years to move from initial appropriation of funds to the completed construction. Nevertheless, the pace of construction currently has 60 of these 127 villages in some stage of building. Village Safe Water estimates that by 2003, 118 villages (incorporated and unincorporated small communities) will have sanitation services serving 90% or more of the households of these communities. It is fair to say that in less than 10 years most rural communities will be operating, maintaining, managing and financing new or substantially expanded sanitation utilities. How well these new sanitation systems deliver services depends upon their ability to finance their operation and maintenance. This paper examines how small communities are financing water and sewer services. A large portion of the information included here was derived from a 1999 survey of 168 small communities in rural Alaska.

BACKGROUND

New and expanded sewer and water systems represent a major upgrade in the health of the community. They also represent a major increase in the services provided to the rural households. Up until only the past few years, most rural community governments offered their residents a very basic set of services, such as; police, fire, road maintenance, community meeting buildings, and recreation. Many of these services grew out of increased resources being provided to rural governments, both cities and tribes. State revenue sharing programs that rapidly expanded during the 1980's provided rural communities with the financial resources to provide additional services to households. Combined with increased government contracting for local community services, such as health clinic services, Village Public Safety Officers, and airport maintenance, rural communities have been expanding services to their households.

Initially, the financial responsibility of paying for services was not a problem for rural communities. State and federal pass through funds made it possible for increased services without substantial increases in local government effort to raise revenue. That changed with the decline of State oil revenues in the late 1980's. Since 1987 all Alaskan municipalities have seen over 80% of the State pass through funds disappear. Each time the State Legislature reduced municipal revenue sharing programs the city councils

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and municipal assemblies either adjusted their levels of services or found additional revenues. Today we see local governments that have eliminated or reduced local services, increased taxing efforts, and/or successfully increased non-tax revenue such as gaming or enterprise revenues. Most have done some combination of these.

FINANCING SANITATION SERVICES IN RURAL ALASKA

Who Is Responsible for Financing Sewer and Water Services in Rural Alaska?

Cities and/or tribes and less frequently boroughs and non-profit corporations established for that purpose usually assume the responsibility of managing, financing and running local sewer and water services. In rural Alaska, by far the majority of sanitation services are owned and operated by Second Class Cities.

The Rural Utility Business Advisor (RUBA) Program of the Alaska Department of Community and Economic Development conducted a recent survey of rural communities of less than 1000 population. The survey team contacted 192 communities of which 168 responded that they operated a sanitation service. Of those 168 communities, 101 were Second Class Cities; 50 were identified as tribal governments; non-profit corporations operated only 6; and, private for-profit corporations operated 2 community services.

Unless something drastically changes, the future of sanitation services in rural Alaska is tied to the well being of city and tribal governments. Sewer and water services will depend upon their abilities to finance and manage these services.

What Kinds of Sanitation Services Are Being Operated in Rural Alaska?

The types of services provided by city and tribal governments may vary from the very basic to the fully piped utilities that the larger communities of the State enjoy. The variety of systems makes classification of these service levels challenging.

The so-called honey bucket communities have a variety of approaches to sanitation. Some have essentially no system, where households are responsible for virtually everything from collection of waste to disposal. Other communities have honey bucket collection and disposal services provided to households. This service includes collection of individual honey buckets at the home. Still others have residents deposit honey bucket waste into strategically located hoppers and the utility removes the waste to a disposal site.

Water services in most of these communities are also basic. Residents go to watering points and carry water home. Some of these watering points may be associated with a washeteria. Washeterias are a combination of watering point, coin operated laundry and bathhouse. Washeterias often include, often in a separate room, a water plant where water is produced for the laundry and for distribution to households.

From this rudimentary level other community systems progressively offer higher levels of service. Ultimately it is the goal to provide delivery of water and disposal of waste through household plumbing. This may be in the form of houses with bathroom fixtures and kitchen plumbing. The distribution of water and collection of waste varies from community wide systems to service limited to a portion of the community. In the most limited case you find only the school with water and sewer service. However to

qualify as a community provided service some portion of the community's households must be served.

Distribution system types vary from haul systems to fully piped systems. Haul operations may include large volume hauls utilizing large trucks as is the case in the City of Bethel to small vehicle hauls such as seen in the City of Mekoryuk, City of Nunapitchuk and a few others in western and interior Alaska.

Community wide piped utilities serve virtually every household. The distribution system provides water to households through pipes and collects waste in the same way. The collection system uses pipes to move waste to a lagoon site. This represents the highest level of service provided by a local utility.

In 1999, our survey of communities indicated that 168 communities provided some form of sanitation service to the community. In eighty-six (86) cases a complete or limited piped water and sewer service was provided to households. The community utility in 102 cases was providing schools with water. In eighty-one (81) cases the community utility provided only water to some or all households and in twenty-seven (27) the utility provided only sewer service to some or all the households. The utility organizations provided in forty-three (43) cases, honey bucket collection and disposal to some or all households in the community. Haul services for water and sewer were provided in 15 cases to some households. Finally, ninety (90) communities reported that they operated a washeteria. Most communities operate some combination of these systems.

What Are the Current Financial Management Philosophies and Practices of Rural Sanitation Systems?

The assumption that rural communities are capable and willing to finance the operations, maintenance and replacement of sanitation systems has for a long time been questioned. The government agencies responsible for improving rural health through construction of sanitation systems have recognized that the replacement of the plant and equipment is usually beyond a rural community's financial ability. A more recently asked question is what is the local capacity to manage and finance the operation and maintenance of sanitation services. This question leads to the related question of how are communities currently managing and financing their sanitation services.

A recently completed business plan for the Too'gha Water and Sewer Utility provides some interesting information. Too'gha is a water and sewer non-profit utility established to provide sanitation services for the residents of the City of Tanana. As part of their early planning they, in conjunction with the Village Safe Water Program in DEC, commissioned a business plan. WW&G Consultants, a business and accounting consultant in Fairbanks, developed the business plan. The consultants surveyed nine interior communities providing piped water and sewer on their financial practices and information. Through a combination of field examinations and telephone surveys they pieced together an interesting picture of how these communities finance their sanitation services.

The results of their analysis indicated that:

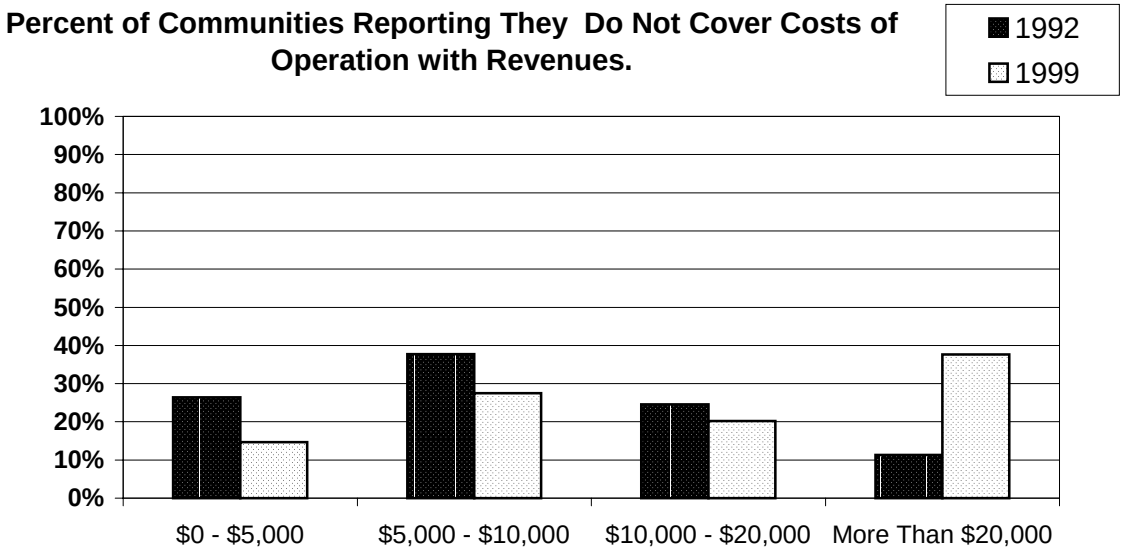
- Payroll for labor amounted to almost half the costs of the systems;
- Funds for O&M are limited; funds for expansion are very competitive but are available;
- Management's perspective towards the fee structure appears to predominately influence the size of the fee;

- Greatest collection problems exist in the community with the lowest fees; and,
- Good management, good record keeping and reporting and trained personnel add up to a well run utility.

The bottom line in most of the utilities examined was that they lost money in their operation. None of the utilities established a reserve to rebuild aging facilities. It appeared to the consultants that the price of the utility service could not support the costs of running the utility.

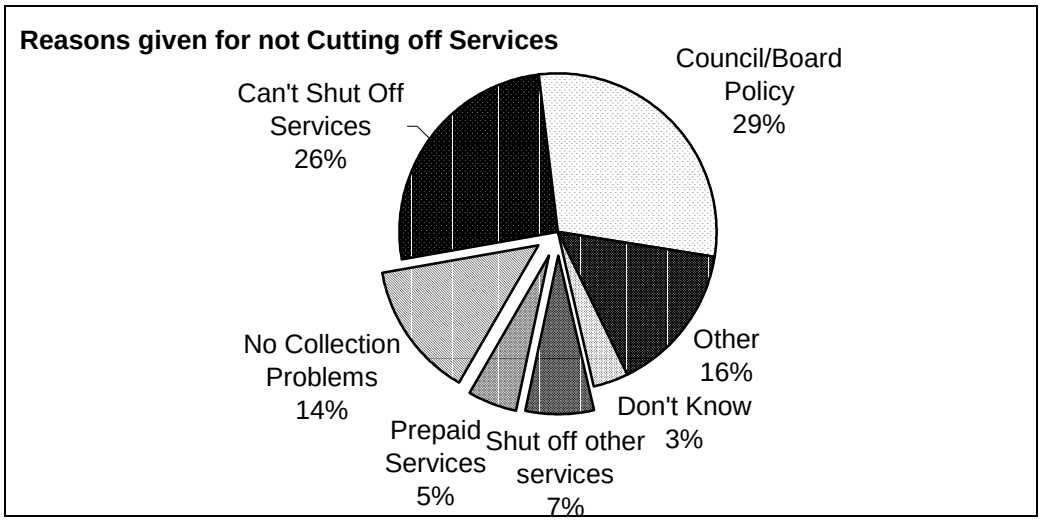
Our survey of communities statewide generally supports the consultant's observations. Ninety-one (91) of the 168 community utilities contacted indicated that they do not collect enough revenue to cover the costs of the service they offer. This represents 64% of the utilities that charge for their services.

The magnitude of the loss for these services was substantial. In 1999, thirty-seven percent (37%) of the sanitation utilities operating in the surveyed communities reported losses in excess of $20,000. As the chart below shows, the 1999 data compared to data collected in a similar survey in 1992 shows an increase in communities that were spending more than revenues by more than $20,000.



The reasons that fees do not cover costs are varied. One clue is how often rates are actually adjusted to reflect costs. In our survey only sixty-one (61) utilities or forty-seven percent (47%) of those surveyed indicated that they review or adjust fees on a regular basis. Many of them have never adjusted their fees since the utility was created.

Another indication of a management problem is the philosophy adopted regarding collection of fees. Only fifty-eight percent (58%) of those communities who charge customers reported that they attempt to collect past due accounts. One collection policy that is widely used by larger utilities is to cut off services when customers are late with payments. In the RUBA survey fifty-seven percent (57%) of the small utilities who answered this question said they had never cut off services for late payments. These sixty (60) communities gave a variety of reasons for not cutting off services, which were categorized and charted as seen on the pie chart below:



The exploded pie slices represent the communities that are not cutting off services because they have solved their collection problems some other way.

Communities that responded that it was not the "policy of the council" to cut off service (29% of those that do not cut off service) gave some reasons for their answer. Those reasons are listed below:

Council/Board Policy

No authority given by City Council.
Procedures not established.
Council/Board Policy to Keep On
Not enforced
Small town, attempt to collect, council directive taking some to small claims court
Talked about but not enforced.
Council/Board Policy to Keep On
Council has finally decided to enforce
"We're a community, not a city."
Won't discontinue service because of health hazard.
Don't Want To
Don't want to penalize elders & children
Due to health, sanitation reasons
Not politically correct—not culturally acceptable.

The communities that indicated "Other" reasons for not disconnecting non-paying customers gave the following explanations:

Other

Brand new system
Difficult to do
Just learning.
No piped w/s to shut off
Concerns regarding legality of shut-offs
Have negotiated repayment plans.
Community members have access to keys to turn back on.
We use a collection agency

There are some important philosophical issues listed here including the importance of health, elders and children to the community. Also noted are the small town and cultural issues.

The survey results appear to support observations made in the Toog'ha business plan. The consultants for Toog'ha identified the major financial problem faced by these

utilities as the attitude of the policy-making board. Their main objective was to keep the costs at a low amount to avoid having to raise fees for the customers. There are numerous reasons for this attitude, including the following:

- Belief that community residents cannot afford any increases
- Political ramification of small town politics (physical proximity to constituents)
- Cultural bias for community harmony
- Utility Customers are the friends and family of the policy makers.

The inclination of the policy-making bodies overseeing rural utilities to sacrifice the financial health of the utility to avoid increased financial demands upon their customers is expected. It is of increasing concern, however, as we construct more sophisticated systems whose operation and maintenance demand more attention and resources.

Other indicators that the financial practices of small utilities need to improve if they are to support increased sanitation services are found in our survey. The survey indicated that only thirty-seven percent (37%) of the utilities that charge for services have service contracts and agreements with their customers. Twenty-seven percent (27%) of the community utilities surveyed indicated they do not have budgets for the current fiscal year. In our survey, one-hundred and ten (110) utilities or sixty-seven percent (67%) stated they do not save any money for equipment replacement. Forty-four (44) communities, representing twenty-seven percent (27%) of those with utilities, indicated that they have long-term debt problems. Most of these debts had to do with payroll tax liabilities, unpaid vendor bills for such things as heating fuel, and overdue insurance premiums.

<u>Is there evidence of improving trends in the way communities manage and finance sanitation services?</u>

There is some evidence that community operated sanitation utilities are improving their financial picture. For example, some communities have augmented their household user fees with other funds to keep the utility operational while keeping down costs to the customer. Because most utilities are operated by governmental entities, subsidies are available from general fund revenues and other enterprise funds. The more common sources are federal and state pass-through operating funds and revenue sharing monies, revenues from gaming operations, and “profits” from other enterprises such as electric utilities and cable television.

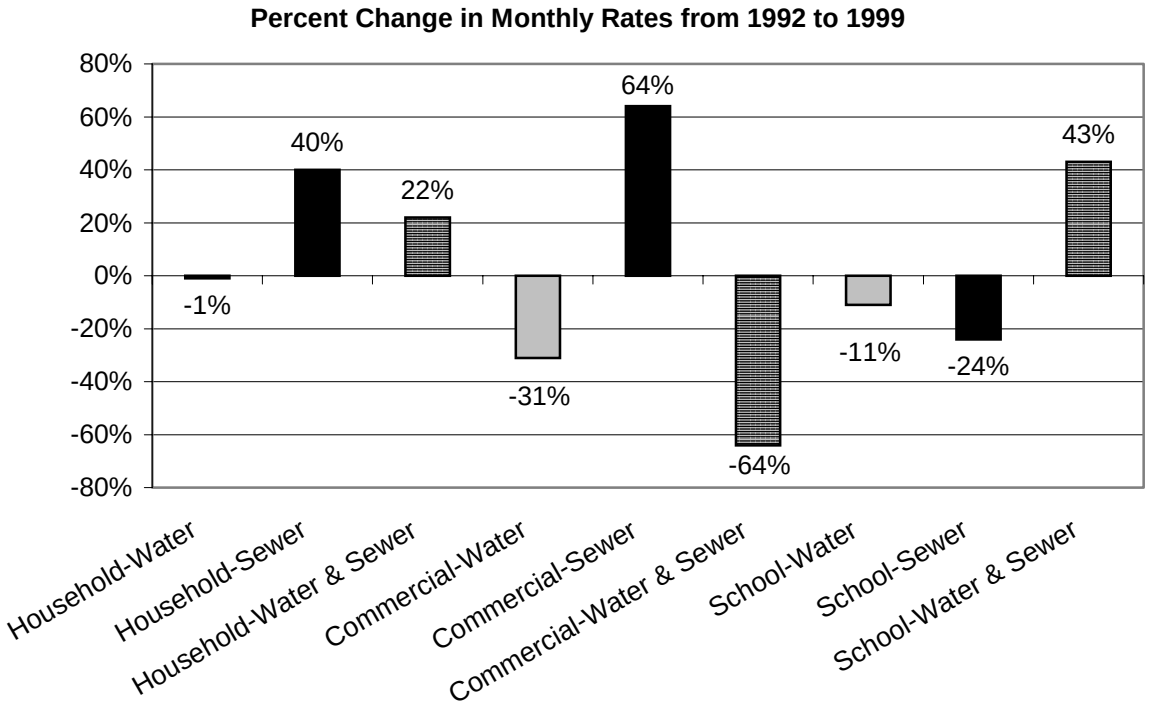
As rural communities receive improved or expanded sanitation services, councils are examining their ability to increase their subsidies to the utility. The loss of State revenue sharing funds to communities have been somewhat offset by increased federal funds to communities such as Payments In Lieu of Taxes (PILT), National Forest Receipts and temporary funds such as Fishing Disaster Assistance funds.

Some communities are increasing efforts at taxation. Most of these communities have relied upon increased sales taxes to help support services such as sanitation. Sales tax increases have often accompanied the building of sanitation systems. These taxes help offset what otherwise would be substantial increases in household user fees. In 1992

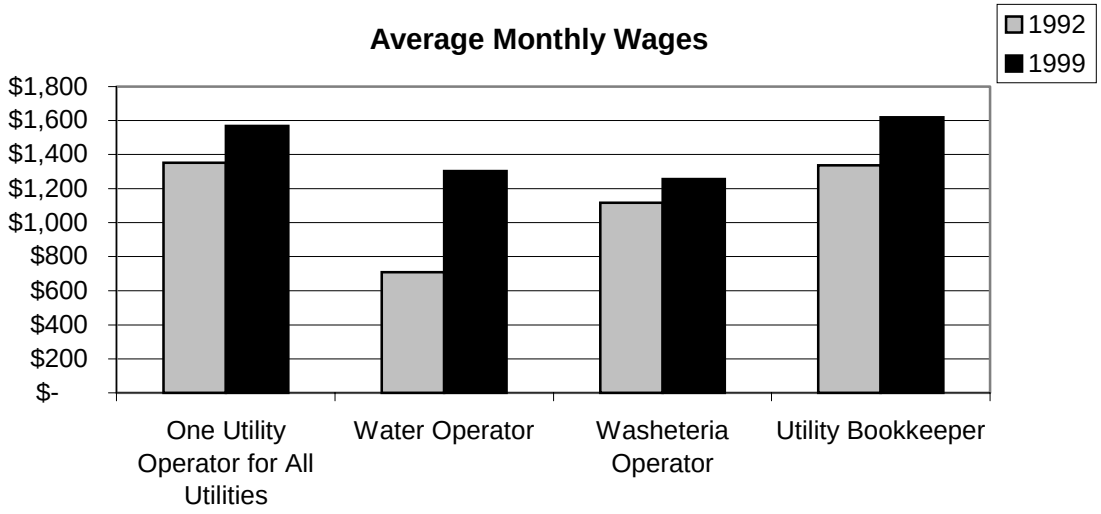
seventy-eight (78) cities levied sales taxes compared with ninety-eight (98) cities in 1999. On average, these cities levy a 3.25% sales tax to help generate revenue.

Efforts to raise local revenue contributions for service delivery have not been limited only to taxes. Small cities and tribes are often relying upon gaming operations to subsidize funds. The numbers of gaming licenses in small communities have increased in recent years.

This is not to say that the utilities have exclusively relied upon general fund subsidies to cover the costs. Utility rates have been adjusted in some of the communities. Even though the inclination of small community policy-making bodies is to avoid household rate increases, average rates have increased in most categories of consumers since 1992. The rate increases have occurred most frequently where major construction and improvements in the level of services have occurred. This should be expected since the construction agencies have emphasized in recent years the need to have a self-supporting utility.



There is evidence that the revenue generation efforts of communities have improved the operation of their sanitation utilities since 1992. The average monthly wages for utility personnel have increased, for example. The greatest wage increases have occurred for utility operators. A combination of additional work hours and hourly pay rate resulted in this increase.



SUMMARY AND CONCLUSION

The future of public heath in rural Alaska is tied to the ability of rural communities to deliver services. Without proper operation and maintenance of the newly built sanitation systems, the promise that the honey bucket will be in the museum will be short lived. The city and tribal governments of small communities are always struggling to provide more or maintain existing services to their residents and members. These governments have to adapt to the challenging role of becoming a utility provider as well as their more traditional roles. New financial management techniques and business type philosophies will need to be adopted if they are to be successful.

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CHAPTER II. ADDENDUM
SUPPLEMENTAL ANALYSIS
OF RUBA SURVEY DATA

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SEPTEMBER 2000

ABOUT THIS ANALYSIS

This analysis is based on the results of the 1999 Rural Utilities Advisor Program community survey and on the community profile database of Department of Community and Economic Development (DCED). When the RUBA data was unclear, we used the DCED database to determine the level of service provided to certain communities. From the RUBA survey we analyzed whether a community charges for services; whether fees are flat, metered, or per haul; the number of customers per type of service; the number of customers more than 90 days behind in payments by type of service; whether a community enforces the collection of past due accounts; whether revenues cover water and sewer costs; and if not, how much additional revenue is needed.

For this analysis, we coded a new variable—"level of sanitation service"—as follows:

- Piped—communities providing both piped water and sewer or only piped sewer service to households
- Flush Haul—communities providing flush haul service to households
- Honey Bucket Haul—communities providing honey bucket haul service to households
- Water Only and Other—communities providing only piped water, sewage pumping services for septic tanks, a sewage lagoon, or a washeteria for the community
- No Service—Communities providing no water or sewer services

We coded each community with only one level of service. When a community showed evidence of multiple service levels, we generally chose the highest level of service provided to households.

We conducted a regression analysis to look at whether the number of customers, collection rates, or monthly fees varied with the amount of deficit per customer. We found no statistically significant relationships. We did find weak evidence that the amount of deficit per customer declined—as expected—with an increase in collection rates, number of customers, and monthly fees. The data are not precise and complete enough for robust analysis.

This is a first cut analysis of this data and does not attempt to explain all the relationships between collection rates, levels of service, and numbers of customers. This analysis in fact may pose more questions than it answers—indicating the need to gather more specific data on financial and other issues.

DATA CONCERNS

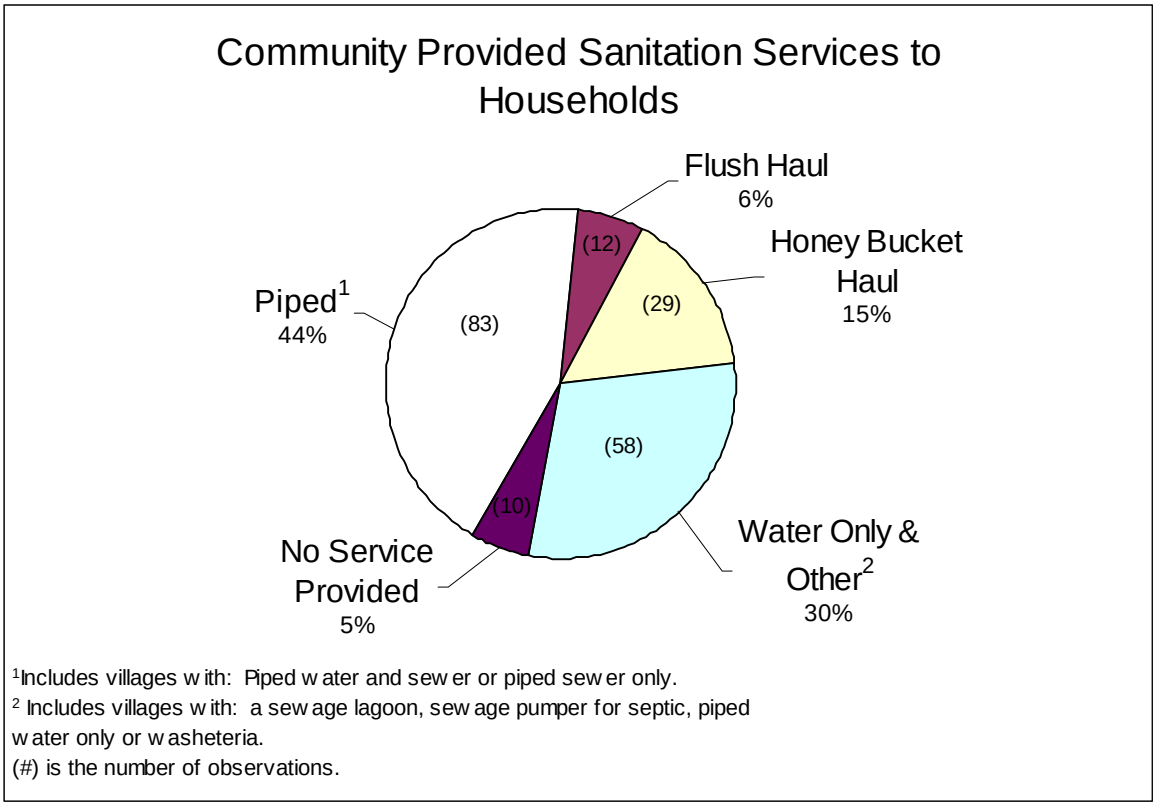
We identified several concerns while working with the RUBA data. First, the data are limited by the knowledge the person being interviewed had about their community's utility system. We don't know what just effect that may have had on the results. It is possible that respondents who had less knowledge about their systems may not have provided complete answers to as many questions and may therefore be underrepresented.

DCED did not code missing survey data as missing data. So we don't know whether data that indicated zero customers behind in payments actually represented a community with no delinquent customers or if the question was not answered. For this analysis, we recoded this data as missing data—which may lead to under-representation of any communities with poor record keeping that did not answer these questions and had many delinquent customers. This would bias the results of the collection rate analysis.

Certain ambiguities arose with the meaning of the questions asked in the RUBA survey and the context of the answers given. Also, inconsistencies between the survey form and the data set exist. It is unclear if two of the categories of services provided were "other water" and "other sewer" or "only water" and "only sewer." And for this analysis, we interpreted "honey bucket service" to mean honey bucket haul service provided by the community, not honey bucket self-haul by residents. It is not clear if this distinction was maintained throughout the data collection process.

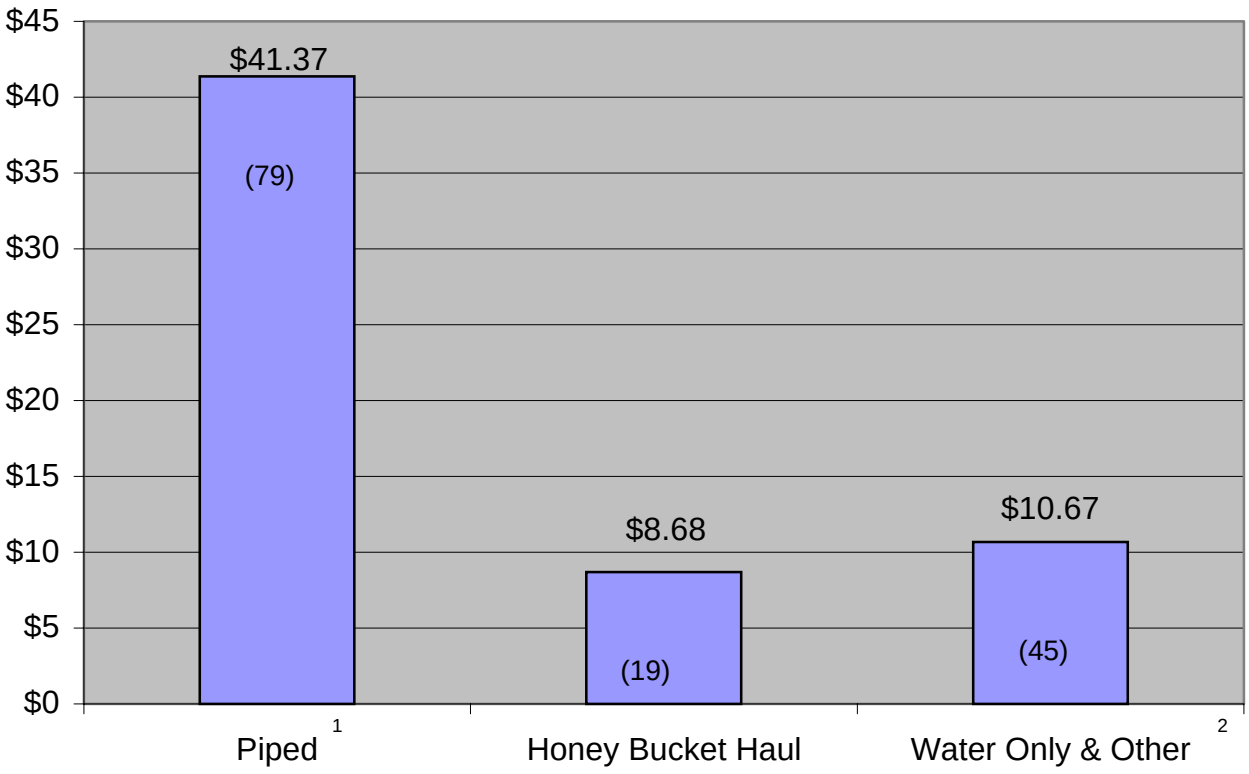
The answers to the question "Do revenues cover water and sewer costs?" are not well defined. It is unclear whether the revenues considered were only revenues communities received from water and sewer fee collection, or if the respondents also included other revenue sources—such as bingo proceeds—that some communities use to supplement customer fees. It is also unknown what unit of time is associated with the question about the amount of revenue needed to cover operating costs. Is the amount respondents reported the amount needed per month, per billing cycle, per year, or the total to bring the system out of accumulated debt?

Despite these uncertainties, the survey yields very useful information about the finances of rural utilities.



- Half the surveyed communities provide piped sewer or flush haul service to homes
- One in three communities provide limited service—including only water, a sewage lagoon, a sewage pumper for septic tanks, or a washeteria
- One in six communities provide only honey bucket haul service

Note that we are reporting here only services that community utilities provide. Individual houses that aren't served by community utilities may have septic tanks or pit privies, or haul their own honey buckets to disposal areas.



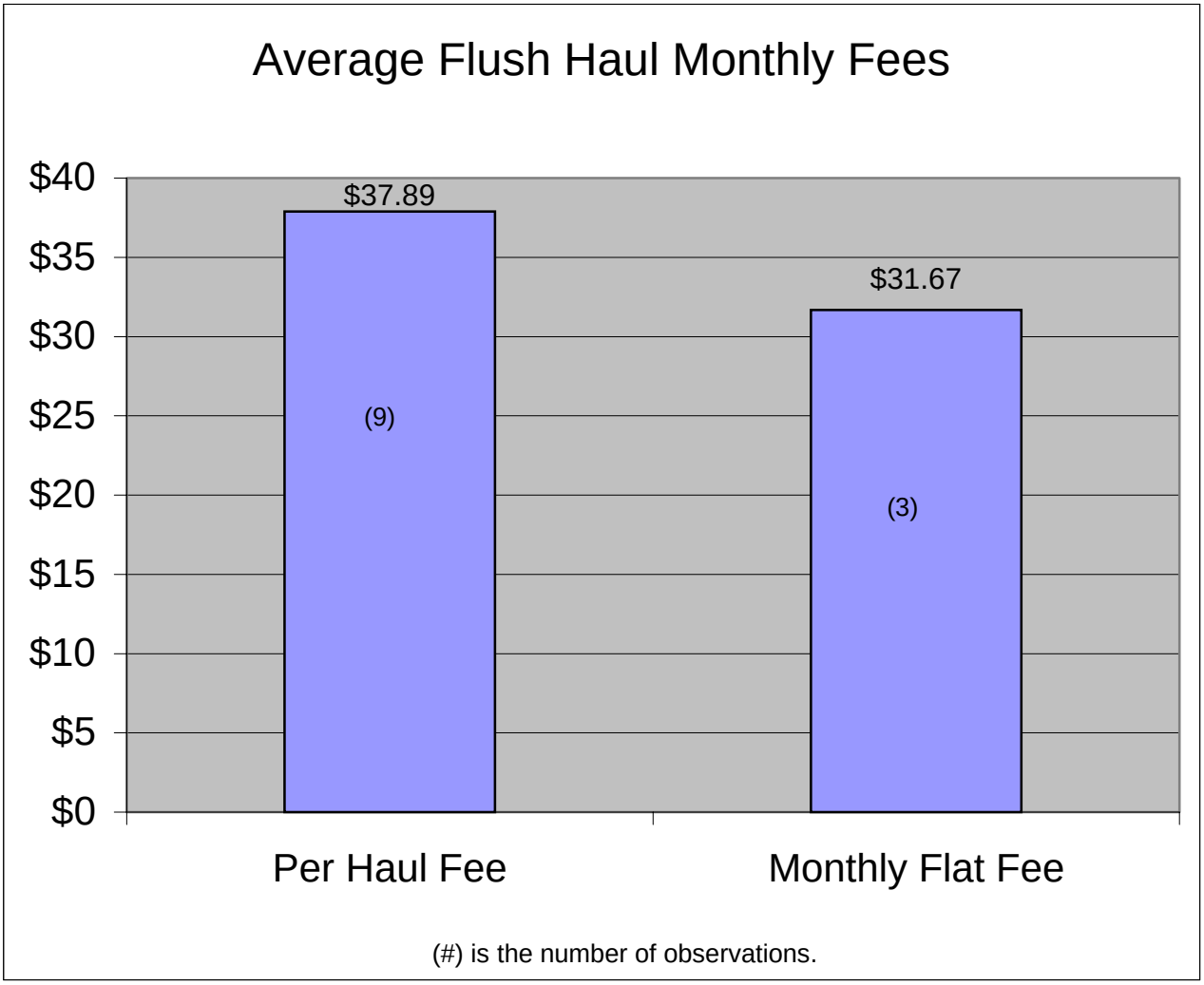
*Does not include communities with per haul or metered only rates.

[1]Includes villages with: Piped water and sewer or piped sewer only.

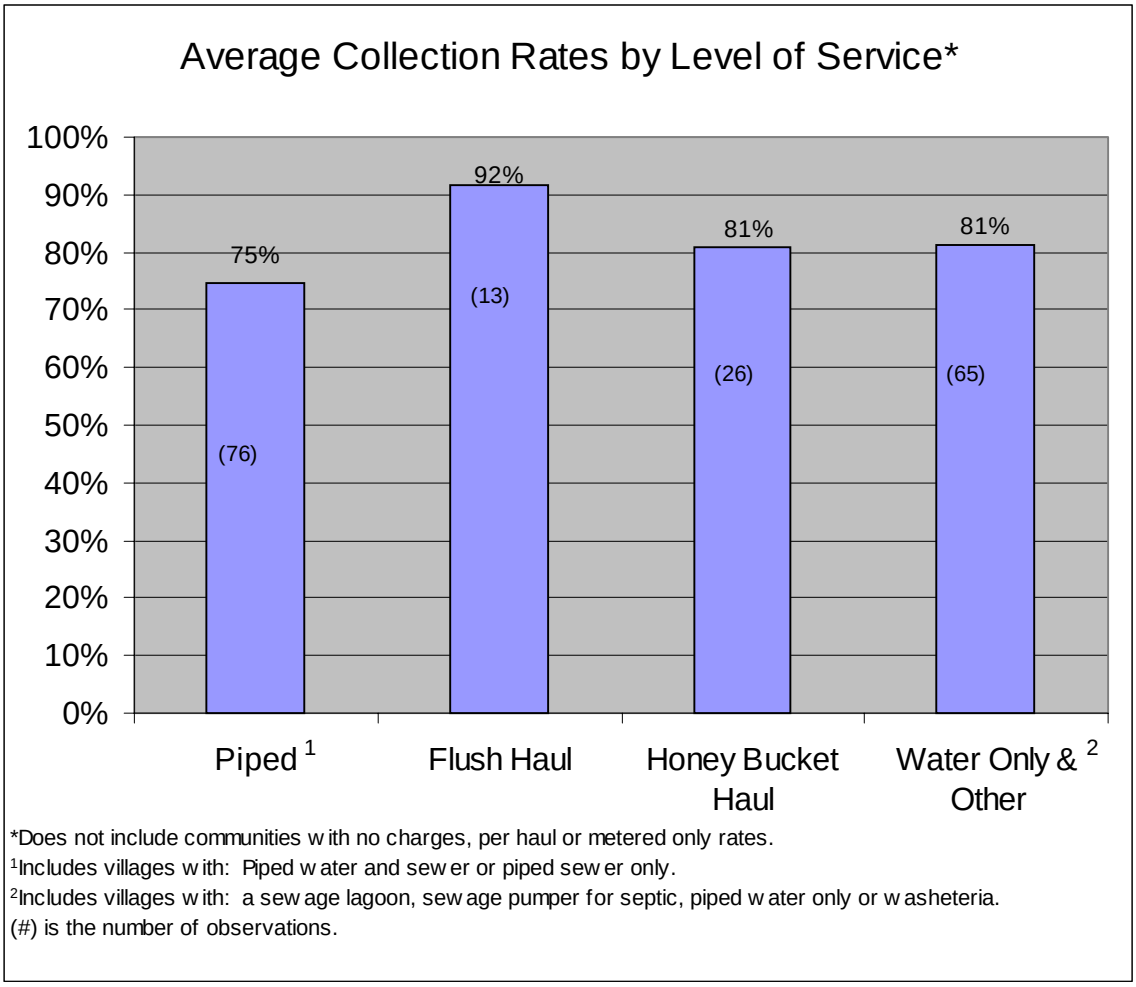
[2]Includes villages with: a sewage lagoon, sewage pumper for septic, piped water only or washeteria.

(#) is the number of observations.

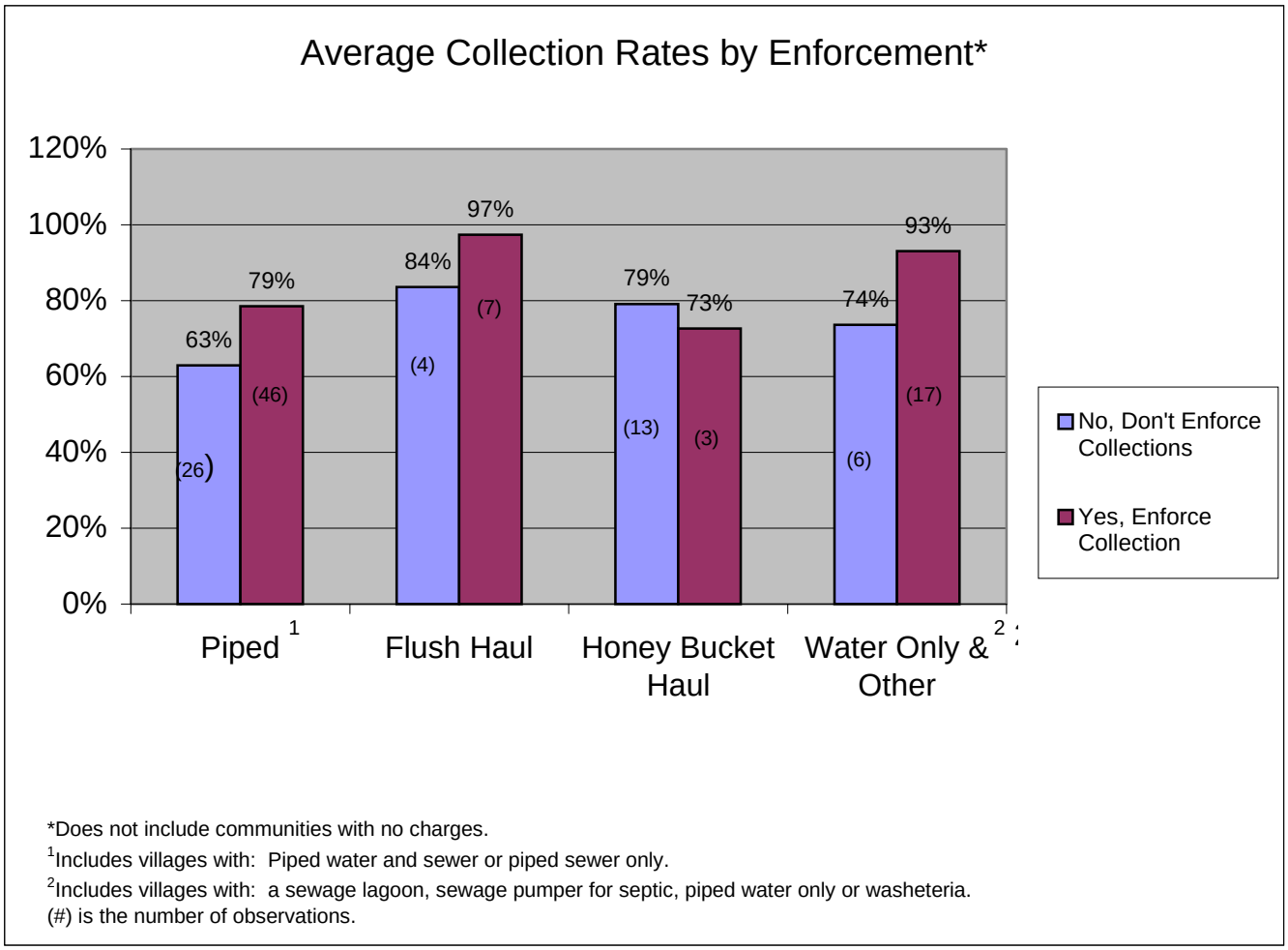
- Communities charge the most (as we would expect) for piped service and the least for honey-bucket haul, but fees for "other services" like sewage lagoons or washeterias are not much higher than for honey-bucket haul.
- Piped service fees are over four times as much as honey-bucket haul fees.
- Flush-haul fees are not included on the graph, because so few flush-haul systems charge flat monthly fees; most charge per haul.



- Per haul fees appear to be higher than monthly flat fees for flush-haul services, but the sample of communities with monthly flat fees is only three. The difference between per haul and flat fees would be larger for customers who require more than one haul per month.
- Flush-haul monthly fees are lower than monthly fees for piped service but higher than for honey-bucket haul or other services.



- At least three in four customers across all services pay their sanitation bills, varying from a collection rate of 75 percent for piped services to a high of 92 percent for flush-haul services.



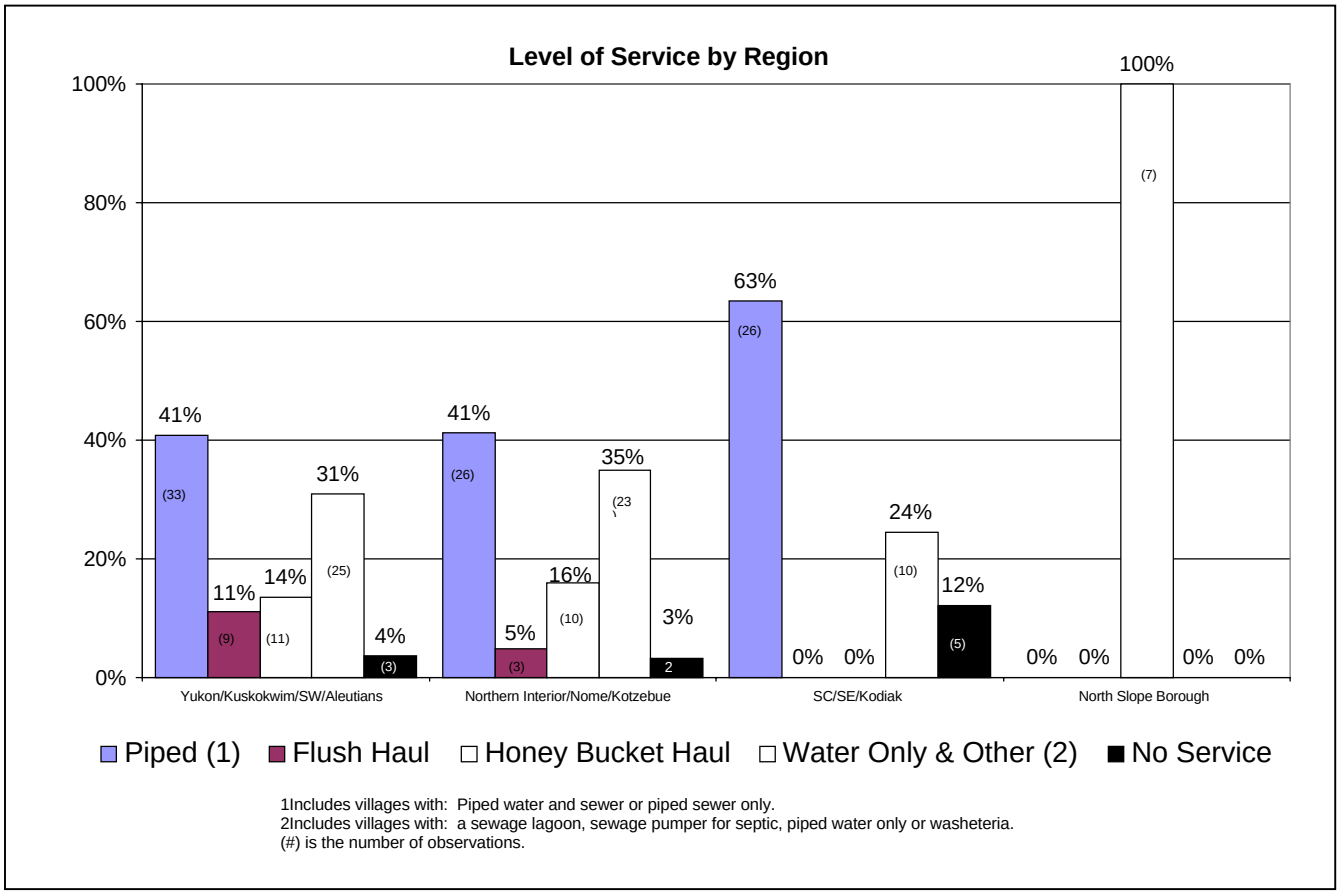
*Does not include communities with no charges.

[1]Includes villages with: Piped water and sewer or piped sewer only.

[2]Includes villages with: a sewage lagoon, sewage pumper for septic, piped water only or washeteria.

(#) is the number of observations.

- Communities providing piped service that do not enforce collections have the lowest average collection rate, at 63 percent.
- Flush-haul service has the highest collection rates, both when collection is enforced (97 percent) and when it is not (84 percent).
- Collection enforcement increases collection rates on average by 14 percent for all levels of service and by 16 percent for piped, flush haul and other collectively.



1Includes villages with: Piped water and sewer or piped sewer only.
2Includes villages with: a sewage lagoon, sewage pumper for septic, piped water only or washeteria.
(#) is the number of observations.

- Communities RUBA surveyed in the North Slope Borough provide only honey-bucket service.
- The most common type of service in the South Central/Southeast and Kodiak regions is piped; no communities in those regions have honey bucket service.
- In the Yukon/Kuskokwim/South West and the Northern Interior/Nome/Kotzebue regions, services provided vary widely, with 41 percent of communities providing piped service; one quarter providing some limited service like a community water source or washeteria; and more than 10 percent providing honey-bucket haul.

CHAPTER III.
COMPARATIVE FINANCIAL ANALYSIS
SECTION 2 OF TOO'GHA BUSINESS AND FINANCIAL PLAN

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OCTOBER 1998

PREPARED FOR
TOO'GHA INC. (TANANA, ALASKA)
AND
ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
VILLAGE SAFE WATER

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Comparative Financial Analysis of Other Rural Communities

Introduction

In order to develop estimated costs for Too'gha's operating budget a survey was conducted of similarly operated utilities. Our survey included the nine interior communities of Fort Yukon, Huslia, Kaltag, McGrath, Minto, Nenana, North Pole, Nulato and Tanacross. North Pole was not included on the original list, but was added because of the number of years of prior experience we have with this community's financial operations.

Not all communities elected to participate in the survey. Minto declined, and Kaltag was not able to participate because of schedule conflicts. A telephone survey was conducted at McGrath. All other communities were visited.

The larger communities of Fort Yukon, McGrath, Nenana and North Pole were able to provide us with audited financial information and this information proved to be more complete than the financial information we obtained from the smaller communities of Huslia, Kaltag, Nulato and Tanacross. Of the information obtained from the four smaller communities, Huslia's was the most complete and accurate. We used the financial information off the state's web site for Kaltag. We visited Nulato and were only able to obtain current financial information on computer disk., and this information is included as well. Tanacross had recently set up their computer and were entering their financial information. Although the information was not available at the time of our site visit, we subsequently received this information and it is incorporated into our financial survey.

The purpose of the site visit was to view the operations and management, inspect the utility system, obtain financial information and meet with management to discuss this information. The site visits and face to face meetings with management and other personnel were invaluable when analyzing the financial information of the utilities. Not being able to travel to Kaltag and McGrath diminished our reliance on their financial information because of our inability to view their operations, management and the utility systems.

There are common denominators in our financial analysis. One is that there are six main categories of cost. We grouped the cost of each utility into the six main categories for comparison and analysis.

Each utility was analyzed separately and selected information was included on the financial summary for all communities.

We used North Pole as a control to confirm information and trends in the selected communities. For example, the six major cost categories observed in the selected communities were present in the North Pole analysis.

It is also important to note at this time that cost trends found in the smaller communities were also present in the larger ones. For example, payroll consistently represented almost half of all costs in all utilities. Nenana shows up outside this trend because allocated administrative payroll costs were not included in the payroll category because the dollar amount was not available.

The Too'gha operating budget was developed taking into consideration expected costs associated with a normal utility operation. The information developed from the comparative community financial study and analysis was used to assist in the preparation of Too'gha's operating budget.

Community Profile

Community	Tanana	Fort Yukon	Huslia	Kaltag	McGrath
Population	293	562	250	232	450
Customers	-	240	61	Unknown	176
User fees	-	$79	$50	Unknown	$40
Average Income*	$17,000	$17,969	$13,333	$15,500	$36,250
Unemployment*	21.8%	27.4%	38.5%	24.1%	9.9%
Owner of Utility	Municipal	Municipal	Municipal	Village Council	Municipal
Age of System(years)		15	20+	new	6--14
Number of employees		2 full time	1 part time	Unknown	2 part time
Type of water system		piped	piped	piped	piped/hauled
Type of sewer system		hauled	piped	piped	piped/other
Subsidised?	Yes	Yes	Yes	Unknown	Yes
Profit (Loss)	$6,944	($25,923)	($11,503)	($21,154)	($17,992)

Community	Nenana	North Pole	Nulato	Tanacross
Population	449	1,523	365	75
Customers	149	350	70	22
User fees	$56	$50	$115	None
Average Income*	$27,292	$32,937	$17,143	$14,750
Unemployment*	17.3%	10.3%	25.7%	35.3%
Owner of Utility	Municipal	Municipal	Municipal	Village Council
Age of System(years)	20	20+	new	26
Number of employees	2 full time	3 full time	2 part time	1 part time
Type of water system	piped	piped	piped	piped
Type of sewer system	piped	piped	piped	cluster
Subsidies	Yes	Yes	Yes	Yes
Profit (Loss)	$64,303	($17,419)	($8,698)	($16,202)

* Average household income and Unemployment rate taken from Alaska Department of Community & Regional Affairs' Community Database.

Community Financial Analysis

Description	Tanana	Fort Yukon	Huslia	Kaltag	McGrath	Nenana	NorthPole	Nulato	Tanacross	**Average**
Income	$91,320	$122,389	$38,610	$13,830	$215,295	$216,791	$394,191	$117,259	$0	$53,494
Expenses										
Salaries	52,780	75,950	27,230	17,273	118,060	60,788	210,958	35,657	5,588	32,366
Maintenance	11,970	9,474	2,880	0	35,749	9,860	35,115	45,439	3,850	7,509
Insurance	0	11,053	4,500	0	8,957	3,546	39,270	0	0	4,902
Electricity	6,701	25,959	3,216	3,447	22,624	19,669	83,018	18,714	3,321	6,883
Fuel	8,701	14,840	10,939	7,311	28,313	11,143	23,892	23,581	1,690	7,789
All Other	4,224	11,036	1,348	6,953	19,584	39,589	19,357	2,566	1,753	4,794
Land Fill	0	0	0	0	0	7,893	0	0	0	0
Total Exp	$84,376	$148,312	$50,113	$34,984	$233,287	$152,488	$411,610	$125,957	$16,202	$61,230
Inc(Loss)	$6,944	($25,923)	($11,503)	($21,154)	($17,992)	$64,303	($17,419)	($8,698)	($16,202)	($7,736)
Cost as a % of total cost										
Salaries	35.59%	51.21%	54.34%	49.37%	50.61%	39.86%	51.25%	28.31%	34.49%	52.86%
Maint	14.19%	6.39%	5.75%	0.00%	15.32%	6.47%	8.53%	36.08%	23.76%	10.90%
Insurance	0.00%	7.45%	8.98%	0.00%	3.84%	2.33%	9.54%	0.00%	0.00%	4.45%
Electricity	7.94%	17.50%	6.42%	9.85%	9.70%	12.90%	20.17%	14.86%	20.50%	11.24%
Fuel	10.31%	10.01%	21.83%	20.90%	12.14%	7.31%	5.80%	18.72%	10.43%	12.72%
All Other	5.01%	7.44%	2.69%	19.87%	8.39%	25.96%	4.70%	2.04%	10.82%	7.83%
Land fill						5.18%				
Total Exp	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
System Cost		$5,972,452	Unknown	Unknown	$6,220,234	$7,157,236	$17,755,053	$10,422,000	Unknown	$2,438,537
Revenue/ System Cost Ratio		2.05%	Unknown	Unknown	3.46%	3.03%	2.22%	1.13%	Unknown	1.10%
Cost/System Cost Ratio		2.48%	Unknown	Unknown	3.75%	2.13%	2.32%	1.21%	Unknown	1.25%

Fort Yukon

Population 562

Year analyzed	June 30, 1996
Cost Sharing	Yes
Depreciation	Yes
Metered	No
Fixed Fee	Sewer is pumped @ fixed fee
Cash Reserves	Yes
Number of Employees	2 @ full time
Site Survey	Yes
Telephone Survey	Yes
PCE	Yes
Budget	Yes

General description of utility

Fort Yukon has a piped water system and a haul sewer system serving approximately 240 residential and commercial customers. The average water and sewer fee is approximately $79 per month.

General description of accounting

The accounting for the utility is done by the city as part of the overall accounting function. We were originally not scheduled to perform a site visit but were able to accomplish this because the city selected our firm to conduct the annual audit for their fiscal year 1997.

The city has experienced turnover in its accounting personnel, and financial information has not been timely. This has caused some serious problems in the management of aspects of the utility operations, most noticeable is in the area of collections.

Presentation

This financial information was taken from the city's audited financial statements for the fiscal year ended June 30, 1996.

Revenue sources

The income sources consisted entirely of water and sewer revenues.

Other revenue

A review of the income indicates it consists of water and sewer revenues and does not include any other types of income. At least none were noted.

Cost analysis

The audited financial information was for the period ended June 30, 1996. The utility operated at a loss for that period. Labor is more than half the cost of operations. The other major cost categories are maintenance, insurance, electricity, fuel and all other categories not consisting of major cost items. Electricity and fuel oil are the second and third highest cost categories for this utility. The cost categories were arranged in good order, and we had no trouble in identifying what the line item cost consisted of.

The utility is operated by the city and therefore benefits from shared costs that can be allocated, for example payroll. The accounting function is performed by the city as part of overall operations, and therefore such costs are shared. The mayor serves as the manager of the utility. From our discussion with management there are two other individuals employed to carry out the day-to-day operations.

Labor

Payroll is a major cost item representing more than half of the total cost. There are two employees. The payroll includes an allocated portion of the city's payroll used for the manager, bookkeeper, and janitorial costs of the utility operation.

Major Cost

Electricity represents the second highest cost for this utility. In comparing this with the other utilities, it is higher but the percentage is similar to North Pole.

All other costs

There are eleven categories of costs that fell outside of the major cost items. They are computer programming, telephone, postage, office supplies, insurance, audit, freight, expediter, water tests, new water hook-ups, training and miscellaneous.

Cost sharing

The utility is operated by the city and therefore benefits from administrative costs that can be shared among the different departments, including space, employees, management, computer and bookkeeping services.

Income (loss)

This utility operated at a loss in1996. The historical operations of the city are not known; however, discussions have indicated that losses have been normal.

Profit loss discussion

The net operating loss for the year was before depreciation. The utility accounts for depreciation, and this created an additional loss.

Depreciation

Depreciation is accounted for and is reflected on the financial statement.

Reserves

The utility maintains a cash reserve for major repairs and replacement of equipment. There are few outside funds available for operations and maintenance. Management anticipates funds for expansion of the system from other sources.

Cash reserves

A review of the financial statement indicates a cash reserve is maintained. The amount for this fiscal period was $21,184. This cash reserve appears to be a positive balance in the checking account, rather than a reserve for future contingencies.

Comparison analysis

In comparison with the other utilities there are some interesting points. A loss appears to be normal. Only one utility in our survey did not present a loss. Labor represents about 50% of all cost, and all the costs fall into predictable patterns. On the average electricity is the second highest cost and this is true for Fort Yukon. In addition, Fort Yukon's electricity is higher than the average.

Philosophy

From our discussions with management the city's philosophy appears to be to operate the utility at its lowest cost and maintain fees at the lowest possible rate to keep the utility in a break even financial position. Management also wants to keep the system in good repair and upgrade and expand into areas the utility would benefit from.

The city feels an obligation to provide sewer and water services at the lowest rates while maintaining the system and expanding the service to needed areas. The city looks to outside sources of funding for expansion and major repairs and replacement.

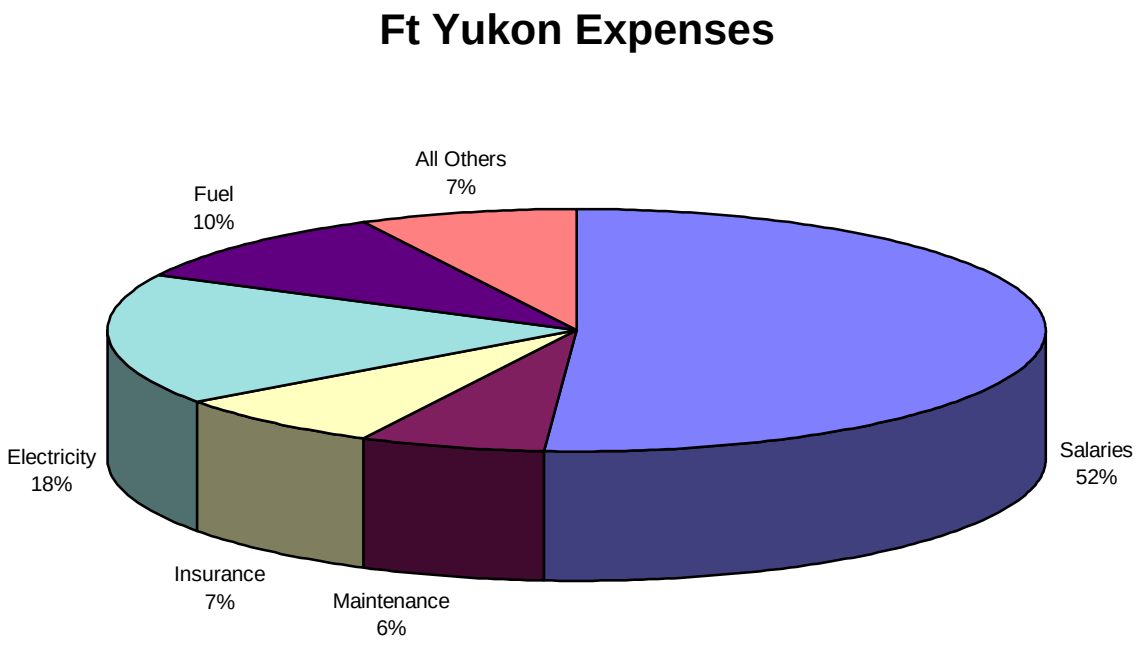
Limitations

There are some limitations in this presentation because of the one-year analysis. We are in the process of acquiring the FY95 financial information and present comparative information. Comparative year information is very helpful in any analysis. Other information we are tracking down is additional data on the hours employees are working and we are inquiring as to how losses are subsidized.

Fort Yukon

Total Customers Served	**Water**	**Sewer**	**Total**
Residential	240	240	240
Commercial	20	20	20
Total	260	260	260
User Fees	$ 28	$ 51	$ 79
System Cost per Customer	$ 11,485	$ 11,485	$ 22,970
Metered	No	No	
Annual Operating Cost per Customer	$ 570		
Age of System		15 Years	
Total Cost of Water and Sewer System		$ 5,972,452	

Description	**Income (loss) 6/30/96**	**Cost as a % of Total Cost**	**Cost & Revenue as a % of Total System Cost**	**Cost as a % of Total Revenue**
Income	$ 122,389	---	2.05%	---
Expenses				
Salaries	75,950	51.21%	1.27%	62.06%
Maintenance	9,470	6.39%	0.16%	7.74%
Insurance	11,053	7.45%	0.19%	9.03%
Electricity	25,959	17.50%	0.43%	21.21%
Fuel	14,840	10.01%	0.25%	12.13%
All Other	11,036	7.44%	0.18%	9.02%
Total Expenses	148,308	100.00%	2.48%	121.18%
Net Loss	$ (25,919)			


Ft Yukon Expenses
All Others
7%
Fuel
10%
Electricity
18%
Insurance
7%
Maintenance
6%
Salaries
52%

Huslia

Year analyzed	June 30, 1997
Cost Sharing	Yes
Depreciation	No
Metered	No
Fixed Fee	Yes
Cash Reserves	No
Number of Employees	1 @ Part Time
Site Survey	Yes
Telephone Survey	No
PCE	Yes
Budget	Unknown

General description of utility

Huslia has a piped water and sewer system serving 61 customers, a few are commercial. The water and sewer fee is $50 per month total.

General description of accounting

The accounting for the utility is done by the city. The bookkeeping is very good and consists of a manual system that generates all the needed information and reports. Second class cities in Alaska that don't meet the threshold for state or federal audits under the "Single Audit Act" are required to generate a Certified Financial Statement. The city is not required to generate audited financial information and therefore our information was obtained from internal reports for the period ended June 30, 1997.

Presentation

This financial information was taken from the city's manually prepared financial statements for the fiscal year ended June 30, 1997.

Revenues and revenue sources

From an analysis of the utility revenues there appeared to be other revenues included in the total revenues presented and therefore we made some adjustments to the amount of utility revenues generated from utility operations.

Revenue sources

Revenue consists of water and sewer user fees, and revenue from laundry washers and showers.

Other revenue

Other revenues from the city subsidize the costs of operation. This subsidy is $11,699.

Cost analysis

Labor is the largest cost and comprises more than half the cost of operations. Insurance and fuel oil consist of the second and third highest cost categories for this utility. The other major cost categories are maintenance, insurance, electricity, and fuel. Other categories are not major cost items. We had some trouble identifying what costs were for the miscellaneous costs category and made some assumptions as to the composition. All other costs appear to be well presented.

The utility is operated by the city and therefore benefits from shared general administrative costs among departments. The accounting function is a general administrative cost performed by the city and is allocated. From our discussion with management there is a part-time employee carrying out the utility's day-to-day operations.

Labor

Payroll is the major cost item representing more than half of the total cost. There is one part time employee. Other payroll costs represent an allocated portion of the city's payroll for manager, bookkeeper, etc.

Major cost

Fuel represents the second highest cost for this utility. Bulk fuel is shipped by barge and its purchase is closely coordinated during the fall months with the availability of funds. To minimize the cost of fuel it must be purchased and shipped before freeze up.

All other cost

Line item cost categories could not be identified as they were not broken out.

Cost sharing

The utility is operated by the city and therefore benefits from costs shared among the different departments. Examples of such costs are space, employees, management and bookkeeping services.

Profit loss discussion

From our analysis the utility was operated at a loss in 1997. The historical operations of the city are not known.

Depreciation

The utility does not account for depreciation, which if accounted for would create an additional loss.

Cash reserves

Since we were not provided with a balance sheet it was difficult to determine if a cash-reserve for major repairs and replacement of equipment is maintained. However, from our discussions we presume there is no cash reserve. Management indicated there are few outside funds available for operations and maintenance and anticipated funds for expansion from other sources.

Comparison analysis

Payroll is the largest cost item with fuel the second major cost item. This cost item is higher than average. Huslia's other major cost items are somewhat out of line with the averages suggesting that the cost groupings are not entirely correct. The payroll cost, although higher than the average, is very much in line with the patterns for this cost item.

Philosophy

From our discussions with management, the city's philosophy appears to be to operate the utility at the lowest cost and maintain fees at the lowest possible rate to keep the utility in a break even financial position before consideration of depreciation. Management did express concern that fees should increase to cover needed repairs and maintenance. There was some reluctance to increase fees because it was felt customers could not afford the increased rate. Management wants to keep the system in good repair and upgrade and expand into areas beneficial to the utility.

The city presented a strong belief that everyone should pay for the service. Management's philosophy in regards to collections was "if the utility fees are not paid then we will shut off your service." Their attitude in this area appears to be very explicit.

Limitations

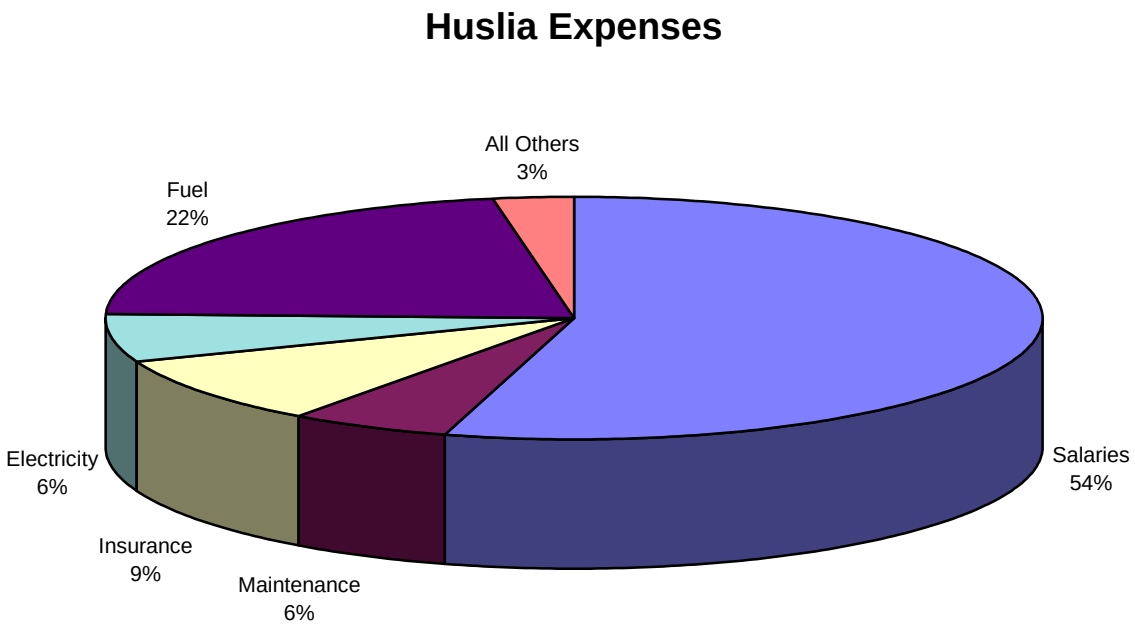
There are two major limitations in this analysis. One is that only one year of financial data was studied. The other is the source of the financial information. In reviewing the certified financial statement for fiscal year 1996 we noticed that it did not appear to contain any information regarding the operation of the utility. A break down of the miscellaneous cost items is needed and the cost groupings need to be further scrutinized. In addition, information needs to be obtained on how is the loss is subsidized and what has been the historical profit and losses?

Huslia

Total Customers Served	**Water**	**Sewer**	**Total**
Residential	61	61	61
Commercial	---	---	---
Total	61	61	61
User Fees	$ 25	$ 25	$ 50
System Cost per Customer	Unknown	Unknown	Unknown
Metered	No	No	
Annual Operating Cost per Customer	$ 822		
Annual Revenue per Customer	$ 633		

Age of System	20 + Years
Total Cost of Water and Sewer System	Unknown

Description	**Income (loss) 6/30/96**	**Cost as a % of Total Cost**	**Cost & Revenue as a % of Total System Cost**	**Cost as a % of Total Revenue**
Income	$ 38,610	---	Unknown	---
Expenses				
Salaries	27,230	54.34%		70.53%
Maintenance	2,880	5.75%		7.46%
Insurance	4,500	8.98%		11.66%
Electricity	3,216	6.42%		8.33%
Fuel	10,939	21.83%		28.33%
All Other	1,348	2.69%		3.49%
Total Expenses	50,113	100.00%	Unknown	129.79%
Net Loss	$ (11,503)			


Huslia Expenses
All Others
3%
Fuel
22%
Electricity
6%
Insurance
9%
Maintenance
6%
Salaries
54%

Kaltag

Year analyzed	June 30, 1996
Cost Sharing	Unknown
Depreciation	Unknown
Metered	Unknown
Fixed Fee	Unknown
Cash Reserves	Unknown
Number of Employees	Unknown
Site Survey	No
Telephone Survey	No
PCE	Unknown
Budget	Unknown

General description of utility

Kaltag has a piped water sewer system serving approximately 75 residential and commercial customers. Since neither a site visit nor a telephone conference was conducted very little is known about the utility's operations, management, financial condition or its philosophy regarding utility operations.

General description of accounting

Kaltag is not required to produce audited financial reports and the information we surveyed was acquired from the internal certified financial statements for the period ended June 30, 1996. Kaltag recently underwent federal single audit for grant projects.

Presentation

This information was taken from the certified financial statements filed with Department of Community and Regional Affairs. The information was not well grouped and presented difficulties in classification.

Revenue sources

Unknown, assumed to be water and sewer user fees.

Cost analysis

Labor is the largest cost and is more than half the cost of operations. Electricity and fuel oil were the second and third highest cost categories for this utility. The cost categories were not arranged in good order, and we were unable to identify maintenance and insurance expenses.

Cost sharing

Information on cost sharing was not available. It was presumed the same type of cost sharing exists with this utility as with other city run utilities.

Profit loss discussion

The utility operated at a net operating loss for the year.

Depreciation

Unknown, we assume it is similar to other villages we have surveyed, that is, the utility does not account for depreciation expense, which would create an additional loss.

Cash reserves

The financial information we reviewed did not indicate, and we were not able to determine, if cash-reserves for major repairs and replacement of equipment was maintained.

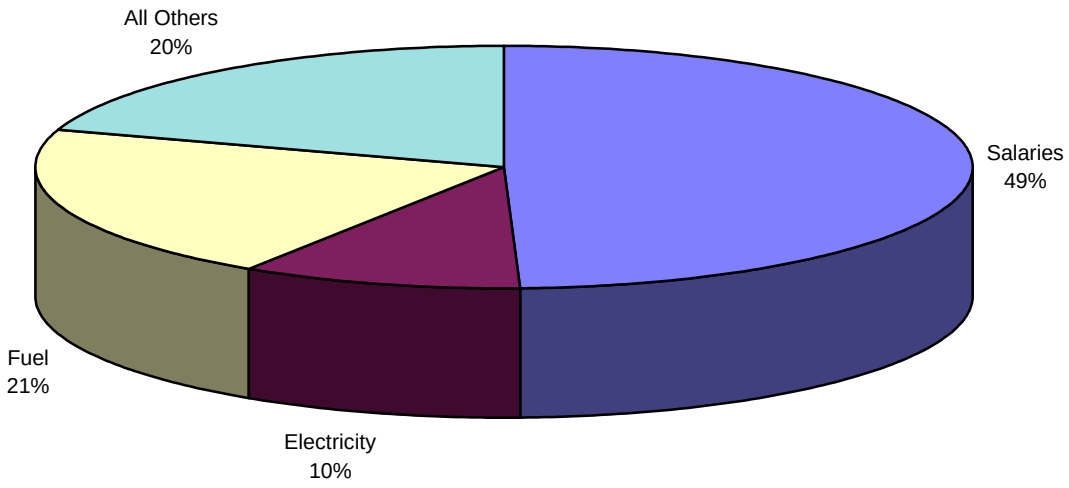
Limitations

This presentation was taken from internal certified financial statements, and neither a site visit nor telephone conference was conducted. Consequently, there is very little known about the utilities operations, management and philosophy.

Kaltag

Total Customers Served	**Water**	**Sewer**	**Total**
Residential	63	63	63
Commercial	12	12	12
Total	75	75	75
User Fees	Unknown	Unknown	Unknown
System Cost per Customer	Unknown	Unknown	Unknown
Metered	Unknown		
Annual Operating Cost per Customer	$ 555		
Annual Revenue per customer	$ 220		
Age of System		Unknown	
Total Cost of Water and Sewer System		Unknown	

Description	**Income (loss) 6/30/96**	**Cost as a % of Total Cost**	**Cost & Revenue as a % of Total System Cost**	**Cost as a % of Total Revenue**
Income	$ 13,830	---	Unknown	---
Expenses				
Salaries	17,273	49.37%		124.90%
Maintenance	0			0%
Insurance	0			0%
Electricity	3,447	9.85%		24.92%
Fuel	7,311	20.90%		52.86%
All Other	6,953	19.87%		50.27%
Total Expenses	34,984	100.00%	Unknown	252.96%
Net Loss	$ (21,154)			


Kaltag Expense
All Others
20%
Salaries
49%
Fuel
21%
Electricity
10%

McGrath

Year analyzed	June 30, 1996
Cost Sharing	Yes
Depreciation	Yes
Metered	Yes
Fixed Fee	No
Cash Reserves	Yes
Number of Employees	2 @ Part Time
Site Survey	No
Telephone Survey	Yes
PCE	Yes
Budget	Yes

General description of utility

McGrath has a piped water and sewer system serving 176 residential and commercial customers. The average water and sewer fee is $40 per month. The commercial users help to offset the total cost of operations.

General description of accounting

The accounting for the utility is done by the city as part of the overall accounting function. We were not scheduled to perform a site visit. A telephone survey was conducted regarding the operations, management and audited financial information of the city.

The audited financial information surveyed was for the period ended June 30, 1996, and the utility operated at a loss for that period.

Presentation

This information was extracted from the city's certified audit reports.

Revenues and revenue sources

It appears that the only revenue source included in income is from water, sewer and laundromat operations. An analysis of the utility revenues revealed that no significant other revenues were included to subsidize the utility operations. However, it is interesting to note that the laundromat revenues comprised only 8% of the total revenues.

Cost analysis

Labor is the largest cost item and totals more than half the cost of operations. Maintenance and fuel oil are the second and third highest cost categories for this utility with electricity coming in fourth. Management described some major repairs performed during this period. We assume this is the reason maintenance is not in line with other utilities. Maintenance costs compared to maintenance costs in previous periods, the maintenance cost is substantially higher in the period surveyed. Generally the cost categories were arranged in good order, and we had no trouble identifying what each line item cost consisted of.

The utility is operated by the city and therefore benefits from shared costs that can be shared, for example payroll. The accounting function is also performed by the city as part of the overall operations and therefore these cost can be allocated. The mayor also serves as the manager of the utility. From our discussion with management, there are two other part-time individuals employed to carry out the utility's day-to-day operations.

Labor

The 1996 cost is half the total. The cost is very comparable to the previous year in dollar amount but less than the percentage amount. There are two part time employees, and the utility also benefits from shared labor normal with a city run utility.

Major costs

All of the costs were easily grouped into the comparison categories. Maintenance was this utility's second highest cost. The mayor commented that the utility had performed some major repairs during the 1996 fiscal year. In comparing this cost item with the previous year we can see the decrease in repairs and maintenance and how it affects the percentages.

All other cost

There are ten categories of costs that fell outside the major cost items. These are chemicals, lease, bad debts, samples and testing, telephone, office and library, Mayoral stipend, permit fees, training and other.

Cost sharing

The city runs the utility and therefore it benefits from the city being able to share costs among different city departments.

Income (loss)

An operating loss was generated in this period, and it is not known if this is historical. Nor how the loss was subsidized. A review of the previous year also indicates a loss.

Depreciation

The utility accounts for depreciation, and this created an additional loss.

Cash reserves

Reserve amounts for 1995 and 1996 could not be determined from the financial data presented. Further analysis indicates this reserve has a positive cash balance and is not a reserve earmarked for major repairs and maintenance. Very few outside funds are available for operations. The city anticipates funds for expansion to come from other sources. Discussion with management indicates that periodically the utility does acquire outside sources of funds to perform needed repairs and maintenance.

Comparison analysis

The payroll cost for both years is very much in line with the averages. Also the number of employees is comparable. Maintenance costs go up and down depending on the type and frequency of repairs. The repair percentage for fiscal year 1996 is greater than the average, and fiscal year 1995 was less than the average. In other words, maintenance costs vary greatly from year to year depending upon equipment breakdown and freeze-ups. There is no pattern.

Philosophy

The philosophy of this utility appears to be similar to that of other communities surveyed: To operate the utility at its lowest cost and expand into areas that need service. Management apparently does not believe the customer base will support the utility and believes that user fees must be kept artificially low - below the breakeven point. Management also anticipates that funds for expansion, major repairs, and replacements will come from outside sources.

The city's philosophy appears to be to operate the utility at the lowest cost and maintain fees at the lowest possible rate. This is an attempt to keep the utility in a break even financial position without considering depreciation. Management also wants to keep the system in good repair and upgrade and expand into areas not served. A majority of the funds for expansion would come from outside sources with possible matching funds coming from the utility or the City of McGrath.

Limitations

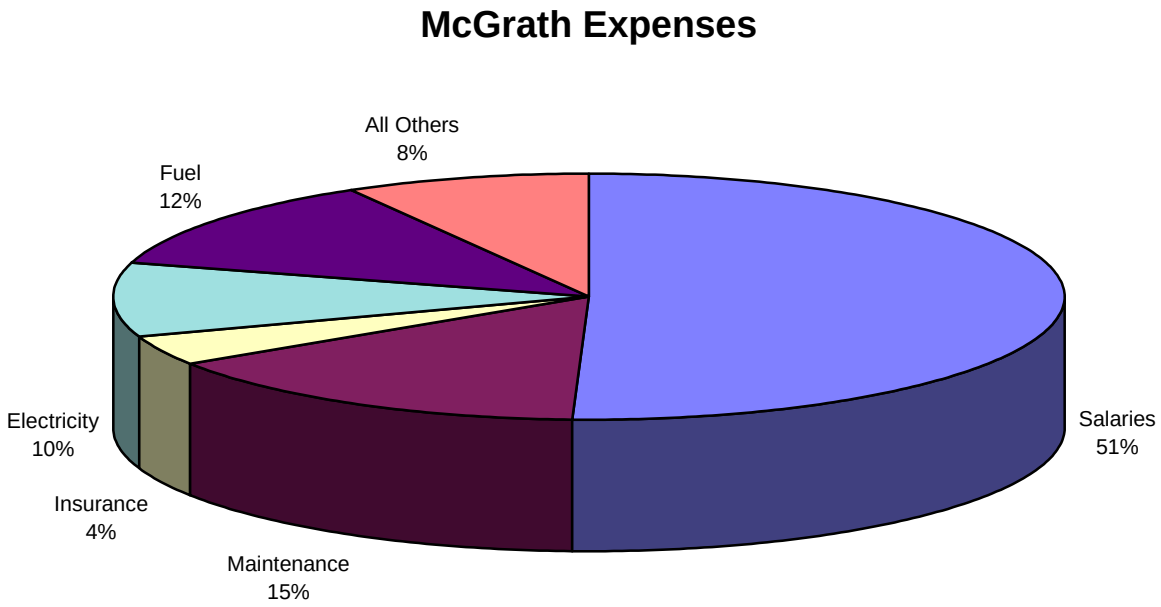
The only limitation to this analysis is that we did not visit the site. The financial information was in very good order, and data was presented for more than one year.

McGrath

Total Customers Served	**Water**	**Sewer**	**Total**
Residential	175	175	175
Commercial	12	12	12
Total	187	187	187
User Fees	$ 20	$ 20	$ 40
System Cost per Customer			$ 33,263
Annual Operating Cost per Customer	$ 1,248		
Annual Revenue per Customer	$ 1,151		

Age of System	6-14 years
Total Cost of Water and Sewer System	$6,220,234

Description	**Income (loss) 6/30/96**	**Cost as a % of Total Cost**	**Cost & Revenue as a % of Total System Cost**	**Cost as a % of Total Revenue**
Income	$ 215,295	---	3.46%	---
Expenses				
Salaries	118,060	50.61%	1.90%	54.84%
Maintenance	35,749	15.32%	0.57%	16.60%
Insurance	8,957	3.84%	0.14%	4.16%
Electricity	22,624	9.70%	0.36%	10.51%
Fuel	28,313	12.14%	0.46%	13.15%
All Other	19,584	8.39%	0.31%	9.10%
Total Expenses	233,287	100.00%	3.75%	108.36%
Net Loss	$ (17,992)			


McGrath Expenses
All Others
8%
Fuel
12%
Electricity
10%
Insurance
4%
Maintenance
15%
Salaries
51%

Nenana

Year analyzed	June 30, 1996
Cost Sharing	Yes
Depreciation	Yes
Metered	Commercial
Fixed Fee	No
Cash Reserves	Yes
Number of Employees	2
Site Survey	Yes
Telephone Survey	No
PCE	No
Budget	Yes

General description of utility

Nenana has a piped water and sewer system serving 149 residential and commercial customers. The average water and sewer fee is $56 per month.

General description of accounting

The audited financial information surveyed was for the period ending June 30, 1997. The utility operated at a profit for that period. Accounting for the utility is prepared by the city as part of its overall management function. During our site visit we talked extensively with management and accounting personnel regarding the operations, management and the financial condition of the utility. Management took us on a tour of the utility plant explaining the various aspects of the system and its operations. Without a doubt this utility is very well managed.

Presentation

This financial information was obtained from the city's audited financial reports.

Revenue sources

This utility is located along a major highway and has several commercial customers who help offset the cost of the system. Water and sewer revenues are the major sources of income. Landfill revenues were included in the total revenues of approximately $50,000. The exact amount was not known.

Cost analysis

Labor is a significant percentage of the total costs but less than the overall average. We attribute this to a well run utility. There were certain administration costs allocated whose composition we could not determine. We assumed these allocated administrative costs contained some payroll expenses. Other major cost categories included maintenance, insurance, electricity, fuel, and “all other” costs. Maintenance and electricity are the second and third highest costs for this utility. The cost categories were arranged in good order, and with the exception of the allocated administrative cost, and we had no trouble in identifying the contents of the line items. A further analysis reveals that repairs and maintenance were higher this year than in previous years. Averaging the years would bring the maintenance percentage into line with the other utilities and with the overall average.

The “other” cost category is higher than other comparable utilities because it includes the allocated administrative costs. It is assumed that if properly allocated this cost category would be in line with other utilities and with the overall averages.

The utility is operated by the city and therefore benefits from shared costs that can be allocated, for example payroll and accounting. The mayor serves as the manager of the utility in addition to other duties. From our discussion with management there appear to be two other individuals employed to carry out the utility’s day to day operations.

Labor

Labor for this utility appears to run below the average for all communities surveyed. The two years surveyed indicate these percentages are consistent. There are two full time operators on the payroll. This is a larger utility, and the payroll costs are beginning to increase.

Major costs

The utility's second highest cost is the all other category. The category includes allocated cost not separately stated. Also included is another category of cost the landfill not found in the other utilities surveyed. There are several categories of cost included in the "all other" category: allocated administration, telephone, supplies, accounting, auditing, travel, training, capital outlay, consulting fees, chemicals, testing, bad debts and miscellaneous.

Cost sharing

The normal cost sharing among the city departments is reflected in the financial statements.

Income (Loss)

This utility operated at a profit for both years analyzed. This is due in part to landfill revenues. If these revenues were excluded the utility would be in a loss situation.

Depreciation

The water and sewer plant is depreciated and accounted for.

Reserves

Analysis indicates a considerable cash reserve, much greater than the positive cash balance needed for working capital. It is maintained for major repairs and replacement of equipment. There are few outside funds available for operations and maintenance. Management anticipates funds for future expansion to come from other sources.

Comparison analysis

When comparing this utility with the others in the survey it should be noted that Nenana has several factors not found in remote villages. These include highway accessibility, significant commercial customers, and the addition of significant other revenues included in the income. The payroll percentages appear to be less than average, although this could change after further analysis of the allocated administrative costs.

Philosophy

The philosophy of the city in regards to operation and maintenance is similar to that of the other communities surveyed. In discussions with management the philosophy appears to be to operate the utility at the lowest cost and maintain low rates to keep the utility in a break even financial position, without considering depreciation.

Management also wants to keep the system in good repair and upgrade and expand into areas not currently served by the utility. The city takes pride in the good condition of the utility and its apparent successful financial operation.

Limitations

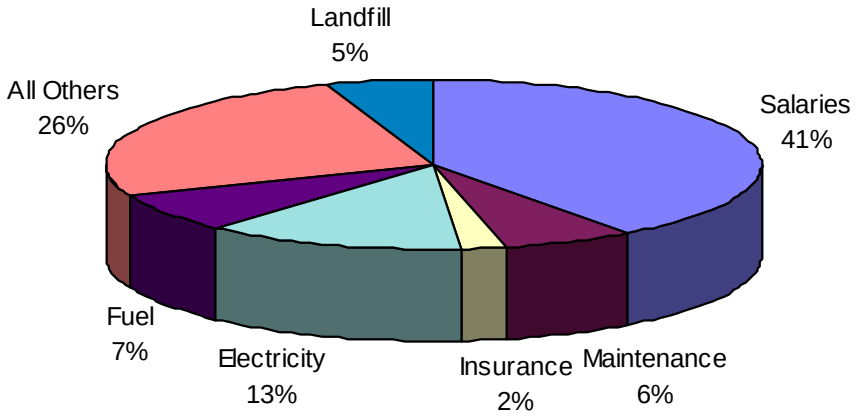
Limitations are few and minor.

Nenana

Total Customers Served	**Water**	**Sewer**	**Total**
Residential	142	142	142
Commercial	7	7	7
Total	149	149	149
User Fees	$ 28	$ 28	$ 56
System Cost per Customer			$ 48,035
Metered	Commercial Users		
Annual Operating Cost per Customer	$ 1,023		
Annual Revenue per Customer	$ 1,455		
Age of System		20	
Total Cost of Water and Sewer System		$ 7,157,236	

Description	**Income (loss) 6/30/96**	**Cost as a % of Total Cost**	**Cost & Revenue as a % of Total System Cost**	**Cost as a % of Total Revenue**
Income	$ 216,791	---	3.03%	---
Expenses				
Salaries	60,788	39.86%	0.85%	28.04%
Maintenance	9,860	6.47%	0.14%	4.45%
Insurance	3,546	2.33%	0.05%	1.64%
Electricity	19,669	12.90%	0.27%	9.07%
Fuel	11,143	7.31%	0.16%	5.14%
Landfill**	7,893	5.18%	N/A	3.64%
All Other	39,589	25.96%	0.55%	18.26%
Total Expenses	152,488	100.00%	2.13%	70.34%
Net Income	$ 64,303			

** The city operates a landfill operation as a part of the utility fund, however the landfill has no relation to the water and sewer plant or expenses.


Nenana Expenses
Landfill
5%
All Others
26%
Salaries
41%
Fuel
7%
Electricity
13%
Insurance
2%
Maintenance
6%

North Pole

Population 1,523

Year analyzed	1996
Cost Sharing	Yes
Depreciation	Yes
Metered	Yes/No
Fixed Fee	Yes/No
Cash Reserves	Yes
Number of Employees	3
Site Survey	Yes
Telephone Survey	No
PCE	No
Budget	Yes

General description of utility

North Pole has a piped water and sewer system serving approximately 350 residential and commercial customers. The average water and sewer fee is approximately $50 per month. The community of North Pole is the largest of the communities surveyed and was used to provide a control for the study because of our past involvement with its financial statements.

General description of accounting

We were able to compile and analyze audited financial information for the prior fifteen years. This helped us draw conclusions about how utility costs behave for different size utilities over a period of years.

The audited financial information presented was for the period ended June 30, 1996, and the utility operated at a loss for that period.

Presentation

The financial information was acquired from audited financial statements.

Revenues sources

The revenues consisted of charges to customers for water and sewer services. An analysis of the utility revenues confirms there were no significant subsidies of the utility operations. It is important to note this utility has several large commercial operations to help offset the cost of operations, a condition not found in rural Alaska.

Cost analysis

Labor is more than half the total cost of operations. Electricity and insurance are the second and third highest cost categories for this utility. Other major cost categories are maintenance, insurance, electricity, fuel and "all other" costs. The cost categories were arranged in good order, and we had no trouble identifying the contents of line items. Further analysis would have to be conducted to determine why this utility's electricity is higher than the average.

The utility is operated by the city and therefore benefits from shared allocated costs, such as payroll and accounting. Unlike the other utilities in the survey, this utility has a full time manager. We attribute this to the size of the utility. From our discussion with management there appear to be two additional full time employees to carry out the utility's day to day operations.

Labor

The 1996 labor percentage for North Pole is half of the total utility costs right in line with the averages for all the utilities surveyed. Selected years of financial information were compiled and analyzed going back fourteen years to 1984. Historically the labor cost was below the average, although the percentage has increased over the last four years.

Major cost

The other major costs of this utility follow the same pattern noted in the other utilities surveyed, with labor constituting half of all costs, followed by electricity. North pole pays a higher percentage of insurance than other utilities. The percentage of these costs over the fourteen years surveyed appears to be relatively stable. A noticeable swing occurs in repairs, and this is probably the result of major unscheduled repairs and freeze-ups.

All other cost

The “all other” cost category percentage was lower than the average but within the expected range. All other items include vehicle gas and oil, telephone, laboratory costs, miscellaneous and training.

Cost sharing

The utility department benefits from cost sharing among departments that exists in a city-operated utility.

Income (Loss)

Although the year 1996 resulted in a loss, there did not appear to be a consistent pattern of income or loss. The years surveyed reflected both income and losses. This utility system is the largest in the survey and is located along a major highway. It is well situated and provides service to many commercial customers.

Depreciation

The utility accounts for depreciation, and the amount is reflected on the financial statements.

Reserves

The analysis of the 1995 and 1996 financial statements reveals significant cash balances. The proposed 1998 budget shows the formal establishment of a reserve account for major repairs and replacements. There is little outside funding available for operations and maintenance. Management anticipates that at least part of the funds for future expansion will come from other sources. This utility recognizes that funds for expansion are limited and very competitive. It is anticipated that most sources of monies will require some form of matching funds from the utility, and a line item has been budgeted to accomplish this goal. This utility does not share one of the major advantages of rural Alaskan funding in that they are ineligible for VSW and PHS grants. Funding sources must be obtained through a combination of loan and other grants and usually entails a special assessment on property owners.

Comparison analysis

North Pole is considerably larger than the other utilities in the survey with a population three to five times greater than average. It is located along a major highway and serves several large commercial customers including two refineries. In this respect it is not comparable. However the utility's cost percentages are in line with others in the survey, including the labor costs which again is more than half the total.

Philosophy

The utility's philosophy is to operate the utility in a cost efficient profitable manner while providing a high quality of service to the customers and to establish sufficient cash reserves for funding major repairs and matching contributions toward future expansion projects.

Management philosophy is to maintain fees as low as possible, without considering depreciation. Management also wants to keep the system in good repair and to upgrade and expand into un-served areas. This utility believes that funds should be accumulated for major repairs and expansion.

Limitations

A detailed analysis for the most recent five-year period would provide additional useful information regarding trends and patterns.

North Pole

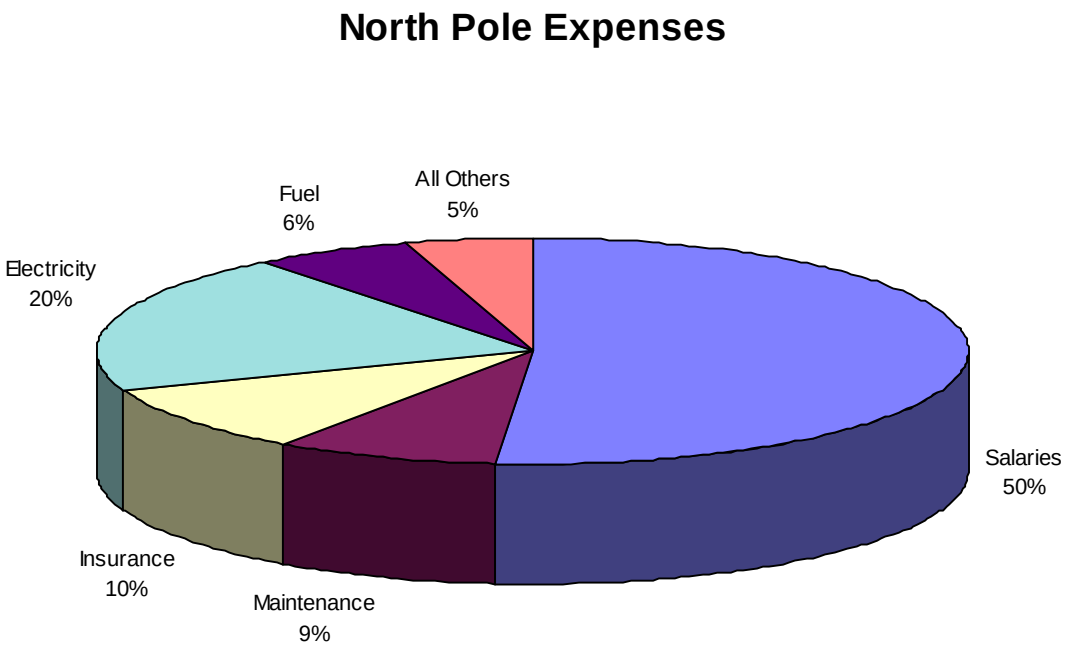
Total Customers Served	Water	Sewer	Total
Residential	215	215	215
Commercial	135	135	135
Total	350	350	350

User Fees

System Cost per Customer		$ 50,729
Annual Operating Cost per Customer	$ 1,176	
Annual Revenue per Customer	$ 1,126	

Age of System	Varies
Total Cost of Water and Sewer System	$ 17,755,053

Description	Income (loss) 6/30/96	Cost as a % of Total Cost	Cost & Revenue as a % of Total System Cost	Cost as a % of Total Revenue
Income	$ 394,191	---	2.22%	
Expenses				
Salaries	210,958	51.25%	1.19%	53.52%
Maintenance	35,115	8.53%	0.20%	8.91%
Insurance	39,270	9.54%	0.22%	9.96%
Electricity	83,018	20.17%	0.47%	21.06%
Fuel	23,892	5.80%	0.13%	6.06%
All Other	19,357	4.70%	0.11%	4.91%
Total Expenses	411,610	100.00%	2.32%	104.42%
Net Loss	$ (17,419)			


North Pole Expenses
All Others
5%
Fuel
6%
Electricity
20%
Salaries
50%
Insurance
10%
Maintenance
9%

Nulato

Year analyzed	1997
Cost Sharing	Yes
Depreciation	No
Metered	No
Fixed Fee	Yes
Cash Reserves	Unknown
Number of Employees	2@Part time
Site Survey	Yes
Telephone Survey	No
PCE	Yes
Budget	No

General description of utility

Nulato has a piped water and sewer system serving approximately 70 residential and commercial customers. The water and sewer fee is $115 per month.

General description of accounting

The accounting for the utility is done by the city as part of the overall accounting function. During our site visit we talked extensively with management and gained a great deal of information about the operations and management of the utility. However, financial information was not available. We were able to obtain computer disk containing financial information and we are in the process of extracting this information.

There were however some financial observation we were able to make from our site visit.

Revenues and revenue sources

Revenues are from water and sewer user fees and laundromat income.

Cost analysis

The utility is operated by the city and therefore benefits from shared costs that can be allocated, for example payroll and accounting. The city treasurer serves as the manager of the utility. From our discussion with management there appear to be two additional employees to carry out the utility's day to day operations.

The utility does not account for depreciation.

Philosophy

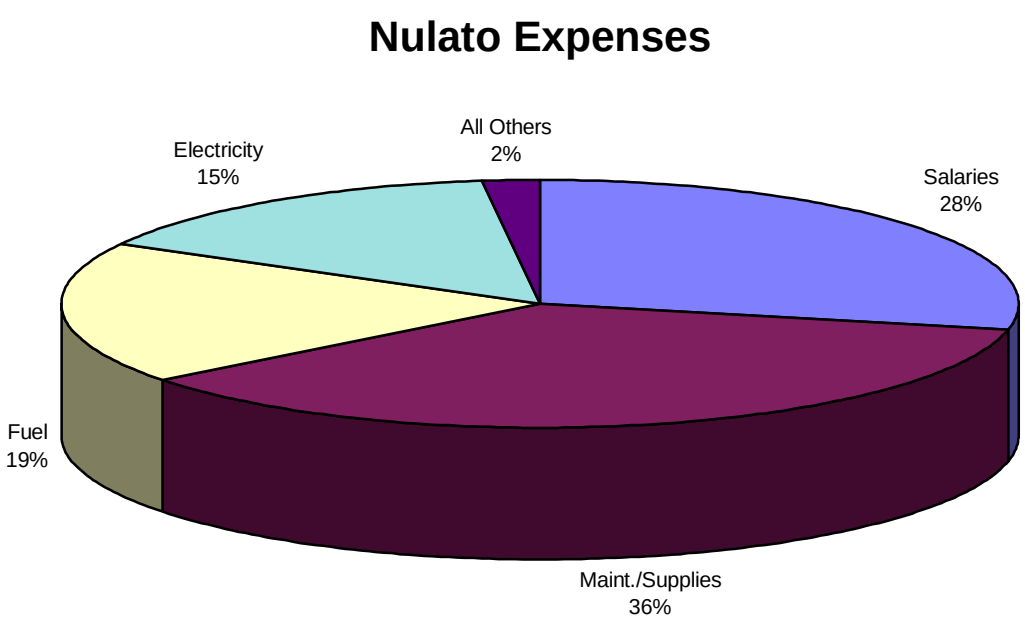
From our discussions with management, the philosophy appears to be to operate the utility and maintain fees at the lowest possible cost in order to keep the utility in a break even financial position, without considering depreciation. Management also wants to keep the system in good repair and to upgrade and expand into areas without service. The Nulato utility fees are the highest in this study. Management believes the customers can pay these fees and that they are necessary to maintain a break even financial position.

Nulato

Total Customers Served	Water	Sewer	Total
Residential	70	70	70
Commercial	0	0	0
Total	70	70	70
User Fees			115
System Cost per Customer			$ 148,886
Annual Operating Cost per Customer	$ 1,799		
Annual Revenue per Customer	$ 1,675		

Age of System	Varies
Total Cost of Water and Sewer System	$ 10,422,000

Description	Income (loss) 6/30/96	Cost as a % of Total Cost	Cost & Revenue as a % of Total System Cost	Cost as a % of Total Revenue
Income	$ 117,259	---	1.13%	
Expenses				
Salaries	35657	28.31%	0.34%	30.41%
Maintenance	45,439	36.08%	0.44%	38.75%
Insurance	0	0.00%	0.00%	0.00%
Electricity	18,714	14.86%	0.18%	15.96%
Fuel	23,581	18.72%	0.23%	20.11%
All Other	2,566	2.04%	0.02%	2.19%
Total Expenses	125,957	100.00%	0.48%	121.18
Net Loss	$ (8,698)			


Nulato Expenses
All Others
2%
Electricity
15%
Salaries
28%
Fuel
19%
Maint./Supplies
36%

Tanacross

Year analyzed	June 30, 1997
Cost Sharing	Yes
Depreciation	No
Metered	No
Fixed Fee	Yes
Cash Reserves	No
Number of Employees	1 @ Part Time
Site Survey	Yes
Telephone Survey	No
PCE	Yes
Budget	Unknown

General description of utility

Tanacross has a very old piped water and cluster septic sewer system serving 22 residential customers. There are no commercial users, and the school is on its own private system. There are no charges for water and sewer fees. However, the community is in the design phase of a new piped water and sewer system, and customer fees will be charged with the operation of the new system.

General description of accounting

The accounting for the utility is done by the tribal council as part of its overall accounting function. During our site visit we talked extensively with management and gained a great deal of information regarding the operation and management of the utility.

Financial information was not available. There were however some financial observations we were able to make from our site visit.

Revenues and revenue sources

There are no revenue sources for the utility, since all costs of providing sewer and water are absorbed by the tribal council.

Cost analysis

Presently part time personnel keep the system functional. However, the design of the new system will require a larger payroll to keep the system operational.

Profit loss discussion

Not applicable.

Philosophy

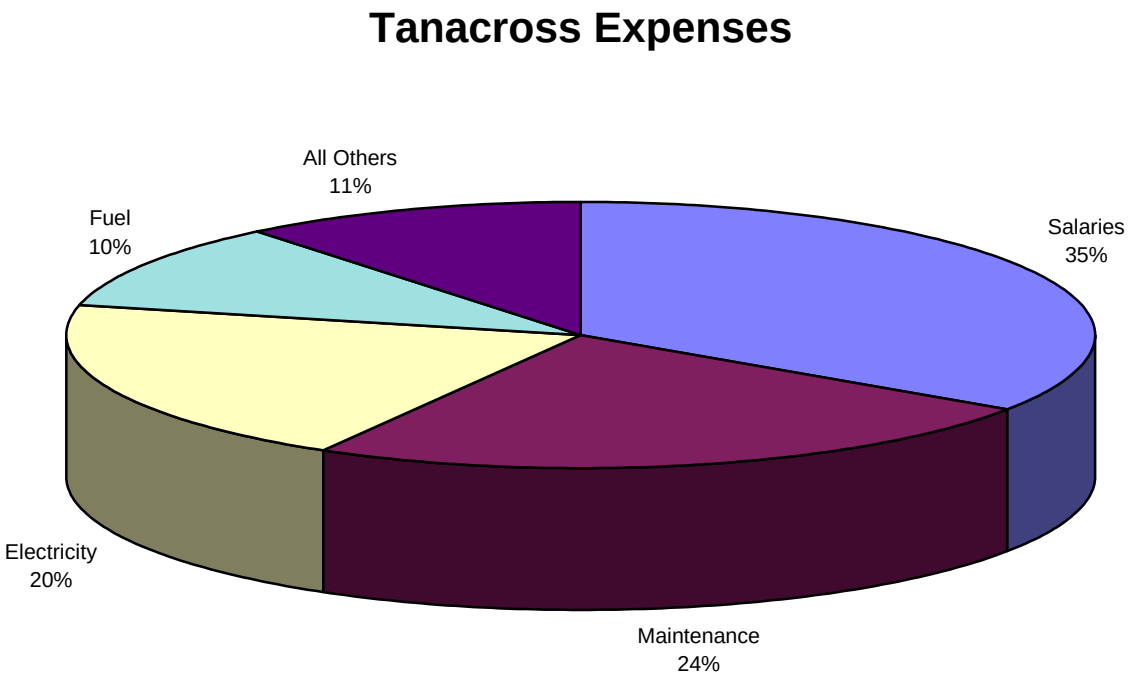
The philosophy of this community appears to be similar to the other utilities in regards to operations, management and financial condition and that is to keep the system operating at the lowest cost. The tribal council does not presently charge user fees for sewer and water.

It appears the accounting and bookkeeping for the new system will be done by the tribal council as part of their operations which will allow certain costs to be shared. Management of the system is performed by tribal personnel, and this also allows certain management costs to be shared.

Tanacross

Total Customers Served	Water	Sewer	Total
Residential	22	22	22
Commercial	0	0	0
Total	22	22	22
User Fees	0		
System Cost per Customer			Unknown
Annual Operating Cost per Customer	$ 810		
Annual Revenue per Customer	$ 0		
Age of System		26 years	
Total Cost of Water and Sewer System		Unknown	

Description	Income (loss) 6/30/96	Cost as a % of Total Cost	Cost & Revenue as a % of Total System Cost	Cost as a % of Total Revenue
Income	$ 0	---	Unknown	
Expenses				
Salaries	5,588	34.49%		N/A
Maintenance	3,850	23.76%		N/A
Insurance	0	0%		N/A
Electricity	3,321	20.50%		N/A
Fuel	1,690	10.43%		N/A
All Other	1,753	10.82%		N/A
Total Expenses	16,202	100.00%	Unknown	N/A
Net Loss	$ (16,202)			


Tanacross Expenses
All Others
11%
Fuel
10%
Salaries
35%
Electricity
20%
Maintenance
24%

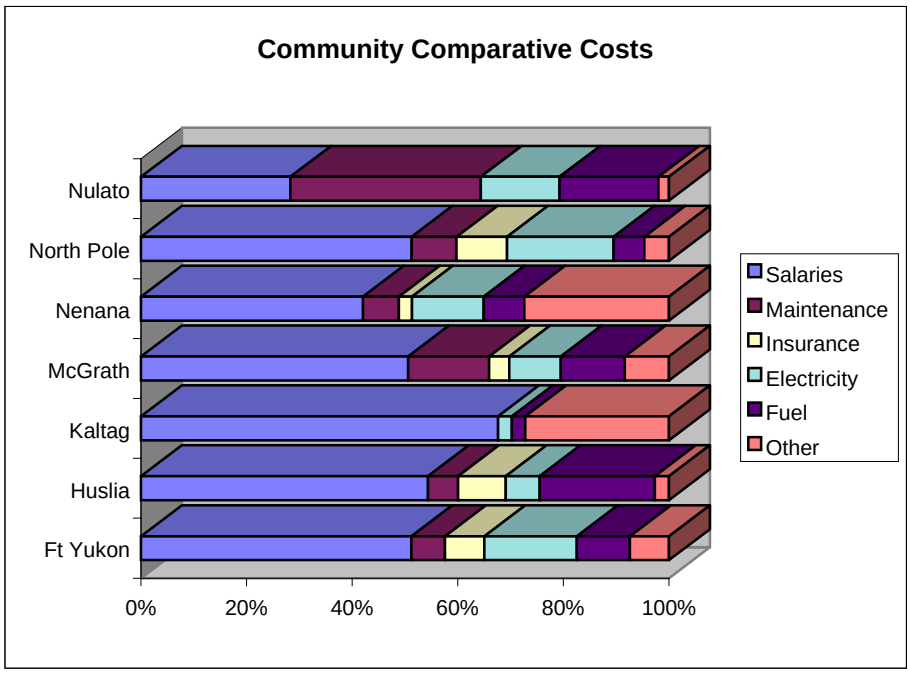
Discussion of Trends and Similar Costs

Value

Throughout this discussion there have been some major trends and similarities. First and foremost, it is very apparent from the survey that all of the communities display a significant amount of pride in their utilities and appreciate having piped water and sewer. All without exception are concerned about needed repairs, the necessity to keep the system in operating condition and, if the system is aging, how they ultimately will deal with the situation.

Major cost categories

The major cost categories were inconsistent in every utility surveyed. However, through analysis and comparison of the cost categories of all the utilities in the study certain trends have been revealed. Labor is the most significant cost followed very closely by fuel oil, electricity and maintenance. The average percentages of the cost categories of all the utilities can be used to establish ranges of cost for estimated future costs of Too'gha.



Depreciation

Depreciation is accounted for by the larger utilities. Our observation is that the larger utilities are required to produce audited financial statements and therefore are required to account for depreciation by GAAP (generally accepted accounting principles). Smaller utilities are required to have certified financial statements, not audited, and do not calculate depreciation.

Depreciation reflects the depletion of the assets. We have found that many of these utility systems are showing signs of needing major repairs and replacement of components as they age. In other words, the systems will not last forever.

Outside funding

Funds for operations and maintenance are limited, but sometimes available on a sporadic basis. Funds for expansion are very competitive but are available. Obtaining these funds depends considerably on the aggressiveness and philosophy of the utility managers. The more aggressive communities are more successful in obtaining funds.

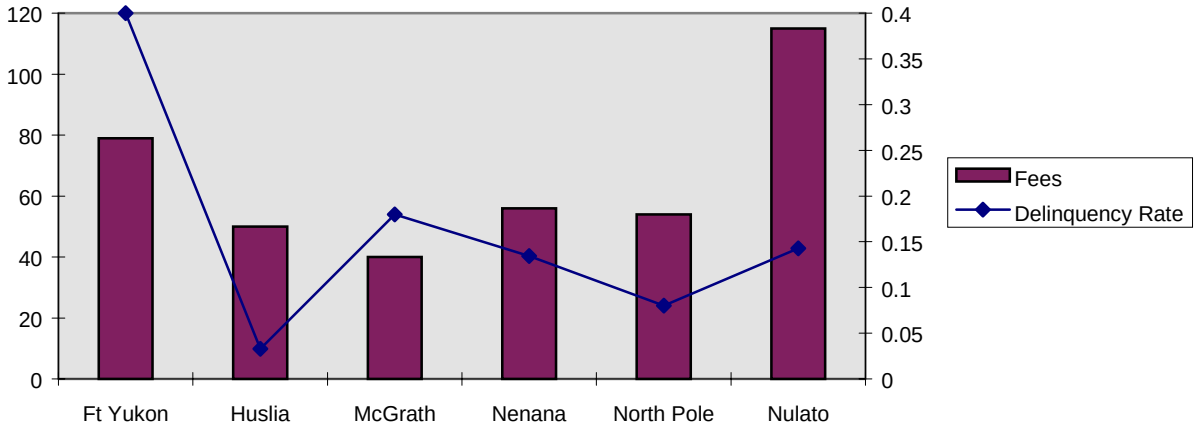
Fee structure

User fees are initially set when the utility is developed and then adjusted periodically as needed. Management's perspective towards the fee structure appears to predominately influence the size of the fee. We have noted a considerable range in fees and various reasons justifying the current amount. We have also noted that communities place a great deal of value on the utility system, and most residents pay the current fee. We found the greatest collection problems in the community with the lowest fees. The community with the highest fees experienced average collection problems.

Philosophy

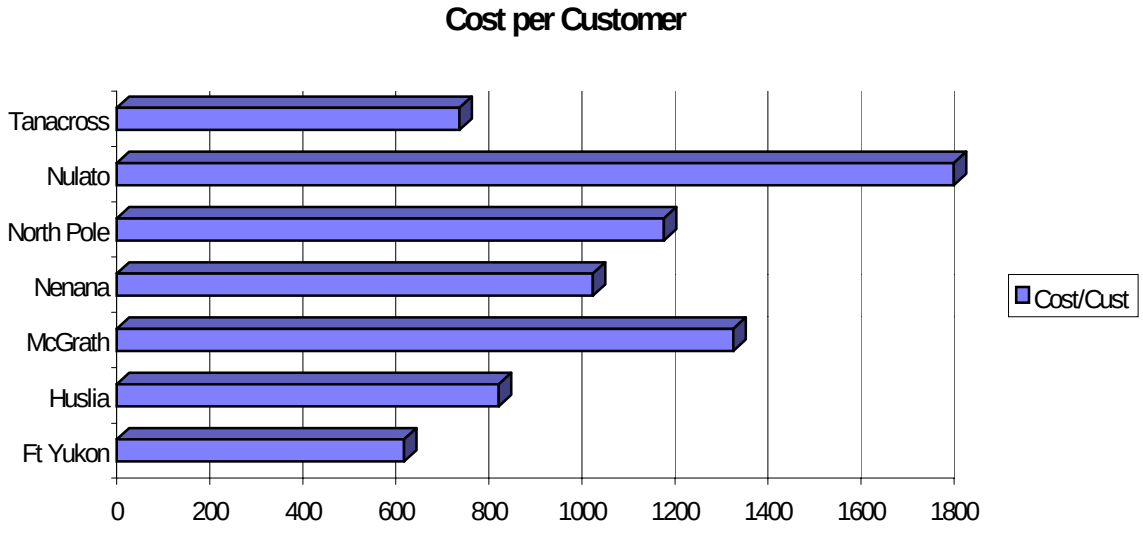
Good management, good record keeping and reporting, and trained personnel add up to a well run utility.

User Fees and Delinquencies



Profit (loss)

Most of the utilities are running at a loss. There can be only two explanations for a loss, either the costs are too high or the price of the service is set too low. From analysis of the communities, it appears that the price of the utility service cannot support the costs of running the utilities. This is compounded when deferred maintenance is calculated into the loss. No community has established a reserve to rebuild aging facilities. Outside funding agencies are bearing the total cost of replacements and system expansion.



CHAPTER IV.
A FISCAL CASE STUDY OF THE WATER AND SANITATION SYSTEMS IN NULATO AND TANANA

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PREPARED FOR
INSTITUTE OF SOCIAL AND ECONOMIC RESEARCH

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Introduction

This paper presents the results of a fiscal case study of the water and sanitation systems in two rural Alaska communities: Nulato and Tanana. Three related research questions were addressed in this study: First, do the accounting records maintained by each community provide adequate information to document the results of operations for these systems in the form of accounting-based income statements? Second, are the water and sanitation systems in these communities operating above or below the breakeven point? And finally, what are the primary factors affecting the profitability of each system?

Regarding the first issue, I found the accounting records in Tanana and Nulato were sufficient to prepare quarterly and annual income statements on a cash basis or modified cash basis respectively. However, in each case I found these records currently are not being used to regularly prepare operating reports and monitor the profitability of the systems. Based on the income statements presented below, it appears both communities currently are operating their water and sanitation systems below breakeven point, but the factors affecting profitability are different in each case. Nulato and Tanana have very different water and

sanitation systems and therefore each community faces different financial challenges.

The next section of the paper describes the water and sanitation systems of Nulato and Tanana. A brief description of the case study methodology follows, and then a section describing the results. The results section contains field observations and the income statements that were prepared from the financial data gathered in the field. The final section of the paper contains concluding remarks.

The Communities and Their Water and Sewer Systems

Nulato is a small community (population 365) located on the Yukon River, 310 miles west of Fairbanks. Over two-thirds of the households in the community are served by a piped water and sewer system which began service in the fall of 1996. Both households and businesses are charged $115 per month for water and sewer service; the only exception is the local school which is charged $30,000 per year.

The household charge of $115 per month was established prior to constructing the water and sewer system. Before construction began potential customers were surveyed to determine what level of

service they desired and the amount they were willing to pay.

At the present time there are approximately 68 household and business customers on the Nulato water and sanitation system. Billings and collections are the responsibility of the city treasurer, who during the past year has implemented various incentives for customers to pay delinquent accounts and prepay accounts that are current. For example, last year customers were offered a Permanent Fund incentive whereby they would receive six months free service in exchange for signing over their Permanent Fund check to the village. This was done to encourage payment by those customers with large amounts owing in arrears. Additional payment incentives have been given to customers that are current in their payments. Specifically, customers that pay for six months of service in advance are charged only $570 or $95 per month, rather than the usual charge of $115.

Regarding collections on delinquent accounts, the current collection policy is set forth in the City of Nulato, Code of Ordinances. Additional collection policies are contained in the Rules and Regulations of the Nulato Utility Board. The collection policies promulgated by the Utility Board and those promulgated by the City Council are not entirely consistent and this raises the

larger question concerning which body has the responsibility and the authority to establish collection policy. In practice the Utility Board has a limited advisory role to the City Council and thus the Utility Board has little actual authority. Ultimate responsibility for establishing collection policy rests with the City Council.

The water and sewer system's major customer is the local school which pays $30,000 per year for service. Prior to the new well being drilled in 1996 the school paid the entire operation and maintenance cost of the previous water and sewer system- $72,000 per year. Although the school's annual billing is now less than half of what it had been prior to 1996, the school is having difficulty paying the current obligation. Given the school's current financial situation, a proposal has been made to lower this year's billing to $25,000. However, as of late 1999, no action had been taken on this proposal.

Nulato has two laundries which are part of the water and sewer system. Rates at these facilities are as follows: $1.50 small machine, $2.50 double loader, $3.50 triple loader, $.75 dryer (7 minutes), and $1.50 for a shower.

Management of day-to-day operations of the Nulato water and

sewer system is not the responsibility of any one individual, since Nulato does not employ a utility manager. The system is loosely managed and supervisory responsibilities are vaguely defined. Decisions are usually made by the city council, the mayor, the treasurer, or some combination thereof. A utility manager has not been hired based on the conclusion that such a position cannot be cost justified. The issue regarding the advisability of hiring a utility manager is a difficult one and it may well be true that Nulato's water and sewer system is simply not large enough and does not produce sufficient income to cost justify such a position. However, to resolve this issue requires a detailed cost analysis which is beyond the scope of this field study.

Nulato employs two operators to run the water and sewer system. These two men alternate working one week on and then one week off. They work six days a week, eight hours a day, and two hours on Sunday with additional hours being worked when necessary. Occasionally outside labor is contracted from within the village. This past year the cost of this outside labor cost was approximately $5,000. The city treasurer allocates on average 4.5 hours per week to the financial aspects of the water and sewer system and this labor cost is charged to the water and sewer system

payroll accounts. A custodian is employed for two hours per day to clean the laundries. None of these employees, including the city treasurer, receive healthcare or retirement benefits.

Tanana, population 317, is in Interior Alaska, about two miles west of the junction of the Tanana and Yukon rivers and 130 miles west of Fairbanks. Too'gha Inc., a non-profit corporation, operates the water and sewer utilities. ("Too'gha" is Athabascan for "place of clean water.")

Too'gha currently obtains water from three wells near the Yukon River. In 1970, 55 individual wells were drilled, but because of permafrost and poor water quality, the project failed. Currently, residents haul treated water from the washeteria and use private honeybuckets. In 1976, a piped water and sewer system was constructed to serve the school, teacher's quarters, clinic, senior center, and IRA council building. In 1999 Too'gha began hauling water to the Alaska Weather Operations building. At the present time construction is underway on a new washeteria, watering point and water treatment plant. Construction should be completed sometime next year.

Too'gha's account customers include eleven commercial and public entities. Currently, there are no residential customers,

however, when the new plant is completed services could be extended to private residences. Rates for the commercial customers were set in 1983 and have not changed since that time. However, rates are anticipated to change once the new plant is completed. Section XVII of the Utility Management Agreement provides that after initial rates are set, Too'gha agrees not to increase rates without public process.

The current commercial rates vary depending on 1) whether the customer receives water services, sewer services, or both; 2) the quantity of water processed; 3) the method of delivery (piped or hauled); and 4) the customers ability to pay. St. Aloysius Church pays $45 per month for sewer service, Tozitna the village corporation pays $90 per month for sewer service as does the Tanana Native Council, Tanana Health center pays $400 per month for sewer service, and Tanana School pays $2,790 per month for sewer service.

The cost of water hauled to the Alaska Weather Operations building is 15 cents per gallon plus a $25 delivery fee. Tanana Power pays a flat fee of $90 per month for piped water. Customers receiving both water and sewer services likewise are charged a variety of rates. Tanana City is charged $180 per month for water and sewer, Tanana Commercial Co. is charged $90 per month for water

and sewer, and the Tanana Elders Program is charged $540 per month for water and sewer.

The eleventh and final customer account is that of Jake Burkett DBA Tanana Lodge. Mr. Burkett is not a regular customer, rather, he owes Too'gha $162.50 for a one time delivery of water.

Currently, cold water is free to residents who fill their containers at the washeteria, however, a resolution is currently pending that would charge residents five cents per gallon for cold water not delivered and ten cents a gallon for cold water delivered. Hot water is sometimes available to residents at the washeteria at a cost of ten cents per gallon. At the time of the data collection for this report hot water was not available to residents due to excessive corrosion in the pipes. Washing machines at the washeteria cost $3.50 per load for a large machine and $2.00 per load for a small machine. Dryers are 25 cents for five minutes and showers are 50 cents for five minutes.

Too'gha has four employees: a utility manager, two operators, and a custodian for the washeteria. The utility manager works 40 hours per week, the primary plant operator works on average 35 hours per week, the alternative plant operator works on average 15 hours per week, and the custodian works 20 hours per week. At the

present time most of the operators' wages are being paid from the new plant construction project. None of these employees receive healthcare or retirement benefits.

Methodology

A case study approach was used to examine the accounting records of the Nulato and Tanana water and sanitation systems, interview the custodians of these records, and gather the data necessary to prepare quarterly and annual operating reports. Both Nulato and Tanana use the QuickBooks Pro accounting software package to process accounting data and most of the information for the financial reports presented below was obtained from the QuickBooks accounting records. When necessary, source documents were examined to verify the computer generated data and provide additional detail of transactions.

Results

Nulato. Perhaps the most serious problem facing the Nulato water and sewer system concerns billings and collections. This is a problem that has worsened over the last year as employment opportunities in and around the community have diminished.

Unfortunately, such conditions are not expected to improve in the foreseeable future. As of May 27, 1999, the accounting records listed 69 residential and business account customers. Of these 69 accounts, 35 customers had not paid amounts owing for the month of March; 23 had not paid amounts owing for as far back as the month of January. This indicates at the time of the field visit approximately one-half of all customers were not current on their accounts and one third of all customers had not paid anything for services received in calendar year 1999. An accounts receivable aging schedule is presented below in Table 1.

Table 1

City of Nulato - Water and Sewer
Accounts Receivable Aging Schedule
As of May 27, 1999

Age	Amount
Under 30 days old	$13,353
31-60 days old	$6,919
61-90 days old	0
Over 90 days old	$14,727
Total	$34,989

Nulato's problem with billings and collections is not just a consequence of limited employment opportunities and poor economic conditions in the village, although these factors certainly

contribute to the problem. Administratively, the billings and collection system needs to be improved. Nulato has a collection policy; however, this policy has not been enforced. The collection policy calls for two notices to be given, one at 30 days and one at 60 days. In practice, however, the city's staff has been unable to get these notices out, and instead has followed an informal practice of giving written notice only after 90 days. The city has disconnected customers in the past for serious non-payment cases, but in each case the customer has been reconnected without paying the entire amount owing. Additionally, there have been months when the billings have not been sent out, which results in a double billing the following month.

The clerical problems in the billing and collection area could be reduced if Nulato: 1) established a collection policy consistent with the administrative and clerical abilities of the city staff; and 2) defined clear lines of authority within the city staff. Currently, lines of authority are vague and job descriptions are unspecified. Responsibility for a given task, such as mailing out the bills, is not focused. The result has been a failure to bill on a timely basis and inadequate attention to the growing bad debt problem. Someone needs to be working to collect

the overdue accounts and initiate the appropriate action when it is determined that an account can't be collected.

Table 2 presents the results of operations for the Nulato water and sewer system. Nulato operates on a fiscal year which begins on July 1 and ends on June 30. The three comparative income statements shown in Table 2 reflect the three fiscal years post-dating the construction of the new well and the beginning of residential water and sewer service. Note, in Table 2 for the 1998/1999 fiscal year only ten months of operating results are presented (July 1,1998 through April 30, 1999). This occurred because the data for this report was gathered in May 1999, and thus April was the last full month of accounting data. Table 3 contains the same information as Table 2, except that the numbers for fiscal year 1998/1999 have been annualized to provide a better comparison to previous years. This was done by multiplying by 1.2 all fiscal year 1998/1999 numbers except the income from the Nulato School, which is set at $30,000 per year.

Table 2.
City of Nulato - Water and Sewer System
Comparative Income Statements - Modified Cash Basis
For fiscal years 1996/97, 1997/98, and 1998/99 (partial)

	7/1/96-6/30/97	7/1/97-6/30/98	7/1/98-4/30/99
Income			
Homeowner Payments	$35,118	$73,804	$55,820
Nulato School	$30,000	$30,000	$30,000
Laundromat User Fees	$37,203	$37,554	$30,732
Total Income	$102,321	$141,358	$111,552
Expenses			
Electricity	$19,317	$18,606	$14,525
Heating Oil	$23,580	$69,235	$48,670
Wages and Payroll Tax	$36,257	$40,420	$38,769
Supplies	$7,086	$8,260	$7,722
Miscellaneous	$2,584	$2,402	$5,522
Total Expenses	$88,824	$138,924	$115,208
Net Income (Loss)	$13,497	$2,434	$(3,656)

Table 3.
City of Nulato - Water and Sewer System
Comparative Income Statements - Modified Cash Basis
For fiscal years 1996/97, 1997/98, and 1998/99 (annualized)

	7/1/96-6/30/97	7/1/97-6/30/98	7/1/98-6/30/99
Income			
Homeowner Payments	$35,118	$73,804	$66,984
Nulato School	$30,000	$30,000	$30,000
Laundromat User Fees	$37,203	$37,554	$36,878
Total Income	$102,321	$141,358	$133,862
Expenses			
Electricity	$19,317	$18,606	$17,430
Heating Oil	$23,580	$69,235	$58,404
Wages and Payroll Tax	$36,257	$40,420	$46,523
Supplies	$7,086	$8,260	$9,266
Miscellaneous	$2,584	$2,402	$6,626
Total Expenses	$88,824	$138,924	$138,249
Net Income (Loss)	$13,497	$2,434	$(4,387)

The income statements for the Nulato water and sewer system were prepared on a modified cash basis which combines certain elements of cash basis accounting and certain elements of accrual basis accounting. Cash basis accounting simply records revenues as cash collected and expenses as cash paid out. Accrual basis accounting records revenues when earned regardless of when the cash is collected and matches costs against revenues as expenses regardless of when the cash is paid out. Regarding the income statements presented in Tables 2 and 3, revenue from residential customers is recognized on a cash basis since the amount and timing of accounts receivable collection is uncertain. Revenue from the Nulato school is accrued. The expenses generally are reported on a cash basis, however, accruals were made for supplies ($2,000), heating oil ($20,000), and electricity ($4,963). These latter costs already had been incurred and adjustments to the accounts were pending.

Tables 2 and 3 reflect the collections problem discussed above as collections from homeowners decreased significantly in the 1998/1999 fiscal year. Regarding the expense items, the operating results for 1998/1999 were aided by lower heating oil costs,

however, wages expense and miscellaneous expenses were up significantly. The upward trend in wages expense is particularly noticeable over the three-year period.

No adjustments were made for depreciation of plant assets. Under the accrual basis of accounting a portion of plant asset cost is matched against revenue as depreciation expense. This is not done under a strict cash basis of accounting and is one of the major weaknesses of cash basis accounting. Over the long-run profit equals cash-in minus cash-out under either the cash basis or accrual basis of accounting. In the short-run, however, not providing a depreciation expense adjusting entry can significantly overstate net income. When the time comes for Nulato to replace its physical plant and equipment, the cash basis of accounting will report extremely large expenses for these expenditures. In order to more accurately reflect the results of operating its water and sanitation system, I recommend Nulato modify its cash basis system to provide for depreciation expense. This will require the adoption of a systematic and rational depreciation method which allocates the cost of plant assets as a period expense against the revenues that the plant assets are generating.

Quarterly income statements for the Nulato water and sewer

system are contained in the appendix. These reports also are prepared on a modified cash basis and cover the period July 1, 1996 through April 30, 1999. For purposes of the quarterly reporting, the heating oil expense has been allocated based on monthly fuel usage. Nulato's quarterly income statements indicate seasonal effects in both cash collections and operating expenditures. The seasonal variation in collections peaks in the October through December quarter and then drops off dramatically in the January through March quarter. For example, for fiscal year 1998-99, collections from home owners totaled $26,274 from October 1 through December 31, versus $9,626 from January 1 through March 31. This result was not unexpected, given Permanent Fund checks are issued in October and Nulato offered its water and sewer customers an incentive to sign over their Permanent Fund Dividend checks, apply it against their balances due, and receive six months of free service. The low level of collections in the January through March quarter is likely due to reduced employment opportunities in winter and the cash shortages experienced by many families following the Christmas holidays.

As expected, operating expenditures peak in the January through March quarter and lowest in the July through September

quarter. For fiscal year 1998-99, operating expenses were $43,405 from January 1 through March 31, versus $20,401 from July 1 through September 30. This seasonal variation is due to the additional fuel and electricity costs required to heat the water during the winter and the additional labor costs required to maintain the system during the winter months.

The cash flow problem created by these seasonal effects is noticeable in Nulato's quarterly financial statements. Operating expenditures are highest when cash collections are at their lowest. For fiscal year 1997-98, Nulato had a net deficit in the January through March quarter of $(15,836); for fiscal year 1998-99 the deficit increased to $(17,543). These deficits are 11 to 13 percent of annual revenue and represent the net cash flow that must be generated by operating activities in the summer and fall quarters to sustain operations through the winter quarter.

Tanana. Since the Tanana water and sewer system does not pipe water to residential customers, accounts that are not collectible have not presented a problem. With one exception, Too'gha's commercial customers pay their bills when due. The one exception is Tanana City, which as of the end of May 1999 had not paid any of the amount owing for its water and sewer service. It is unclear

from the Utility Management Agreement whether Too'gha or the Tanana City Council has the authority to establish a collection policy. Although not a high priority, Too'gha's utility manager recognizes the need to develop a collections policy for problem accounts in the future.

Too'gha's overriding problem at the present time is a cash flow shortfall that has the operation running on the brink of insolvency. The grant money that had financed operations has now run out, and as a result Too'gha is having difficulty meeting its payroll and other obligations. This situation is putting considerable stress on the utility manager and other employees. Too'gha's very survival as a going concern depends on solving its cash flow problem.

One measure that has been taken to improve cash flows is a change from quarterly to monthly billing for commercial customers. Monthly billing was begun in May 1999. Before that, a large sum of money would be collected at the end of the quarter, only to be consumed almost immediately by overdue bills. Monthly billing should mitigate the problem of having to go extended periods of time without cash. Unfortunately, monthly billing will not solve the fundamental problem of having more cash going out than coming

in.

Table 4 presents the results of operations for the Tanana water and sanitation system. Too'gha operates on a fiscal year which begins on October 1 and ends on September 30. The three comparative income statements in Table 4 cover the three fiscal years that Too'gha has been in existence. Note that for the 1998/1999 fiscal year only six months of operating results are presented (October 1,1998 through April 30, 1999). As stated above, this partial period is presented because the data for this report was gathered in May 1999, six months before the end of the fiscal year. The 1998/1999 fiscal year data was not annualized due to the availability of only seven months of data. (I felt it would be too speculative to project an annual report based on only seven months of data.)

The transfer of operations from Tanana City to Too'gha did not occur on a specific date, but rather took place gradually over the 96/97 and 97/98 fiscal years. This means that the numbers reported in Table 4 are not very useful for establishing trends and making annual comparisons. What can be observed from the information reported in Table 4 is the past dependence on grant income to finance ongoing operations. Since grants will not be available to

finance operations in the future, Too'gha must generate more income from user fees. Existing rates need to be increased and new sources of revenue, possibly residential customers, need to be explored once the new system becomes operational.

Table 4.
Too'gha Inc. - City of Tanana Water and Sewer System
Comparative Income Statements - Modified Cash Basis
For fiscal years 1996/97, 1997/98, and 1998/99 (partial)

	10/1/96-9/30/97	10/1/97-9/30/98	10/1/98-4/30/99
Income			
Laundromat User Fees	$40,362	$55,001	$28,817
Water/Sewer User Fees		$26,958	$45,259
Water Haul Fees			$300
Consulting Fees	$6,000		
ANHB Grant	$30,000	$20,000	
Interest on VSW Funds	$12,230	$5,422	$642
Comm. Development Grant		$10,000	
Miscellaneous Income		$2,989	$1,553
Total Income	$88,592	$120,370	$76,571
Expenses			
Electricity	$5,181	$12,656	$11,347
Heating Oil	$7,154	$14,085	$7,342
Wages and Payroll Tax	$44,291	$69,865	$47,755
Travel/Training	$7,434	$7,055	$2,045
Equipment Repair/Replace	$3,603	$4,139	$2,463
Supplies	$5,418	$6,391	$2,556
Water Testing	$1,459	$1,060	$888
Board Meeting Fees	$1,725	$1,425	$525
Insurance			$1,466
Miscellaneous	$2,182	$8,334	$3,549
Total Expenses	$78,445	$125,010	$79,936
Net Income (Loss)	$10,147	$(4,640)	$(3,365)

Also, Too'gha needs to address some difficult issues concerning its wages and payroll cost. At the current rate,

Too'gha's wages expense and cash flow for wages will be somewhere in the neighborhood of $82,000 per year. Fiscal year 1998/1999 may be somewhat less, because certain labor costs are being shifted to the new construction project. Once construction is completed, however, these costs will shift back to Too'gha. When this occurs, Too'gha's wage costs will be significantly higher than those of Nulato, which runs a larger and more complicated system. Having the luxury of employing a utility manager may be viable only if new revenue sources are developed.

The income statements for Too'gha were prepared on a simple cash basis, meaning revenues reflect cash collected and expenses reflect cash paid out. Once the new plant is completed and on line, I recommend Too'gha modify its cash basis approach to make an adjustment for depreciation expense. For the reasons stated above, this will provide a more accurate measure of net income in the short-run. Quarterly income statements for Too'gha are in the appendix.

Too'gha's cash flow problem, coupled with the planned change-over to the new plant in a year or so, has resulted in a bare bones approach to maintenance of the present facility. Virtually no preventive maintenance is being done and the present goal is simply

to keep the existing system running until the new plant comes on line. Certain critical parts are kept in inventory, however; for example, one spare pump is on hand for each working pump.

Concluding Remarks

It is difficult to compare the financial performance of Nulato and Tanana in operating and maintaining their water and sanitation systems. Nulato has an established system with a residential customer base that is not likely to grow very much. Nulato has demonstrated it has a financially-viable operation, if its collections problem can be overcome. If collections can be improved, Nulato's system should do better than break even and provide the necessary funds for future capital investment and replacement. As of May 27, 1998, Nulato had $34,989 of uncollected accounts receivable. Collection of these receivables would provide funds needed for capital replacements in the future. Assessing the feasibility of collections is beyond the scope of this paper.

Tanana, on the other hand, has more fundamental problems. The existing old system is not financially viable and has been kept operating only through the infusion of large amounts of grant money. Currently, Too'gha is in a process of transition to a new

system, and whether the new water plant will be financially viable is uncertain. Many questions remain unanswered—for example, will the new plant provide piped water to residential customers, and if so how much will customers be charged?

The system planners in Tanana could learn from Nulato's experience in surveying potential customers and designing the system to meet their needs. As Andy Durney, Nulato's treasurer stated, "what people want does not always equate to what they can afford." A survey document conditions potential customers as to what they can expect to pay for their water and sewer service, in addition to providing valuable feedback to city planners. This is one example of how the sharing of information could benefit communities in operating and maintaining their water and sewer systems. Setting up an information exchange between rural communities could potentially yield many benefits to the communities in operating and maintaining their water and sewer systems.

Finally, both Nulato and Tanana need to make better use of their accounting systems. Each uses the Quickbooks software package, which is an excellent tool for monitoring the financial health of their respective operations. Monthly financial

statements and monthly aging schedules of accounts receivable should be prepared in order to better monitor and manage the systems. Currently, neither community prepares monthly reports, and therefore, neither community really knows on a month-to-month basis whether it is making or losing money in operating its water and sewer system. Financial reports are easily generated from the Quickbooks package and provide a means for early detection of financial problems.

CHAPTER IV. ADDENDUM
COMMENTS ON FISCAL CASE STUDY OF THE WATER AND SANITATION SYSTEMS IN NULATO AND TANANA

BY
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Steven Campbell's case study makes some very valid points. However, by concentrating solely on fiscal aspects of the Nulato and Tanana systems, Dr. Campbell may have missed the heart—the reason these two systems will continue to grow and survive while others may fall away.

My discussion is in two parts. The first looks at the rural Alaskan water and sewer situation more broadly. The second part looks more specifically at Dr. Campbell's analysis, with points of agreement and disagreement.

Part 1. How Rural Water and Sewer Systems Succeed

What is the definition of a successful rural water or wastewater utility?

There are several approaches to defining a successful utility, and zealots are firmly encamped in each area. First, the primary objective of the utility must be to maintain and promote the health of the community by delivering a valuable product in an efficient and affordable manner. Second, the utility must keep itself viable both financially and operationally. Third, some type of ownership or community support is needed. The citizens have to want the service and recognize its value.

If a utility has only two of these elements, it will fail. All three will be needed to ensure long-term success. We are all familiar with short-term burn out. This is where the RUBA, RMW, or engineer recruits an enterprising community member as clerk, manager, operator, or other authority. This person may go a long way in cleaning up the accounting, implementing preventive maintenance schedules, indeed, even getting the council to meet and act on what are perceived as "important" matters. Soon, this utility is noticed by others around the state and is often pointed out as an example—"A community that knows how to get things done!"

Then, just as suddenly, the key employee quits for reasons that run the gamut from community pressure to the opening of fishing season. The utility falls back into a state of disrepair and lack of interest and everybody says—"What happened?" The reason is, of course, that we have not made a "sale" to the community on the merits of the utility. Indeed, we did not even really make a sale to the $8.00-an-hour horse we were riding (and overloading). We are groping in the darkness with no leadership and no plan. The Sisyphean struggle will continue until a semblance of leadership and strategy is in place.

Why Nulato and Tanana may succeed with their water and sewer utilities

The answer is as simple as a matter of local priority. Both communities want the utilities, and both want them to succeed. Both are very interested in the health and environmental issues associated with having the utility. Both have good depth of available personnel. Both communities have at least adequate accounting, O&M, and financial systems. Both communities have a good resource pool of leadership.

Yet, both communities could still be derailed. Tanana could easily suffer a setback attributable to polarized political factions. Nulato has some good leaders but they prefer to sit back and wait, for now. How long can they wait before the utility suffers irreparable damage? Too'gha customers pay their bills 100 percent, some even early. They know the money is vital to keeping the utility open. We hope Too'gha can keep this momentum going when it moves into the realm of residential service. Nulato customers also prefer to sit back. After all, so far nothing seems to happen if they do not pay their bills. My impression is that this will change very rapidly when the city runs out of "fund balance" to subsidize the utilities. The citizens will be very reluctant to let the utility fail. Both communities appear willing to kick, bite, scratch and claw any and all available revenue and grants to keep the utilities operable—which is exactly what it is going to take. Even citizens in Nulato who are not paying their bills must be sensing what is about to come. In short, the utilities will succeed because the communities will find a way to make them continue to operate, and that is the heart of the system.

How are these two communities unique?

Nulato and Tanana share a degree of functionality not found in many bush communities. Both have moderately advanced accounting systems, in comparison with some others. By that I mean that both keep records that are at least adequate to tell you, within a reasonable degree of accuracy, what they are spending, what they are taking in, and what monies they have in the bank. Both communities have at least a rough handle on the amount of production and the cost of that production. Both have excellent hardworking dedicated people. Both communities have strong infrastructures (city and tribal organizations) which complement the utilities.

Contrast this with the community whose council has not met in several months. The records are scattered and may be even non-existent. Unopened letters from the IRS remain in the desk drawer. A frightened clerk is threatening to quit so she "won't get into trouble." The finger of blame is pointed at everyone else, both inside and outside the community. This is the typical starting point. Even in our own chaos and that of the village we can look at a Nulato or a Tanana and see that some progress is being made—somehow.

How can "we" best assist communities?

To begin with, who is "we?" We are representatives of RUBA, RMW, VSW, ANTHC,TCC, EPA, ANHB, ISER, and others—in short, anyone with a sincere desire to see a community better itself through increased community health and functional water and sewer utilities. Ways we can help:

1. Point—rather than lead—the way. We can't lead what we don't understand. We can only communicate what has produced workable solutions in our own experiences. It is up to the community to sort through these possibilities and decide which may be applicable to their own situations. Failure can be an opportunity and a learning process.

2. Communicate—not only with the communities but with each other. Work together and be respectful of each other's feelings and beliefs. Quit the agency scramble over dwindling pools of money and other resources. Do not point fingers at each other. If this sounds like first grade, good—it was meant that way. I've met a lot of professionals in this game that I have disagreed with, but none I did not like or respect. If you have not been to communities and heard about how ANTHC, VSW, or RUBA have totally screwed them up, then you have never traveled to the bush. Villages do not turn us inward upon ourselves—we do it! How this situation is handled will be the first determination by the community as to whether or not they will ever listen to anything you say.

3. Find the starting point at which residents will begin to participate. Sometimes it is as simple as assisting a clerk with a troublesome bank statement. Or it may mean intervening with a tax or other regulatory agency for a point of clarification. Wherever this point, we must find it to establish a foundation for trust.

4. Be flexible. There is an exception to every rule, and you will find it the second day on the job.

5. Provide training opportunities. Most communities actively seek any opportunity for training for local residents—sometimes to learn, sometimes for a trip to town, and sometimes because they perceive they can use the training for a particular advantage. Whatever the reason, encourage the training! One caveat—people are quick to grasp the intellectual elements of the training. They will regurgitate back what you want to hear. This intellectual element must be translated to substance and practicality. For example, is not extremely difficult to teach a clerk how to do a monthly reconciliation on a bank statement. In a matter of weeks the clerk will be reconciling the statements like an accountant. However, the clerk will never carry through with the task if he or she does not see the point or even the value of knowing what money is in the bank.

6. Look at the AVEC lesson. There is somewhat of a simile between what happened with rural electrification and what is now happening with water and sewer. The lesson of the organized and systematic (even subsidized) approach is obvious.

Part 2. Comments on Dr. Campbell's Paper

Dr. Campbell's paper proposes to address three related research questions:

1. Do maintained accounting records contain adequate information for financial statements?
2. Are water and sanitation systems operating above or below break-even point?
3. What are the primary factors affecting profitability of each system?

Answers from Dr. Campbell:

1. Yes. However, records are not being used to prepare regular operating reports and monitor profitability.
2. Both are below break-even.
3. Profitability factors are different for each system because the two have different types of systems, and therefore each community faces different financial challenges. I would argue that the systems in Nulato and Tanana are actually quite similar and are definitely headed in the same direction. Nulato's is simply further along.

System Description

Included in Dr. Campbell's system descriptions is a digression to a couple of items that are quite interesting. The first is that collection incentives, at least in Nulato, apparently do not work. Why? RUBA often recommends incentives as a collection tool. Nulato seems determined to prove that even at "fire sale" prices it can't collect funds. Dr. Campbell notes, "For example, last year customers were offered a Permanent Fund incentive whereby they would receive six months free service in exchange for signing over their Permanent Fund checks to the village. This was done to encourage payment by those customers owing large amounts in arrears."

That offer can be interpreted in a couple of different ways. But if it means what I think it means—six months free service, plus credit for an additional 13 months of arrearage ($1,500 estimated PFD, divided by $115 monthly charge)—then residents would be receiving 19 months of service for a price of $1,500. or a 30 percent discount! This is a great deal; however, I suspect that initial projections for profitability (break-even) were calculated on the $115 monthly rate, rather than the $80 discount rate. Also interesting is the fact, as reported by Dr. Campbell, that customers who stay current and pay six months in advance receive only an 18 percent discount—from $115 to $95 per month. The Great Society lives on.

The other comment in the system description that I found interesting was, "Management of the day-to-day operations of the Nulato water and sewer system is not the responsibility of any one individual, as Nulato does not employ a utility

manager." This statement is false; there is always some utility manager (or non-manager), with the job in this case probably defaulting to the mayor and council.

Dr. Campbell goes on to say, "Essentially the system is loosely managed and supervisory responsibilities are vaguely defined. Decisions are usually made by the city council, the mayor, the treasurer, or some combination thereof. A utility manager has not been hired, based on the conclusion that such a position cannot be cost justified. The advisability of hiring a utility manager is a difficult question, and it may well be true that Nulato's water and sewer system is simply not large enough and does not produce sufficient income to cost justify such a position." My question about this observation is: "How can you afford to NOT have someone in charge?"

Results

Nulato: Dr. Campbell identifies Nulato's problem as a collection problem. But in my opinion, Nulato's problem is not collections but leadership: the old "who is in charge?" question. The collection problem is merely the most obvious result of the leadership crisis.

An interesting sidebar here is that if we examine the total of Nulato's enterprise funds (which include equipment rental, fuel sales, and others), we see that the city does—or at least did a couple of years ago—operate its cumulative enterprise funds (including water and sewer) with a positive cash flow. If the city chooses to subsidize the water and sewer utility through a healthy fund balance in the other enterprises, there is nothing wrong with that. Residents can certainly use such a break, given the worsening economic conditions cited in Dr. Campbell's report.

Tanana: Dr. Campbell says, "Too'gha's overriding problem at the present time is a cash flow shortfall which has the operation running on the brink of insolvency."

In fact, some municipal and tribal water and sewer systems may show "positive cash flow" in some years and not others—with a positive cash flow measured by whether total annual revenues exceed total annual expenses. Oftentimes, this may be the result of prudent management, a good operator, prompt billing, and an efficient preventive maintenance policy. An element of luck may also be involved—say a year when the south half of the village didn't freeze at 60 below, necessitating an extra $20,000 in maintenance and thawing bills.

The point is, I have never seen a municipal or tribal system that made a profit after an allowance for capital depreciation was taken. That is not to say that none exist—but I have never seen one in Alaska. I include urban municipal utilities as well as rural utilities. I worked with the North Pole (urban) system for 16 years and got it to positive cash flow (including a reserve account), but could not totally cover the capital

depreciation. I worked with the Galena system for a year and was unsuccessful at that time in getting it to even cash flow.

Concluding Remarks

In his concluding remarks, Dr. Campbell observes, "Nulato has demonstrated it has a financially viable operation if its collections problem can be overcome. If collections can be improved, Nulato's system should do better than break even and provide the necessary funds for future capital investment and replacement."

On the contrary, I believe that it's not even going to be close. Even at a reasonable 20-year (or 30-year on some items) straight-line depreciation, Nulato would be looking at allocating depreciation in the neighborhood of $300,000 to $400,000 a year. Go ahead and throw in the $35,000 of uncollected receivables, which would be just a drop in the bucket. What can Nulato hope to accomplish? Assuming that the collection problem is handled and someone steps up to the plate, Nulato could run a nice little water and sewer system at a break-even cash flow and maybe even set a little aside for reserves and equipment replacement. However, unless the utility feels inclined to charge each household about $400 to $500 per month, recovering the capital cost isn't even a subject of discussion.

I agree with the statement Dr. Campbell quotes by Nulato's treasurer: "What people want does not always equate to what they can afford." That is why the court dockets are full of personal bankruptcies. It is the function of government (leadership) to sift through the public process and identify projects that are affordable and improve the quality of life for the electorate, whether that project is an Egan Center, a water system, or a public library.

About Tanana's sanitation system Dr. Campbell concludes, "Tanana, on the other hand, has more fundamental problems. The existing old system is not financially viable and has been kept operating only through the infusion of large amounts of grant money."

My comment on that conclusion is that if the $50,000 in grant funds Too'gha used over a period of three years can be characterized as "infusion of large amounts of grant money," then Too'gha is guilty as charged.

Dr. Campbell also suggests, "Setting up an information exchange between rural communities could potentially yield many benefits to the communities in operating and maintaining their water and sewer systems."

I agree with that sentiment, but what is the author specifically proposing that is not being done now?

At the time Dr. Campbell prepared his analysis, rural communities were facing the possible elimination of the state's Power Cost Equalization program, which subsidizes a portion of the very high costs of electricity in rural areas. I agree with the author that such a cut would have left rural communities scrambling for ways to make up for the loss of that state funding. The state legislature ultimately created an endowment fund so the PCE program could continue. But the reductions in the state's revenue sharing and municipal assistance programs (Safe Communities) are having a draconian impact on rural municipalities. Smart communities and utilities will survive by shifting funding requests to in-vogue grant schemes. Interesting also that even those bureaucrats (non-legislators, of course) who are normally against "subsidies" appear to be generally in favor of the PCE program. Imagine the gasps if someone suggested a PCE type program to aid rural water and sewer utilities.

Finally, Dr. Campbell notes that, "Currently, neither community prepares monthly reports, and therefore neither community really knows on a month-to-month basis whether it is making or losing money in operating its water and sewer system."

My feeling is that both communities are pretty well in tune, at an elementary level, with how their utilities are running. Both communities budget, and both do comparisons between budgeted and actual expenses.

Nonetheless, the author is right: financial statements should be submitted on a monthly basis to the boards. Too'gha went from quarterly financial statements (prepared with RUBA assistance) to monthly financial statements (prepared solely by the manager) in June 1999. I can't speak for the situation in Nulato, except to say that the community appears to have very competent (and possibly overworked) financial personnel.

When I speak of an "elementary" level, I would include the preparation of monthly financials as being "in tune at an elementary level." Too'gha, with the assistance of the remote maintenance worker (RMW), is beginning to move from this level into the realm of awareness of the cost of production, gallons produced, and the interrelationship of the operational data and the financial statement.

CHAPTER V.
COST EVALUATION OF CLOSED–HAUL SYSTEMS

BY
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Chapter V. Cost Evaluation of Closed Haul Systems

Introduction and Methodology

This cost evaluation covers the three different closed haul systems in service on the Yukon-Kuskokwim Delta: the Flush Tank and Haul™ system (FTH), the Pump and Haul system (P&H) and the Microflush system (MF). The information contained in this study was collected during site visits and haul administrator phone interviews in June and July of 1999. We estimated lifetime and maintenance costs for vehicles those systems use by referencing information from area retailers about vehicles of like kind and quality.

There are several data limitations that restrict the exactness of this report. First, the data set used in calculations covers less than six months of the year. Therefore, any future shift in population could significantly alter the projections in this study. Second, village record-keeping was not always timely and efficient. As a result, we had to use some data from operator and administrator interviews in the calculations. Without documented references, this data is prone to recall error. Each village could improve its documentation of services. Third, since there was no pre-existing data on some aspects of this study, we extrapolated data and applied that data to each village, to maintain uniformity of data where applicable. Finally, since use of this technology is relatively new, there have been multiple hardware problems that have affected use of haul services. No record of maintenance or site specific shut downs is kept; if we had such a record, we could use it to adjust frequency of haul calculations. This lack of records has resulted in under approximations of haul frequencies.

Despite these limitations, this report should serve as a useful starting point for future research. More accurate data will become available with installation of more closed-haul systems and increased experience with their operation and maintenance.

Systems Overviews

In Mekoryuk, Cowater Alaska, Inc. has expanded the Flush Tank and Haul™ system from 65 units to 80 units. Structures that pre-date the FTH system are individually retrofitted with plumbing and bathrooms inside the existing structure. In new homes, plumbing is designed into the structure. The FTH system can be installed in two ways. When the building is elevated high enough above the ground, waste flow is gravity operated. If, however, the building lies too low to the ground for a gravity system, the plumbing is augmented with a separate blower system that pulls waste from a temporary storage tank under the toilet into the exterior storage tank. Besides bathroom installations, separate gray water pumps have been installed to allow for remotely placed kitchen sinks. The use of electric vacuum blowers for the transfer of water and sewage into tanks is central to the FTH system. The FTH system delivers water in 100-gallon tanks supported on either wheels or skis. Based on weather conditions, either a standard ATV or an industrial size snowmachine is used for towing.

The Pump and Haul system in Quinhagak currently serves 44 units in homes and businesses. David Nairne and Associates designed the P&H system with gravity driven waste disposal. The P&H system has also been either retrofitted or designed into buildings. The movement of water and sewage between storage and transport tanks is accomplished with a gas-powered motor and vacuum pump. The motor and pump are attached to the front of the haul trailers. The use of this motor and pump unit allows the system to also pump waste hoppers for which no charge was reported. The wheeled water tank, pulled by a commercial size ATV, delivers 200 gallons in each haul.

The Microflush system operating in Tuntutuliak serves 37 homes and businesses. The MF system is designed into new buildings or added onto older ones. A separate bathroom can be attached to an exterior wall, into which a door is later cut to provide access. This add-on structure contains all the fixtures for use with the sewage tank placed directly below for gravity collection. The MF system haul trailers carry motors and vacuum pumps inside metal casings to protect the equipment from the weather. The MF system delivers 130 gallons per haul, though haul tanks are either 300 or 400 gallons. A more powerful haul vehicle, the John Deere Gator, is used to compensate for the larger tanks.

Management Structures

The general schemes by which the systems are managed are very similar. Among the differences are Mekoryuk and Tuntutuliak require the customers to pay at an office location while Quinhagak allows the operator to receive payment at the time of service. Mekoryuk's management system was reported to take two hours a day. This amount is much larger than the under two hours weekly reported in Tuntutuliak and ten minutes biweekly for Quinhagak. This longer management time is possibly due to Mekoryuk's use of multiple manual records, but is still questionably high. The community reportedly uses manual methods because of difficulties with computerized record keeping, though accounting software training was scheduled following the completion of this study.. The recording of services at Tuntutuliak is vulnerable to the loss of information between the operators and clerk. The operators record water and sewer deliveries on a dry erase calendar following each delivery. The clerk then transfers records to paper monthly. If the calendar is cleared before the clerk records the accounts to paper, the information is irrevocably lost. Just such a problem occurred with the service records during the month of June 1999.[1] Quinhagak reported no problems in billing, while Mekoryuk and Tuntutuliak have experienced difficulty with collecting payments. These two villages have adopted resolutions for the discontinuation of service at a five-haul limit in Mekoryuk and a per bill charge in Tuntutuliak.

[1] Monthly income was not lost. Bills were issued based on usage patterns for previous months. No complaints were noted during this billing cycle.

Provision of Services

It would appear that the differing amounts of water provided per haul by each system would affect haul frequency proportionally. However, the dynamics of these systems currently show no such trend. The most regularly used system was the MF system in Tuntutuliak. This village showed an average of one water and one sewer haul per unit per month. This system again supplies 130 gallons per water haul, while sewage storage is slightly larger. The P&H system, which provides a third more water per haul at 200 gallons, has refill frequencies double that of the MF system. The P&H customers request a water haul an average of every 65 days and a sewer haul every 62 days. The FTH system is not following any discernable pattern, with average refill periods of 67 days for water and 41 days for sewage—and yet it supplies the smallest amount of water per haul of the three systems.

The variation in haul frequencies may result from several reasons. Several customers in Mekoryuk cited the cost as a major reason for limiting water usage. The charge for service is $22.50 per haul (water or sewer) in Mekoryuk; $15 (water) and $20 (sewer) in Quinhagak; and $17.50 (water) and $20 (sewer per month) in Tuntutuliak. Additionally, villagers can water themselves from the water plant at no cost.[2] For a smaller amount of water than the MF system, the FTH duration between sewer hauls is longer. Several FTH customers noted the practice of disconnecting sink disposal lines and collecting gray water in buckets. These buckets are then emptied into nearby drainage ditches, thereby reducing the flow into the sewage storage tank. Although this practice was mentioned several times, we don't know exactly how widespread it is. Finally, the difference in plumbing fixtures my create some of the variation, though no such effect could be corroborated in this study.

It is likely that each of the systems will be expanded in the future. In Mekoryuk, a total of 80 units serve approximately 100 eligible structures. The P&H system delivers service to 44 units of the over 120 buildings, allowing for a nearly triple scale increase. The MF system could possibly be doubled in size from its current 37 units. These increases in system sizes have been incorporated into a rate decrease in vehicle depreciation in Table 1.

Income Comparison

Based on data collected for the first months of 1999, Table 1 presents a comparison of projected incomes. For each village, we recorded the dates of water and sewer hauls. The dates were transcribed from utility records into the more useful data format of successive numerals for each date. *The average number of days between hauls* was calculated by averaging the number of days between each haul. The *average days between hauls in period* is the number of days in the survey, divided by the number of hauls in the survey. The *haul frequency in days* was calculated by dividing the total number of hauls during the survey period by the number of days in the survey period.[3] Next, a projected number of h*auls per year at rate* was calculated, using this daily frequency rate. The *hauls per year at rate* projections were combined with the *cost per*

[2] A coin operated dispensing system is being researched in surrounding villages to partially offset the cost of water production.

[3] Mekoryuk's *Haul frequency in days* was corrected for the 15 newly installed units not in operation during the survey dates.

haul resulting in the p*rojected yearly income* listed on Table 1 under the Water and Sewage headings. These incomes, as well as any additional incomes, were then added to calculate the *Total Projected Income* appearing at mid-page of Table 1.

Quinhagak and Tuntutuliak are projected to generate incomes of $16,690 and $20,045 respectively. Despite the lower frequency of hauls in Quinhagak, the assessment of a charge per sewer haul, rather than the flat monthly charge as in Tuntutuliak, helps create higher revenues. Mekoryuk is projected to receive an income of approximately $29,138 primarily due to its higher per haul charge.

Expenditure Comparison

The lower half of Table 1 is a summary of expenditures for each of the villages. For all the villages, the amount of time for hauls was fairly even, ranging from 0.58 to 0.67 hours on sewer hauls to 0.62 to 0.63 hours on water hauls. These times were calculated based on both interviews and observation of the haul service from receipt of the work order until completion of haul records. *Direct labor cost* of service was calculated with the projected *hauls per year at rate*, the reported *time per haul in hours*, and operator wage information. For this calculation, the number of hauls was the overwhelming factor in the difference in labor costs, as seen in the higher haul total and higher expense for Mekoryuk. As mentioned in the earier section, Structures of Operations, the time for administering the systems varied. *Administrative labor costs* again weigh heavily on the FTH system of Mekoryuk. The reported time in Quinhagak seems extremely low in comparison with the other systems. However, this time was verified by two sources and therefore we accept it as accurate. In addition to direct labor costs, a tax rate of 14 percent was included, based on TSCA records and RUBA data.

The vehicles that haul the water and waste were major areas of investigation. Vehicles were depreciated over retailer-reported lifetimes for associated workloads. A decrease of depreciation rate was included, according to availability of system expansion (as mentioned above). *Annual fuel cost* was estimated by recording frequency of refueling and average volume of fuel. The one consistent vehicle maintenance practice reported was changing of the oil. Therefore, it is reported separately from other miscellaneous maintenance costs.

These closed haul systems were designed to prevent human waste from contaminating the environment where people live. However, all of the systems reported incidents within the past year in which waste either overflowed the storage tank or spilled during transfer to the haul trailer. Clean-up techniques varied between the villages. In Mekoryuk, the contaminated earth was collected by hand into plastic bags and deposited in the sewage lagoon. Quinhagak's technique for clean-up included washing the area with a milk of lime solution. Along the same line, Tuntutuliak dumped crushed lime around the contaminated area. Of these three methods, the milk of lime solution presents the best option, as removal of material is laborious and powdered lime can become airborne causing safety problems. The lime solution also can be used to more thoroughly clean contaminated tanks and vehicles that are otherwise neglected. The *estimated cost of overflow/spill per year* includes time and materials according to method of cleaning and reported frequency.

Since snow clearance can constitute a significant problem, the expense of accessing the units is included. The location and infrastructure of the villages played a large role in the amount of resources devoted to this problem. The P&H system reported no additional expense for snow

removal, because of its more southern location and good roadway system. Tuntutuliak uses small vehicles to maintain its boardwalks through the winter, providing a reasonably cost efficient clearance operation. Mekoryuk operates on both road and boardwalks. Thus, both a large front-end loader and manual clearance are necessary. The large vehicle is necessary because of the large amount of snowfall received annually in Mekoryuk, but it presents a formidable cost to balance. The FTH operator reported an additional average of ten minutes for manual clearance for each home following road clearance.

Total miscellaneous maintenance costs includes a variety of expenses for vehicle maintenance costs such as replacement tires, ball hitch repairs, and time spent on carburetor repairs. Other costs in this sub-heading included gloves for the operators, repairs to water and sewer tank trailers, and administrative supplies. To estimate the *cost of water per year* the total *hauls per year at rate* and amount per haul were multiplied by a cost of $0.10 per gallon. This per gallon rate was reported by two administrators and cross referenced with OEHE experience on the subject. We strongly suggest a study of the actual cost of production of water within the villages, to aid in future grant proposals.

The final subcategory of Table 1 is the *cost of extraneous services* not directly designed as part of the overall system. As the notation of the P&H system indicates, this cost was not included in the expenditure total. Quinhagak operates a honey bucket haul operationat no charge. The resources for both the honey bucket haul and the P&H are not delineated in the accounting procedures. The amount of $15, 043 was calculated solely on direct labor costs. Tuntutuliak is still in the process of installing units in homes and repairing the systems previously installed. The general manager of the Tuntutuliak Community Services Association (TCSA) reported numerous problems with the electrically powered Microphor toilet. As a result, operators are currently responsible for in-house maintenance of all difficulties with the system. During the past five months of operation, TCSA operators made service calls on 29 occasions at an estimated labor cost of $1,618.

The *total projected expenditures* for the systems listed on Table 1 are the FTH system spending $35,872, the P&H system spending $22,338 and the MF system spending approximately $25,626.

Comments

While conducting this study, we recorded numerous customer and administrator comments to evaluate the efficacy of each system. A few of the intricacies of the FTH system have already been mentioned—most notably, the high cost to customers and high overhead. Also, some customers disliked the means by which the bathrooms were retrofitted to the home. Retrofitted bathrooms appeared to be often times cramped and disruptive to the overall house design. As an alternative, the MF system utilizes the bolt-on bathroom, which does not intrude as much on the existing structure. This bolt-on design also makes the system uniform and easier to maintain.

The difficulties with the MF system have mainly to do with equipment and installation problems. The Microphor toilet is being taken out of service and replaced with a manual, foot-flush unit. All subsequent installations will use the manual toilet. The other main problem with the MF system is the lack of adequate insulation on sewage lines, which allows them to freeze. It should be noted that similar freezing problems with the FTH gravity systems have been corrected by installation of heat tape. The transfer tank FTH units have no such problem. Another problem is that the gravity FTH, P&H, and MF system require the building to be of sufficient height to allow drainage to the storage tank. Thus, those homes that lay on low supports must first be raised before the system can be installed. The transfer tank FTH system overcomes this difficulty at the expense of making the system more difficult to install and use.

From an aesthetic point of view, homeowners were most happy with the FTH and MF systems, which have a neat exterior appearance. The FTH system encloses tanks in wooden "doghouses," while the MF system has a smooth metal exterior. The sewer tanks in the P&H system are merely coated with spray foam and placed under the house.

The operators' overall impressions of the systems were very positive. One area that should be considered for improvement is the supply of personal protective equipment. The duties of the operators require them to be exposed to a variety of environmental hazards. The gloves being supplied to operators should be augmented with clothing sufficient for the environment in which the operators work to ensure their safety. One operator at Mekoryuk additionally requested dust masks.

The final logistical dilemma results from the amount of water that is hauled to the home. The 200-gallon tank in use at Quinhagak taxes the ATV, causing premature depreciation. Also, this larger tank is difficult to maneuver and bogs down in wet areas much more easily than its ATV and 100-gallon tank counterpart at Mekoryuk. The MF system actually uses two tanks of 300 and 400 gallon capacity. The issue of a stronger vehicle has been addressed by using a John Deere Gator, but the weight of the tank increases damage to the trailer frame. One such 400-gallon tank was out of operation during observations and was awaiting shipment to Anchorage for repair. This repair arrangement adds significantly to the overall maintenance cost of the system.

Conclusions

The final line of Table 1 shows the balance of yearly business for the three systems. At the time of this study, all the systems were running their operation at losses ranging from $4,500 to $6,700. The negative balances would seem to indicate the amounts the customers are being charged are too low. However, the higher cost at Mekoryuk has inclined some customers to look for ways of reducing their use of the service.

These systems fill a vital niche between the honey bucket and piped water systems. As compared to the honey bucket haul (HBH), closed haul offers several advantages. First, supplying customers with water from the water plant helps ensure that more villagers have safe drinking water, thereby helping reduce waterborne illness. Second, closed haul offers customers an ease of use approaching that of a fully piped system. Reducing villagers' exposure to human waste is another step in reducing illness. However, the collection of honey bucket waste in haul containers still allows for contamination through spills, which can pose a risk, particularly to children. In terms of operation and management, the closed haul and HBH require many of the same resources. Vehicles, tanks, and operators are held in common. Granted that HBHs require fewer and less expensive supplies, the additional cost of the closed haul system is being recovered. Comparing the losses associated with the P&H and HBH in Quinhagak, the benefits can be seen easily. If some charge were instituted for the users of the HBH, the costs could be partially offset.

The closed haul concept is in its early application. Over time, operations and management of the closed haul systems will improve, as will the designs of the system hardware. As to achieving the goal of piped water systems in all villages, the closed haul concept certainly appears a step in the right direction.

Table 1 - Income and Expenditure Comparison Summary

	MEKORYUK	QUINHAGAK	TUNTUTULIAK
Number of Units (HH and commercial)	**65**	**44**	**37**
INCOME COMPARISON			
SEWAGE			
Total # of hauls during survey	336	206	249
Average haul frequency in days	41	62	31
Average hauls per day	2.07	1.24	1.65
Hauls per year at rate	757	453	602
Projected yearly income	$17,033	$9,060	$8,880
Time per haul in hours	0.65	0.58	0.67
Cost per haul	$22.50	$20.00	$14.75*
WATER			
Total # of hauls during survey	239	213	264
Average haul frequency in days	67	65	39
Average hauls per day	1.48	1.28	1.75
Hauls per year at rate	538	468	638
Projected yearly income	$12,105	$7,020	$11,165
Time per haul in hours	0.63	0.63	0.62
Cost per haul	$22.50	$15.00	$17.50
Additional water income**	$0	$610	$0
TOTAL PROJECTED INCOME	$29,138	$16,690	$20,045
EXPENDITURE COMPARISON			
Direct labor cost of sewage haul	$5,659	$3,385	$4,338
Direct labor cost of water haul	$4,022	$3,798	$4,336
Administrative labor costs	$6,250	$104	$1,144
Taxes	$1,355	$1,006	$1,374
Vehicle depreciation	$1,788	$867	$650
Annual fuel cost	$680	$555	$216
Cost of oil changes for year	$171	$141	$161
Cost of overflow/spill per year	$25	$83	$126
Total cost of access clearance per year	$9,460	$0	$672
Total misc. maintenance costs	$1,082	$1,491	$3,257
Cost of water per year	$5,380	$10,908	$6,734
Cost of extraneous services***	$0	$15,043****	$1,618
TOTAL PROJECTED EXPENDITURES	$35,872	$22,338	$24,626
BALANCE OF YEARLY BUSINESS	-$6,734	-$5,648	-$4,581

*Cost is calculated from $20 per month charge and total hauls per year.
**Income from water delivery to households without closed haul installations.
***Extraneous services reported included operation of HBH system and in-home maintenance.
****Extraneous services not included in projected expenditures. It is included here as resources are not discriminated between P&H and HBH services.

CHAPTER VI.
COST ANALYSIS OF SELECTED FLUSH HAUL WATER AND WASTEWATER SYSTEMS IN RURAL ALASKA

PREPARED FOR
ALASKA NATIVE HEALTH BOARD OPERATION & MAINTENANCE DEMONSTRATION PROJECT

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1. Introduction

This research memorandum presents and compares estimates of the operating costs of selected flush haul sanitation systems in rural Alaska. The estimates are based on actual operating experience. For two reasons, an accurate picture of operating costs is important when evaluating flush haul systems. First, communities are generally responsible for paying these operating costs, and people need to know them in advance when choosing among alternative systems. Second, the operating cost of flush haul systems is the major contributor to the total life cycle cost of these systems. To get an accurate picture of total life cycle cost we must have a good grasp of operating costs.

In previous work (Colt 1994), I estimated life-cycle costs for prospective flush haul systems in Buckland and Mekoryuk. An important—but provisional—finding from that research was that flush haul systems are likely to have *lower total life cycle costs* than conventional piped systems. This lower cost is due to fact that the significantly lower up-front installation cost of flush haul was only somewhat offset by its presumed higher operating costs. Thus, the actual level of flush haul operating cost is a key factor that needs to be identified so we can accurately judge the overall cost-effectiveness of flush haul systems. Since the Buckland and Mekoryuk systems have now been operating for several years, it is possible to begin making cost assessments based on actual data. In addition, flush haul systems have recently been installed in Galena, Napakiak, Nunapitchuk, Quinhagak, Shishmaref, and Tuntutuliak.

As part of the Alaska Native Health Board Operation and Maintenance Demonstration Project, we collected operating data from the communities of Buckland, Galena, and Nunapitchuk.[1] Additional data for systems in Mekoryuk, Quinhagak, and Tuntutuliak has been collected by others (Yukon-Kuskokwim Health Corporation 1998). This paper therefore considers the six communities listed in Table 1.

Table 1
Summary of Communities Analyzed

Community	Units Served	Year and Data Source
Buckland	36	1997/98, ANHB demonstration project
Galena	97 water, 115 sewage	1997/98, ANHB demonstration project
Mekoryuk	65	1999, YKHC
Nunapitchuk	20	1997/98, ANHB demonstration project
Qunihagak	44	1999, YKHC
Tuntutuliak	37	1999, YKHC

[1] We also tried to collect data from Mekoryuk, Napakiak, and Shishmaref as part of the ANHB Demonstration Project evaluation. For Mekoryuk and Napakiak, much useful operating data is contained in the final project reports by Cowater International, but these reports lack actual operating cost detail. From Shishmaref, we have detailed data on the allocation of the operator's time between flush haul and honey-bucket haul activities, but no detailed financial data against which to compare this time allocation.

In this paper I first develop flush haul system cost estimates for each community. Next, I compare the data for the four Yukon-Kuskokwim communities using small haul vehicles (ATVs and snowmachines). Finally, I compare the estimates reported here to my earlier – prospective – cost estimates of operating costs (Colt 1994).

The definition of "cost" is the cost of operating the *delivery and removal* system. It does *not* include the cost of treating the water at the treatment plant. I focus on O&M costs, since capital costs are generally well determined and were not an objective of this data gathering process. However, I do consider expenses such as depreciation of haul vehicles where data is available.[2]

2. Cost Estimates for Buckland

Between 1993 and 1996, Buckland installed a flush haul system for 36 houses based on Hummer vehicles to haul larger quantities of water and sewage. This technology is feasible because the city sits on hard soils that can support the heavier vehicles. Monthly bills for the system can run to more than $200. In addition some customers have seen their electric bills increase substantially due to increased hot water heating. An additional 48 households were served by a honeybucket haul system as of 1998.

Table 2: Buckland Flush Haul System Summary (circa 1998)

FH System Size:	36	households (HH)	
Other System:	48	HH using HB Haul	
Initial Installation:	14	HH in 1993 (HUD/NIHA)	
Additions:	22	HH in 1996 (PHS)	
System Type:	PHS/HUD "Flush and Hold"		
Fees Charged:	25	$/full tank of water	
	30	$/sewage tank haul	
Late fees:	unknown		
Delinquency rate:	unknown		

The City of Buckland combines the positions of water plant operator, electric plant operator, and water and sewer haulers. The City Administrator uses a 60% allocation factor to assign these pooled utility labor costs to the water and sewer hauling functions, which include flush haul and honeybucket haul. The use of this 60% factor is built in to the monthly haul system cost data reported by the City.

Because of the honeybucket haul operations, it is necessary to break out the portion of total reported hauling costs that should be attributed to the flush haul system. To do this I use the proportion of total households that are served by flush haul and make three additional assumptions about the relative times and frequencies of flush haul (FH) and honeybucket haul (HB) operations. The key assumption is that the average time per honeybucket haul is 50% of the average time for a flush haul sewage haul, because

[2] Since vehicles depreciate rapidly, they can be legitimately considered an operating cost or a capital cost, depending on one's perspective.

several HB bins can be hauled one after another, while FH hauls are more likely to be "on-demand". With these assumptions I calculate that 60% of total reported water/sewer expenses should be allocated to flush haul services, as shown in Table 3.

Table 3

Computation of FH share of the total water/sewer function time:				
Assumptions:				
ratio of FH sewer hauls to all sewer hauls:				0.27
ratio of HB haul time to FH sewer haul time				0.50
ratio of FH water hauls to FH sewer hauls				1.00
ratio of FH water haul time to FH sewer haul time				1.00
Results:				
Time breakout in units of FH sewer haul time:				
FH sewer hauls				1.00
Honeybucket sewer hauls				1.33
FH water hauls				1.00
FH time as % of total time				**60%**

Using this 60% allocation factor,[3] the resulting flush haul cost estimates for Buckland are shown in Table 4. The average cost of service is $1,007 per household per year.

Table 4: Buckland Estimated Flush Haul O&M Costs for 36 Houses

						FH
		total	FH	FH	# of	$ per
Item		**amount**	**share**	**amount**	**households**	**household**
Labor		54,608	60%	32,765	36	910
Fuel		1,294	60%	776	36	22
Electricity		-	60%	-	36	-
Equipment		-	60%	-	36	-
Parts		91	60%	55	36	2
Repairs (outside svcs)		4,291	60%	2,575	36	72
Supplies		114	60%	68	36	2
Travel		-	60%	-	36	-
Accounting & Legal		-	60%	-	36	-
Rent		-	60%	-	36	-
Telephone		-	60%	-	36	-
Other		-	60%	-	36	-
Total		**60,398**		**36,239**	**36**	**1,007**

It is important to note that these expenses reflect significant repairs to the Hummer vehicles, although they do not seem to reflect any kind of routine vehicle maintenance.

[3] It is a coincidence that both allocation factors mentioned in this section are equal to 60%.

3. Cost Estimates for Galena

The City of Galena has provided hauled water and sewer service since 1975. As of October 1997 they served about 100 customers with trucked water and about 115 customers with sewer haul.

Table 5

Galena System Summary -- as of October 1997			
Population and Households			
	1990 Census Occupied housing units	173	
	1997 occupied housing units	200	
Physical Size of system			
Water			
	HH receiving piped water	28	
	customers receiving hauled water	97	
Sewer			
	holding tanks pumped	115	
	septic tanks	36	
	honey buckets	38	
	outhouses	13	
	Haul system residential customers	160	
	Haul system commercial customers	20	
Rates			
	water delivery	0.075	$/gal
	sewer haul 200 gals	12.00	$/pickup
	sewer haul 1000 gals	45.00	$/pickup
	sewer haul 2000 gals	82.50	$/pickup
Output			
	gallons of water delivered by pipe	70,000	gal/mo
	water delivered by truck	70,000	gal/mo

The City of Galena maintains a well-developed bookkeeping system that allocates direct expenses to hauled water and hauled sewer functions. However, administrative costs for water, sewer, and solid waste are lumped together. I have allocated these admin costs based on the ratio of total haul system direct costs to total utilities (water/sewer/solid waste) direct costs. Table 6 shows the resulting estimates of haul system O&M costs. The average cost of service is $1,085 per household per year.

Table 6: Galena O&M Cost Summary for FY97 and FY98

	FY98 Budget	FY97 Actual	Average	# of cust.	$ per cust.	gallons/ cust/day
Water Delivery						
Labor (mostly operators)	32,961	44,243	38,602	97	398	
Fuel	1,800	2,179	1,990	97	21	
Vehicle repair	1,000	870	935	97	10	
Supplies	200	549	375	97	4	
Insurance	1,700	1,353	1,527	97	16	
Subtotal Water Delivery	37,661	49,194	43,428	97	448	24
Sewer Haul						
Labor (mostly operators)	29,973	32,907	31,440	115	273	
Fuel	1,800	1,626	1,713	115	15	
Vehicle repair	500	485	493	115	4	
Supplies	200	688	444	115	4	
Insurance	1,700	1,353	1,527	115	13	
Subtotal Sewer Haul	34,173	37,059	35,616	115	310	
Administration Cost (allocated)						
Total Direct Haul Operation	71,834	86,253	79,044		757	
Total Direct all non-electric utils	205,724	154,273				
Ratio for allocation of total admin						
to haul operations	35%	56%				
Allocated Admin Costs	30,126	41,768	35,947			
Total Cost of Haul Service	**101,960**	**128,021**	**114,990**	**106**	**1,085**	

Analysis of utility records revealed that a substantial number of households had reduced their usage to fewer than 10 trips per year. Also, there was a checkerboard pattern of FH use, which may cause average costs of service to be higher than they would be if more people used the service in contiguous blocks of houses.

4. Cost Estimates for Nunapitchuk

A combination of 5 Cowater plus 15 David Nairne FH units were in place in Nunapitchuk during the ANHB data collection period of October 1997 - September 1998. The expenditure data also reflect service to 87 HB haul household accounts.

The charges for service as of 4/98 are $20 for a full tank sewage haul or a full tank water delivery. This represents an increase from $15 per sewage haul as of 8/97.

Joe Sarcone's field notes from 8/97 indicate that the city spent about $3,000 the previous year maintaining boardwalks for FH system use. This expense would be categorized as a labor item according to the list of expense categories used.

Table 7 summarizes the basic system data for Nunapitchuk. The main point to note is that the water and sewer system is a combination of 20 flush haul units *and* 87 honeybucket haul units.

Table 7: Nunapitchuk Flush Haul System Summary

FH System Size:	20	households (HH)	
Other System:	87	HH using HB Haul	
Initial Installation:	5	HH in 1991 (Cowater)	
Additions:	15	HH in 1996 (Nairne)	
System Type:	Cowater (5) and Nairne (15)		
Fees Charged:	20	$/full tank of water	
	20	$/sewage tank haul	
Late fees:	5%	surcharge rate per month on late payments	
Delinquency rate:	10%	after interest rate imposed	

Because of the honeybucket haul operations, it is necessary to break out the portion of reported actual costs that should be attributed to the flush haul system. I use the same method as described above for Buckland. For the Nunapitchuk situation I calculate that about 50% of total reported water/sewer expenses should be allocated to flush haul services, as shown in Table 8.

Table 8:

Computation of FH share of the total water/sewer function time:	
Assumptions:	
ratio of FH sewer hauls to all sewer hauls:	0.19
ratio of HB haul time to FH sewer haul time	0.50
ratio of FH water hauls to FH sewer hauls	1.00
ratio of FH water haul time to FH sewer haul time	1.00
Results:	
Time breakout in units of FH sewer haul time:	
FH sewer hauls	1.00
Honeybucket sewer hauls	2.18
FH water hauls	1.00
FH time as % of total time	**48%**

With the allocation percentage estimated, I now compute the actual expenses for the flush haul system during the study period. The total actual O&M expenses are $768 per household served. This is almost surely an underestimate of the true cost since it does not include any vehicle depreciation, vehicle repairs, or replacement parts. However, some of the reported labor cost may be due to routine vehicle maintenance.

Table 9:
Nunapitchuk Estimated O&M Costs for Flush Haul Service to 20 Households (based on data from 10/97 to 9/98)

Item		total amount	FH share	FH amount	# of households	FH $ per household
Labor		28,225	50%	14,113	20	706
Fuel		1,503	50%	752	20	38
Electricity		323	50%	162	20	8
Equipment		-	50%	-	20	-
Parts		-	50%	-	20	-
Repairs (outside svcs)		60	50%	30	20	2
Supplies		4	50%	2	20	0
Travel		-	50%	-	20	-
Accounting & Legal		-	50%	-	20	-
Rent		-	50%	-	20	-
Telephone		217	50%	109	20	5
Other		391	50%	196	20	10
Total		**30,723**		**15,362**	**20**	**768**

5. Cost Estimates for Mekoryuk

The Mekoryuk flush haul system was one of the first to be installed in Alaska. When data were collected during the first half of 1999 the system comprised 65 Cowater Flush Tank and Haul (FTH) units (YKHC 1999). The Cowater system uses blowers to transfer sewage and greywater from the house to an external holding tank. Sewage and water are hauled in 100-gallon tanks pulled by an ATV or snowmachine.

Table 10 summarizes the Mekoryuk system characteristics. The low number of hauls per unit is perhaps noteworthy. The YKHC report suggests that some customers self-haul their water and others have disconnected their kitchen sink drains from the system so that greywater is manually emptied into outdoor drainage ditches.

Table 10: Mekoryuk Flush Haul System Summary

FH System Size	65	units			
(as of winter 1999)					
System type:	Cowater Flush Tank and Haul (FTH)				
Gallons per haul	100				
Estimated annual water hauls	538	hauls, or:	8	hauls per unit	
Estimated annual sewage hauls	757	hauls, or:	12	hauls per unit	
Fees Charged:	$ 22.50	per 100 gallon tank of water			
	$ 22.50	per sewage haul			

The cost data for the Mekoryuk FTH are not “co-mingled” with other functions due to the accuracy of the survey methods. No allocations of shared operator time are necessary. Table 11 shows the resulting cost estimates.

Table 11:
Mekoryuk Annual Operating Expenses for Flush Haul Service to 65 Units
(based on data from 1/99 to 6/99)

Item		total amount	FH share	FH amount	# of households	FH $ per household
Labor -- water		4,907	100%	4,907	65	75
Labor -- sewage		6,904	100%	6,904	65	106
Fuel		680	100%	680	65	10
Access (snow removal)		9,460	100%	9,460	65	146
Equipment depreciation		1,788	100%	1,788	65	28
Equipment routine O&M		1,278	100%	1,278	65	20
Major Repairs (outside svcs)		-	100%	-	65	-
Supplies		-	100%	-	65	-
Travel		-	100%	-	65	-
Admin, Accounting & Legal		7,625	100%	7,625	65	117
Rent		-	100%	-	65	-
Telephone		-	100%	-	65	-
Other			100%	-	65	-
Total		**32,641**		**32,641**	**65**	**502**
	Total number of hauls			1,295	(538 water + 757 sewer)	
	Average cost per haul			$ 25		

In contrast to Nunapitchuk, the Mekoryuk estimate does include an estimate for depreciation of the snow machine and ATV. The number may be low, however, due to the method used in the YKHC report.[4] A key issue in determining actual depreciation is whether the vehicles wear out over some fixed lifetime independent of the number of hauls they make per year, or whether they wear out in direct proportion to their running time. Only additional years of experience from several communities will be able to resolve this question. However, vehicle depreciation is a minor cost element, accounting for only 6-10% percent of total O&M in Mekoryuk and similar systems.

The other noteworthy cost item for Mekoryuk is snow removal, which costs almost as much in labor time as the actual hauling operations. According to the YKHC report, the Native Village of Mekoryuk requires that customers provide access to their external holding tanks, but since "access" has not been clearly defined, the City currently assumes the responsibility for clearing snow around tanks.

[4] The YKHC methodology starts with a vehicle "design lifetime" (5 years, for example) and assumes that this design lifetime would be achieved under "full-scale" village service (defined as service to all households). They then increase the vehicle lifetime if a system is only serving some portion of the "full scale" number of households. There is no way to judge in advance whether the assumed "design lifetime" or the adjustment for operation at less than "full scale" are valid. Only actual operating experience will provide the data on how fast these vehicles actually wear out.

6. Cost Estimates for Quinhagak

Quinhagak has a Pump and Haul (PH) system designed by David Nairne and Associates. As of June 1999, the system served 44 units. The PH system moves 200 gallons per haul. Table 12 summarizes the Quinhagak system.

Table 12: Quinhagak Flush Haul System Summary

FH System Size	44	units			
(as of winter 1999)					
System type:	Pump and Haul (David Nairne)				
Gallons per haul	200				
Estimated annual water hauls	471	hauls, or:	11	hauls per unit	
Estimated annual sewage hauls	456	hauls, or:	10	hauls per unit	
Fees Charged:	$ 15.00	per 200 gallon tank of water			
	$ 20.00	per 200 gallon sewage haul			

Quinhagak has roughly the same number of hauls per unit as other study villages even though the system provides twice as much volume per haul. Quinhagak also has slightly lower fees *per haul,* which translate to a user fee *per gallon* that is less than half the user fee per gallon in Mekoryuk. The lower fee per gallon is associated with about twice the usage in terms of gallons per unit.

Table 13 shows the estimated annual O&M costs for the Quinhagak PH system.

Table 13:
Quinhagak Annual Operating Expenses for Flush Haul Service to 44 Units
(based on data from 1/99 to 6/99)

						FH
		total	FH	FH	# of	$ per
Item		amount	share	amount	households	household
Labor -- water		4,634	100%	4,634	44	105
Labor -- sewage		4,130	100%	4,130	44	94
Fuel		555	100%	555	44	13
Access (snow removal)			100%	-	44	-
Equipment depreciation		867	100%	867	44	20
Equipment routine O&M		1,632	100%	1,632	44	37
Major Repairs (outside svcs)		-	100%	-	44	-
Supplies		-	100%	-	44	-
Travel		-	100%	-	44	-
Admin, Accounting & Legal		127	100%	127	44	3
Rent		-	100%	-	44	-
Telephone		-	100%	-	44	-
Other			100%	-	44	-
Total		**11,944**		**11,944**	**44**	**271**
	Total number of hauls			927	(471 water + 456 sewer)	
	Average cost per haul			$ 13		

The average cost in Quinhagak is only $271 per household -- significantly lower than the cost in Mekoryuk. There are two principal reasons for this. First, Quinhagak has no significant snow removal costs. Second, this system apparently uses little or no administrative time to operate the system. Although the YKHC analysis verified the very low amount of admin time devoted to system operation, it is possible that there are significant amounts of time being spent on flush haul work orders and billing by the clerical staff at the IRA Council office.

7. Cost Estimates for Tuntutuliak

In the Native Village of Tuntutuliak, the Tuntutuliak Community Services Association (TCSA) operates a Microflush (MF) system with 37 units as of June 1999. Each haul delivers 130 gallons of water or removes slightly more than 130 gallons of sewage. Table 14 shows the Tuntutuliak system summary.

Table 14: Tuntutuliak System Summary

FH System Size	37	units			
(as of winter 1999)					
System type:	Microflush (MF)				
Gallons per haul	130				
Estimated annual water hauls	642	hauls, or:	17	hauls per unit	
Estimated annual sewage hauls	606	hauls, or:	16	hauls per unit	
Fees Charged:	$17.50	per 130 gallon tank of water			
	$20.00	per 130+ gallon sewage haul			

Note that the Tuntutuliak system is used with almost twice the frequency of the Mekoryuk or Quinhagak systems. There is no obvious reason for this, since the fee per haul is about the same for all systems, and residents can self-haul water from the water plant at no cost in all three communities.

Table 15 shows the annual cost estimate for Tuntutuliak. The average cost per household is $961, almost twice the amount for Mekoryuk. The main reason for this higher number is that the MF system uses two operators per haul, according to the YKHC survey. Other reasons why the estimated cost is higher include the high number of service calls to repair plumbing on the customer's premises and the explicit recognition of routine vehicle maintenance at 8 hours per month of operator time.

Table 15:
Tuntutuliak Annual Operating Expenses for Flush Haul Service to 37 Units
(based on data from 1/99 to 6/99)

Item		total amount	FH share	FH amount	# of households	FH $ per household
Labor -- water		12,626	100%	12,626	37	341
Labor -- sewage		12,879	100%	12,879	37	348
Fuel		216	100%	216	37	6
Access (snow removal)		672	100%	672	37	18
Equipment depreciation		650	100%	650	37	18
Equipment routine O&M		3,544	100%	3,544	37	96
Repairs to Plumbing		1,618	100%	1,618	37	44
Supplies		-	100%	-	37	-
Travel		-	100%	-	37	-
Admin, Accounting & Legal		3,365	100%	3,365	37	91
Rent		-	100%	-	37	-
Telephone		-	100%	-	37	-
Other			100%	-	37	-
Total		**35,570**		**35,570**	**37**	**961**
	Total number of hauls			1,248	(642 water +	606 sewer)
	Average cost per haul			$ 29		

8. Comparisons and Discussion

Comparison of the Four Small Vehicle Systems

As a way of drawing together and summarizing the data, the following two tables present a comparison of the four small vehicle systems operating in southwest Alaska. The operating cost of flush haul service (over and above the cost of providing water at the treatment plant) varies from less than $300 per unit per year (Quinhagak) to almost $1,000 per unit per year (Tuntutuliak).

When cost is measured in terms of gallons of water delivered, it ranges from 13 cents per gallon in Quinhagak to 61 cents per gallon in Mekoryuk. Tuntutuliak residents pay about 43 cents per gallon. Thus, Tuntutuliak residents pay more total dollars per year partly because they have significantly more water delivered. There is not enough data to calculate a per gallon cost for Nunapitchuk.

Table 16:
Comparison of the Four Small Vehicle Flush Haul Systems

			Nunapitchuk	Mekoryuk	Quinhagak	Tuntutuliak
		units served	20	65	44	37
Level of Service						
	Water					
		fees, $ per haul	20.00	22.50	15.00	17.50
		hauls per unit per year	unknown	8	11	17
		gallons per haul	100	100	200	130
		gallons per unit per year	unknown	828	2,141	2,256
	Sewage					
		fees, $ per haul	20.00	22.50	20.00	20.00
		hauls per unit per year	unknown	12	10	16
		gallons per haul	100	100	200	130
		gallons per unit per year	unknown	1,165	2,073	2,129
Reported Cost of Service						
		Direct Labor -- water haul		4,907	4,634	12,626
		Direct Labor -- sewer haul		6,904	4,130	12,879
		Direct Labor -- snow removal		9,460	-	672
		Direct Labor -- plumbing				1,618
		****Direct Labor -- Total**	14,113	21,271	8,763	27,795
		Fuel & Electricity	913	680	555	216
		Equipment depreciation		1,788	867	650
		Equipment O&M	30	1,278	1,632	3,544
		Admin, Accounting & Legal		7,625	127	3,365
		Office Expense & Other	306	-	-	-
Total Reported Cost of Service			**$ 15,362**	**$ 32,641**	**$ 11,944**	**$ 35,570**
		Cost per Unit per Year	$ 768	$ 502	$ 271	$ 961

Table 17:
Cost of Service per Unit and per Gallon

		Nunapitchuk	Mekoryuk	Quinhagak	Tuntutuliak
Cost Per Unit Per Year Breakdown					
	Direct Labor	706	327	199	751
	Equipment (Fuel, O&M, Depr)	47	58	69	119
	Admin & Office	15	117	3	91
	Total Cost per Unit per Year	**$ 768**	**$ 502**	**$ 271**	**$ 961**
Total Flush Haul Cost per Gallon of Water Delivered					
	Gallons water per Unit per Year	unknown	828	2,141	2,256
Total Cost per Gallon (of water deliver		unknown	$ 0.61	$ 0.13	$ 0.43

Figure 1:

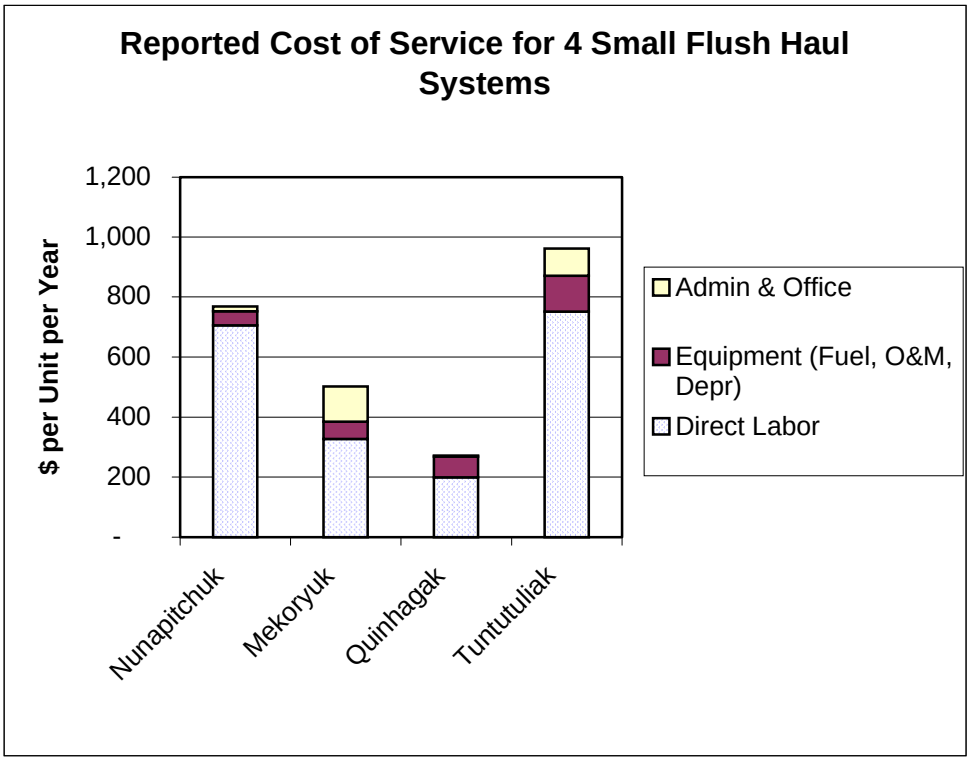
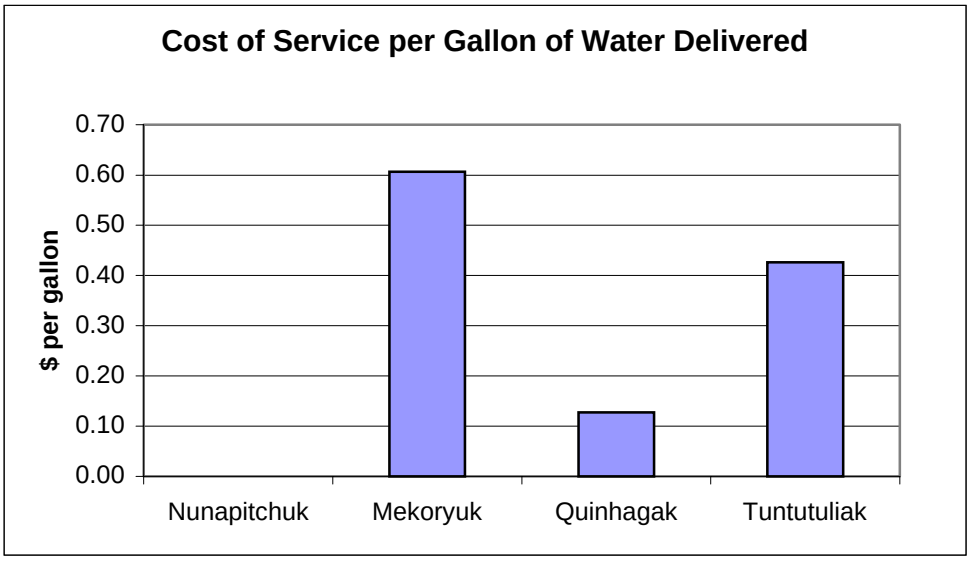


Figure 2:



Comparisons to Previous Estimates

Buckland. In a previous paper (Colt 1994) I estimated life cycle costs for three possible systems that were contemplated or just entering service in 1994. I concluded that the average annual O&M cost for a Buckland-type truck haul system would be about $1,435 per household. This compares with a figure of $1,007 estimated here from actual data. Since the actual data may be skimping on vehicle maintenance expense, I believe the two estimates are reasonably close. The 1994 estimate was for a system serving all 84 houses in the village, while the data used here reflect only 36 houses.

Other Communities -- Small Vehicle Systems. In 1994 I estimated the annual O&M for small vehicle flush haul system to be about $2,000 per household per year, of which about $1,600 was for direct labor.

The cost data presented here for the four small vehicle systems suggest that *due to reduced demand for the service*, annual labor costs range between $300 and $750, or less than half of the projected amounts. The Nunapitchuk data reported above include very little provision for vehicle maintenance or replacement. Applying the allowances for these items that were estimated in 1994 to the actual data on labor costs yields a revised estimate of about $1,200 per household per year for Nunapitchuk. The Quinhagak data shows almost zero cost for administration and billing. Adding in a reasonable estimate of $200 per unit per year would increase the Quinhagak cost up to about $500 per unit per year.

The main conclusion from the detailed studies of actual usage conducted by YKHC is that many people apparently prefer to self-haul their water and/or directly empty their gray water to keep their monthly bills down. Under this arrangement, the people still receive many of the health benefits of the flush haul system, such as isolation from raw sewage. The cost per unit served of the system may be higher than necessary due to diseconomies of small scale. But if the key cost element – labor – is paid for on an hourly basis based on actual deliveries, then this cost can be kept down if the demand for service is low. Unfortunately it is not possible to tell from the YKHC data whether the subject communities are in fact paying their operators for actual deliveries or for some flat amount of time. Flexibility in labor use appears to be the key to keeping costs down for the flush haul systems examined here.

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CHAPTER VII.
EXISTING AND POTENTIAL LOCAL CONTRIBUTIONS TO VILLAGE SAFE WATER PROJECTS

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Existing and Potential Local Contributions To Village Safe Water Projects

This paper considers four types of existing or potential local contributions small rural communities do or could make to projects under the Village Safe Water (VSW) program. More than 250 small communities (almost all with populations considerably below 1,000) are potentially eligible for the VSW program, which helps communities carry out sanitation capital projects. The program is administered by the Alaska Department of Environmental Conservation. Contributions we consider are:

- Local payment of operations and maintenance costs
- Contributed labor
- Contributed land
- Cash contributions toward construction costs

Summary of Findings

- The average per capita income in VSW-eligible communities is between 30 and 40 percent below the statewide average. Of the 118 communities that are both eligible for VSW grants and able (by virtue of being incorporated) to levy some sort of tax, 80 actually do collect local taxes. On average, however, VSW communities collect only about $313 per capita, or 27 percent of the per capita tax revenue collected by larger communities that are not eligible for the program.
- Although VSW communities do not currently pay a direct cash match toward construction, they are responsible for 100 percent of the ongoing operation, maintenance, and management (OMM) costs. Utility rates often fail to cover costs, which are high due to diseconomies of small scale and remote, harsh operating conditions.
- Those communities that use force accounting often contribute significant amounts to construction efforts by providing labor at wage rates below the (legally) "prevailing" level required for standard contracting. For the six representative projects analyzed here, the in-kind contribution provided by force account labor ranged from 3 percent to over 20 percent of total project cost. With one exception, these amounts greatly exceeded what would have been provided by a five percent construction cash match.
- Most sanitation facilities are built on municipal land provided at no cash cost to the state. Many of these sites represent village corporation land that has been reconveyed to municipalities under requirements of the Alaska Native Claims Settlement Act. The reconveyance process can be quite costly to the village corporations involved.
- There is currently no requirement for communities to provide a direct cash match to receive VSW assistance. A required local cash match equal to 5 percent of year 2000 VSW project construction costs would generate an average required match of about $65,000 per community for that year. Many projects require several years to complete.
- Most projects serve a limited number of households. Case study analysis shows that for major construction projects, a five percent local cash match would range between $2,500 and $5,000 per household served.

Economic Status and Fiscal Capacity of VSW Communities

This section summarizes some relevant demographic and economic data for communities that are served by the Village Safe Water (VSW) program.

Program Description and Eligibility

The Village Safe Water Program (VSW), administered by the Division of Facility Construction and Operation of the Alaska Department of Environmental Conservation, helps small Alaskan communities to carry out water, sewerage and solid waste capital projects and related studies. The program does this in several ways:[1]

- Secures federal grant funds with state CIP matching funds
- Provides grants to small communities for water, sewerage and solid waste studies and projects
- Assigns an engineer to each project to assist communities with planning, developing facility design options and selection, and addressing regulatory issues
- Ensures appropriate and effective use of grant funds by disbursing funds to communities as progress payments after review of invoices

The grants do not pay operations or maintenance costs of the facilities built with VSW funds. Local communities and facility users are responsible for these costs.

It is not possible to make a complete list of all the potential applicants for VSW grants. By statute, second-class cities, first-class cities with populations of less than 600, and unincorporated areas with populations of between 25 and 600 are eligible. In addition, larger communities may apply to provide service to small isolated settlements within their boundaries. Tribal governments and school districts may also apply. We estimate that at least 254 places are potentially eligible.

Characteristics of VSW-Eligible Communities

Population

The Alaska Department of Labor estimates population for about 350 places in the state. After eliminating some of these places to avoid double counting, we developed a list of 328 places. The list covers 540,422 people, or about 87 percent of the total Alaska population.[2] We used the VSW criteria to identify places eligible for VSW grants. Although over three-quarters of the identified places could apply for VSW grants, together these places account for only about 12 percent of Alaska's population. Table 1 shows that just over half of communities eligible for VSW grants are unincorporated; most of the rest are second-class cities, and a few are first-class cities.

Table 2 shows that most of these communities are small. Almost one third had fewer than 100 residents in 1999, and 60 percent had fewer than 250 residents.

[1] Description taken from the Division of Facility Construction and Operation Website: http://www.state.ak.us/local/akpages/ENV.CONSERV/dfco/aboutus.htm#Village

[2] Most of the remainder of the population is suburban in character, living outside designated places in the Matanuska-Susitna, Fairbanks, Kenai, and Ketchikan boroughs.

Table 1. Legal Status of VSW-Eligible Communities

Type of incorporation	Number	Percent of Communities
First Class City	6	2%
Second Class City	112	44%
Unincorporated	136	54%
Total	254	

Source: Alaska Department of Revenue. *Alaska Taxable 1998*

Table 2. Size of VSW Eligible Communities

Population, 1998	Number	Percent of Communities
Fewer than 100	76	30%
101 to 250	73	29%
251 to 500	65	26%
501 to 1000	37	15%
More than 1,000	3	1%
Total Number of Communities	254	
Total Population of these Communities	72,080	

Source: Alaska Department Of Labor Research and Analysis Division, *Population Estimates* 1998

Income

Communities eligible for Village Safe Water grants have significantly lower per capita incomes than other communities in the state. As shown in Table 3, the estimated per capita income in first-class cities that are eligible for VSW projects is almost 40 percent below that in all first-class cities taken together. The second-class cities – all of which are eligible for VSW– have average per capita income 33 percent below the level for all first-class cities. These differences are largely tied to size: small Alaskan communities generally have lower per capita cash incomes than larger communities.

Table 3. Per Capita Income by Community Type and VSW Eligibility, 1999

	VSW Eligibility		
Type of community	Not Eligible	Eligible	Total
First Class City	$18,989	$11,850	$18,574
Second Class City		$12,374	$12,374
Other Incorporated	$22,393		$22,393
Unincorporated	$21,677	$14,718	$19,541
Total	$22,163	$13,124	$21,326

Source: Calculated by authors from U.S. Census *STF#3, Tables P98 through P105,* 1990 and Department of Commerce, Bureau of Economic Analysis, *Local Area Personal Income*, 1990 and 1998

Water and Sanitation Facilities

The level of water and sanitation services currently available in communities eligible for VSW grants varies widely. In May 1999, the Rural Utility Business Advisor (RUBA) program, part of the Alaska Department of Community and Economic Development, surveyed communities with population of less than 1,000 that had some type of sanitation system. They identified 192 communities and completed surveys of 185. Of these, 168 reported that they provided some water or sanitation service; 17 did not provide any service. To identify services provided in the VSW-eligible communities not included in the RUBA survey we used the *Alaska Community Database* facility listing.

The level of sanitation available in communities that don't offer services also varies widely. Some communities that provide no services still have a substantial number of fully plumbed houses that use individual wells and septic systems. Others are located where individual wells and septic are not practical, and in those communities households use rain water or surface water sources and honey buckets or outhouses. These two groups of communities are not readily distinguishable in the table below.

Table 4. VSW Eligible Communities Providing Water or Sewer Service

	Piped Water		
Sewer Service	Yes	No	Total
Yes	92	12	104
No	49	101	150
Total	141	113	254

Source: Alaska Department of Commerce and Economic Development (DCED), *RUBA Survey 1999* and *Alaska Community Database.*

Tax Revenues

Incorporated communities can levy taxes. The sales tax is the most common tax levied by VSW communities. A few have property taxes. Other taxes include taxes on lodging, raw fish, fisheries business activity, car rentals, alcohol, fuel, tobacco, vehicle registration, and gaming. Of the 118 incorporated communities that are eligible for VSW grants, 80 currently levy some sort of tax and 38 don't. Table 5 shows what taxes the VSW-eligible, incorporated communities levy. The remaining 136 VSW-eligible communities are unincorporated and therefore cannot levy taxes.

Table 5: Taxes Levied by VSW Eligible, Incorporated Communities

Property Tax	Sales Tax	Other Taxes	Number of Communities
NO	NO	NO	38
YES	NO	NO	3
NO	**YES**	NO	59
YES	**YES**	NO	1
NO	NO	**YES**	9
YES	NO	**YES**	0
NO	**YES**	**YES**	6
YES	**YES**	**YES**	2

Source: Alaska Department of Revenue, *1998 Alaska Taxable*

Table 6 shows how much revenue these communities collect from their taxes. On a per capita basis, "Other Taxes" produced the most revenue in 1998. About two thirds of those taxes in 1998 were fish landing or fisheries business taxes. These taxes allow the communities that levy them to tax non-residents and to capture some of the value of nearby commercial fisheries. Obviously, communities' ability to levy fish-related taxes is strictly limited by their geography.

Table 6. Total and Per Capita Tax Collected by VSW-Eligible Incorporated Communities, 1998

Tax Type	Total	Per capita
Sales Tax	$7,667,199	$277
Property Tax	$431,075	$191
Other Taxes	$4,494,325	$352
Total Taxes	$12,592,599	$313

Source: Alaska Department of Revenue, *1998 Alaska Taxable*

Table 7 shows that VSW communities aren't able to raise as much tax revenue, on a per capita basis, as the average Alaska community. On average, VSW-eligible communities collect only about 27 percent of the per capita tax revenue collected by ineligible communities. In particular, sales taxes are less effective revenue producers in small, remote communities because people must make a relatively large share of their purchases outside the community.

Table 7. Tax Revenues Per Capita, by Community Type and VSW Eligibility, 1998

	VSW Eligibility		
Type of community	Not Eligible	Eligible	Total
First Class City	$1,136	$333	$1,098
Home Rule Borough	$10,371		$10,371
Home Rule City	$854		$854
Second Class Borough	$755		$755
Second Class City		$313	$313
Third Class Borough	$498		$498
Unified Home Rule	$931		$931
Grand Total	$1,169	$313	$1,120

Source: Alaska Department of Revenue, *1998 Alaska Taxable*

In summary, the VSW-eligible communities are small and remote, by definition. They have average per capita incomes about 40 percent lower than the state average. The tax revenue they are able to raise, per capita, is 70 percent lower than Alaska's average.[3]

[3] This 70 percent figure does not count the large number of unincorporated communities that can't raise any revenue through taxation.

Existing Local Contributions

In this section we describe the three major forms of existing local contributions to VSW projects: operation and maintenance, force account labor, and contributed land.

Operation and Maintenance Expenditures

Although VSW communities do not currently pay a direct cash match toward construction, they are responsible for 100 percent of the ongoing operation, maintenance, and management (OMM) costs.[4] Village Safe Water grants typically fund projects that serve small populations in remote villages with harsh climates. For all these reasons, operations and maintenance costs tend to be higher than average. Although there is little data available on rural utilities' revenues and expenditures, the RUBA program surveys rural utilities and includes questions about rates and revenue shortfalls. This section reports data from their 1999 survey.

Table 8 and Table 9 look at communities providing piped water or sewer. Table 8 shows that a flat rate charge was the most common type of rate structure. Table 9 looks at the range of fees charged for monthly flat rate service, and compares them with Anchorage's. The monthly rates reported by these rural utilities ranged from under $10 per month to over $100. The overall average of $46 (combined) is very close to Anchorage's rates.

Table 8. How Communities with Piped Water or Sewer Bill for Services

Type of Billing	Piped Water & Sewer	Water Only	Sewer Only
Flat Rate	58	35	20
Metered	1	8	0
Both	18	18	3
Total	77	61	23
No Answer	8	20	4
Grand Total	**85**	**81**	**27**

Source: Alaska DCED, *RUBA 1999 Survey*

[4] Recent work by Haley (1999) documents the importance of the "management" factor in the OMM equation.

Table 9. Rural Utility Rates for Piped Water and Sewer Systems

	Water	Sewer	Combined
Minimum per Month	$5	$5	$10
Maximum per Month	$110	$110	$220
Mean per Month	$27	$27	$46
Number of Communities Reporting	45	44	74
Item: Anchorage rate per Month	$26	$22	$48

Source: Alaska DCED, *RUBA 1999 Survey*
Note: This table only looks at communities that charge flat rates.

Of greater importance is the fact that in rural areas, *rates often do not cover costs*. Most communities in the RUBA survey—93 out of 124 responses—reported that their current charges for service do not cover their identified water and sewer expenses.[5] Table 10 shows that the shortfalls range from under $5,000 to over $20,000. Communities have many ways of attempting to make up the difference. Table 11 shows the more commonly listed sources of funds for covering revenue shortfalls: as the list shows, communities are using all the revenue-producing tools at their disposal to cover these costs.

Table 10. Number of Communities With Revenue Shortfall by Size of Shortfall

	Do Revenues Cover Water and Sewer Costs?		
How Much More Revenue Needed to Cover W & S Costs?	No	Yes	Total
None	4	28	32
$0 - $5,000	12	2	14
$10,000 - $20,000	17		17
$5,000 - $10,000	26		26
More Than $20,000	34	1	35
Grand Total	93	31	124

Source: Alaska DCED, RUBA 1999 Survey
Note: Three communities reported both covering their costs and requiring additional funds.

[5] In addition to the identified expenses likely to be reported to the RUBA survey, it is highly likely that most systems have significant additional costs that are "off the books"—including especially staff time of city administrators, accountants, and others.

Table 11. Sources of Revenue for Water and Sewer Expenses

Revenue Sharing	Tribal Council Funds
General Fund	Compacting Funds
Property Taxes	Cut back on operator hours
Sales Tax	Electric Coop
Gaming (Bingo and Pull-Tabs)	Equipment rental, building rents, etc.
Other Fees or Enterprise Funds	Gas sales, SAFE communities $
ANHB Grant	Liquor store
BIA Grant for Operator Wages	Washeteria funds
Raw fish tax	Clinic money
Cable TV	PILT

Source: Alaska DCED, *RUBA 1999 Survey*

Labor Contributions from Force Accounting

Many communities are making substantial in-kind contributions to the projects for which they receive grants by providing local labor at rates below the prevailing wage rate. We looked at the expenditures and wage rates for six of these communities, using 1998 data, and estimated the value of the in-kind contribution those communities provided.

The law requires that projects funded with federal money pay prevailing wage rates. In the case of many Village Safe Water grants, these are the wage rates used by the Alaska Native Tribal Health Consortium. As shown in Table 2, rates under that scale are from $25 to $35 per hour.

By contrast, laborers provided by the local communities for VSW projects built under "force accounting" arrangements often work for $10 to $15 per hour. Force accounting is a system under which government (rather than a private contractor) buys the materials, provides the necessary equipment, supervises the construction, and pays workers a reduced prevailing local wage rate. This difference in wage rates either saves projects money or stretches given amounts further. The amounts saved can be substantial for labor-intensive projects.

Table 12. Alaska Native Tribal Health Consortium Construction Wage Schedule

ANTHC Job Title	Hourly Rate
Laborers	25.15
Trades helpers	25.94
Crew leaders	26.99
Power Equipment Operators, I	29.82
Power Equipment Operators, II	29.16
Carpenters	30.03
Plumbers	31.73
Superintendent I	35.02
Superintendent II	32.87
Superintendent III	30.26

Source: ANTHC, Dept of Environmental Health and Engineering

We gathered data on expenditures and hours worked for six representative projects in Alakanuk, Hooper Bay, Deering, Teller, Nulato and Napakiak in 1998. As 13 shows, the in-kind contribution provided by force account labor ranged in these communities from 3 percent to over 20 percent of total project cost. With one exception, these amounts greatly exceeded what would have been provided by a 5 percent cash match. The average amount of contributed wages was $125,000, or about 13 percent of total project cost.

Table 13. Estimated In-Kind Labor Contribution to VSW Projects in Six Rural Communities, 1998

Community	Total Expenses in 1998	In-Kind Labor Contribution	In-Kind Contribution as percent of Expenses
Alakanuk	$1,219,000	$256,411	21%
Deering	$2,282,084	$159,839	7%
Teller	$127,226	$9,644	8%
Nulato	$185,600	$6,029	3%
Hooper Bay	$1,212,082	$242,310	20%
Napakiak	$561,256	$75,780	14%
Total	$5,587,247	$750,012	13%
Average	$931,208	$125,002	13%

Source: Authors' estimates

Contributed Land

Most facilities built with VSW funds are on municipal lands. According to Rick Elliot,[6] a retired land specialist, these sites are typically village corporation lands that have been conveyed to the local government under section 14 (c)(3), "reconveyance process," of the Alaska Native Claims Settlement Act (ANCSA). This section of ANCSA requires that village corporations reconvey to municipal governments "as much additional land as is necessary for community expansion, and appropriate rights of way for public use, and other foreseeable community needs."[7]

While ANCSA requires that a minimum of 1,280 acres of land be transferred, the act was silent on *when* the transfers needed to be completed. In addition, for many (small!) village corporations the administrative costs of carrying out the reconveyances have been substantial; technical and legal assistance that state and federal agencies used to provide for these purposes have long since disappeared. As a result, many village corporations have entered into interim lease arrangements with municipalities to permit construction of sanitation facilities; others have probably accelerated their 14 (c)(3) processes in response to community sanitation needs.

Thus, while it is almost impossible to place dollar values on the lands provided by village corporations and the communities themselves, it is clear that for most VSW projects, the required lands have been provided at no cash cost to the project. While one could argue that ANCSA required the village corporations to provide many of these sites, they nonetheless represent a real diminution of the village corporations' land base. Perhaps more important, in most cases they also represent a significant contribution of village corporation staff time or technical and legal expenses necessary to carry out or accelerate the land transfers.

Potential Size of Local Cash Matches

In this section we consider the potential contributions that would be required under state legislation introduced in 1999. That legislation did not pass in 1999, but several legislators have said they are interested in re-introducing the legislation in the future. We first consider the potential required match amounts for all communities that will receive FY 2000 VSW funding. Because many projects are phased over several years, we then consider the potential cumulative match amounts for a subset of communities with good data covering specific multi-year projects.

Estimated Cash Match Amounts for All FY2000 VSW Grants

We calculated how large a cash match all FY 2000 VSW grant communities would have had to pay under the proposed requirements of SB 147.[8] The calculated local matches ranged from just under $2,000 to $175,000, with an average of about $40,000. The lower match amounts were usually associated with design or feasibility studies or master plans.

In almost all cases, SB 147 would have required a five percent local match on funds disbursed by the State of Alaska for Village Safe Water projects. Because much of the federal funding for

[6] Personal communication with S. Colt, 7 February 2000.
[7] P.L. 92-203, Alaska Native Claims Settlement Act, section 14(c)(3)
[8] A bill introduced in the Alaska Legislature in 1999.

these community projects passes through the state government, communities would have had to match federal as well as state dollars. In practice, this means that 5 percent of the total grant was equal to 15 or 20 percent of the nonfederal funding, with the larger construction grants requiring the higher percentage match.

Estimated Local Matches for Selected Multi-Year Projects

Because most projects are split into several phases, a community moving from honey buckets to a piped water and sewer system typically needs to secure several grants over several years. To see how a cash match requirement might add up over the life of an entire project, we looked at four communities in more detail. These communities all have FY 2000 VSW grants approved to serve a clearly defined number of households moving from honey buckets to piped water and sewer systems.

The four case studies suggest that a single year's 5 percent local match requirement would often be around $2,000 per household served. The total required match on a complete set of projects carried out over many years would range between $2,500 and $5,000 per household served. One way to consider the burden such a requirement might impose is to calculate the amount by which monthly water and sewer bills would have to be increased to cover the additional cost of the match. If the match amounts were to be amortized and paid off over 20 years by a surcharge added to user fees, the fees would have to be increased by between 25 and 45 percent.

Conclusions

The Village Safe Water program was created to help small remote communities obtain basic water and sanitation facilities. In many of these small communities the cash economy and employment are quite limited. The average per capita income in VSW-eligible communities is between 30 and 40 percent lower than the statewide average.

Nonetheless, two out of three of the communities that are both eligible for VSW grants and able (by virtue of being incorporated) to levy some sort of tax actually do collect local taxes. On average, however, VSW communities manage to collect only about $313 per capita, or 27 percent of the per capita tax revenue collected by ineligible communities. Sales taxes in particular are less effective revenue producers in small, remote communities because residents must make a greater than average share of their purchases outside their communities.

A required local cash match equal to five percent of year 2000 VSW project construction costs would range from just under $2,000 to $175,000 per community, with an average required match of about $40,000. The lower match amounts are associated with design or feasibility studies or master plans. While the average match for studies would be just over $6,000, the match for construction projects would average over $65,000. This equates to a range of roughly $100 to $150 per person, or between 30 and 50 percent of total current local tax collections. Because most projects take several years to complete, this burden would persist for several years.

Most projects serve a limited number of households. Our case study analysis suggests that for major construction projects that eliminate honeybuckets, a five percent local cash match would range between $2,500 and $5,000 per household served.

Although VSW communities do not currently pay a direct cash match toward construction, they are responsible for 100 percent of the ongoing operation, maintenance, and management (OMM) costs. Local users pay higher rates than Anchorage residents for service levels that often fall far below piped plumbing. In addition, rates often fail to cover "booked" costs, and booked costs often exclude other elements of the true cost of utility services. Communities attempt to make up the differences with a variety of revenue sources, but their efforts are only partly successful.

Those communities that use force accounting often contribute significant amounts to construction efforts by providing labor at wage rates below the (legally) "prevailing" level required for standard contracting. For the six representative projects analyzed here, the in-kind contribution provided by force account labor ranged from 3 percent to over 20 percent of total project cost. With one exception, these amounts greatly exceeded what would have been provided by a five percent cash match

Finally, most sanitation facilities are built on municipal land provided at no cash cost to the state. Many of these sites represent reconveyed ANCSA village corporation land. The reconveyance process can be quite costly to the village corporations involved.

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CHAPTER VIII.
LOCAL UTILITIES MATCHING PROGRAM (LUMP) DEMONSTRATION PROJECT

PREPARED BY
NORTHWEST ARCTIC BOROUGH
AND
VILLAGE SAFE WATER PROGRAM
ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

1995

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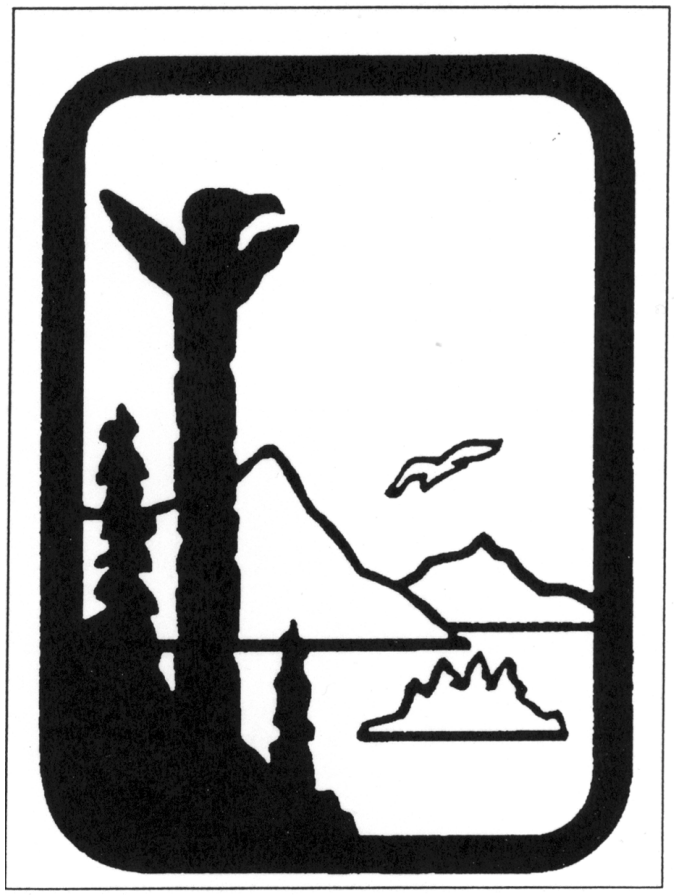
THE NORTHWEST ARCTIC BOROUGH
and
ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
VILLAGE SAFE WATER

LOCAL UTILITIES MATCHING PROGRAM (LUMP) DEMONSTRATION PROJECT



NORTHWEST ARCTIC BOROUGH
LUMP DEMONSTRATION PROJECT

INDEX

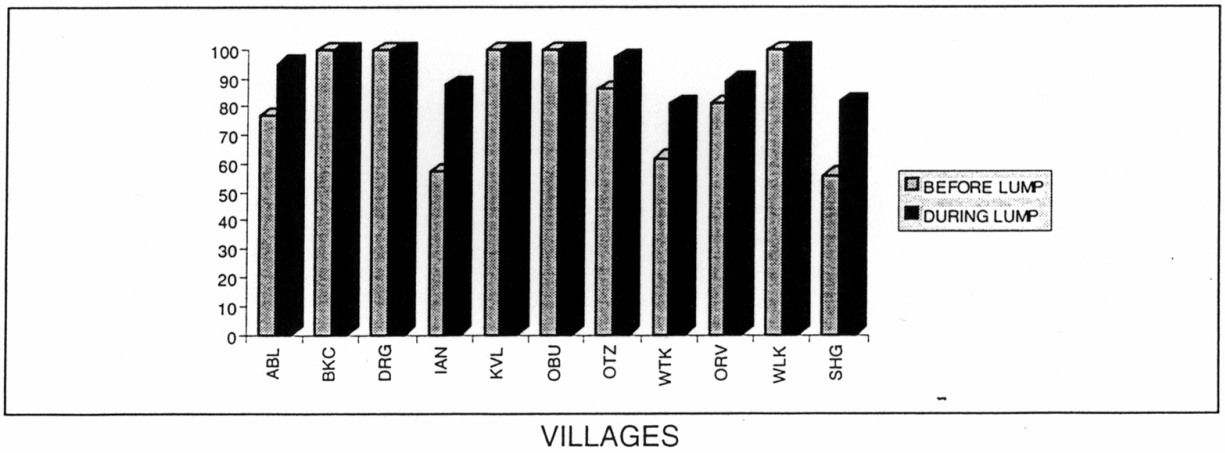
LOCAL UTILITIES MATCHING PROGRAM
A JOINT PILOT PROGRAM FUNDED BY
THE ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AND ADMINISTERED BY
THE NORTHWEST ARCTIC BOROUGH

EXECUTIVE SUMMARY

From November 1992 until October 1994, the Local Utilities Matching Program (LUMP) was made available to 11 communities in the Northwest Arctic Borough. The communities were Ambler (ABL), Buckland (BKC), Deering (DRG), Kiana (IAN), Kivalina (KVL), Kobuk (OBU), Kotzebue (OTZ), Noatak (WTK), Noorvik (ORV), Selawik (WLK), and Shungnak (SHG). A $480,000 State appropriation was used as a dollar-for-dollar match of residential user fees collected and capped at $10,000 per village per quarter. These financial incentives supported the following LUMP objectives:

1. Encourage communities to collect user fees. **User fee collection increased during the LUMP.** The bar chart below compares the user fees for each community, before and during LUMP.

USER FEE COLLECTIONS
Before and During LUMP



2. Promote the employment and retention of trained operators working full-time with a stay-at-home wage. **Turnover before LUMP was at a rate of 115 percent per year.** Turnover during the program was reduced to less than 30 percent.

3. Reduce enforcement costs. **At the beginning of the program, four of the eleven communities were out of compliance with water testing requirements. Two were, in fact, under U.S. Environmental Protection**

Agency (EPA) administrative order and were considering shutting down their systems to avoid fines or criminal penalties. During the LUMP, the compliance was 100 percent, and no enforcement actions were initiated by the Alaska Department of Environmental Conservation.

4. Facilitate successful preventive maintenance programs. **At the beginning of the program, three of the eleven communities, or about 28 percent, had critical parts lists. No villages had acquired all the critical parts.** During the LUMP, eleven communities, or 100% produced critical parts lists. Ten communities purchased the critical parts, and the eleventh had a written plan to do so. Communities became more involved with their systems as a result of the LUMP requirement that operators provide monthly reports to the council. Further, the number of villages possessing daily, weekly, and monthly operator log sheets increased from three to eleven, and the number actually using them increased from two to eleven. Remote Maintenance Worker (RMW) reports indicate that systems were better maintained during LUMP, but that much training was still needed.

5. Reduce costs for the rehabilitation/replacement of existing water and sewer systems. **It is not possible to state definitely that this objective was achieved. The program was too short.** In order to measure this accurately, a full twenty-year observation period would probably be necessary to test whether these costs could be reduced.

There were also unanticipated benefits and some lessons learned. Borough Planners/Proposal Writers observed that ten of eleven villages had well-thought-out plans for acquiring and maintaining the capital projects they were requesting,

The lesson learned is that LUMP requires a "parent" who can assure that the recipient complies with LUMP objectives. The parent must assure that the village bookkeeping system is acceptable and coordinate training, both for the operators and the village administrative staff.

CONCLUSION

LUMP can dramatically improve short- and long-term operations and maintenance for water systems in villages with subsistence economies. LUMP requires the support of a parenting agency who can provide frequent site visits, rigorous standardized bookkeeping, telephone support, and coordination of operator and utilities management training.

I. PURPOSE

A. LUMP GRANT OFFER

The purpose of the Local Utilities Matching Program Demonstration Project was to:

- **Encourage communities to collect user fees**
- **Promote the hiring of full-time qualified operators**
- **Facilitate successful preventive maintenance programs**
- **Reduce enforcement efforts**
- **Reduce costs for the repair/replacement of existing water and sewer systems**

The LUMP pilot project was funded through a grant offer to the Northwest Arctic Borough (NAB) through the Alaska Department of Environmental Conservation, Village Safe Water program. E,Ieven (1 1) villages of the NAB participated in the LUMP pilot project. These were Ambler, Buckland, Deering, Kiana, Kivalina, Kobuk, Kotzebue, Noatak, Noorvik, Selawik and Shungnak.

B. LUMP OPERATION

The LUMP began November 1, 1992. A LUMP administrator, supervisor and a project officer were assigned. This represented 18 percent of the Northwest Arctic Borough staff assigned to the program either full- or part-time. The reason for this emphasis is described below.

It was hypothesized that training operators and increasing their salaries would promote better operation and job retention in the villages. This proved to be true, but the connection to the LUMP was tenuous because the training of village administrative personnel in utilities management was not organized. This training was ongoing and included training of city councils in utility management. This took a tremendous amount of time and effort.

Water treatment plant operator training was exceptional. Eleven new training modules which can be delivered in-village by a visiting engineer, sanitarian, or Remote Maintenance Worker are now available as a result of the effort, and this region has one of the highest percentages (50%) of certified operators when compared to other rural areas. However, a utility management training curriculum still needs to be developed and implemented.

The following agencies assisted the NAB with the LUMP:

AGENCY	SERVICES PROVIDED
Department of Environmental Conservation	Funding, Consultation
United States Public Health Service	Operator Training
Dept. of Community and Regional Affairs	STEP funding, Rural Utilities Business Advisor, Local Government Specialist
Arasmith Consulting Resources	Training, Curriculum
Northwest Arctic Borough	Standard Accounting System, Math preparation or operators
Maniilaq Association	Sanitarian, RMW, Water Test Funding

II. DESCRIPTION OF STUDY AREA

The Northwest Arctic Borough is the second largest borough in Alaska, comprising approximately 39,000 square miles. Extending 175 miles north to south and 250 miles east to the west, the Borough is roughly the same size of the State of Indiana.

The Borough is home to approximately 6,700 people in eleven communities located along the coastal waters and inland along the major waterways which include the Ambler, Wulik, Kobuk, Noatak, and Selawik rivers. Over 90 percent of the residents are Inupiaq Eskimos whose ancestors settled the land over 4,500 years ago. Then, as today, life in the region depended on the resources of the land.

The northwest Alaska region has a diverse terrain that consists of mountains, great sand dunes of the Upper Kobuk, alpine tundra, moist tundra, wet tundra, sand and gravel spits and barrier islands, and boreal forests.

The eleven villages served by the LUMP demonstration project are:

VILLAGE	POPULATION	SYSTEM
Ambler	375 (1993)	Piped water and sewer for 71 percent of homes.
Buckland	382 (1993)	Honeybucket haul with washeteria and showers.
Deering	165 (1991)	Honeybucket with washeteria and showers.
Kiana	412 (1992)	Piped water and sewer with river outfall to serving 95 percent of homes.
Kivalina	317 (1990)	Fill and draw with washeteria and showers and honeybucket bunkers.
Kobuk	110 (1991)	Well with piped delivery and leach field for school and city buildings. Sanitary privey and watering point/washeteria elsewhere.
Kotzebue	3000-3400	Full piped service to 95 percent of homes.
Noatak	369	Full piped service to 98 percent of homes.
Noorvik	532 (1990)	Full piped service to 94 percent of homes, vacuum collection system.
Selawik	684 (1993)	Washeteria serving school with piped service, watering point for rest of village
Shungnak	232 (1990)	Full piped service to almost all homes.

III. PROGRAM ADMINISTRATION

A. ELIGIBILITY CRITERIA

To be eligible for LUMP, NAB villages had to:

1. Have a full-time operator (30 hours/week or more).
2. Have a paid alternate operator.
3. Have either the operator or alternate certified or enrolled in an approved program leading to certification.
4. Have a plan to correct deficiencies identified by the various inspecting agencies (engineer, sanitarian, or Remote Maintenance Worker).
5. Be collecting 80 percent of the residential user fees.
6. Have a water/sewer ordinance in effect.
7. Be current with water testing requirements or have a plan to become current.
8. Have a critical spare parts list.
9. Have the operator or the city administrator making reports to the city council on the water/sewer system at each regular meeting.
10. Have a water/sewer budget.

These were known as **pre-qualification criteria.**

B. CONTINUING QUALIFICATION CRITERIA

To continue to qualify, the villages had to:

1. Make expenditures according to the water/sewer budget, including paying a full-time operator.
2. Spend LUMP matching funds on critical parts and correcting system deficiencies, until a parts inventory is established and the deficiencies corrected.
3. Report on plant operations to the council, either through appearance at the meetings or through the completed log sheets.
4. Continue to collect at least 80 percent of residential user fees.
5. Operate and maintain the system properly according to sanitarian, engineer, and RMW reports.
6. Complete the operator log sheets.
7. Comply with all water testing requirements.

These were known as **continuing qualification criteria**.

C. SUMMARY OF DISBURSEMENTS TO VILLAGES

The following disbursements were made to communities:

CITY	DATE	AMOUNT
Ambler	09/24/93	10,000
	08/08/94	20,000
	TOTAL	**30,000**
Buckland	01/05/94	10,000
	08/08/94	30,000
	TOTAL	**40,000**
Deering	11/29/93	10,000
	05/16/94	3,104
	05/27/94	2,457
	06/29/94	4,163
	TOTAL	**19,724**
Kiana	09/24/93	10,000
	08/08/94	29,340
	TOTAL	**39,340**
Kivalina	04/21/94	5,865
	08/08/94	5,390
	TOTAL	**11,255**
Kobuk	09/24/93	10,000
	04/21/94	15,885
	05/16/94	9,384
	TOTAL	**35,269**
Kotzebue	11/29/93	10,000
	04/21/94	20,000
	08/08/94	10,000
	TOTAL	**40,000**
Noatak	02/08/94	10,000
	08/08/94	28,864
	TOTAL	**38,864**
Noorvik	09/24/93	10,000
	08/08/94	30,000
	TOTAL	**40,000**
Selawik	11/29/93	10,000
	04/21/94	30,000
	TOTAL	**40,000**
Shungnak	04/06/94	8,745
	TOTAL	**8,745**
TOTAL DISBURSED: LUMP DEMONSTRATION PROJECT		**343,197**

D. LUMP ADMINISTRATIVE COST SUMMARY

The administrative costs as of 06/30/94 of the operations of the LUMP project are as follows:

Personal Services	$68,172.78
FICA	$935.11
PERS	$4,611.29
Worker's Compensation	$490.28
Medical	$2,098.57
Audit	$5,000.00
Office Supplies	$452.78
Telephone & Postage	$2,846.04
Transportation	$15,517.98
Per Diem	$5,760.20
TOTAL	**$105,885.03**

The administrative costs exceeded the amount originally planned because it took some time for villages to meet LUMP requirements. More training and technical assistance had to be provided even though all the villages except Kotzebue had common, standardized, and easy-to-learn accounting systems. The following areas of information sharing and training were especially critical:

COLLECTING USER FEES

Villages were creative in their approaches though most eventually tied an easily cut service (cable TV) to water/sewer payments, they did so by different means. Noatak decided to award a prize by drawing the names of their paid-up customers as soon 80 percent of the bills were current (they had to widen their doors to accommodate the pay-the-bill rush).

WATER/SEWER ORDINANCES

Some villages waited for their legal council to send a draft; others waited on consulting engineers for the same. Despite the assistance provided by LUMP staff, this proved to be the most time-consuming process.

OPERATOR REPORTS

This requirement delayed all but one community. The idea of water/sewer reports to each regular council meeting was alien. Now that the practice is in place, the councils seem to feel more ownership of their systems.

IV. LESSONS LEARNED

A. THE IMPORTANCE OF LOCAL ACCOUNTING/BOOKKEEPING SYSTEMS

The LUMP program demonstrated the importance of local accounting/bookkeeping systems for rural villages of Alaska. It records the expenses incurred such as overhead, rent, utilities and water. Accounting principles determine what should be recorded in the bookkeeper's ledgers, journals, and computer printouts. The analysis and interpretation of these records is the primary function of municipal accounting. The various financial statements produced by these systems then furnish the city administration with the basis for their financial planning and management.

Accounting provides insights into the village's financial condition. It provides the city administration with the information to evaluate financial performance over a previous period of time and to make decisions regarding the future. It informs the general public, and particularly the City Council, about the financial status of the city over the previous month, quarter, or year and provides accounting reports for the tax and regulatory departments of the various levels of government.

A majority of the villages maintain their own internal accounting; some villages may hire services of an outside accounting firm. In either case, the bookkeeper's principal duty is to gather the figures that relate to such financial matters as grant revenues, tax liabilities, and other departments and to present them to the city council in a logical form that is readily understood.

For many villages that receive State and federal grants, bookkeepers also prepare regularly published reports for those granting agencies concerned with the village's financial condition. At fiscal year end, a summary or annual report is published, which must include the opinion of an outside reviewer, or an auditor. These reports include the following:

The balance sheet compares the village's assets and liabilities. Assets include cash, accounts receivable, and the worth of property, plant, and equipment. Liabilities include village debts, equity, or the assets that are used in the daily operations of the village. Although some balance sheet items like cash are easily measured for reporting, the value of others, such as plant and equipment, must be estimated. Plant and equipment are usually represented by figures that are reduced by a certain portion each year. For example, a boiler purchased for $20,000, will be worth $20,000 minus 15 percent the next year, and $20,000 minus 30 percent the second year. The percentage of depreciation varies according to the method used. Almost every item of plant and equipment is subject to depreciation, which is listed as an expense. The balance sheet is merely a statement of the financial condition of the village at a given date showing the equality of total assets to all liabilities plus net worth of or total liabilities to total assets plus deficits.

The income statement shows the results of the village's operations over time, as well as for the current period. Income is the difference between revenues and expenses. Accountants usually record revenues at the time they are earned (when a grant has

been approved, not when cash for the grant is received), and expenses only when they are incurred, rather than when they are paid out. This practice of relating current expense with current grants granted is called accrual accounting and is fundamental to almost all accounting systems. The simpler cash method, which records revenues when cash from grants is received and expenses when cash is disbursed, rarely presents a true financial activity picture of the village. The income statement is a financial statement of a village showing the details of grant revenues, costs, expenses, losses and profits for a given period grouped under appropriate headings—also called a *profit and loss statement.*

Each of these reports will contain figures for previous months, quarters, and years as well as for the current period, providing a way of comparing present and past village performance. Accompanying the statements will be a set of notes, presenting explanations of the impact of important grants within the previous year.

Cost accounting is primarily responsible for determining the cost of providing fresh water or providing a particular service. This usually requires estimates of overhead costs, variable costs, and unit costs for services such as chlorine and fluoride. Costs may be monitored daily in order alert village administrators of budget with computerized bookkeeping. Reports can be generated almost as soon as the data has been collected. Cost statements will also help administrators determine whether it may be more profitable to invest in more equipment or other capital assets, or to make do with the old; to increase production by hiring more workers or by computerizing plant facilities; and so forth.

Budgeting is also an important ingredient in the accounting process. The bookkeeper may also be responsible for creating a budget which sets forth goals based on realistic estimates of what can be accomplished. Comparing actual performance with planned goals is another function of budgetary planning and is useful in evaluating the performance of individuals and village administrators.

Therefore, the importance of accounting systems in the villages is a critical part of their daily operations. Having properly trained bookkeepers and/or accountants in these villages is critical yet sometimes unattainable due to the lack of properly trained personnel and low wages. Without accounting, a LUMP program is impossible to administer and manage in rural Alaska.

B. LUMP AS AN INCENTIVE PROGRAM

The LUMP pilot project is an excellent incentive program for the proper operation and maintenance of Alaska's rural water/sewer systems. The LUMP project provides the villages an incentive to prevent costly breakdowns and/or repairs of existing water and sewer facilities by:

1. Taking inventory and having critical spare parts on hand to prevent a major shutdown due to equipment failure. Before the LUMP pilot program came into effect, there were no inventoried parts and equipment in ten of the villages.

2. Implementing or updating ordinances. Seven of the villages had ordinances that were outdated and updated as a result of the LUMP project. The remaining four villages ordinances were adequate.

3. Realizing the importance of providing their operators with proper training to better operate the facilities to prevent major breakdowns and/or repairs in the future. As a result of the LUMP project requirements, village administrators are more aware of the importance of operator training sessions and of providing funds for training when possible.

4. Realizing the importance of a "parent" agency to coordinate training in utilities operation and management. The Northwest Arctic Borough sought and obtained grant monies for operator training and increased the amount of utilities management training delivered to the villages through direct training and coordinated efforts.

C. LUMP DO'S AND DON'TS

1. LUMP is a privilege, not a right. Parenting agencies must reinforce this notion.

2. A primary concern of the "parent" agency is to ensure that funding disbursed to a village is spent for the purposes intended. Stipulations must require the community to hold this money to purchase all critical spare parts and to ensure that any deficiencies are taken care of by a scheduled completion date. Villages that do not document expenditures will not continue to qualify for LUMP.

3. A percentage of the monies should be used to send the operators to training sessions as most villages do not have the funds to do so.

4. Funds should be used to send the village clerk or administrator to computer and utilities management training.

5. It is necessary for any future "parenting" agency to implement operator training utilizing the one-on-one in-village curriculum which is available from the Northwest Arctic Borough or ADEC.

D. LUMP MEASURED IMPROVEMENTS

There have been measurable improvements in the villages of Ambler, Kiana, Noatak, and Shungnak as a result of the LUMP project. The main improvement is that the villages have increased their user fees to 80 percent or better. **The other villages, with the exception of Kotzebue and Noorvik whose collections were over 80**

percent prior to the LUMP, sell tokens for services at the washeterias or watering points, which results in a 100 percent collection rate. The previous collections ranged from 60 percent to 70 percent collection rates with an average improvement of 20 percent due to the LUMP qualifications.

Operators are more aware of training opportunities as a result of the LUMP. Before the implementation of LUMP, the operators were not inclined to attend training sessions to learn more about the proper operations and maintenance of the facilities. Also, some villages such as Kivalina and Kobuk did not have alternate operators before the LUMP project. **All have alternates now, and all have organized training schedules for the operator or alternate. The one village that did not continue to qualify had a primary operator who declined all training.**

Checklists with more emphasis on preventative maintenance have also been introduced. The operators provide reports to the council members and provide a copy of a daily/weekly/monthly operations log.

Operator turnover before the LUMP was 115 percent (one year up to pre-qualification). During a one-year period following pre-qualification, the turnover rate was measured at 30 percent.

CHAPTER IX.
CONCLUSIONS AND PROSPECTS

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CONCLUSIONS AND PROSPECTS

Importance of Adequate Sanitation

Clean water and adequate sanitation benefit not just individual utility customers but the larger community, as well as the state and the nation. Improved public health reduces the demand for health care services, decreases absenteeism at school and work, and increases productivity. Better water and sewer service broadens business opportunities. It improves the quality of life for residents. Given the existing institutional arrangements, taxpayers also benefit from improved operation and maintenance of local facilities, through decreased costs for facility repair and replacement.

Because adequate sanitation has such broad benefits, economists describe it as a "public good." That perspective is reflected in Article VII, Section 4 of the Alaska Constitution, which requires the legislature to provide for the "promotion and protection of public health." In addition to its general public health mission, the U.S. Public Health Service has a specific mandate to provide public health services to Alaska Natives, deriving from the Snyder Act.[1] That law addresses the federal government's continuing contractual and legal obligations to provide for the health and welfare of tribal members, in partial compensation for the lands surrendered by the indigenous nations.

Since 1989, the state and federal governments have spent an estimated $723 million constructing water and sanitation systems in rural Alaska. The push to "put the honey bucket in the museum" has accelerated: construction funding in FY 2000 was up approximately 40 percent, to $82 million. The state's Village Safe Water program estimates that by 2003, 118 villages will provide in-home sanitation services to 90 percent or more of their households.

The current government policy is that once these systems are built, communities must operate and maintain them at their own expense. How well these new sanitation systems deliver services over time depends on the communities' ability to finance their operation and maintenance. For most rural communities, financing these operation and maintenance activities is a major challenge.

Conclusions From Analyses

Rural water and sanitation revenues do not cover costs.

Across the board, the investigations in this volume show that rural water and sanitation systems operate in the red. In the 1999 RUBA survey described in Chapter II, 64 percent of the 134 small communities that reported charging for sanitation services said they did not collect enough revenue to cover their costs; 37 percent of these utilities reported losses in excess of $20,000.[2] The total deficit across 94 small communities was roughly $2.7 million in 1999.

[1] 42 Stat. 208; 90 Stat. 2233; 112 Stat. 1619

[2] But in additional analysis, Wiita (Chapter II-A) observes that the survey question did not specify a time period for losses, so the data are not well defined and may not be consistent.

Table 9-1 summarizes financial data from this report for five rural water and sewer utilities with piped systems and five with closed-haul systems. Both expenditures and net income (or losses) per customer show wide variations across communities.[3] But the table makes it clear that most of these utilities are operating in the red.

It's important to keep in mind that we can't make valid cost comparisons between those communities with piped systems and those with closed-haul systems in Table 9-1. Our data for the closed-haul systems do not include the costs of water production or of washeterias; the data for piped systems do includes such costs.

[3] There are also unexplained differences between analysts. Compare Campbell and WW&G, Woodlee and Colt. These estimates could be improved if we had more complete data.

Table 9-1 Expenditures and Net Income per Customer for Selected Rural Water and Sanitation Utilities

Piped Systems							
	Nulato (WW&G)	Nulato (Campbell)	McGrath	Nenana	Huslia	Ft. Yukon	Average
Customers	70	68	176	149	61	240	127
Total Expenditures	125,957	121,999	233,287	152,488	50,113	148,312	138,693
per customer	**1,799**	**1,794**	**1,325**	**1,023**	**822**	**618**	**1,230**
Net Income (Loss)	(8,698)	6,773	(17,992)	64,303	(11,503)	(25,923)	1,160
per customer	(124)	100	(102)	432	(189)	(108)	1
per customer per month	(10.35)	8.30	(8.52)	35.96	(15.71)	(9.00)	0.11
as % of expenses	-7%	6%	-8%	42%	-23%	-17%	1%
Closed Haul Systems							
	Bucklan	Nunapitchuk	Tuntutuilak	Mekoryuk	Quinhagak	Average	
Customers	36	20	37	65	44	40	
Total Expenditures*	36,239	15,362	24,626	35,872	22,338	26,887	
per customer	**1,007**	**768**	**666**	**552**	**508**	**700**	
Net Income (Loss)	-	-	(4,751)	(6,734)	(5,543)	(5,676)	
per customer	-	-	(128)	(104)	(126)	(119)	
per customer per month	-	-	(10.70)	(8.63)	(10.50)	(9.94)	
as % of expenses	-	-	-19%	-19%	-25%	-21%	
* Does not include the cost of water production or washeteria services.							

None of the utilities calculate depreciation. No community has established a reserve to rebuild aging facilities: outside funding agencies are bearing the total costs of replacing and expanding systems. Some communities maintain an inventory of spare parts and reserve funds to pay for replacement parts, but many do not. Many communities short their preventive maintenance, resulting in emergency repairs and premature failure. The foregoing estimates of loss do not include the deferred costs and reduced levels of service in utilities that short their operations and maintenance.

O&M costs for Arctic piped systems are high.

Piped systems designed for Arctic conditions are more expensive to operate and maintain than are such systems in temperate regions. Harsh climate, permafrost, and flat terrain dictate engineering solutions that involve more specialized equipment—and that equipment is more complex to operate and maintain, both for operators and for users. Small scale and remoteness also increase per unit operating costs.

Rocky Wilson and others (Chapter III) found that labor is the most significant operating cost—making up almost half—followed by costs of fuel oil, electricity, and maintenance.

Operating and maintaining closed-haul systems is no cheaper.

While closed haul systems are much cheaper to build than piped systems, they are not cheaper to operate and maintain.[4] (Note that the figures in Table 9.1, while they appear lower than for piped systems, do not include costs of water production or washeteria services.) And they provide a lower level of service: the closed-haul technologies used in villages do not support either bathing or laundry facilities in the home. They do have other advantages. They require more labor and less skilled labor to operate—a plus in village economies. And because they operate on a pay-per-haul basis, collection and enforcement are politically and administratively easier. Still, Charles Woodlee (Chapter V) found the three closed-haul systems he studied operate at a loss. These are new technologies in rural Alaska, and their design and operation are still being refined.

Rural residents pay more for water and sewer.

Village residents on average spend more of their cash income for water and sewer services than do Anchorage or other U.S. residents. Average U.S. water and sewer spending as a percentage of household income is less than half a percent. Anchorage residents pay about one percent. [5] Across 81 small Alaska villages with piped water and sewer systems, residents paid an average of about 1.5 percent of their household income for sanitation services in 1999. The range of income residents spent for piped water and sewer services ranged from 0 percent (for the five utilities that reported not charging for service) to about 4.3 percent.

[4] Steve Colt's findings in Chapter VI support the conclusion that closed-haul systems do have lower life-cycle costs. His estimates of per household O&M costs were lower than he had anticipated, because customers conserved water and ordered fewer hauls; some customers apparently dispose of their graywater themselves, to keep costs down.

[5] Source: Average annual expenditures and characteristics of all consumer units, U.S. Bureau of the Census, Consumer Expenditure Survey, Anchorage 1992-93, U.S. 1997.

Fig. 9-1. Comparison of Household Spending for Piped Water and Sewer Service, U.S., Anchorage, and 81 Small Alaska Villages

(As Percentage of Household Income)

* Weighted by population.

Fees and collections are insufficient to cover costs.

The RUBA survey (Chapter II) cites several reasons why sanitation revenues in small rural communities (those with populations under 1,000) don't cover costs:

- Twenty one percent (21%) of the surveyed utilities do not charge customers for services.
- Fifty three percent (53%) of the utilities that charge fees do not review or adjust fees to reflect costs. Many of them have never adjusted their fees since the utility was created.
- Forty two percent (42%) of those communities that charge customers do not attempt to collect past due accounts.
- Fifty-seven percent (57%) of the respondents had never cut off service for past due accounts.

The reasons communities cited for non-enforcement varied. Twenty six percent (26%) said that they are unable to shut off service (e.g., no shut-off valves, or inability to exclude non-payers from honey-bucket haul services). Other reasons included reluctance to cut off service to family and friends in small towns and worries about the detrimental effects cutting off service would have on community health and on elders and children.

Rocky Wilson and other with WWG consultants (Chapter III) found that utility fees generally reflect management philosophy—e.g. the council's subjective impression about how much residents can and should pay—not costs. The greatest collection problems were in the communities with the lowest fees.[6] The community with the highest fees experienced average collection rates.

Poor economic conditions and other factors contribute to deficits.

Nulato is a community with generally good administration and accounting (though short on staff), high fees ($115 per month), and collections enforcement. Steven Campbell's fiscal analysis (Chapter IV) showed positive net income (not accounting for depreciation or reserves for parts replacement) in Nulato for two years, and a net loss in the third year; the trend was downward. As of May 1999, half the 69 customer accounts were overdue;

[6] This finding is reinforced by observations of Remote Maintenance Workers (RMWs) in Kodiak villages.

one third were more than 90 days overdue. Poor economic conditions were a factor; administrative failure to send timely bills and overdue notices also contributed. Labor and supply costs had increased almost 30 percent over the period.

Campbell also found a seasonal cash flow problem in Nulato. Collections are lowest during the winter quarter (January to March) when unemployment peaks; this is also when expenses for energy and emergency repairs are highest. The seasonal deficit is about 12 percent of annual revenues.

In Tanana, Campbell found that Too'gha would have operated at a significant loss throughout the study period without the one-time availability of grant funds. Collections were not the problem: the problem was start-up costs and the lag between operating expenses and customer revenue. During the multi-year transition to full piped service, the customer base was too small to carry the utility's expanding operations.

Nulato and Tanana face the same dilemma but from opposite sides. Campbell concluded that Nulato's utility would be financially viable if it could solve its collections problems, but it is not likely to resolve its billing and collections problems without hiring a part-time utility clerk or manager—the cost of which would put it back in deficit. And Too'gha can't afford to keep the manager it already has.

Communities subsidize water and sewer service.

In the early 1980s, rural communities commonly paid for water and sewer O&M with state and federal pass-through funds. With the decline of state oil revenues, however, all state pass-through funds to Alaskan municipalities have declined over 80 percent since 1987. Black and Logan note in Chapter II:

> Each time the State Legislature reduced municipal revenue sharing programs, the city councils and municipal assemblies either adjusted their levels of services or found additional revenues. Today we see local governments that have eliminated or reduced local services, increased taxing efforts, or successfully increased non-tax revenue such as gaming and/or enterprise revenues. Most have done some combination of these.

Black and Logan report improved local revenue generation since 1992. In 1999, ninety-eight (98) cities levied sales taxes, compared with seventy-eight (78) cities in 1992. On average, these cities levy a 3.25 percent sales tax to help generate revenue. Average household fees have increased—22 percent for both water and sewer and 40 percent for sewer only. Most of the increases, however, were in communities with new systems. Also, average monthly wages for water operators increased, both absolutely and relative to those for some other village occupations.

Besides state or federal pass-through funds, sales taxes, and gaming receipts, communities also incur long-term debt to finance their water and sewer deficit. In the RUBA survey, 27 percent of communities said they have long-term debt for their utilities; 89 percent of this debt is for operations, not capital expenses.

John Fischer (a long-time RUBA who provided an addendum to Chapter IV) does not expect rural water and sewer utilities to break even. A utility may show a positive cash flow in some years, but he believes this is as much due to luck (e.g., mild weather and no

freeze ups) as to good management. He found the same to be true for smaller urban municipal utilities.

> I worked with the North Pole (urban) system for sixteen years and got it to [positive] cash flow (including a reserve account) but could not totally cover the capital depreciation. I worked with the Galena system for a year and was unsuccessful at that time in getting it to even cash flow.

He regards it as normal and appropriate that small communities subsidize water and sewer operations with other revenue sources.

In the early 1990s the LUMP demonstration project in villages in the Northwest Arctic Borough (Chapter VIII) found that incentive-based subsidies increased collections an average of 20 percent; reduced operator turnover 74 percent; improved water testing compliance from 64 percent to 100 percent; improved facility maintenance, with 100 percent of the villages maintaining critical parts lists, regular operator logs, and monthly reporting to the council; and increased attention to operator training.

The fiscal capacity of villages is limited.

In Chapter VII, Steve Colt and Alexandra Hill of ISER analyzed the fiscal capacity of 254 villages that are eligible for sanitation construction projects under the state's Village Safe Water (VSW) program. They found the average per capita income in VSW-eligible communities is between 30 and 40 percent lower than the statewide average. Of the 118 communities that are both eligible for VSW grants and able (by virtue of being incorporated) to levy some sort of tax, 80 do collect local taxes. On average, however, VSW communities collect only about $313 per capita, or 27 percent of the per capita tax revenue collected by larger communities that are not eligible for the VSW program.

Communities that receive VSW funding do often contribute land and provide labor for facility construction at below-market rates. Colt and Hill report that force accounting (which increases local employment but at lower-than prevailing wage rates) contributes in-kind 3 to 20 percent of total project construction costs.

Community support and administrative capacity are critical.

John Fischer observed (in an addendum to Chpater IV) that community support and commitment are critical ingredients for a successful water and sanitation utility—just as important as delivering a valuable, affordable service in a financially and operationally viable manner. He believes that Nulato and Tanana will succeed where others fail because water and sewer service is their priority: the citizens will not let the utilities fail. Both communities also enjoy better than average leadership, city and tribal organization, and administrative capacity.

Many communities are not organized to effectively manage O&M costs and do not have accurate up-to-date records of sanitation revenues and expenditures. There are often too few trained people and too few funded hours to effectively carry out all O&M functions. Another hindrance to effective O&M management is the prevalent "who's in charge" dilemma. Without clear leadership and strategy from within a community, not even basic tasks such as bill collection can be accomplished efficiently and effectively.

The Local Utility Match Program evaluators (Chapter VIII) found:

> [T]he importance of accounting systems in the villages is a critical part of their daily operations. Having properly trained bookkeepers and/or accountants in these villages is critical yet sometimes unattainable due to the lack of properly trained personnel and low wages.

For the eleven communities they surveyed (Chapter III), Rocky Wilson and other reported that:

> All of the communities display a significant amount of pride in their utilities and appreciate having piped water and sewer. All without exception are concerned about needed repairs, the necessity to keep the system in operating condition and, if the system is aging, how they ultimately will deal with the situation.

Prospects for the Future

In most communities there is ample room for improvement in financial management, specifically in levying and collecting fees for service. At the same time, evidence in this report suggests that even with higher fees, effective collections and good management, some small rural utilities will not be self-supporting. Even if user fees can cover the day-to-day costs of operations, these utilities will not be able to build up the cash reserves required for routine repair and replacement of equipment. The shortfall is currently covered by a combination of poor service, local general funds, federal, state and regional assistance programs, and premature repair or replacement of facilities—paid for by VSW and ANTHC. The premise for the analysis below is that this defacto public policy is inefficient. With thoughtful policy attention and research, we can craft a better solution.

Policy Analysis

O&M finance is not just a local concern. Given the larger public interest in adequate local sanitation services, adequate funding for operations, maintenance, and management is a concern for state and federal agencies as well. Strategies for lowering costs and increasing revenues might include: improved operating efficiency of existing systems; lower cost technologies; lower cost administrative arrangements; increased collections from households; or subsidies to utilities. The larger objective of improving sanitation O&M also requires community support and agency collaboration.

Efficient operations. Just as the state's weatherization program in the 1970s performed energy audits and upgraded the energy efficiency of homes, a systematic assessment of each utility's operations would find many opportunities to improve operating efficiency and cut O&M costs. For example, Noorvik used an O&M grant from the Alaska Native Health Board to replace old toilet units, which both reduced repair costs and improved the vacuum efficiency of the entire sewer system—thereby prolonging the life of the pumps. Sleetmute saved an estimated $200 per month in winter energy costs by insulating the wellhead and pipe to the pump house. Nondalton and Hydaburg used grant money to replace leaking water lines and dramatically reduced the number of gallons the utility had to produce. Systematic improvements in preventive maintenance planning, implementation, and critical parts inventories should also increase operating efficiency.

Another approach to cost efficiency is customer education. Under a demonstration grant from the Alaska Native Health Board, Nondalton, Noatak, Shaktoolik, Nulato, and Noorvik reduced their utility costs for operations and repairs with campaigns focusing on water conservation, the proper use and maintenance of home plumbing units, and simple homeowner repairs.[7]

Lower cost systems. O&M costs need to be a major consideration in the system planning and design phase. Improvements might be made in three areas: (1) development and dissemination of alternative technologies with low O&M costs, as well as labor and other inputs appropriate to village conditions; (2) development and effective presentation of O&M cost information on alternatives, in support of community-based planning and decision making; and (3) strong community involvement in the planning process and effective communication between community people and agency personnel, to ensure that communities fully understand the financial obligations of each alternative and that agency planners understand and consider village concerns and priorities.

Nulato's city treasurer has pointed out that "what people want does not always coincide with what people can afford." A first step to bringing the villages closer to determining and obtaining what they can afford might be to organize and update communities' financial record keeping and data entry procedures.

Lower cost administrative arrangements. Currently, most village water and sanitation systems are operated by municipal or tribal governments and share overhead (office space, management and accounting personnel) with other governmental functions. This is an important cost saving arrangement. The tradeoff is that the focus and expertise required for efficient utility management is diluted. There are currently two demonstration projects—proposed or in the initial stages—that explore alternative arrangements, looking for greater cost savings with fewer tradeoffs. One would contract out billing and collection functions to the Alaska Village Electric Cooperative based in Anchorage.[8] The other would create a regional utility, consolidating billing and collections, personnel, purchasing, technical assistance, and possibly policy and planning functions at a regional hub.[9] Both of these would be important demonstrations.

A third idea would be a regional purchasing cooperative. This might offer several advantages: bulk buying reduces unit costs; a single purchasing agent develops more expertise and relationships with suppliers; a common warehouse at a transportation hub might reduce the stock needed for some critical spare parts; a level monthly payment to the coop might help utilities with financial planning and management of cash reserves for replacing parts and equipment; and a coop could provide some risk pooling or "insurance" type service for unanticipated major expenses.

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[7] *Evaluation of the Alaska Native Health Board Sanitation Facility Operation and Maintenance Program: Final Report on Phase II Projects*, volumes I and II, Institute of Social and Economic Research, February 2000, and *Evaluation of the Alaska Native Health Board Sanitation Facility Operation and Maintenance Program: Final Report on Phase I Projects*, April 1999. Both are available at http://www.iser.uaa.alaska.edu/projects/ruralsan/ruralsan.htm

[8] For further information, contact Mike Black, Rural Utility Business Advisor Program, (907)269-4564.

[9] For further information, contact Steve Weaver, Alaska Native Tribal Health Consortium, (907)729-1900.

Another dimension that warrants thoughtful attention is risk pooling. Small utility operations in Arctic environments are subject to large expenses associated with unpredictable events such as freeze ups, equipment failures, or transportation delays for parts and technical assistance. Small operations lack the cash flow and reserves needed to absorb these financial emergencies.

Increased Collections. Increasing collections is the current policy focus. The Rural Utility Business Advisor program provides training and technical assistance to client communities on the full range of utility management functions. The largest part of the RUBAs' time is devoted to billing and collections, accounting, and financial management. This program could be expanded to provide services to more communities. A valuable supplement to the RUBA program might be regional conferences where community representatives could share their experiences in peer-led workshops. Communities participating in ISER's evaluation of the ANHB operation and maintenance demonstration grant program frequently commented that this sort of information exchange is very valuable to them. This format is likely to elicit practical ideas that work in village conditions[10] and foster changes in perspective as well as build networks. A third program approach might be to support community education campaigns on why maintaining the sanitation system is important, why fees must be levied and paid, and what the money goes for. Ambler, Mekoryuk and New Stuyahok piloted this kind of education campaign using Alaska Native Health Board demonstration grant funds.[11]

The potential for higher fees and increased collections is of course limited by household incomes. Assessing potential additions to income through opportunities for wage employment, dividends, or transfer payments is beyond the scope of this paper. We can, however, consider subsidies to households for water and sewer services. Some urban utilities have "lifeline" rates for low-income households, subsidized by other consumers. This model will not work in communities where low income households are a high proportion of total customers. Lifeline utility rates in rural communities would likely require state funding.

Subsidies to utilities. Local governments currently subsidize water and sewer utilities from a wide range of other funds, including sales taxes and state revenue sharing. While these are good mechanisms, given the many unincorporated communities, limited tax base, dramatically reduced revenue sharing, and many competing local service needs, these sources are inadequate. A broad approach to the local fiscal squeeze would be to increase revenue sharing. A more focused approach would be a need-based O&M subsidy factoring per capita cost, per capita income, and local effort. The Local Utilities Matching Program demonstration project reported in Chapter VIII successfully piloted an incentive-based approach. Extending this model to small communities statewide might cost on the order of $10 million per year—about two thirds of the PCE subsidy for small electric utilities.

Another approach would be a wage supplement for certified operators. This pay increase would not only provide a positive incentive for certification, it would improve operator

[10] Examples include raffling one month of free service among paid-up cutomers; and publicizing the names of delinquent customers on the local cable scanner.
[11] Op. cit.

retention and help the state meet new EPA regulations for small water systems (and avoid financial penalties). A $4 per hour increase in wages for certified operators would cost on the order of $2 million per year.

Community support. Community support is critical to the success of community sanitation systems. Community involvement and customer education are basic to building community commitment to supporting the water and sewer utility. But the question goes deeper than that: the sanitation system must be an integral part of the community's values and lifestyle. The values-based strategic planning process for small communities, developed by the U.S. Department of Agriculture's Rural Development Office is a step in this direction.[12] There also needs to be institutional support and encouragement of community innovation, looking for ways to customize the operation, maintenance and administrative systems to better match local resources and preferences.

Agency collaboration. Small communities cannot solve their long-term O&M finance problems without agency collaboration. Federal, state, and regional personnel provide needed information and institutional resources. The foregoing policy discussion has mentioned many programmatic ways that state and federal agencies can support and promote local learning and problem solving. In addition to these, continuing education for agency personnel might enhance their effectiveness at working with the full spectrum of rural communities, each one unique in its resources and circumstances. Even more important, effective collaborative relations are time intensive: line personnel must be afforded the time and travel to support this style of work. The policy regarding agency-community relations must be set at the highest agency level, and reinforced through the hiring, evaluation and promotion process.

[12] Community Strategic Plan Form and Guide, USDA Rural Development, 2000.

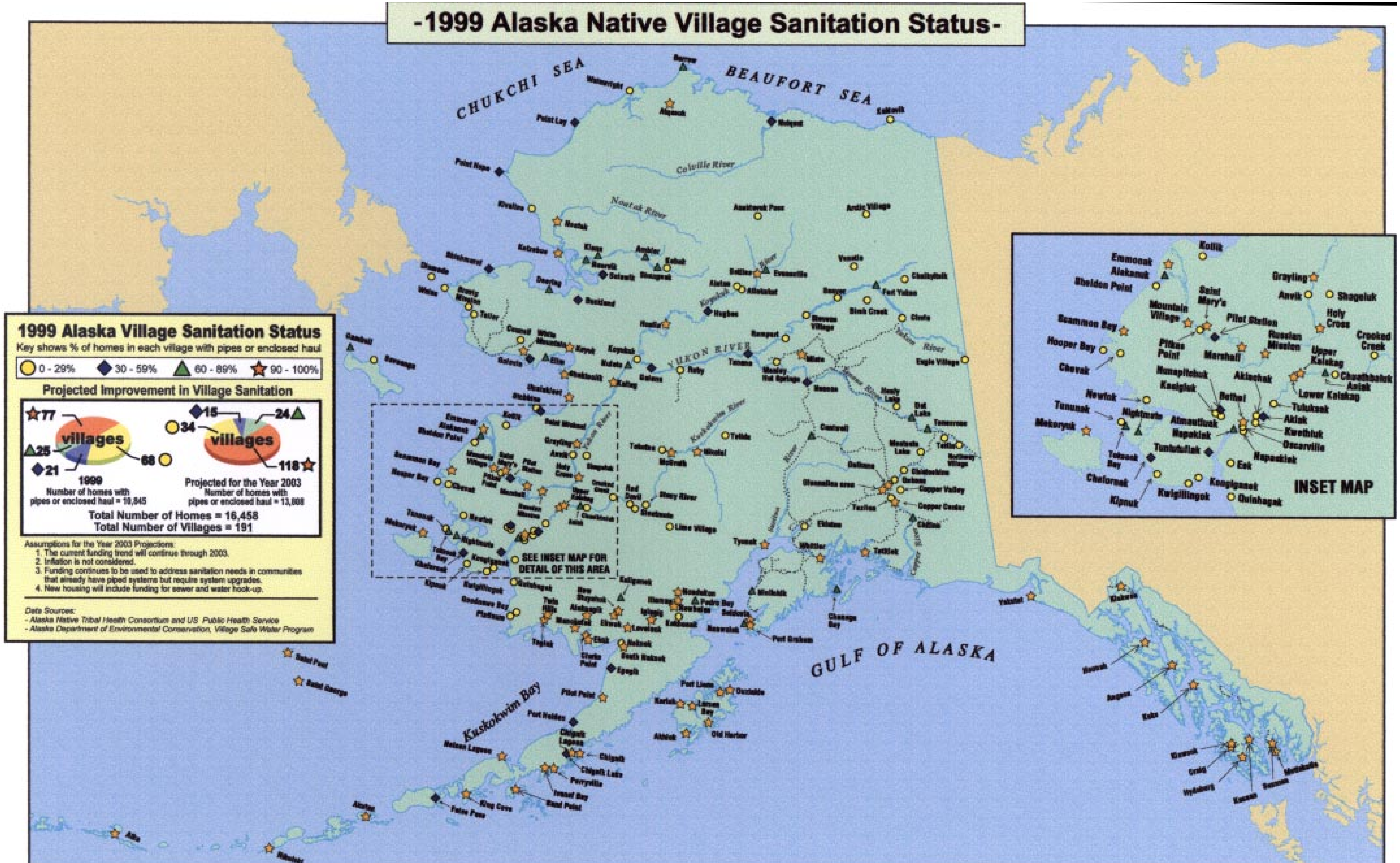
Further Research

To more clearly focus and assess the policy options, we need more information. An agenda for further research might include:

- Cost analysis. Identification of the actual cost of operations in each village would serve multiple purposes: communities would use the information in rate setting and long-term financial planning, and agencies and researchers would use the data from many places to compare system costs and evaluate policy options. Since many communities lack good financial record keeping, generating cost data requires a substantial investment in fieldwork.
- Financial Analysis. Once good cost data is at hand, the scope of the analysis could be expanded to collect and analyze revenue data and estimate depreciation. Such data would be used to analyze seasonal and annual variance in costs and revenues, and estimate reserve requirements for cash management, as well as risk management parts replacement, and training. The data would also support first estimates of the size of the total O&M deficit, or how large the public subsidy would have to be to bring O&M up to par.
- Flush haul analysis. Additional data would further our understanding of the use and economics of flush-haul systems. Of interest would be the actual employment patterns of flush-haul operators; customer satisfaction with service levels; actual patterns of household water supply and consumption, (including self-haul from traditional sources); actual patterns of household gray water and septic disposal (including gray water dumping, use of public facilties, and reversion to honey buckets); and analysis of elasticity of demand, comparing usage under pay-per-haul versus flat-rate pricing.
- Household budgets I. Data available on household income, sources of income, and expenditures is limited, especially for small rural communities, whose data is lost in aggregation even with regional hubs such as Barrow, Bethel and Kotzebue. Decennial census data (which covers 1999 for income) should be available within the next two years and represents one of the few sources of community data for Alaska's small rural communities. These data should be analyzed while they are still relatively recent.
- Household budgets II. The Survey of Living Conditions in the Arctic (SLiCA) will provide additional information on household cost of living. The SliCA, however, will cover only the North Slope, Northwest and Bering Straits regions. This data could be extended with a household survey in other rural Alaska regions, using the household economy section of the SLiCA questionnaire.
- Alternative collections and enforcement mechanisms. Cutting off water and sewer service is not always feasible, and often is not a desirable means for collections enforcement. There is great need for creative thinking about and piloting of alternative billing and collection mechanisms, incentives and enforcement strategies that will be practical and effective in rural communities.

- Community ability to pay. The ability of rural communities to pay the costs of water and sewer services has likely declined in the last decade due to decreased state support and stagnant growth in real income. Further research on both halves of this topic—fiscal capacity of governments and the practical ability of potential rate payers—is necessary. The two are intertwined, as local government's ability to raise local revenues rests on the personal income of community members. In addition, it is important to assess local governments' ability to raise continuing revenues from state or federal grants to meet ongoing O&M costs as well as capital costs, and to combine this with the assessment of feasible local revenues.
- Comparisons to electricity. Casual observation suggests that, by and large, village electric systems have fewer (or perhaps different) difficulties than sanitation systems. The most obvious reason for this is the Power Cost Equalization (PCE) program, which provides a $15 million+ annual subsidy to electric utilities. A rigorous analysis focused directly on the differences between electric and sanitation utilities in rural Alaska has never been attempted and might produce valuable new insights.
- Demonstration programs. Any of the previously mentioned program initiatives could be usefully piloted and evaluated.
- Other jurisdictions. Rural Alaska isn’t the only region with challenging water and sewer finance problems. All the circumpolar Arctic regions have high costs associated with harsh climate, poor soils, small scale, and remote locations. And even major metropolitan areas such as Atlanta and Chicago have collections problems exceeding [twenty] percent. Research into comparative institutional responses to these challenges would provide a broader perspective for policy.
- Public goods analysis. Estimates of the collective benefits from adequate sanitation systems in small communities might help us decide how much to collectively invest in O&M. Analysis would include the public health outcomes measured by school attendance and the costs of deferred maintenance. Analysis of the consumer and public health benefits of piped service relative to closed haul—i.e. in-home showers and laundry—would help us decide what level of service merits our collective support.

The development of long-term operations and maintenance financing solutions will require teamwork among communities, agencies, researchers, and policy makers. It is an exercise in collective learning and institutional innovation in which we all have a role to play and contribution to make.



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