# Sustainable Utilities in Rural Alaska

Effective Management, Maintenance
and Operation of
Electric, Water, Sewer, Bulk Fuel, Solid Waste

## FINAL REPORT

## Part B: Supporting Chapters

Prepared by:
Steve Colt
Scott Goldsmith
Amy Wiita

Institute of Social and Economic Research
University of Alaska Anchorage
3211 Providence Drive
Anchorage AK 99508
www.iser.uaa.alaska.edu

In collaboration with
Mark Foster
Mark A. Foster and Associates

Funding provided by:
U.S. Department of Agriculture, Rural Development
Denali Commission
Alaska Science and Technology Foundation

July 15, 2003

This page intentionally blank

# Table of Contents


**1. Project Purpose and Intent ..... 1**

**2. The Setting and the Problem ..... 2**

**3. Utility Cost and Consumption in Alaska ..... 4**

**4. Social, Economic, and Cultural Context ..... 6**

4.1 Introduction and Summary ..... 6
4.2 Statewide Economic Review ..... 7
4.3 Key Factors Influencing the Economy ..... 21
4.4 Sustainability of Dividends and Transfers ..... 29
4.5 Regional Economic Review ..... 37
4.6 Tracking Dollars Into Rural Alaska ..... 71
4.7 Wade Hampton: Example of a Particular Region ..... 76
4.8 The Hierarchy of Trading Centers ..... 78
4.9 Subsistence Values and the Noncash Economy ..... 79

**5. Utility Service in Other Places ..... 82**

5.1 Introduction and Summary ..... 82
5.2 Finland ..... 83
5.3 Canada ..... 87
5.4 The Colonias ..... 92
5.5 Appalachia ..... 96
5.6 Virginia ..... 97
5.7 Developing Countries ..... 102
5.8 National Park Service ..... 105

**6. Current Subsidies and Incentives in Rural Alaska ..... 107**

6.1 Introduction and Summary ..... 107
6.2 Current Utility Subsidies ..... 108
6.3 Rural Utility Funding Priority Processes ..... 111
6.4 Incentive Effects of Current Subsidies ..... 120
6.5 Changing the Incentives: Lessons from the PCE Efficiency and Staffing Standards ..... 124
6.6 Role of the School ..... 133

**7. True Cost, Book Cost, and Revenue from Rates ..... 137**

7.1 Summary of Findings ..... 137
7.2 Introduction ..... 138
7.3 Electricity ..... 140
7.4 Water & Sewer True Cost ..... 153
7.5 True Cost of Bulk Fuel ..... 157
7.6 Solid Waste ..... 159
7.7 True Cost of Telephone Service ..... 160

**8. Effective Management Practices for Rural Alaska Utilities ..... 163**

8.1 Introduction and Summary ..... 163
8.2 Overview of “Best Practices” Concepts ..... 166

8.3 Detailed Example of Generic Basic Management Practices.....174
8.4 Utility Performance Measures.....195

**9. Solid Waste Challenges .....196**
9.1 Introduction and Summary .....196
9.2 Current Challenges.....196
9.3 Current Funding.....200
9.4 The Cost of Solid Waste Management.....202
9.5 Improving Solid Waste Systems.....204
9.6 Success Stories.....205

**10. Field Visit Notes .....209**
10.1 Venetie Site Visit Notes (Summary) .....209
10.2 Napaskiak Site Visit Field Notes.....211
10.3 Tuntutuliak Site Visit Notes.....222
10.4 Deering Site Visit Notes.....235

**References .....243**

## Table of Figures

Figure 1 Jobs: Annual Growth Rate Falling .....8
Figure 2 Basic Jobs: 4,000 Lost Since 1990.....9
Figure 3 Basic Jobs: 16,000 Added in the 1980's.....10
Figure 4 Jobs Added in the 1990's .....11
Figure 5 Real Average Paycheck: Annual Growth Rate Negative .....12
Figure 6 Real Personal Income: Annual Growth Rate Falling.....13
Figure 7 Real Personal Income: Growth Since 1990 .....14
Figure 8 Real Personal Income: Growth 1980 to 1990 .....15
Figure 9 Per Capita Personal Income: Annual Growth Rate Flat.....16
Figure 10 Per Capita Personal Income: Growth Since 1990.....17
Figure 11 Per Capita Personal Income: Now Below the US Average.....18
Figure 12 Non-Oil GSP (Real Value Added): Annual Growth Rate Falling .....19
Figure 13 Population Under 40: Annual Growth Rate Flat.....20
Figure 14 Market Value of Selected Alaska Natural Resources .....22
Figure 15 Permanent Fund Dividend Annual Increase .....23
Figure 16 Federal Payments to Persons: Annual Increase.....24
Figure 17 Federal Grants: Annual Increase.....26
Figure 18 Federal Expenditures: Alaska Versus United States Average, Part 1.....29
Figure 19 Federal Expenditures: Alaska Versus United States Average, Part 2.....30
Figure 20 Federal Expenditures: Alaska Versus United States Average, Part 3.....31
Figure 21 Federal Aid Per Capita: Highest States in 1999.....32
Figure 22 Federal Payroll per Capita .....33
Figure 23 Federal Procurement: Alaska Versus United States Average .....34
Figure 24 Map Model Projection: Jobs .....35
Figure 25 Map Model Projection: Population .....36
Figure 26 Percent Increase in Jobs: 1990 to 1998 .....40
Figure 27 Rural Jobs: 1990 to 1998.....41
Figure 28 Rural Jobs Added: 1990 to 1998 .....42
Figure 29 Service Job Growth: 1990 to 1998.....43
Figure 30 Services Jobs Added: 1990 to 1998 .....44
Figure 31 Trade Jobs Added: 1990 to 1998.....45
Figure 32 Local Government Jobs Added: 1990 to 1998.....46
Figure 33 Transportation and Utilities Jobs Added: 1990 to 1998 .....47
Figure 34 Other Jobs Added: 1990 to 1998.....48
Figure 35 Percent Increase in Real Average Wage: 1990 to 1998.....49
Figure 36 Real Average Wage: 1990 to 1998.....50
Figure 37 Real Average Wage Growth: 1990 to 1998 .....51
Figure 38 Percentage Increase In Real Income: 1990 to 1998.....52
Figure 39 Rural Income: 1990 to 1998.....53
Figure 40 Real Income Growth: 1990 to 1998 .....54
Figure 41 Net Labor Earnings Income Added: 1990 to 1998.....55
Figure 42 Investment Income Added: 1990 to 1998 .....56
Figure 43 Government Transfer Income Added: 1990 to 1998.....57
Figure 44 Percent Increase in Real Per Capita Income: 1990 to 1998 .....58
Figure 45 Real Per Capita Income: 1990 to 1998.....59

Figure 46 Real Per Capita Income Growth:1990 to 1998 .....60
Figure 47 Per Capita Net Labor Earnings Added: 1990 to 1998.....61
Figure 48 Per Capita Investment Income Added: 1990 to 1998 .....62
Figure 49 Per Capita Government Transfer Income Added: 1990 to 1998.....63
Figure 50 Percent Increase in Population: 1990 to 1999 .....64
Figure 51 Population Change: 1990 to 1999 .....65
Figure 52 Native Population: 1990 to 1999.....66
Figure 53 Percent Increase in Real Local Government Revenues: 1990 to 1998 .....67
Figure 54 Real Local Government Revenue Growth: 1990 to 1998 .....68
Figure 55 Percent Increase in Real Per Capita Local Government Revenues: 1990 to 1998.....69
Figure 56 Real Local Government Revenue Per Capita: 1990 to 1998 .....70
Figure 57 Real Per Capita Local Government Revenue Growth: 1990 to 1998.....71
Figure 58 Federal Grants to Local Government Per Capita: 1990 to 1999.....72
Figure 59 Federal Direct Payments to Persons Per Capita: 1990 to 1999 .....73
Figure 60 Permanent Fund Dividend (PFD) Per Capita: 1990 to 1999.....73
Figure 61 1999 Federal Dollars (Transfers and Half of Grant Dollars) Plus Dividends Compared to Personal Income 1990 & 1999.....74
Figure 62 Sources of Personal Income Growth: 1990 to 1999 .....75
Figure 63 Wade Hampton: Sources of Personal Income in 1997 .....76
Figure 64 Wade Hampton: Population of 20-29 Year Olds.....77
Figure 65 Wade Hampton: Sources of Local Government Operating Revenues.....78
Figure 66 Compliance with Generation Efficiency Standards .....128
Figure 67 Changes in Generation Fuel Efficiency.....129
Figure 68 Improvements in Average Fuel Efficiency Between 1993 and 1999.....130
Figure 69 Nonfuel Costs Excluding Capital vs. Kwh Sold.....132
Figure 70 True Cost of Major Rural Utilities and Fraction Covered by Rates.....138
Figure 71 Components of True Cost of Electric Service .....146
Figure 72 Non-Fuel cost vs. System Condition Number (higher condition number means poorer condition).....147
Figure 73 Population Served by type of Electric Utility Management.....148
Figure 74 True Nonfuel Cost of Electricity vs. Annual Sales (Village Level Data Places with Less than 10 million kWh/yr) .....149
Figure 75 True Nonfuel Cost of Electricity vs. Annual Sales, for Different Management Structures .....150
Figure 76 Sources of Funds to Cover Cost of Electric Service .....152
Figure 77 Revenue Sources to Cover Full Cost of Service (Booked vs. Actual).....153
Figure 78 Alaska Solid Waste Funding.....200
Figure 79 Solid Waste Project Costs in Alaska from the Sanitation Deficiency System .....203

## Table of Tables

Table 1 Income and Utility Consumption Comparisons .....5
Table 2 Federal Payments to Persons: 1999 (Million $) .....25
Table 3 Federal Grants to Alaska: 1999 (Million $).....27
Table 4 Real Personal Income Growth: 1990 to 1999 (Million $).....28
Table 5 Native Share of Population by Region .....38
Table 6 Energy Funding to Rural, Railbelt, and Four Dam Pool Populations.....109
Table 7 Minimum Efficiency Standards for Utilities that Rely on All-Diesel Generation (Annual kWh sold per gallons consumed) .....127
Table 8 Components of the True Cost of Service .....140
Table 9 Examples of Cost Implications of "Off-Book" Capital Additions – Alaska Energy Authority Projects.....142
Table 10 Examples of Cost Implications of "Off-Book" Capital Additions – Denali Commission .....143
Table 11 Estimate of Interest Rate Subsidy on $1 million Loan at 3% Interest over 30 years .....144
Table 12 Estimate of Interest Rate Subsidies to AVEC and THREA .....145
Table 13 Electric Utility Condition Number vs. Size (higher number means poorer condition) .....148
Table 14 Estimated True Cost of Small Flush/Haul System (Small Village Example: 60 to 80 Households).....154
Table 15 Operating Cost Estimates for Four Flush/Haul Systems.....155
Table 16 Estimated True Cost of Vacuum Piped Sewer and Water System.....156
Table 17 Estimated True Cost of Bulk Fuel Storage.....157
Table 18 Indian Lands Open Dump Sites—Potential Threat to Health & Environment197
Table 19 Differences Between Federal and State Solid Waste Regulations for Small Community Landfills in the State of Alaska.....199
Table 20 Sanitation Deficiency System Solid Waste Funding Requirements by Area .202

# 1. Project Purpose and Intent

Adequate utilities are a basic foundation of economic and social well-being in American communities today. However, despite decades of effort and billions of dollars spent, this foundation is still out of reach for many residents of small communities in rural Alaska. From a purely fiscal standpoint, a huge and growing public investment in rural utility infrastructure -- approaching $2 billion of gross value and growing by $60-$100 million per year – is potentially at risk due to inadequate operations and maintenance. The problem is most dramatically illustrated by the catastrophic failure of several rural utility systems during the past two decades.[1] Such failures can mean the instant loss of several million dollars of investment which must be replaced at great cost or abandoned. But the issue goes far beyond fiscal responsibility. Reliable electricity, clean water, effective sanitation, and the removal of solid waste are basic requirements for public health, social well-being, and economic development.

In this report we examine the maintenance, management, and operation of rural Alaska utilities. We ask three fundamental questions:

- What does it really cost to operate these utility systems?
- Who currently pays these costs?
- How can we reduce these overall costs through more efficient operating practices?

The intent of this project has been to focus on the long term sustainability and efficient operation of utility infrastructure in rural Alaska. To protect and best use these assets requires sustainable utility management and governance, backed up by community support and community capacity. Thus, we pay primary attention to institutions, incentives, and other components of the "human system." Purely technical issues, while important, are not the central concern of this report.[2]

[1] Catastrophic failures have occurred in Kotzebue, Venetie, Goodnews Bay, and Mekoryuk. Most occurred during the 1980s. Due to advances in technology such as plastic "freeze-friendly" piping, and better maintenance practices such as RMW program, there has been a dramatic reduction in the number of such failures. However, that reduction may be difficult to sustain unless O&M resources keep pace with capital investment.

[2] The recently updated *Cold Regions Utility Monograph* (ASCE 1996) provides an excellent overview of technical problems and approaches from an engineering standpoint.

## 2. The Setting and the Problem

It is a tremendous challenge to build, operate and maintain basic utility systems in rural Alaska today. Most rural villages are small (under 1,000 population), remote (not connected by roads or utility grids), have very low per capita cash income (less than $15,000[3]), and face formidable environmental challenges, including Arctic winters, permafrost, poor soils, and seasonal flooding.

Electricity is generated by isolated diesel generators that are not tied into regional grids. Water and sewer systems must move fluids to and from buildings under some of the harshest environmental conditions on the planet. Fuel and construction materials cannot be delivered by truck; they must be barged in during short summers or delivered by air. Remote local economies generate little cash to support utility operations.

Arctic utility systems are very expensive. Many of the electric systems and almost all of the struggling sanitation utilities are run by local governments. With a small customer base and limited income, many--if not most--systems are not self supporting. The difference between customer payments and the actual cost of day to day operations is made up by the power cost equalization program (PCE), by general city revenues, by several state and federal assistance programs, and by the deferral or avoidance of maintenance, with public agencies often picking up the bill for major repairs or premature replacement.[4]

While the lights are generally on in rural Alaska, inadequate sanitation and water supply remains a serious problem.[5,6,7] Thousands of Alaskans in small rural villages lack flush toilets and running water. Bulk fuel facilities are in serious disrepair. The Denali Commission (2001) has identified the need to immediately replace more than 45 million gallons of fuel storage capacity.

---

[3] Colt and Hill (2000) estimated that the average per capita income in VSW communities was $13,000 in 1999.

[4] Colt, Stephen, 1994. *Operation and Maintenance Issues in Rural Alaska Sanitation*. Prepared for USEPA / Region 10 and Federal Field Work Group on Rural Alaska Sanitation. Anchorage: Institute of Social and Economic Research.

[5] Miller, Nina, and Joe Sarcone, 1999. *Rural Sanitation Facilities Operation and Maintenance Demonstration Project: Interim Project Report.* Prepared for Alaska Native Health Board, Anchorage AK, and U.S. E.P.A. Region 10. April.

[6] Governor's Council on Rural Sanitation, 1998. *Rural Sanitation 2005 Action Plan.* Available from the Council, c/o Department of Environmental Conservation, FC&O, 410 Willoughby Avenue Suite 102, Juneau AK. February.

[7] U.S. Environmental Protection Agency, 1995. *Federal Field Work Group Report to Congress on Alaska Rural Sanitation.* Seattle WA: U.S. GPO, EPA 910/R-95-002.

This situation is not necessarily due to an overall lack of funding -- more than $1.5 billion has been spent on capital construction projects and valuable lessons have been learned from engineering research and development. Instead, there is widespread agreement[8] that inadequate operations, maintenance, and management is at the heart of the problem. After a year of careful review, the Federal Field Work Group (1994) wrote:

> "It will not be possible to attain a satisfactory level of sanitation service in a significant number of rural Alaska communities unless the O&M issue is addressed effectively. The FFWG regards this issue as one of its key priorities..."[9]

In this report we examine the maintenance, management, and operation of rural Alaska utilities. We ask three fundamental questions:

- What does it really cost to operate these utility systems?
- Who currently pays these costs?
- How can we reduce these overall costs through more efficient operating practices?

These questions are important to everyone. Alaskans depend on sustainable utilities for their long-term health, safety, and well-being. State and federal agencies have a multibillion dollar investment in utility facilities at risk due to improper operation, maintenance, and management. Yet most rural utilities have fewer than 200 customers and cannot afford a full-time utility manager. Many cannot afford inventories of critical spare parts or basic business insurance.[10] Others lack a personal computer or software to keep track of customer accounts; partly as a result, the delinquency rate on customer payments in many villages exceeds 25%.[11] In this environment, breakdowns lead to shutdowns and routine component failure can lead to complete system collapse. The cost of neglect can be very high.

---

[8] At least one Steering Committee Member disagrees with this contention, stating: "We don't agree that the reason that rural Alaskans lack sanitation infrastructure is due to inadequate operations and maintenance. They lack toilets and sinks because the infrastructure hasn't been built, not because of inadequate operations."

[9] U.S. EPA 1995, *op. cit.*, p. 13.

[10] Colt, Stephen, 1996. *Yukon -Kuskokwim Region Sanitation Utility Management Options Type I Market Feasibility Study.* Prepared for U.S. Army Corps of Engineers, Partners in Environmental Progress Program, Alaska District. January.

[11] Alaska Department of Community and Regional Affairs, Rural Utility Business Advisor Program (RUBA), *1999 Utility Management Survey*.

## 3. Utility Cost and Consumption in Alaska

At the outset, it is important to understand a few basic facts about the cost and use of utilities in both rural and urban Alaska.

Some people feel that because of the Power Cost Equalization program (PCE), electricity is cheap in rural villages and heavily consumed. There is no evidence to support this view. Even *after* deducting the amounts that PCE covers,[12] rural consumers pay between 15 and 35 cents per kilowatt-hour (kWh) for the first 500 kWh per month. Residents who consume more than this level and all commercial customers pay significantly more. Overall, customers in PCE communities pay about twice the average rate of about 10-12 cents per kWh paid by Anchorage or Fairbanks residents. As a result, rural Alaskans consume only about 4,000 kWh per year, less than 40% of the average consumption of Anchorage or U.S. residents (10,000 kWh/year) (Colt 1993, Energy Information Administration 2001).

The situation is no different for water and sewer. Rural Alaskans lucky enough to have piped water and sewer are generally charged between $50 and $120 per month –sometimes more -- for this service, compared to $49 per month in Anchorage. Many users of flush/haul systems, who pay by the gallon, have cut back their water consumption to less than 6 gallons per person per day in an effort to reduce their bills (Colt 2000). Anchorage consumers use about 100 gallons per person per day (AWWU 1994). Since medical data show a significant increase in the prevalence of infectious diseases when water use drops below 8 gallons per person per day (ASCE 1996, p. 2-3), the low consumption levels currently associated with some flush haul systems could have serious health consequences.

Table 1 summarizes these comparisons and shows that when the low level of per capita income in rural Alaska is taken into account, rural consumers pay between 3.2 and 5.1 percent of their pre-tax household income for electric, water, and sewer, while Anchorage residents pay about 1.5 percent. The water/sewer component of this total burden ranges up to 3 percent of household income. Our review of several studies of affordability suggests that when water and

[12] The PCE program reimburses utilities for a fixed amount per kWh for the first 500 kWh of residential consumption and for community facility use of up to 70 kWh per person. The reimbursement per kWh is equal to between 75-95% of the eligible costs that exceed the "floor" amount (set at 12 cents for FY2000) and the "ceiling amount" (set at 52.5 cents). The reimbursement percentage cannot exceed 95% by statute, but often falls short of this level due to limited overall funding.

sewer costs rise above 2 percent of household income, ability to pay is compromised (EPA 1996, EPA 1993).

**Table 1**
**Income and Utility Consumption Comparisons**

| | Rural AK | Anchorage | US |
|---|---|---|---|
| Per Capita Income 1999 | 13,000 | 30,000 | 28,500 |
| Residential Electric Consumption (kWh/yr) | 4,000 | 10,500 | 10,100 |
| Percent of Household Income Spent on electric/water/sewer | 3.2 - 5.1% | 1.6% | N/A |

Sources: Author calculations based on PCE data, BEA Local Area Personal Income, Energy Information Administration
Notes: Rural Alaska per capita income based on VSW-eligible communities (Colt & Hill 2000).

# 4. Social, Economic, and Cultural Context

## *4.1 Introduction and Summary*

A realistic approach to sustainable utility services must start with an honest appraisal of the social, economic, and cultural context. We consider this in three steps. First, the statewide economic outlook strongly affects the rural economy. Second, we consider how the outlook for the rural Alaska economy differs from the statewide picture. Third, we discuss the importance of traditional culture, subsistence values and the non-cash economy.

The demand for utility services is growing faster than the economic base in rural Alaska. The rural economy is tied to the statewide economy, and statewide economic performance during the 1990s was lackluster and dominated by increases in transfer payments. Real personal income in Alaska increased by $1.8 billion between 1990 and 1999, but more than 90 percent of this increase is due to the growth of Permanent Fund dividends, federal transfers, federal grants, and the economic multiplier effects created by these cash infusions.

Rural economies are similarly becoming more dependent on grants, transfers and dividends. In parts of Interior Alaska the dollar flows from federal grants and PFDs are now 40% of total regional income whereas in 1990 they were only 20%.

Rural Alaskans face trade-offs between the need for cash income and the need to participate in subsistence. This trade-off makes it hard for small utilities to keep trained operators on the job and means that sometimes people must choose between raising cash to pay utility bills and getting food for their families.

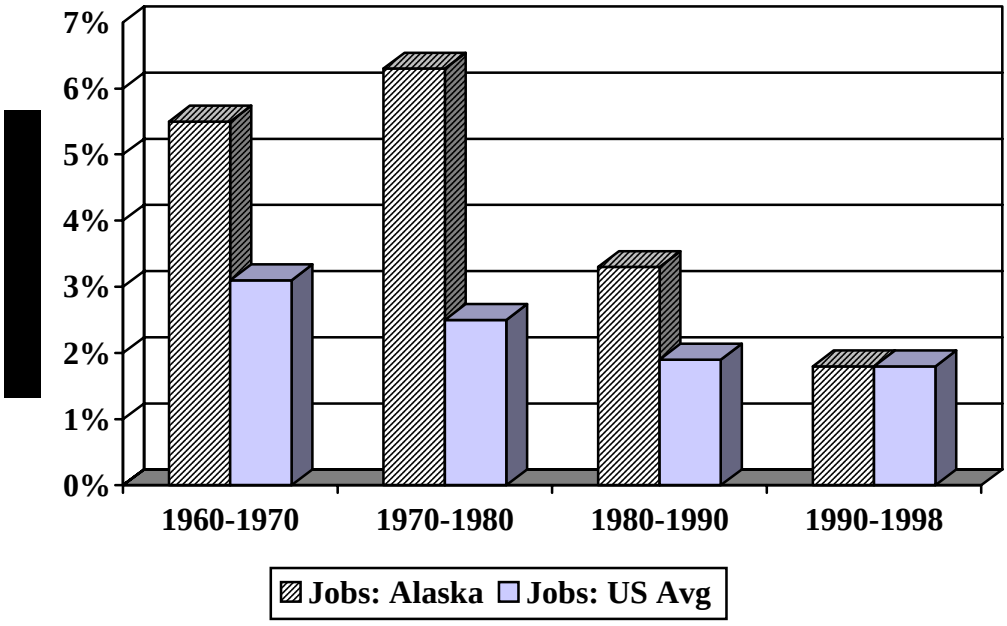
Given this fundamental tension between traditional culture and the forces of modernization, some feel that there is a critical linkage between outside influence, local capacity, and long-run prospects for sustainability. According to this view, sustainability is as much about cultural survival as it is about economics. Therefore, manner in which services are delivered and by which communities develop their general capacity for self-governance is equally, if not more, important to long run sustainability than the achievement of some predetermined standard of conduct or performance by a utility. The Governor's Council on Rural Sanitation echoed this view when it stated that "Performance targets should be developed as a *collaborative effort* between the community and the funding agency."

## *4.2 Statewide Economic Review*

The economy is giving off both positive and negative signals. Talk of commercial development of North Slope gas, the opening of the Alaska National Wildlife Refuge, federally funded transportation projects, and possible construction of a missile defense system have created a sense of confidence within the economy. This is in spite of a marked slowdown in the US economy. Furthermore the economy has been adding jobs at a healthy rate and the unemployment rate is low. However, there is also evidence that the economic base of the state—our traditional natural resource industries—is weakening and that the new jobs being created are not comparable to those being lost. Furthermore there is some concern that the present growth trajectory may not be sustainable. Economic Indicators include jobs, average paycheck, total personal income, per capita personal income, gross state product (value added) and the population under 40.

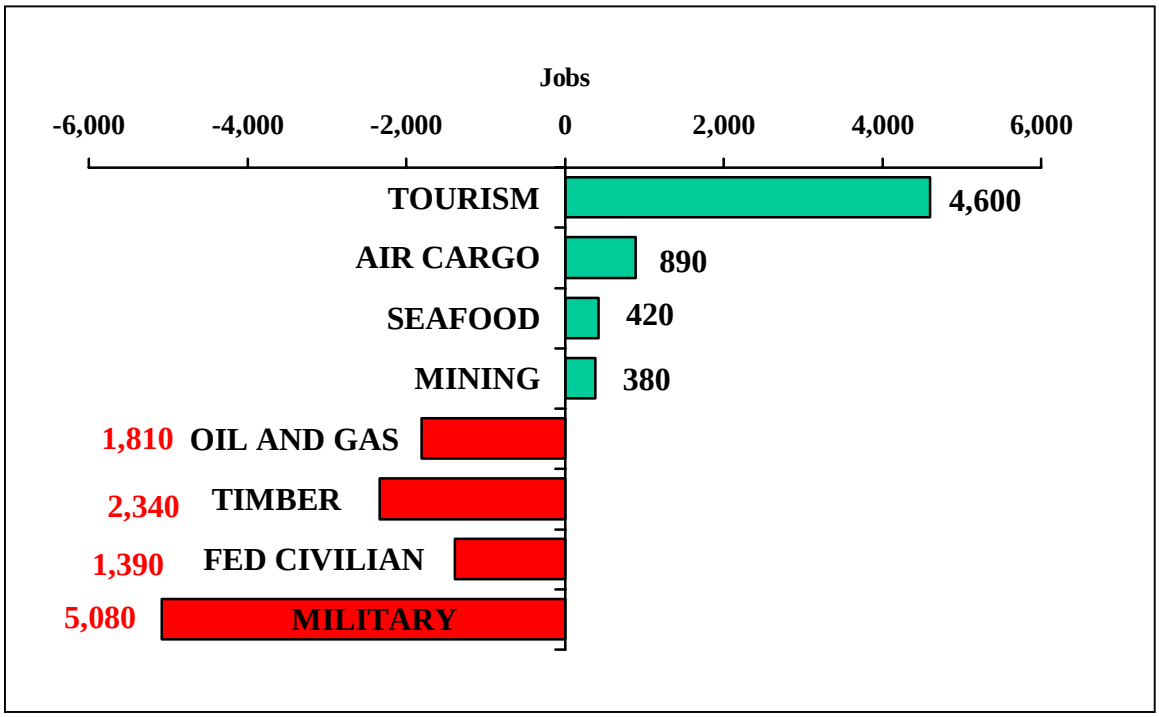
The annual growth rate of jobs in Alaska has been slowing over the last 3 decades. Graphs relating to job growth all show the annual average growth over the decade. From the time Alaska became a state until 1990 we consistently beat the US average, but since 1990 we have just managed to add jobs at the same rate as the United States as a whole--1.8% annually (Figure 1).

**Figure 1**
**Jobs: Annual Growth Rate Falling**



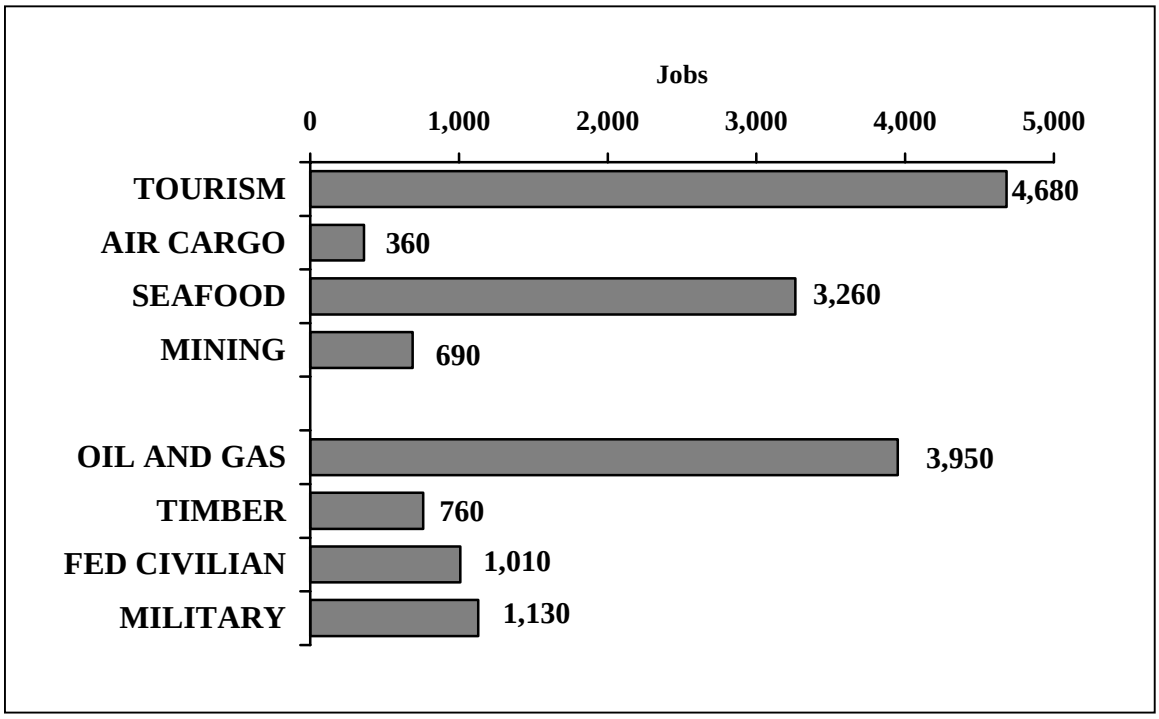
Since 1990 we have added 27 thousand jobs (1990-1998). But more important than job growth is the composition of those jobs. We would like to see the number of Basic Jobs, jobs that bring new money into the economy, increasing. Without infusions of new money, there is a limit to economic growth potential. Unfortunately basic sector job growth since 1990 has been a negative 4 thousand. The economy added 2 thousand private sector basic jobs, mostly in tourism, but lost 6 thousand from the public sector, mostly military related. (These numbers are not precise as there are different ways of attributing jobs within the economy to different industries, and the cyclical nature of many basic industries reduces the validity of using an arbitrary base year.) Virtually all the new jobs have been in trade and services, which grew 25 thousand, not including those jobs in tourism, and state and local government, which increased 3 thousand (Figure 2).

**Figure 2**
**Basic Jobs: 4,000 Lost Since 1990**



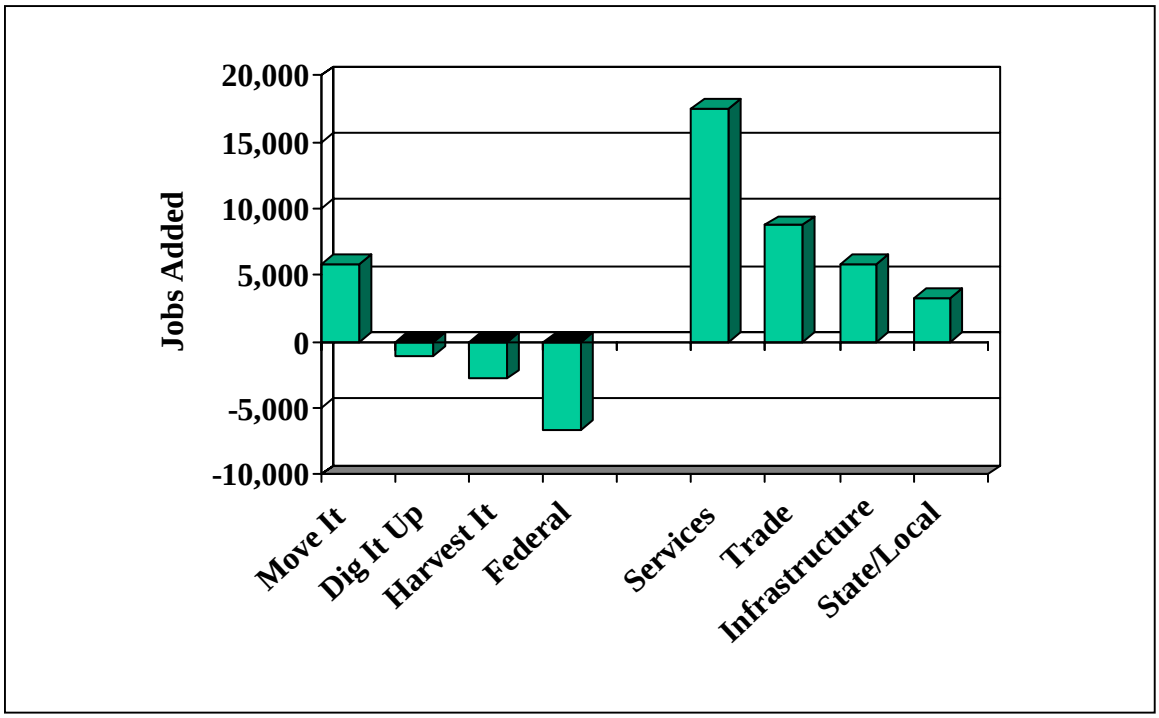

In contrast, between 1980 and 1990 total job growth was 72 thousand. Basic job growth was 16 thousand, and all the major sectors contributed. Because the number of jobs has increased since 1990 but the number of basic jobs has fallen, our economic base has eroded. For our size, and based on the growth from 1980 to 1990, we should now have 10-12 thousand more basic jobs than we do (Figure 3).

**Figure 3**
**Basic Jobs: 16,000 Added in the 1980's**



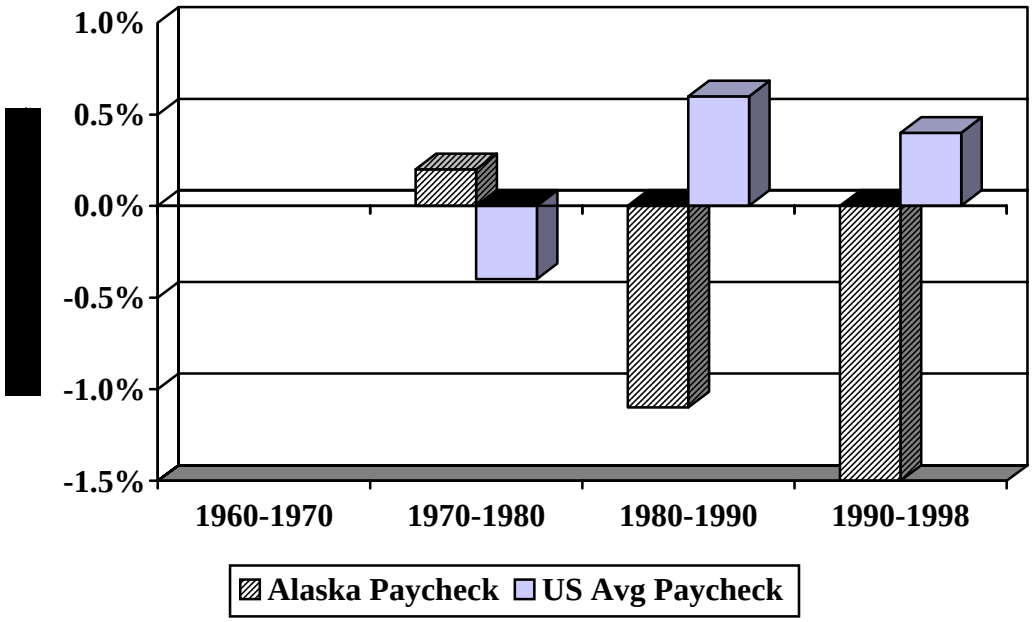
Most of the job growth in the 1990's has been in trade and services, excluding those jobs attributable to tourism (Figure 4).

**Figure 4**
**Jobs Added in the 1990's**



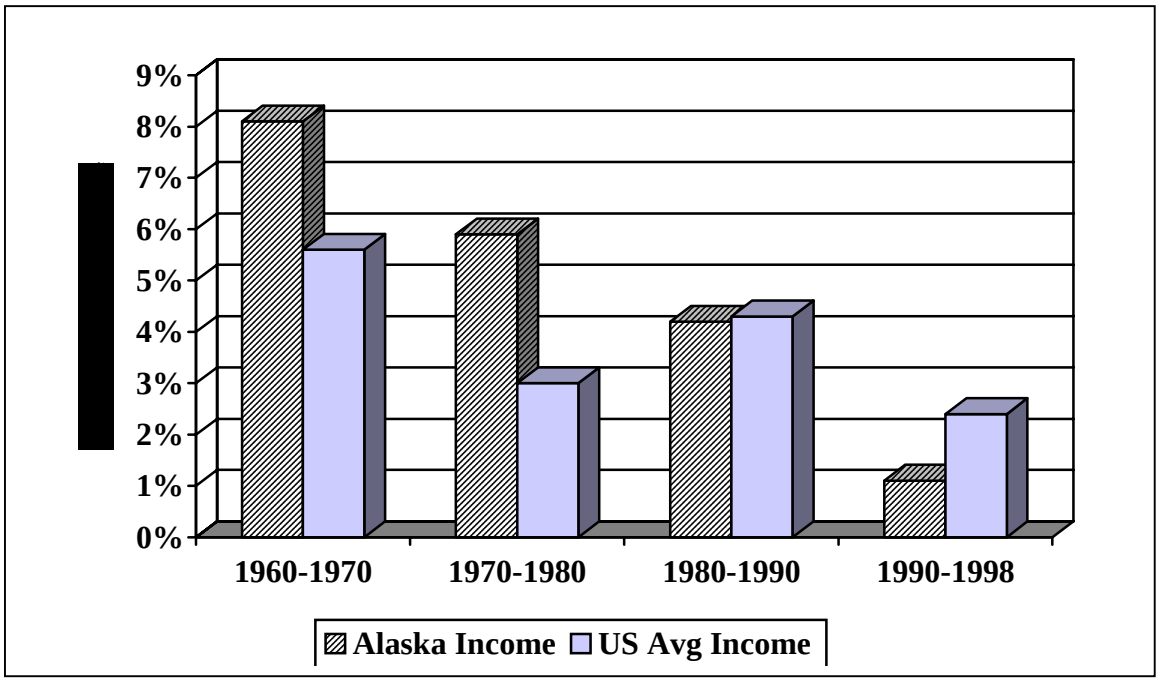
The purchasing power of the paycheck of the average Alaskan worker has been falling in value for the last two decades. It has lost about 10 percent just since 1990. In contrast for the US as a whole the average paycheck has been growing. The decline in the Alaska paycheck is due both to the changing composition of jobs, with lower paying jobs replacing higher paying jobs, and the erosion in the average wage for particular types of work. During boom times paychecks have gotten bigger, but those episodes have been temporary and have not arrested the downward trend. The average paycheck is still higher than the US average, but we are losing ground fast (Figure 5).

**Figure 5**
**Real Average Paycheck: Annual Growth Rate Negative**



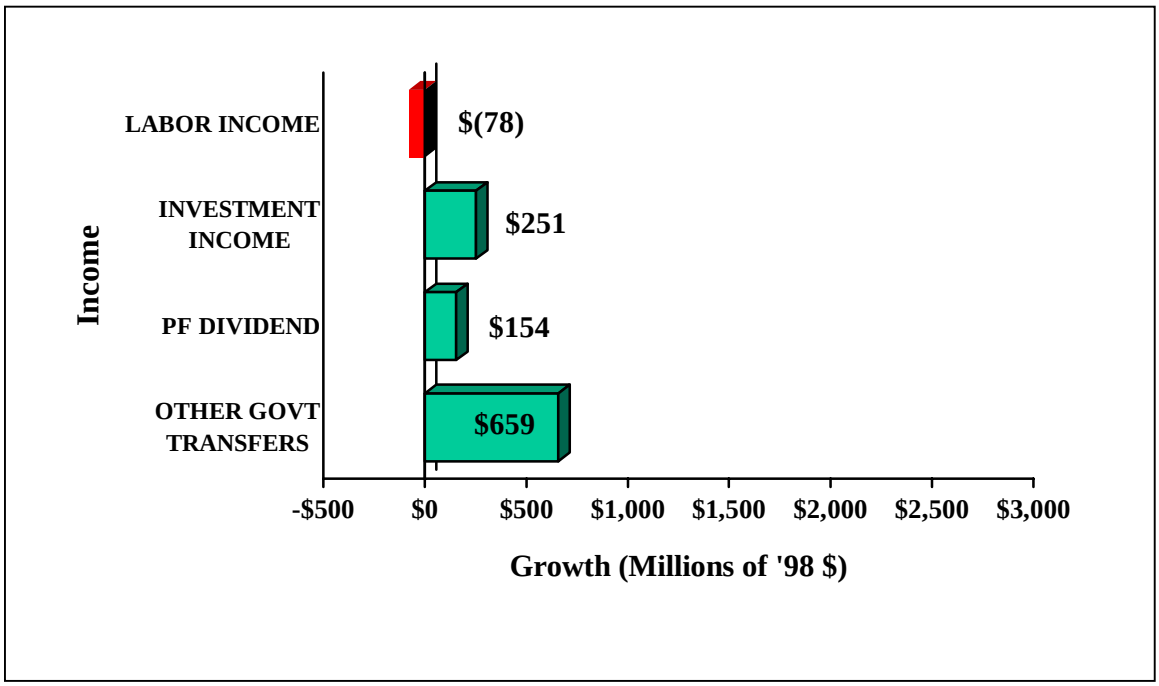
The annual growth rate of real personal income in Alaska, our best measure of the purchasing power of households, adjusted for inflation, has slowed over time. The growth rate since 1990 has been below the US Average for the first time since Alaska became a state (Figure 6).

**Figure 6**
**Real Personal Income: Annual Growth Rate Falling**



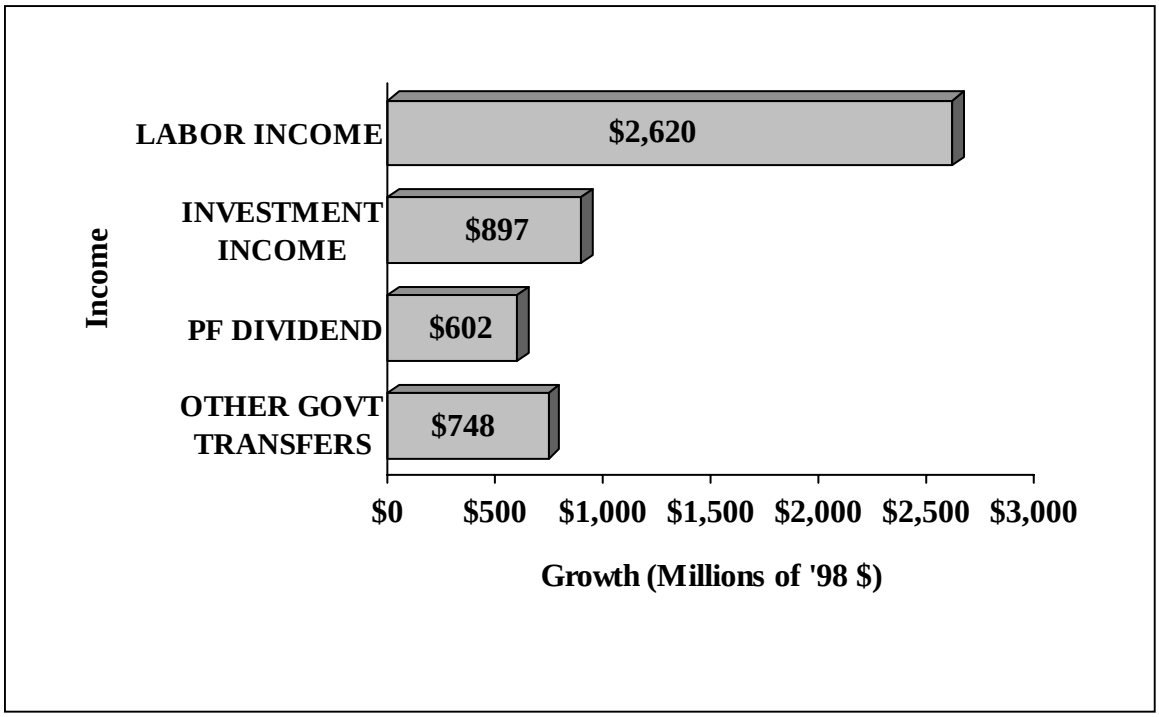
Since 1990 total growth in Alaska real personal income has been about $1 billion. Labor income has fallen, in spite of the increase in jobs, because the average paycheck has fallen. Investment income, the return on assets held by households, has added about $250 million. Government transfers, including the PF dividend, and a variety of federal transfers, has been the main source of growth of personal income--over $800 million. This figure includes data only thru 1997. Since then expenditures on the PFD have increased another $300 million and federal transfers have continued to grow as well. Thus, personal income growth is now even more dependent on government transfers. While the press touts tourism and air cargo jobs as driving the economy, almost all the increase in outside money entering the economy in recent years has come from government (Figure 7).

**Figure 7**
**Real Personal Income: Growth Since 1990**



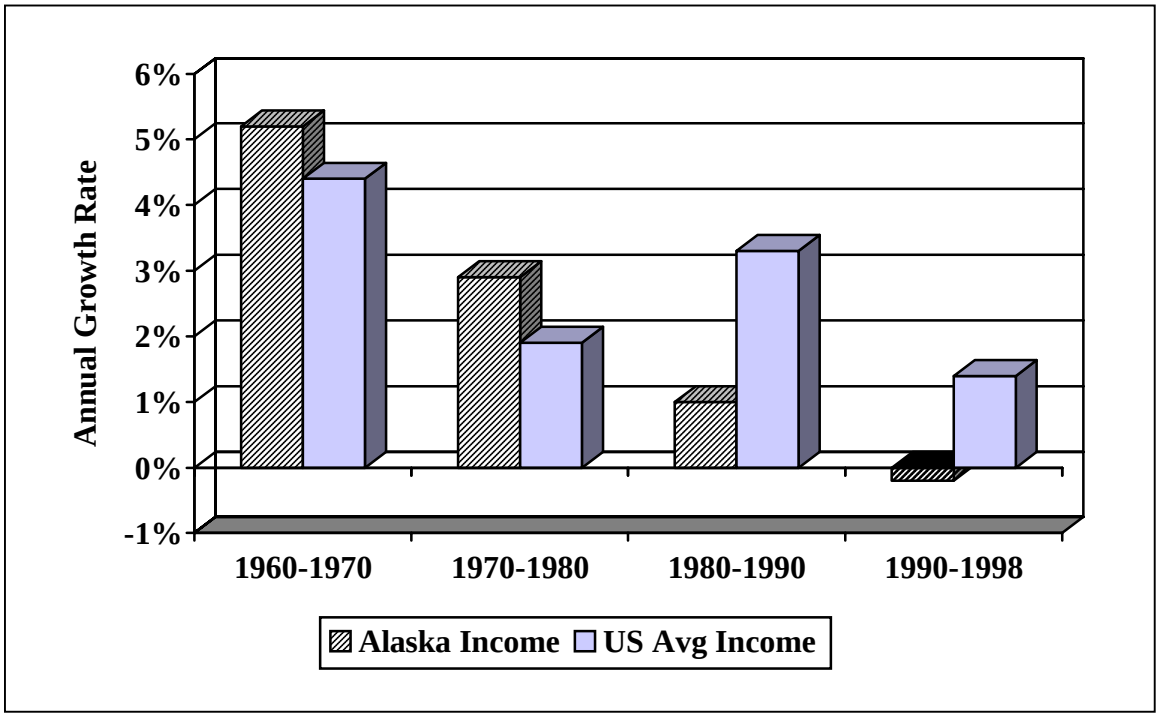
In contrast in the 1980s, real personal income grew about $4.9 billion, and the contribution of the different sources was well balanced (Figure 8).

**Figure 8**
**Real Personal Income: Growth 1980 to 1990**



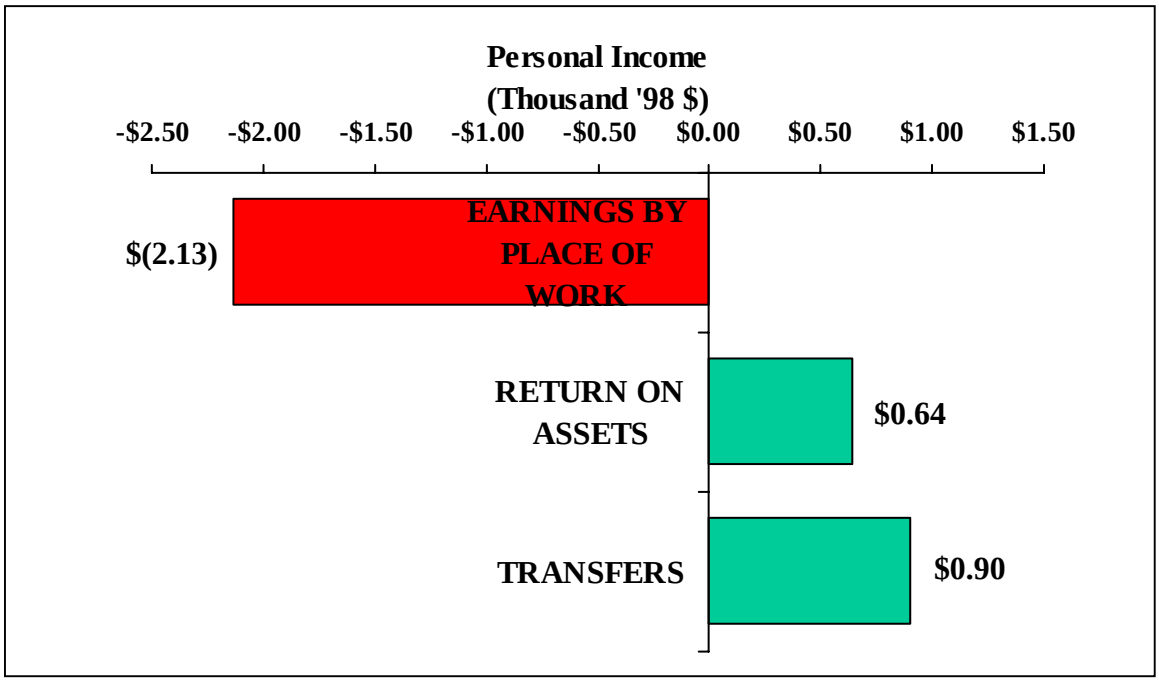
Because of the slow growth in total personal income, the growth rate for per capita income, our best measure of average household income, has been falling. In fact, since 1990 real per capita personal income has fallen by about $600. For the last two decades the annual growth rate of real per capita personal income in Alaska has lagged behind the national average (Figure 9).

**Figure 9**
**Per Capita Personal Income: Annual Growth Rate Flat**



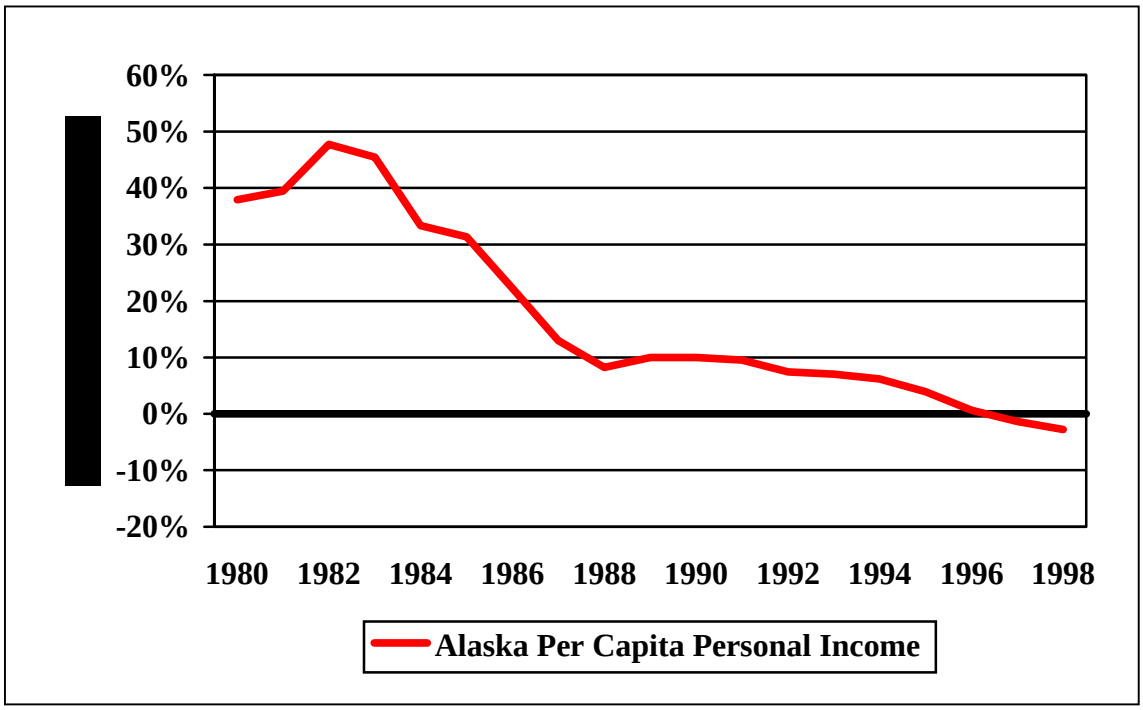
Alaskan households are getting a smaller share of their income from wages and more from investments and government transfers than in 1990. The diversification of sources of income for households is good, but the decline in income from wages, together with the drop in the earnings of the average worker, is troublesome (Figure 10).

**Figure 10**
**Per Capita Personal Income: Growth Since 1990**



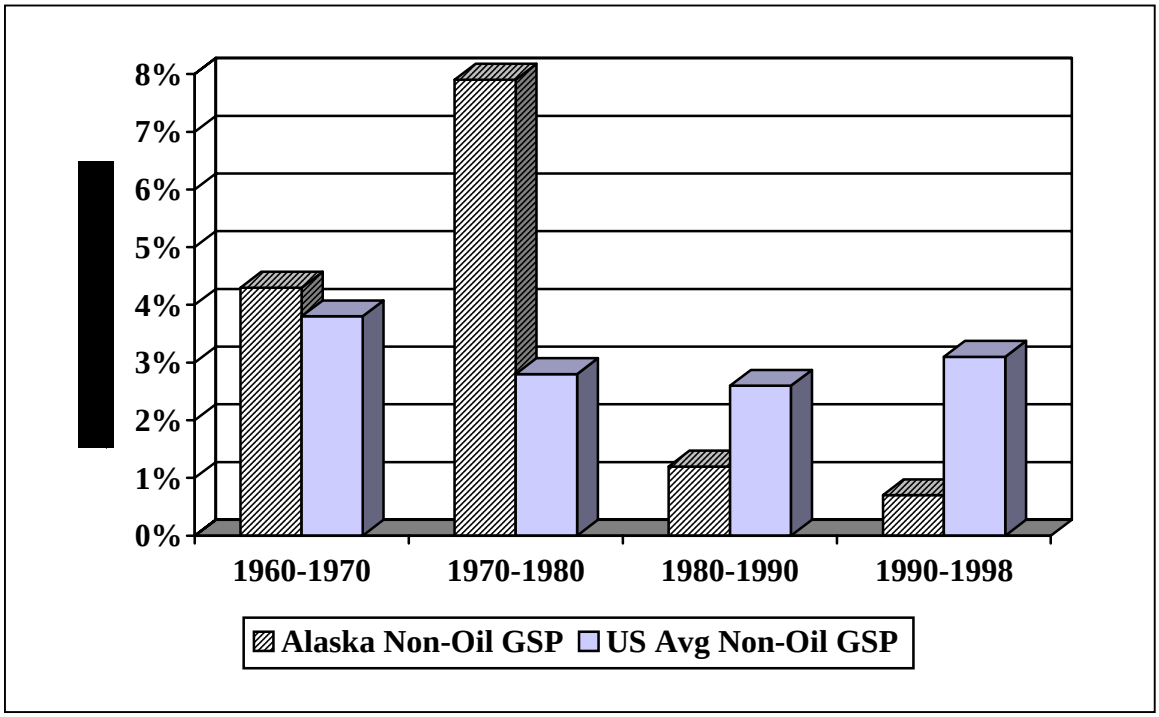
In fact, per capita personal income in Alaska, which has historically exceeded the US average, fell below that benchmark in 1997. Since the cost of living in Alaska is higher than the lower 48, the real purchasing power of Alaska per capita personal income has been below the US average for about a decade (Figure 11).

**Figure 11**
**Per Capita Personal Income: Now Below the US Average**



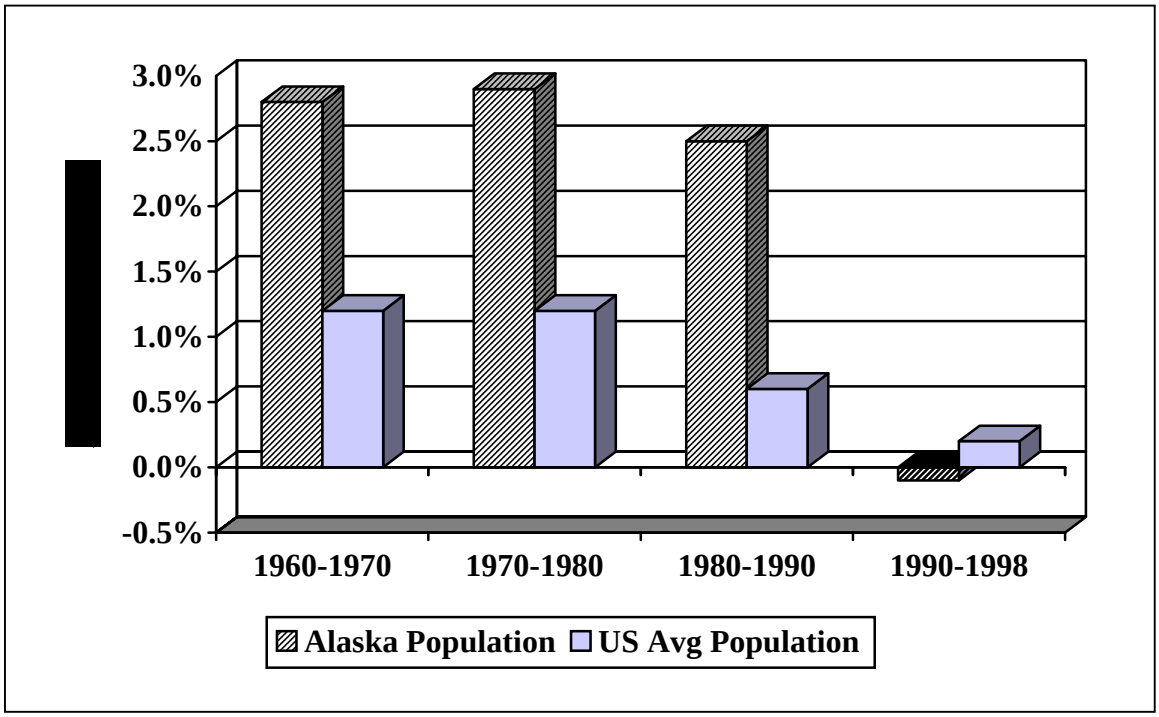
Gross State Product, or Value Added, is the value of all goods and services produced by the economy in a year. Its growth rate in Alaska net of petroleum has slowed over the last two decades. For the US as a whole it has consistently increased at about 3% annually. Since we have been adding jobs faster than real value added has been increasing, output per worker has been falling (Figure 12).

**Figure 12**
**Non-Oil GSP (Real Value Added): Annual Growth Rate Falling**



Since 1990 the population under 40 has been flat, while the total population has grown 1.4% annually. The population 40 and over has accounted for all the increase and it is now about 50% higher than it was just in 1990. There are two reasons for this ageing of the population. First, the baby boomers are moving into the over 40 population. This national phenomenon is more pronounced in Alaska since we are the land of the boomers. Second, migration in the 1990s has not provided a fresh supply of young people to Alaska as it had in earlier decades, and younger Alaskans now appear more ready to seek opportunities outside Alaska (Figure 13).

**Figure 13**
**Population Under 40: Annual Growth Rate Flat**



## *4.3 Key Factors Influencing the Economy*

There are three key factors that are likely to influence the economy during the coming decade.

First, the income flowing into both the private and public sectors from Prudhoe Bay oil production will continue to fall as production declines, and other petroleum activity on the North Slope, as well as growth in other basic sectors, will be hard pressed to fill the resulting gap.

Second, there are a number of basic sectors with growth potential to offset this trend. These include other petroleum activity, tourism, mining, military activity, international air cargo activity will continue to expand.

Third, the economy is in the midst of a small economic boom, created by a rapid but unsustainable increase in federal and state expenditures in the form of federal grants, federal transfers to persons, and high Permanent Fund dividends.

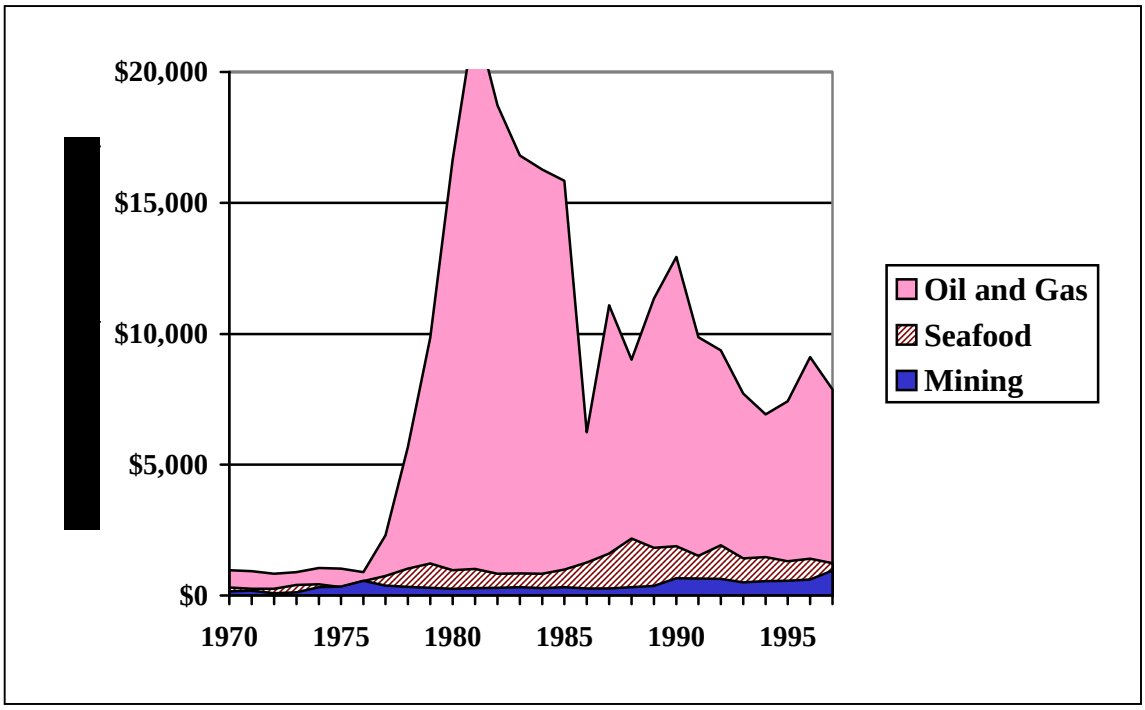
### The Post-Prudhoe Blues: Market Value of Oil (and other resources)

During the late 1970s and through the 1980s the economy was overheated by all the wealth being generated from production of Prudhoe Bay oil on Alaska's North Slope. Alaska has been blessed with the largest oil field in North America. Prudhoe Bay oil has created unimaginable wealth since the mid 1970's (about $160 billion in North Slope oil at 1998 $ so far). This bounty has raised our expectations about continued economic growth and also and made us complacent since the wealth flowed so freely for so long. We expect the economic growth generated by Prudhoe Bay oil to continue indefinitely and automatically. But the continuation of the kind of growth generated by Prudhoe Bay is not possible. Prudhoe Bay oil is running out even though it still dominates the economy. This is clearly demonstrated by a comparison of the market value of oil with seafood and mining (Figure 14). As the value of oil has fallen, growth in the seafood and mining sectors have not filled the gap. We need to adjust our expectations to the reality of this structural change in the economy.

At the same time we need to work harder get the most out of the considerable assets we do have. Twenty years of dependence on Prudhoe Bay oil has made us less receptive to consider new ideas and alternatives to the traditional economic growth strategies that might not work for

us in the future. As a group, oil and other resource rich countries have been very successful in generating long term sustained economic growth.

**Figure 14**
**Market Value of Selected Alaska Natural Resources**




## Potential Sources of New Economic Growth

The potential stars of the new millennium are petroleum, tourism, mining, international Air Cargo, footloose services and the military. Even as Prudhoe Bay oil production continues to fall, Alaska has a number of other basic industries that could be adding jobs and growth to the economy in the future.

## The Easy Government Money Boomlet

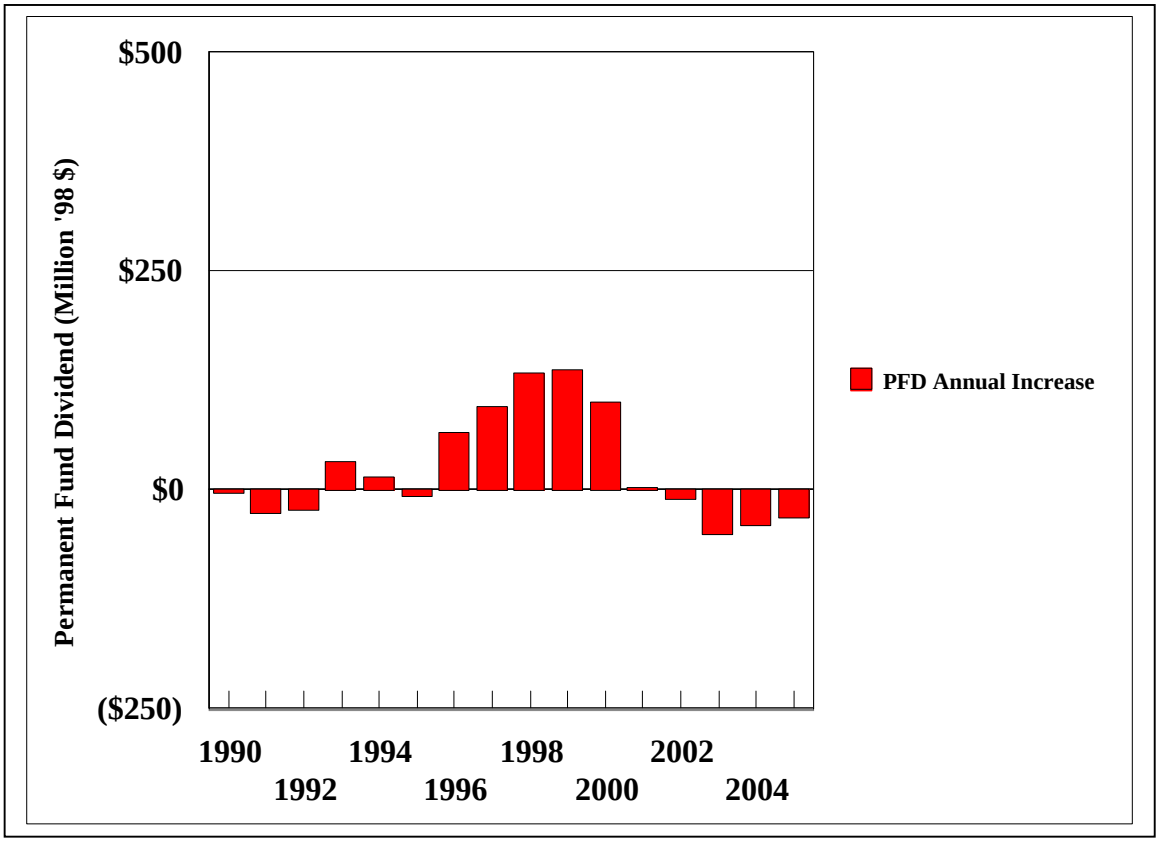
The growth in consumer purchasing power is coming from the Permanent Fund Dividend (PFD), federal dollars, direct payments to persons and grants to state and local governments. During the 1990's most of the growth in jobs and personal income in Alaska can be traced to increased flows of dollars from the state and federal governments into the economy. Three sources account for most of this – the Permanent Fund Dividend, direct federal transfers to persons, and federal grants to state and local government. We can characterize this as a

"Boomlet" since the rate of increase of these flows is sure to slow, and will likely turn into a contraction at some future date.

## Permanent Fund Dividends

The size of the Permanent Fund Dividend changed little during the first half of the 1990's, but between 1995 and 2000 it almost doubled in size. For a five year period beginning in 1996 and ending in 2000 the annual infusion of purchasing power into the Alaska economy grew by about $100 million per year. Assuming a return to a normal rate of return on the PFD, the size of the dividend will actually decline during the next few years. Consequently the amount of purchasing power the dividend pumps into the economy will fall (Figure 15).

**Figure 15**
**Permanent Fund Dividend Annual Increase**




## Federal Transfers to Individuals

Federal transfers to individuals have been steadily increasing throughout the 1990's. These transfers consist primarily (about 2/3) of various retirement payments such as social

security payments and government (civilian and military) retirement. The remainder consists of Medicare, unemployment insurance benefits, food stamps, and housing assistance. Because of the nature of these programs, we expect them to continue to grow in the future, consistent with their trend during the previous decade (Figure 16, Table 1).

**Figure 16**
**Federal Payments to Persons: Annual Increase**

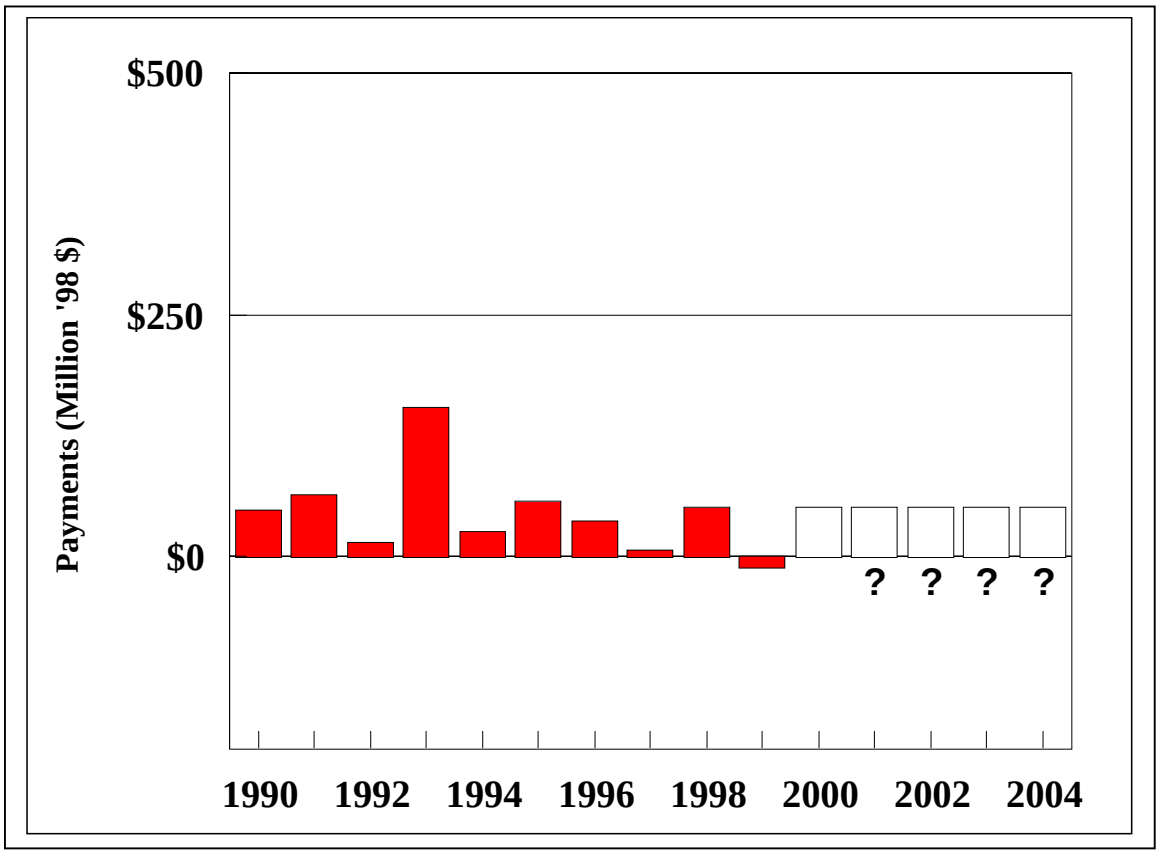


**Table 2**
**Federal Payments to Persons: 1999**
**(Million $)**

| | |
|---|---|
| **TOTAL** | $1,232 |
| | |
| **RETIREMENT AND DISABILITY** | |
| Social Security | $453 |
| Federal Retirement | $123 |
| Veterans Benefits | $71 |
| Other | $140 |
| **OTHER** | |
| Medicare | $161 |
| Unemployment Compensation | $120 |
| Food Stamps | $49 |
| Public and Indian Housing | $33 |
| Other | $83 |

## Federal Grants to State and Local Governments

Alaska has long been at the top of the list of states in receipt of per capita federal grants to state and local governments for capital projects and operations. During the early 1990's the grants increased at a rate well below $100 million per year. In the later half of the 1990's the growth has been much more rapid. In the most recent year for which data is available federal grants increased by nearly $500 million over the previous year. Growth is expected to continue for an unknown number of years, partly because this grant money does not all get spent immediately so its impact gets spread over several years. At some undetermined time in the future the annual increase can be expected to change into an annual decline. The magnitude and duration of this decline are unknown (Figure 17, Table 2).

**Figure 17**
**Federal Grants: Annual Increase**

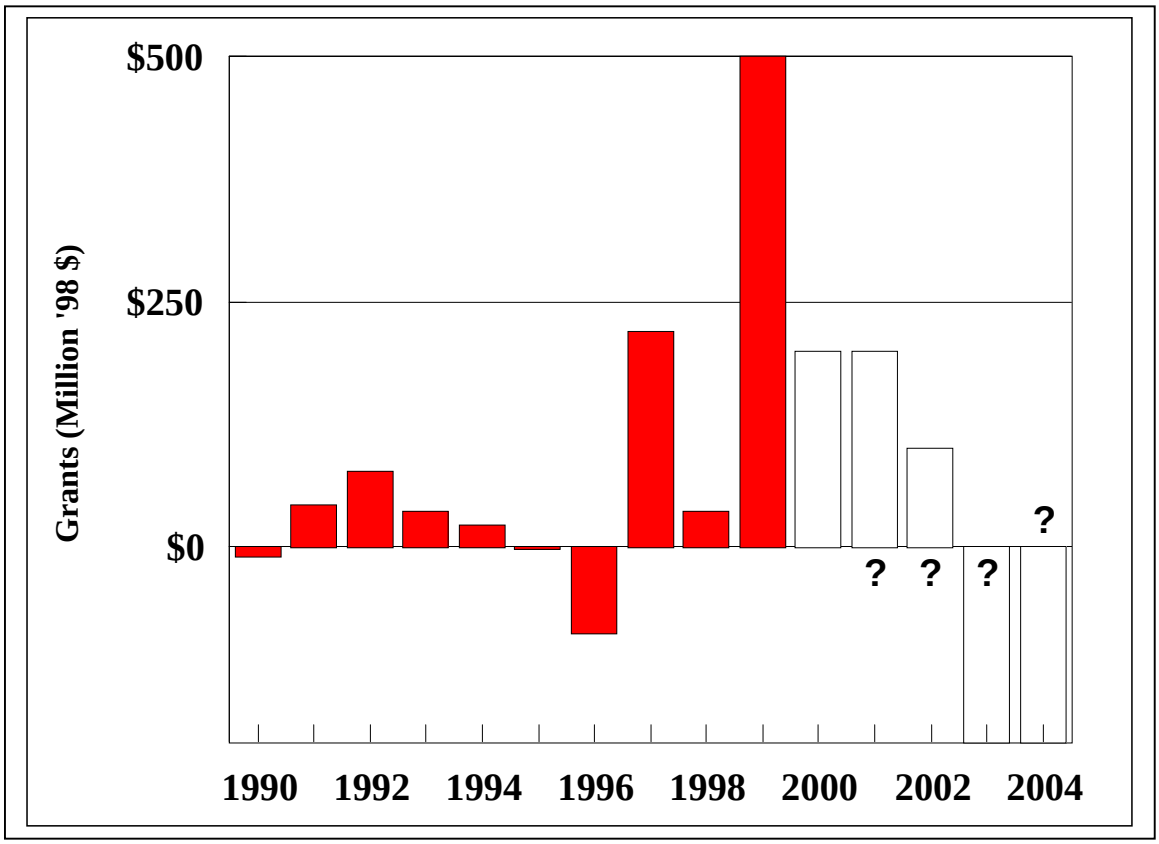


**Table 3**
**Federal Grants to Alaska: 1999**
(Million $)

| | |
|---|---|
| **TOTAL** | **$1,932** |
| | |
| Highways | $362 |
| Medical Assistance | $282 |
| Indian Health Service | $259 |
| Health/Human Service | $142 |
| Bureau of Indian Affairs | $109 |
| Impact Aid | $101 |
| Environmental Protection | $84 |
| Federal Aviation Admin | $79 |
| K-12 Education | $76 |
| Food/Nutrition Programs | $61 |
| Jobs and Training Admin | $56 |
| NOAA | $37 |
| Justice Programs | $32 |
| Rural Water/Sewer | $32 |
| NSF | $18 |
| Alcohol/Drug Abuse | $15 |
| Disease Control | $13 |
| Economic Development | $12 |
| Energy | $11 |
| Housing | $11 |
| All Other | $140 |

Federal Grants cover a wide variety of programs and are divided between capital and operations.

Growth in the Permanent Fund dividend, federal transfers, and federal grants directly add up to 70% of the increase in real personal income in Alaska between 1990 and 1999. The PFD

and transfers to individuals go directly into personal income. Federal grants pay for construction projects and the delivery of a wide variety of services to Alaskans. The above chart assumes that half of the dollars distributed in Alaska as grants is used to pay the wages and salaries of public and private workers. This becomes a part of personal income. The other half is used to pay for supplies and other procurement that does not directly create jobs and does not directly add to personal income.

**Table 4**
**Real Personal Income Growth: 1990 to 1999**
**(Million $)**

| **Total Personal Income (million)** | **$1,784** |
|---|---|
| Fed & State Government money | $1,251 |
| PFD | $425 |
| Federal Transfers | $420 |
| ½ Federal Grants | $405 |
| Income Multiplier on Government Money | $375 |
| All Other | $158 |

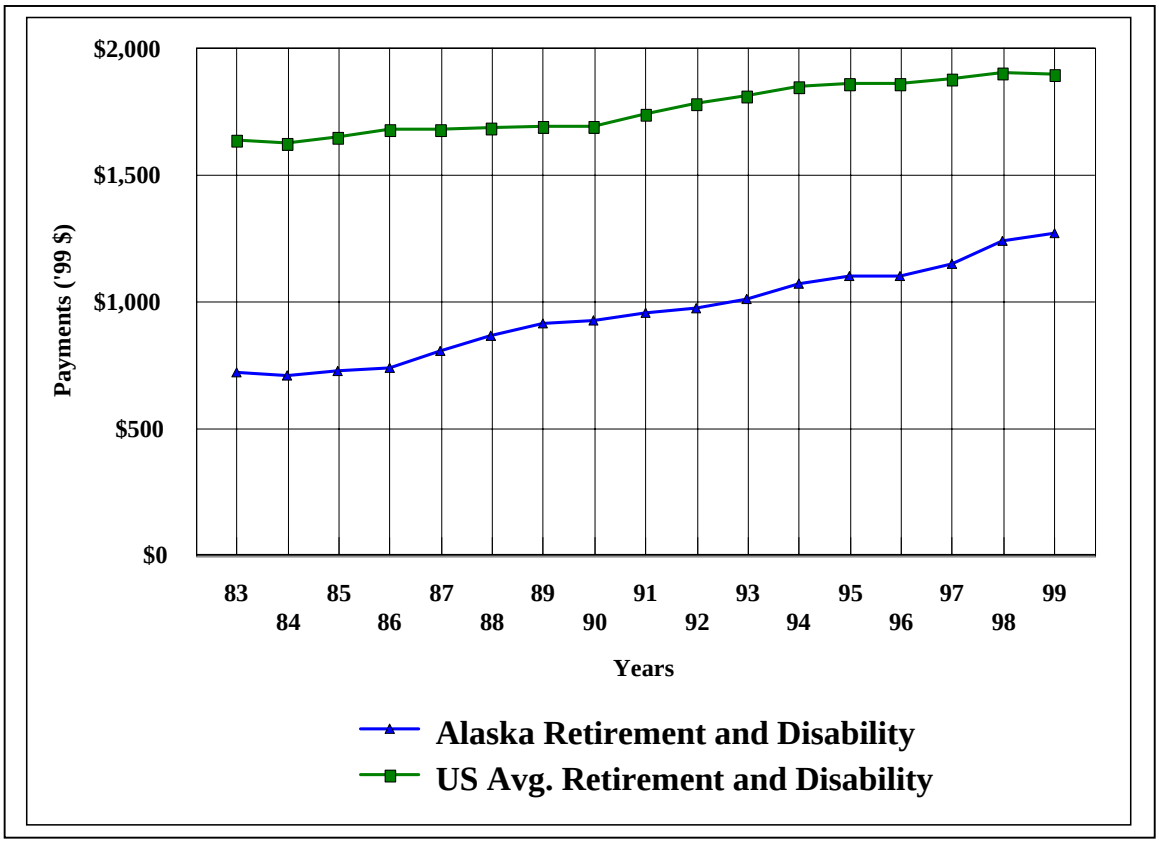
The infusion of this money into the economy has a multiplier effect. $375 million of the growth in personal income is attributable to this multiplier effect. (This assumes a multiplier of 1.3, meaning that each $1 of new money that enters the economy from one of these three sources generates an additional $.30 of income elsewhere in the economy.) The remainder, after adding together the direct and indirect contributions to the growth in personal income from expanded government expenditures, is $158 million. This represents the growth in personal income over this interval attributable to all other sources within the economy. This is the net result of growth in some sectors such as tourism, mining, seafood, and air cargo, offset by declines in some other sectors such as wood products, military, federal civilian, and petroleum.

Without growing infusions of money into the economy from these government sources, the performance of the economy would not have been nearly as positive as it was. Furthermore, if and when these sources of growth disappear, employment and income growth will slow unless something else can be found to take their place.

## 4.4 Sustainability of Dividends and Transfers

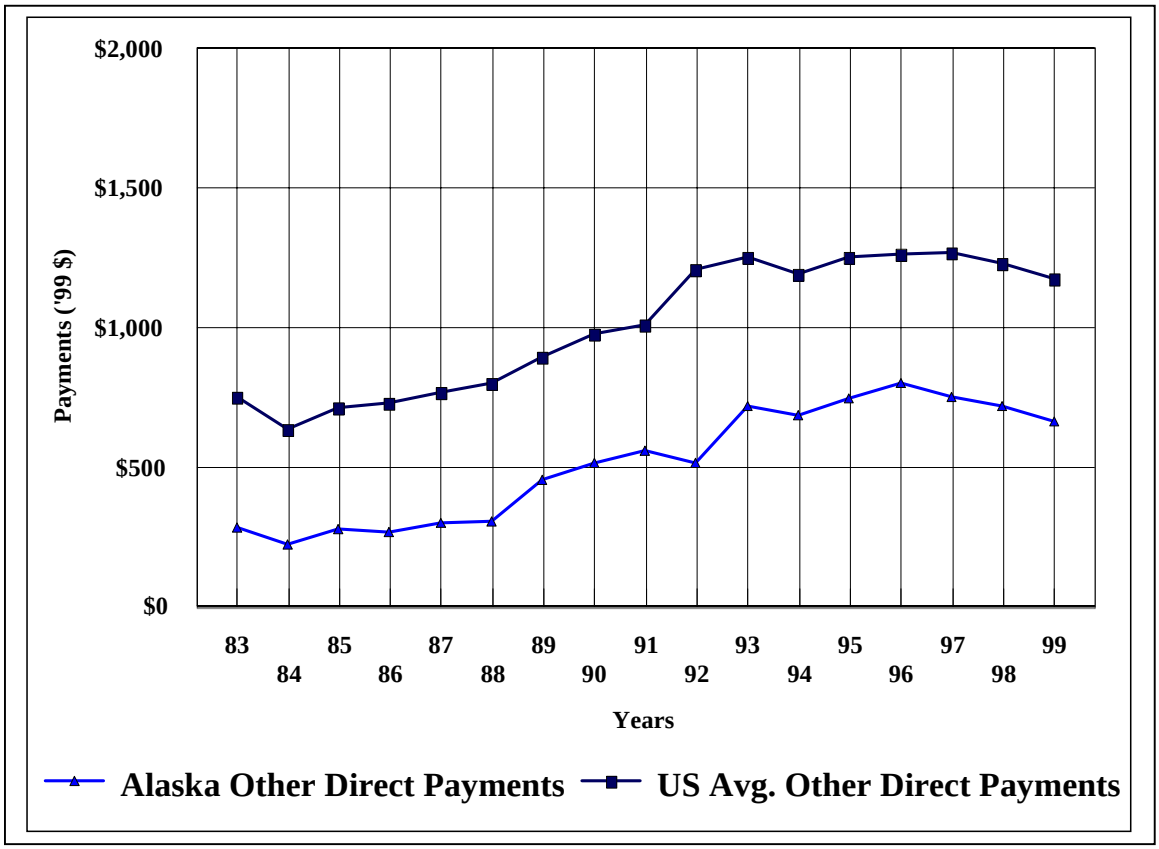
Federal transfers to individuals in Alaska have been less than the National Average, but the difference is narrowing as the Alaska population ages. This will continue to be a growing source of purchasing power for Alaska households.

**Figure 18**
**Federal Expenditures: Alaska Versus United States Average, Part 1.**



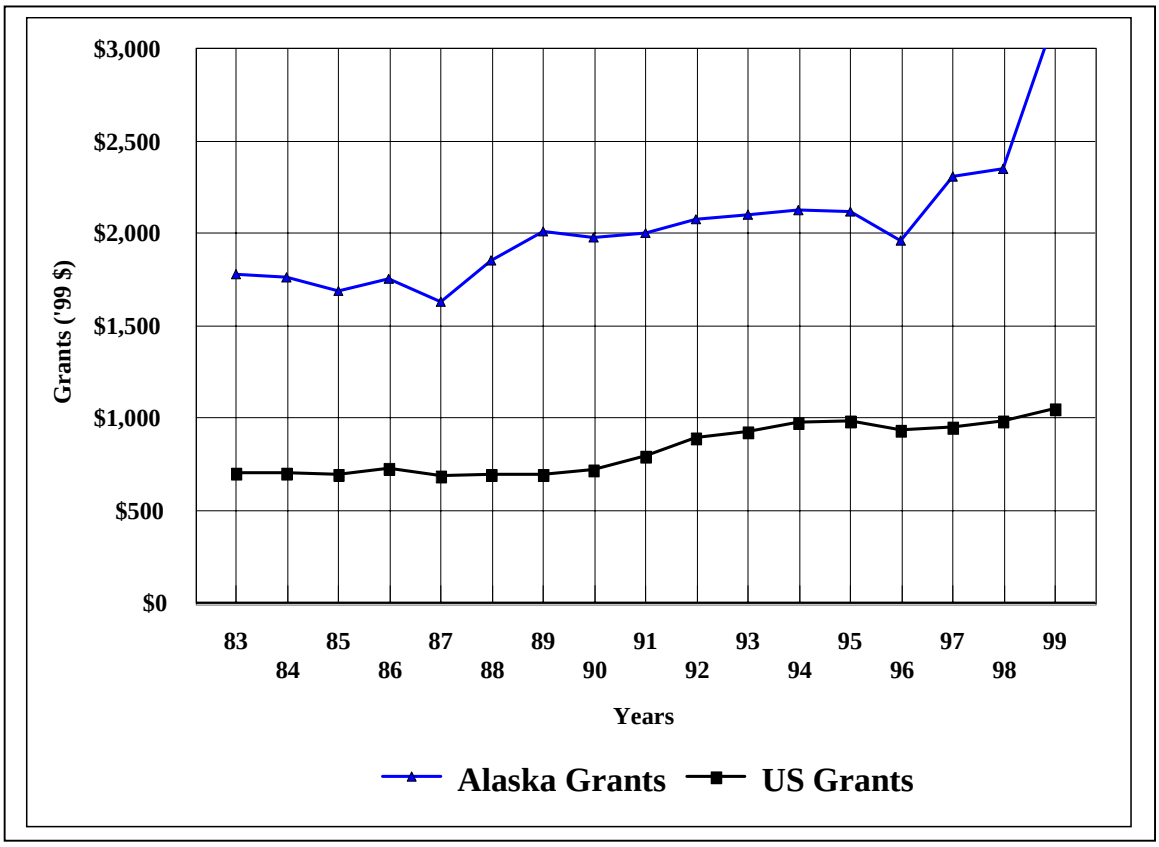
Other direct payments to persons has also been below the National Average, but this gap is also narrowing.

**Figure 19**
**Federal Expenditures: Alaska Versus United States Average, Part 2.**



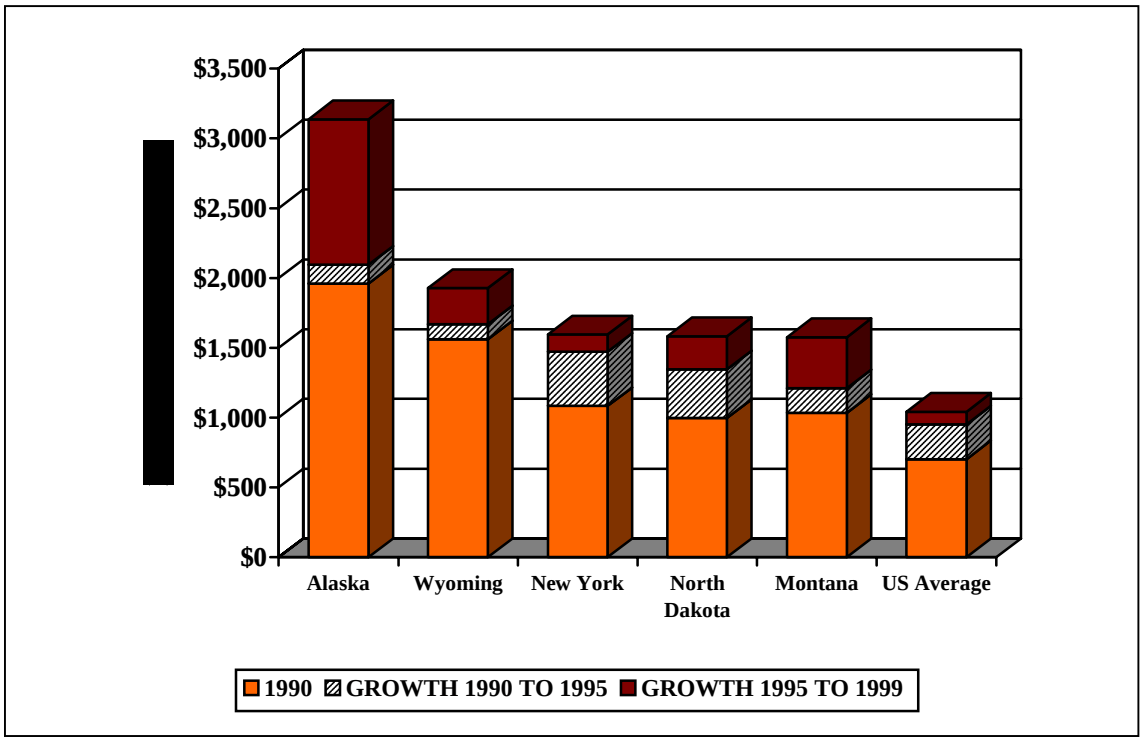
Federal grants to state and local government in Alaska have always been more than twice the National Average per person. In recent years that differential has grown dramatically and in 1999 Alaska was three times the National Average. Neither this rate of increase, nor this high differential, are likely to be sustainable in future years.

**Figure 20**
**Federal Expenditures: Alaska Versus United States Average, Part 3.**



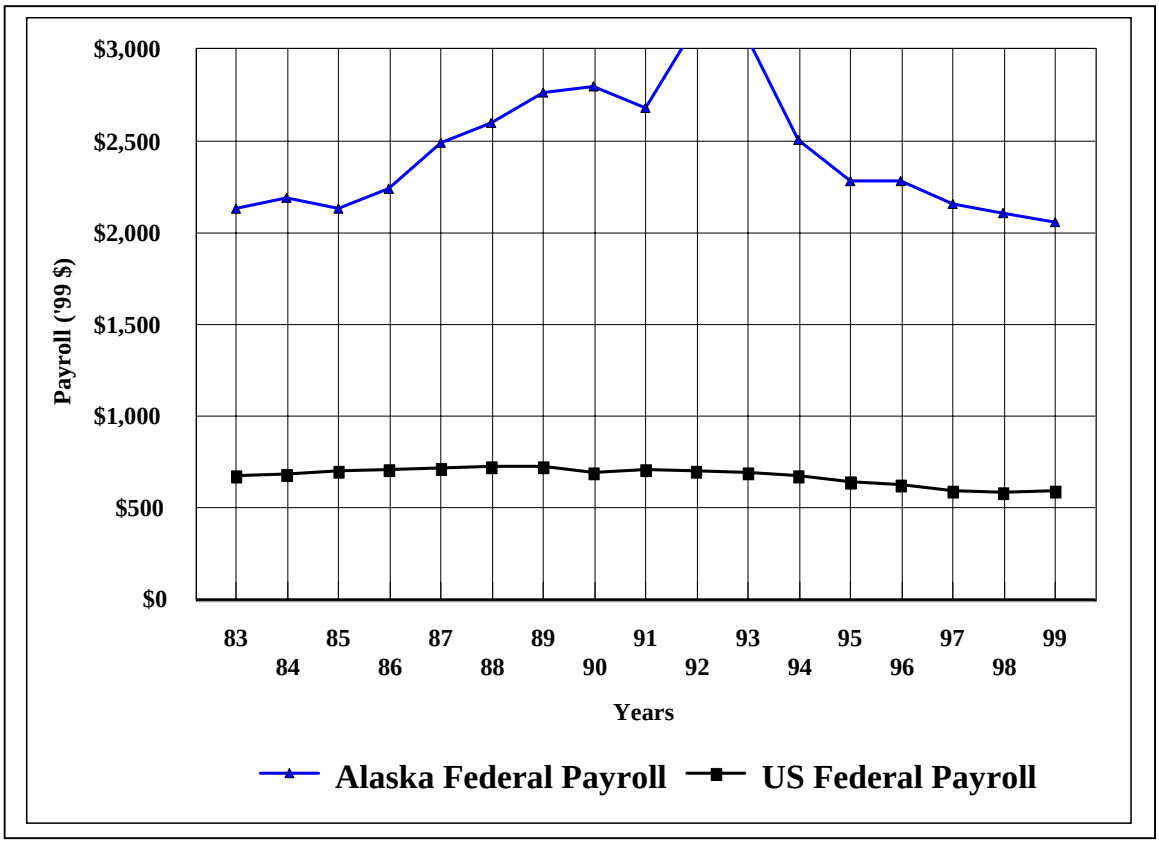
Federal grants to Alaska are greater than $3,000 per person, compared to about $1,000 on a National Average. Between 1995 and 1999 the increase for Alaska was quite dramatic, particularly compared to the other states with the highest grants per capita.

**Figure 21**
**Federal Aid Per Capita: Highest States in 1999**



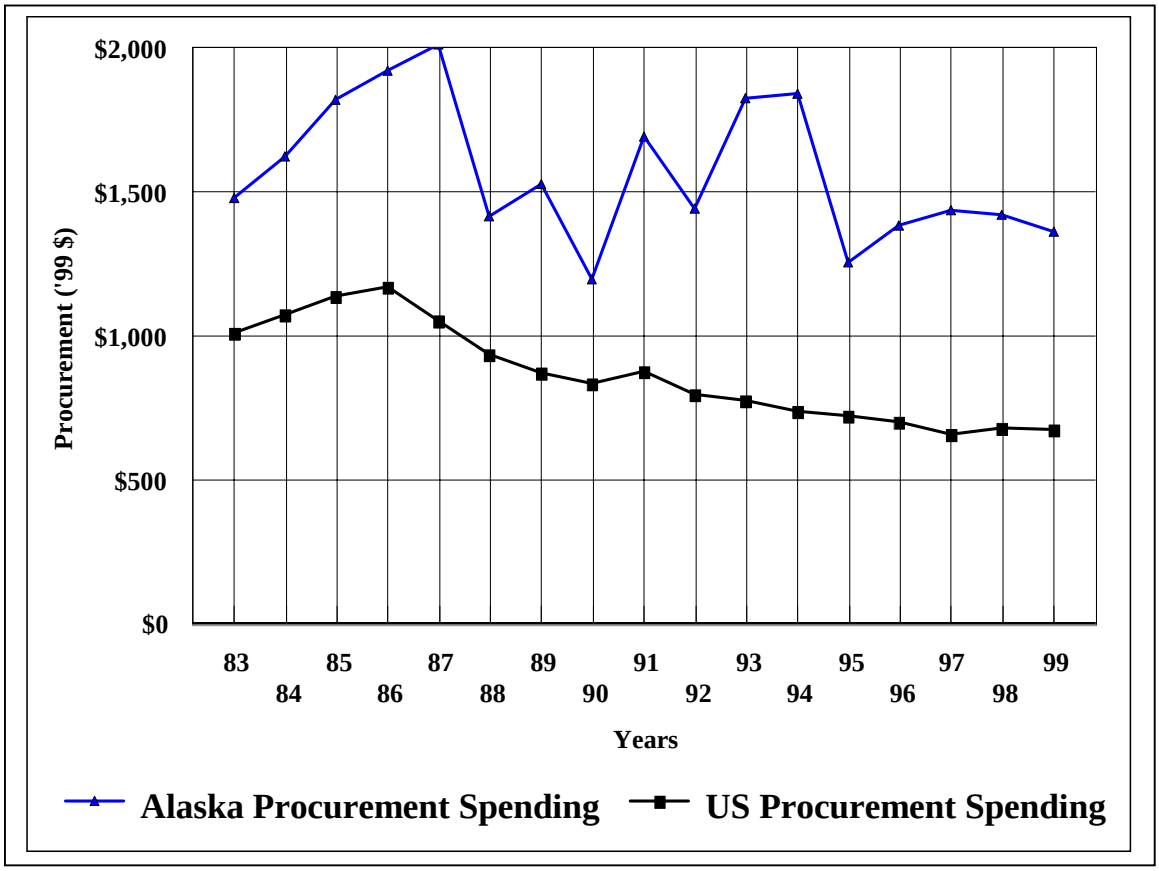
Alaska has a relatively large number of federal employees (military and civilian) and as a consequence the level of the federal payroll is relatively higher in the state. Although this is not a component of federal transfers or grants, it is a large source of dollars flowing into the state from the federal government. The federal payroll expanded in importance in the early 1990's, but has been falling through most of this decade.

**Figure 22**
**Federal Payroll per Capita**



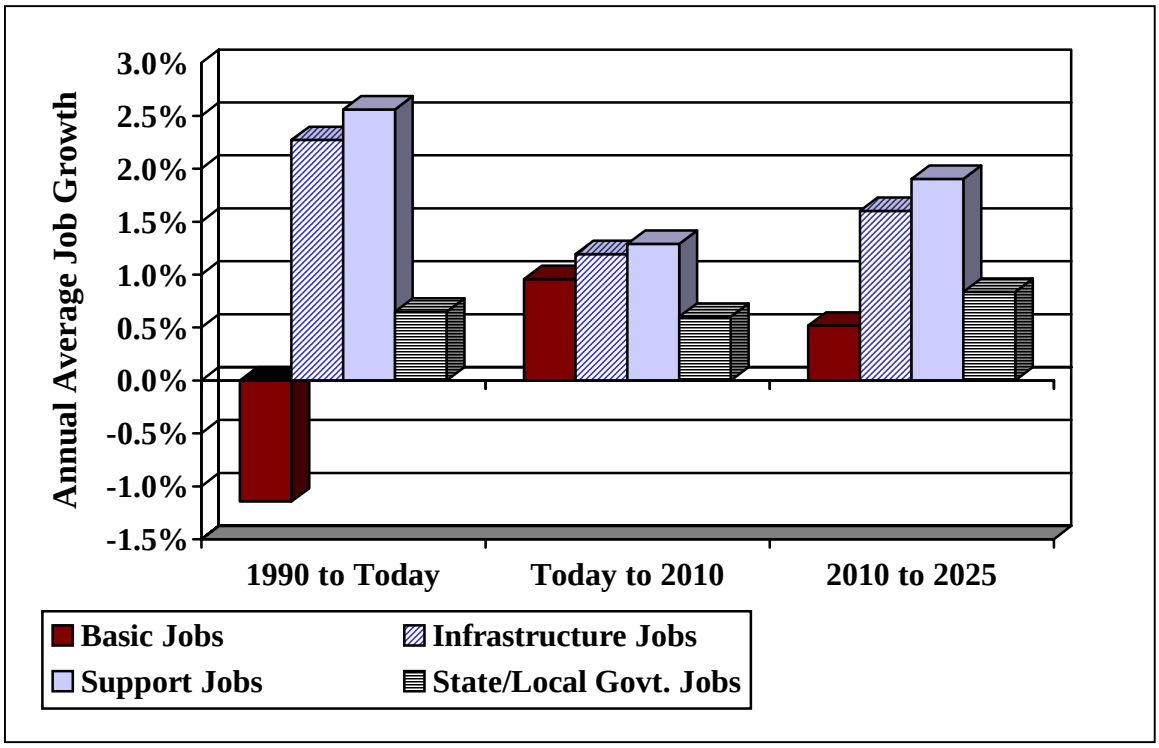
Because of the large federal presence in the state, procurement spending is an important source of activity for Alaska businesses. Although this is not a component of federal transfers or grants, it is a large source of dollars flowing into the state from the federal government. Procurement has been declining in importance very slowly in Alaska, but still remains considerably above the National Average.

**Figure 23**
**Federal Procurement: Alaska Versus United States Average**



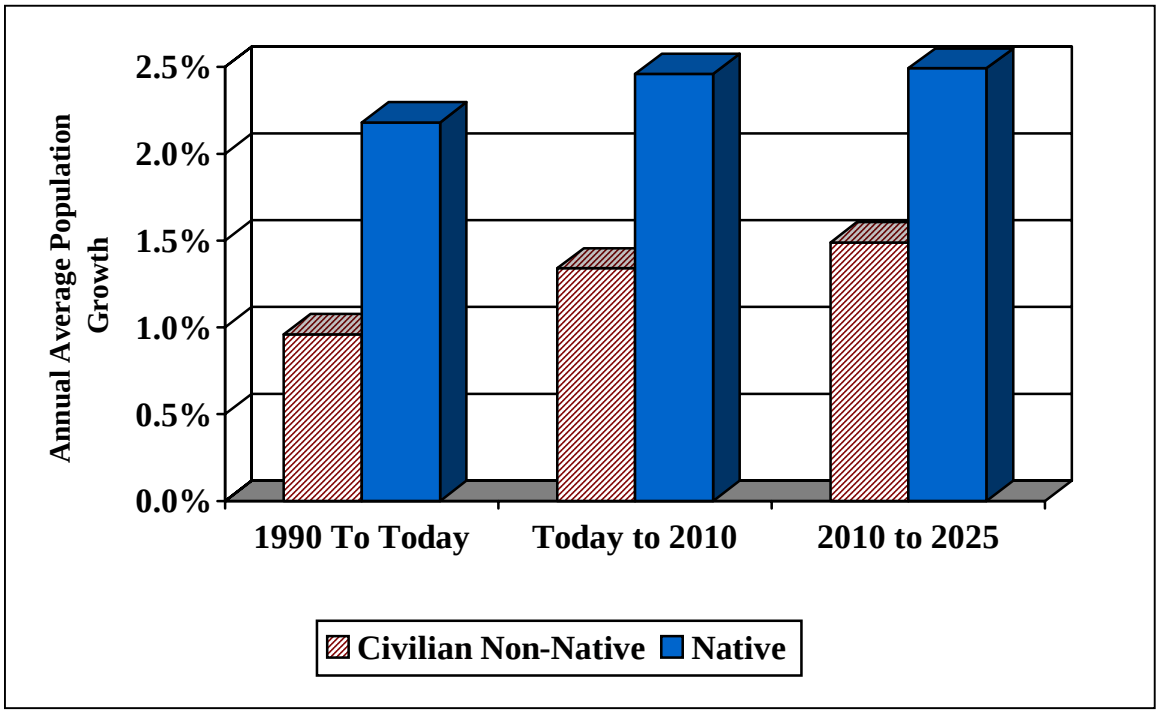
Economic projections for Alaska suggest a decade of slow growth in jobs. If a series of large projects like construction of a gas line occurred, the growth rate could be somewhat faster. However, the general picture is one of continued slow growth as the economy adjusts to the realities of life after Prudhoe Bay.

**Figure 24**
**Map Model Projection: Jobs**



Population growth is projected to be similar to the recent past. The Native population will continue to grow at a faster rate than the Non-Native population.

**Figure 25**
**Map Model Projection: Population**



## *4.5 Regional Economic Review*

We break the state into 6 Regions in order to review the economic performance of different parts of Alaska. Urban includes the Census Areas along the Railbelt as well as Juneau because of its size. 8% of the Urban population is Alaska Native. All the rest of the state we define as Rural. 48% of the Rural population is Alaska Native. In part of Maritime Alaska (the coastal Census Areas around the Panhandle, Gulf of Alaska, and Bristol Bay that are dependent on seafood and timber) Non-Natives make up the majority of the population (Non-Natives Predominate). In some Census Areas, Natives are a small share of the total (Marine: Non-Native), while in others the Native share is larger (Marine: Mixed). Finally, Natives predominate in some Maritime Census Areas (Maritime: Native).

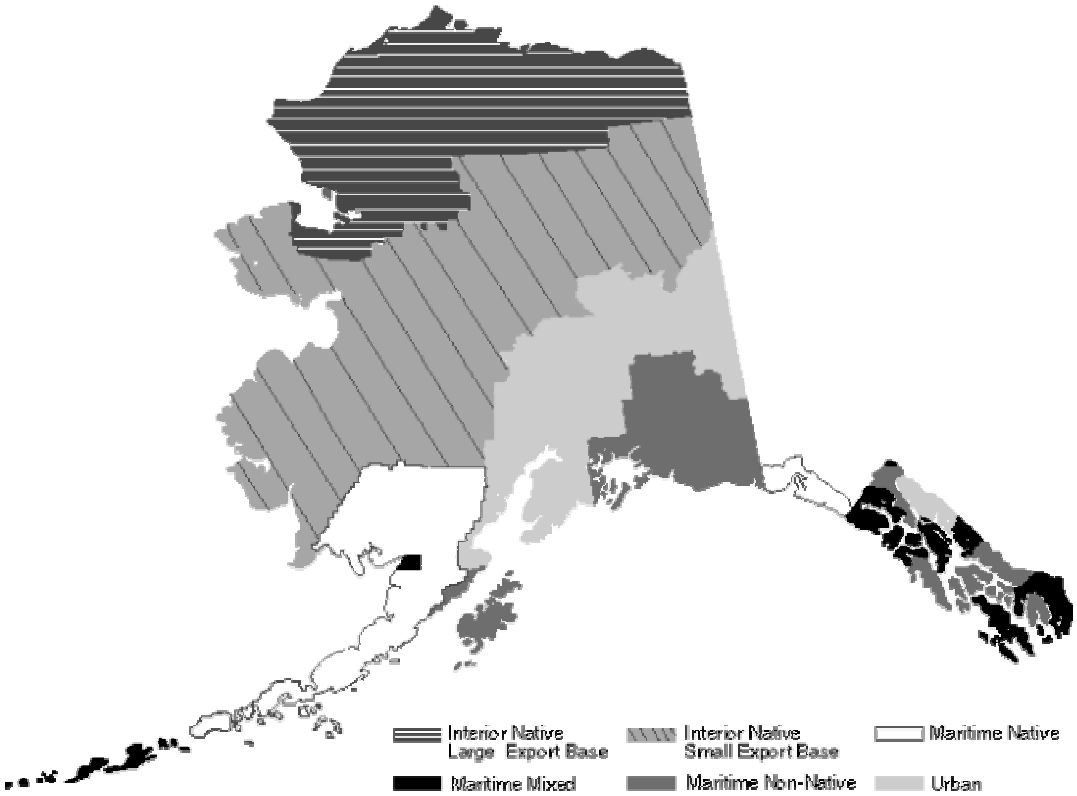


**Table 5**
**Native Share of Population by Region**

| | |
|---|---|
| URBAN | (8%) |
| RURAL | (48%) |
| Non-Natives Predominate | (22%) |
| Maritime: Non-Native | (17%) |
| Maritime: Mixed | (39%) |
| Natives Predominate | (78%) |
| Maritime: Native | (71%) |
| Interior: Native | (80%) |
| Large Export Base | (71%) |
| Small Export Base | (83%) |

In Interior Alaska, including the Census Areas on the Northwest and Northern Coasts, Natives Predominate, accounting for 80% of the total population. Northwest Arctic and North Slope Boroughs have a large export base but the rest of Interior has a very limited export base.

The justification for this regional breakdown is partially based upon the share of Native Alaskans in the regional population, which serves as a measure of the importance of subsistence in the regional economy.

The Regional Breakdown consists of the following categories:

URBAN
- Denali Borough
- Matanuska-Susitna Borough
- Fairbanks North Star Borough
- Kenai Peninsula Borough
- Anchorage Borough
- Juneau Borough
- Southeast Fairbanks Census Area

RURAL, Non-Natives Predominate, Maritime: Non-Native
- Ketchikan Borough
- Valdez-Cordova Census Area
- Haines Borough
- Kodiak Island Borough
- Wrangell Petersburg Census Area
- Sitka Borough

RURAL, Non-Natives Predominate, Maritime: Mixed
- Aleutians West Census Area
- Skagway-Hoonah-Angoon Census Area
- Bristol Bay Borough
- Prince of Wales-Outer Ketchikan Census Area

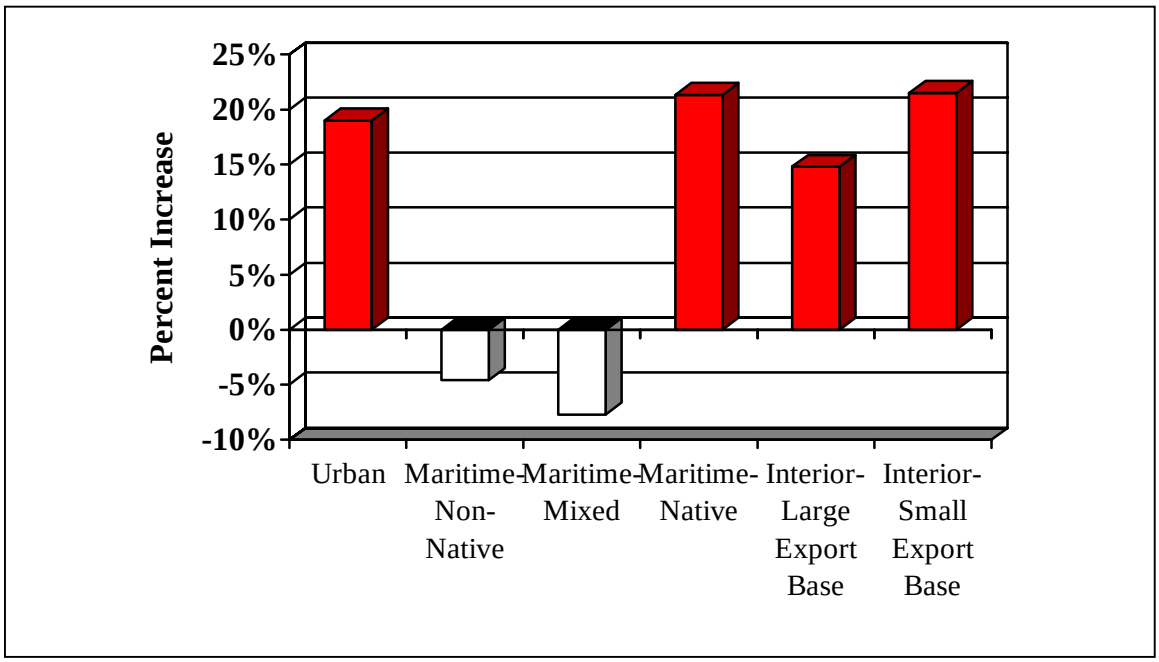
RURAL, Natives Predominate, Maritime: Native
- Aleutians East Borough
- Yakutat Borough
- Dillingham Census Area
- Lake and Peninsula Borough

RURAL, Natives Predominate, Interior: Native, Large Export Base
- North Slope Borough
- Northwest Arctic Borough

RURAL, Natives Predominate, Interior: Native, Small Export Base
- Yukon-Koyukuk Census Area
- Nome Census Area
- Bethel Census Area
- Wade Hampton Census

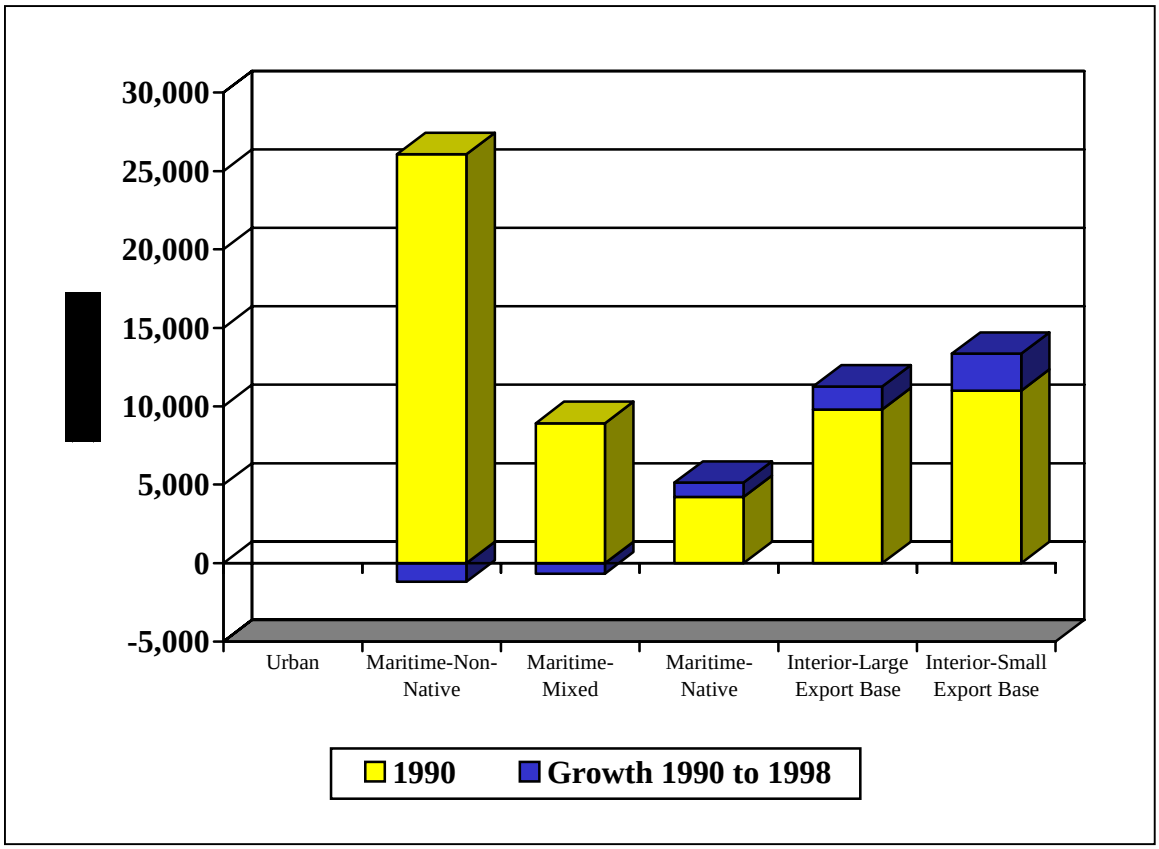
Statewide wage and salary employment in Alaska grew 15% between 1990 and 1998, about the same as the United States average. Job growth was spread throughout most of the state except those parts of maritime Alaska most dependent upon forest products and military installations. Wage and salary employment has declined since 1990 in those parts of the state. Due to the marginally faster rate of jobs in the Native regions of Rural Alaska, about 11% of total jobs are now located in those regions. However the share of jobs in Urban Alaska also increased from 74% to 76% over the decade.

**Figure 26**
**Percent Increase in Jobs: 1990 to 1998**



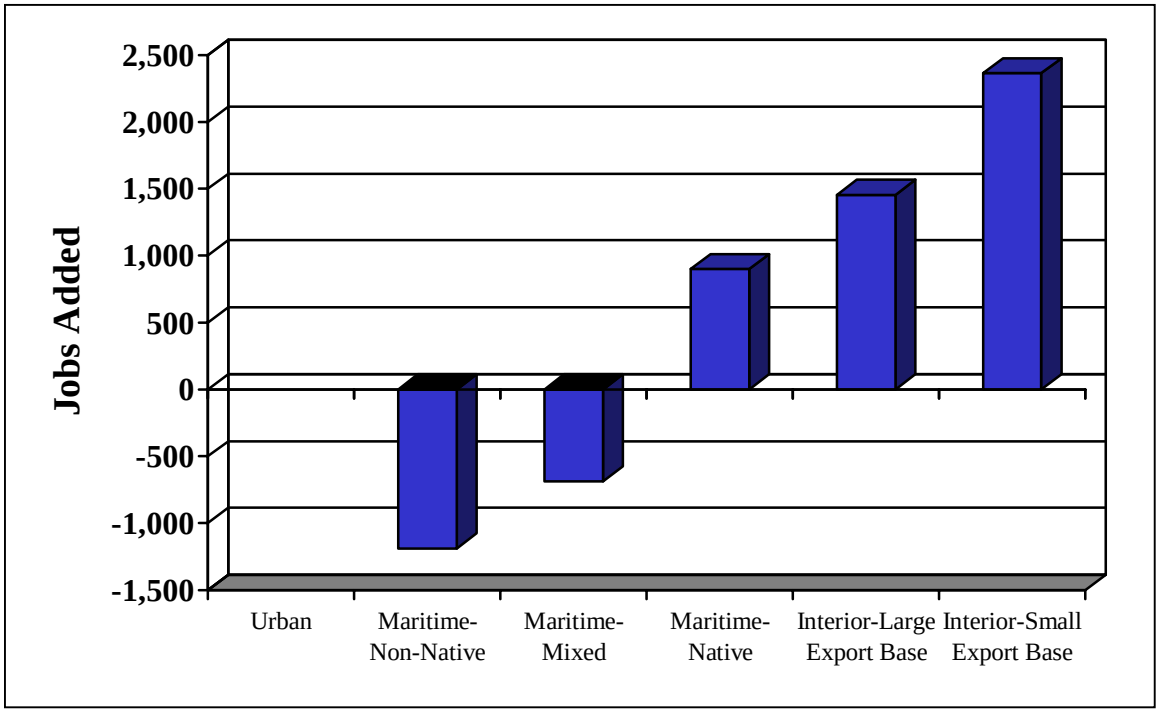
In Rural Alaska all the job growth occurred where the number of jobs was small in 1990—primarily in the Interior.

**Figure 27**
**Rural Jobs: 1990 to 1998**



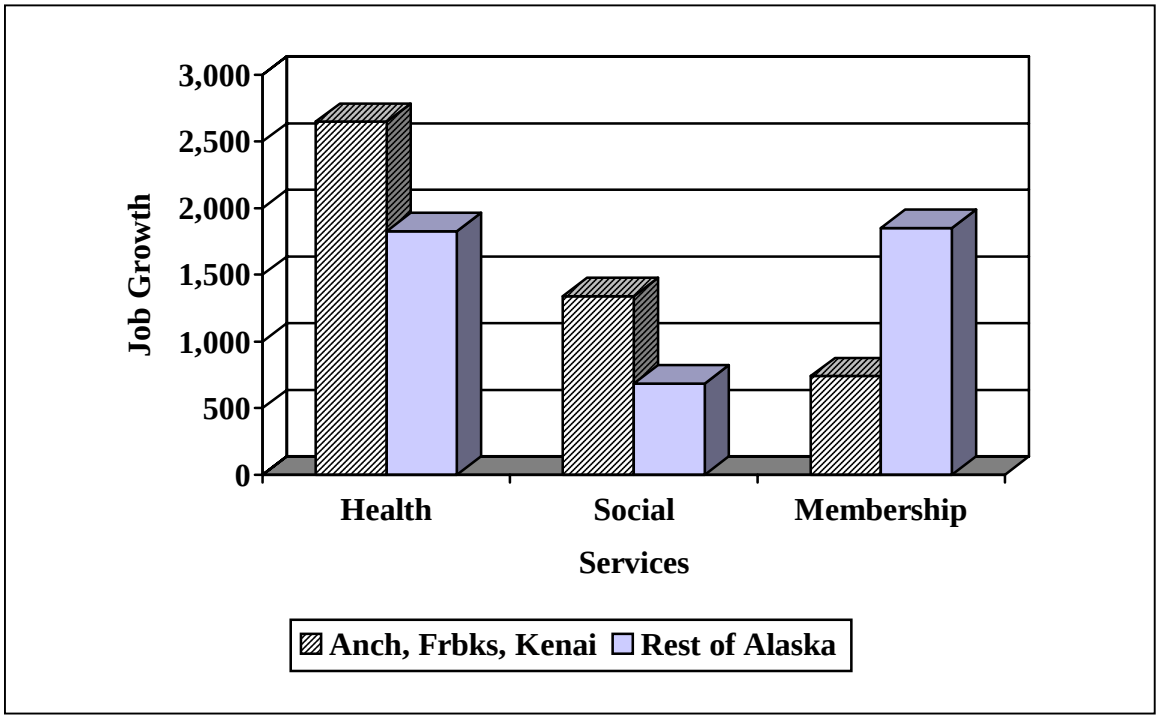
Altogether about 2,800 of the 36,000 new jobs were added in Rural Alaska. The number of jobs added in the predominantly Native regions areas was 4,700. Nearly half of the new jobs have been in Services-2,100, a 45% increase. Three types of services dominated—health, social, and membership. The membership services category includes village councils and other quasi governmental bodies. Most of the remaining job growth was in Retail Trade, which increased by 700 jobs, a 41% increase, and in Local Government, which increased by 750 jobs, a 9% increase. Transportation, communications, and Public Utilities jobs increased by 425, 27%.

**Figure 28**
**Rural Jobs Added: 1990 to 1998**



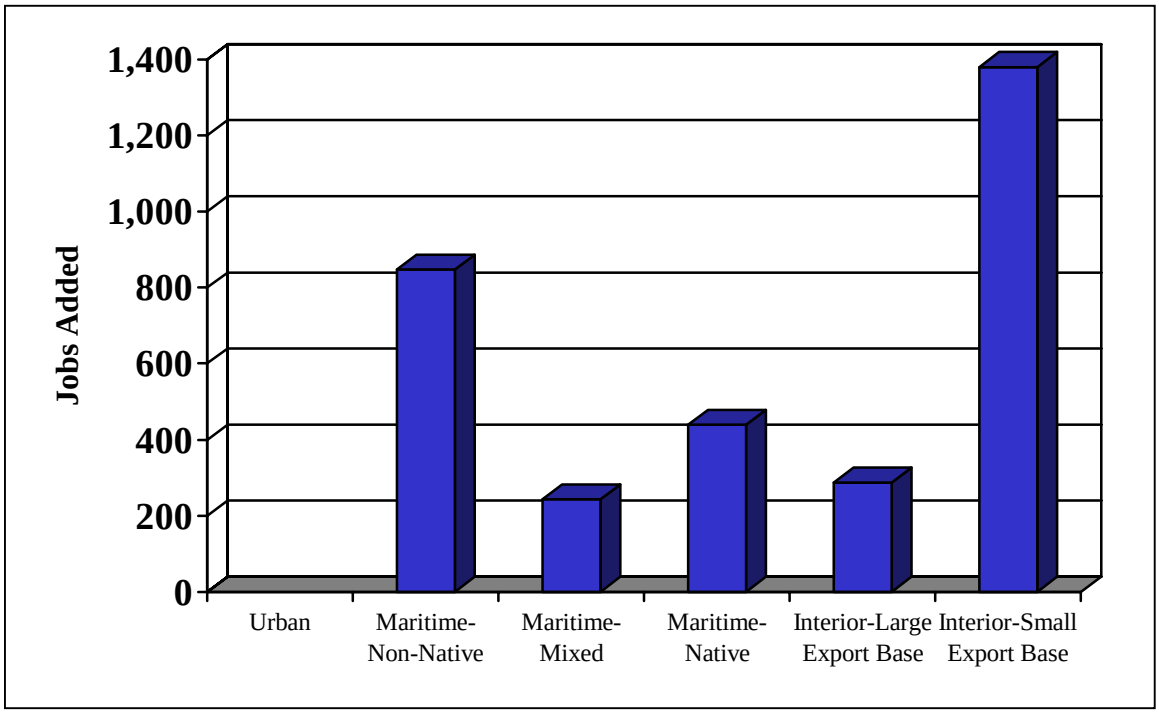
Service job growth was particularly strong outside of the core Railbelt.

**Figure 29**
**Service Job Growth: 1990 to 1998**



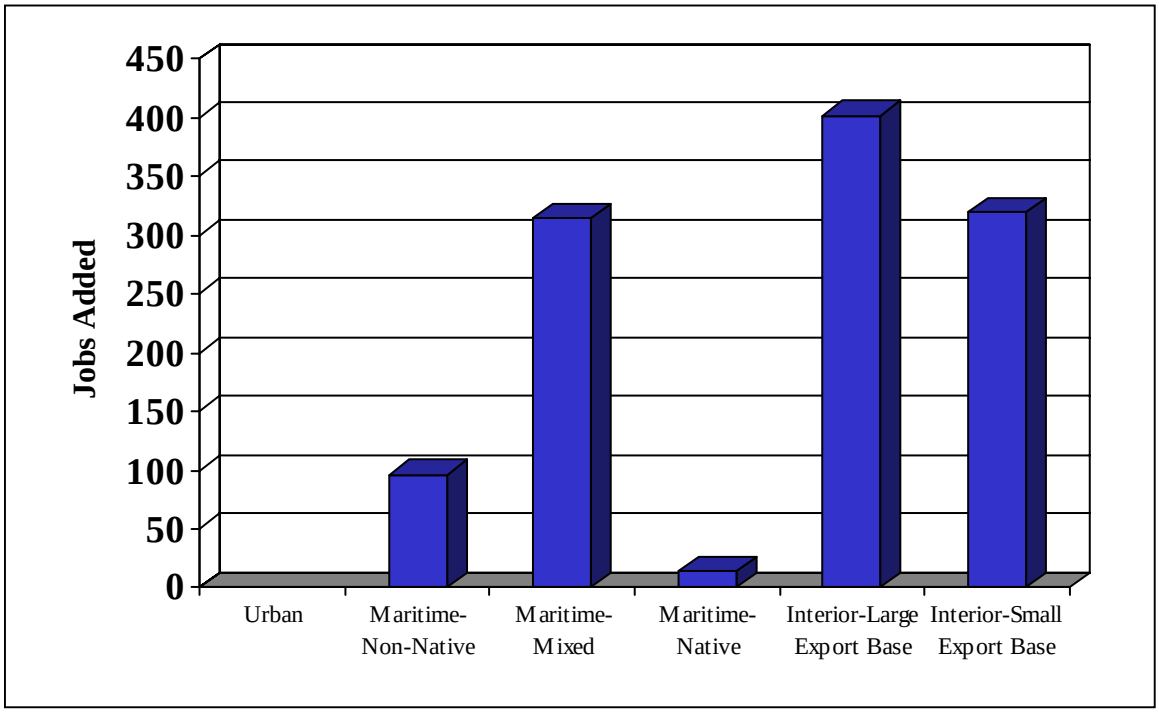
Service job growth was most pronounced in the Interior, in the Census Areas with a small export base. Service jobs in the health, social, and membership categories are closely tied to federal and state grants for health, social services, housing, and other services.

**Figure 30**
**Services Jobs Added: 1990 to 1998**



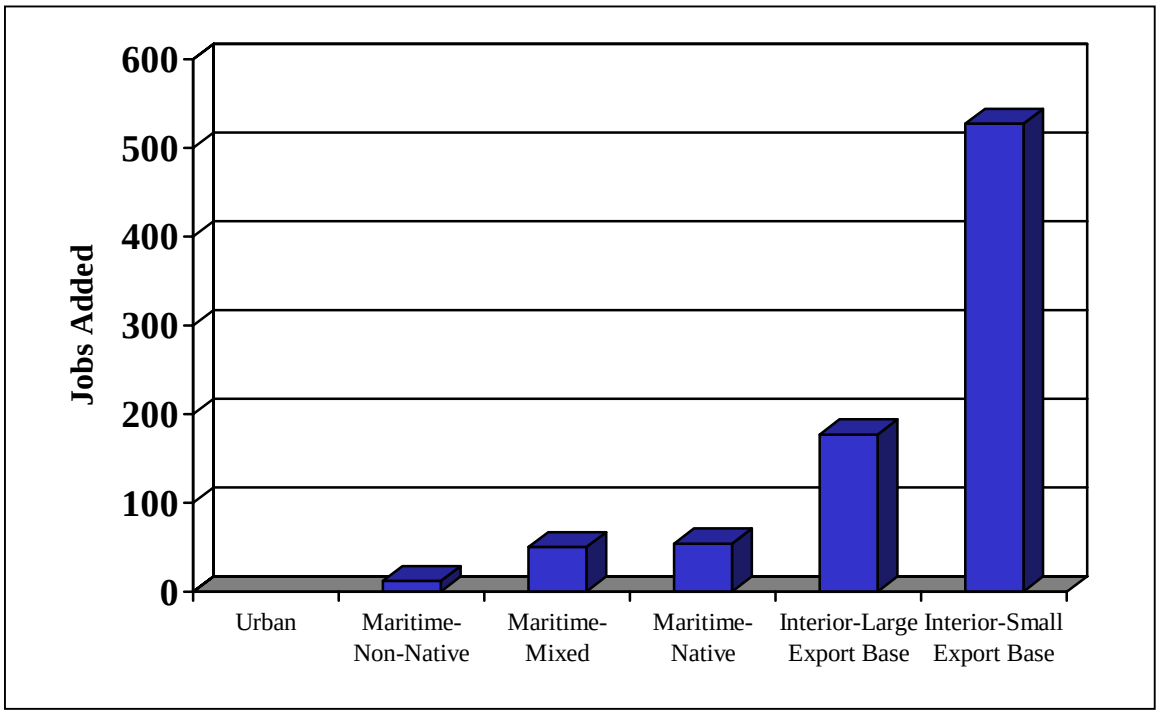
Trade jobs grew in most of Rural Alaska, including the Maritime regions where total employment declined. Trade jobs are related to the level of household income. The growth of the Permanent Fund dividend and Federal transfers to individuals have been a direct contributor to growth in trade jobs. Federal and state grants also contribute to household income and thus indirectly to growth in trade jobs.

**Figure 31**
**Trade Jobs Added: 1990 to 1998**



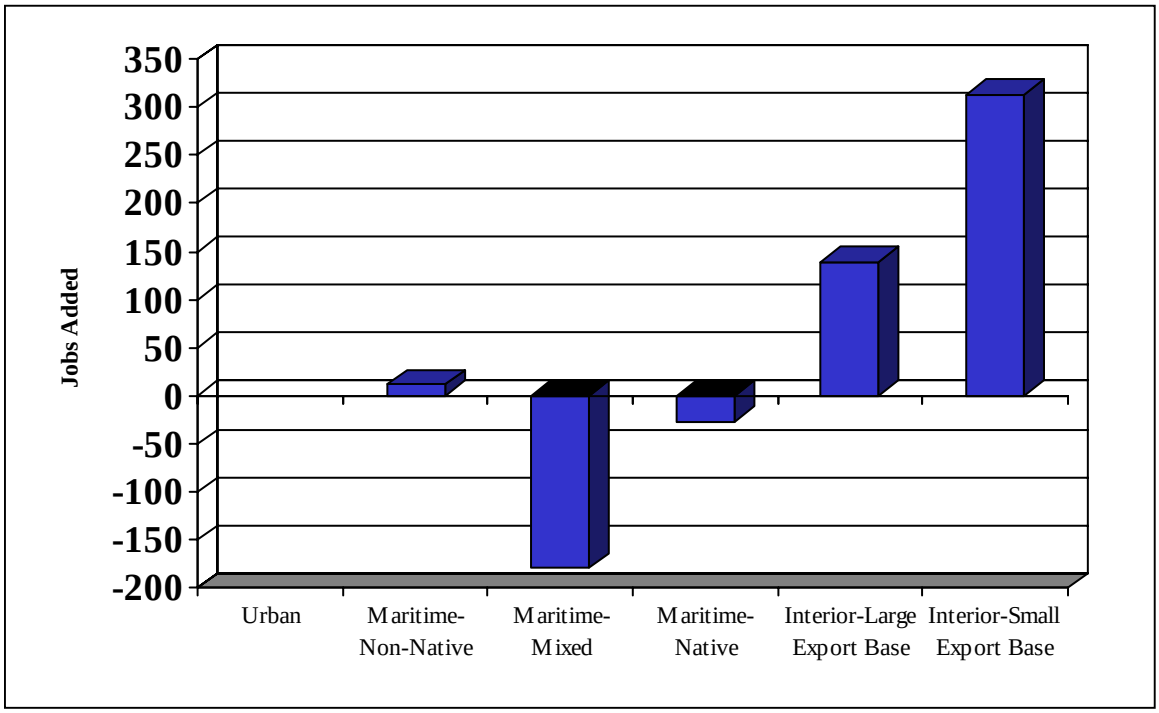
Local government job growth was concentrated in the Interior. The rate of growth of jobs in local government in Rural Alaska slowed considerably during the 1990s. This is a reflection of the reduction in state assistance to local governments together with the absence of local fiscal resources to make up for that loss.

**Figure 32**
**Local Government Jobs Added: 1990 to 1998**



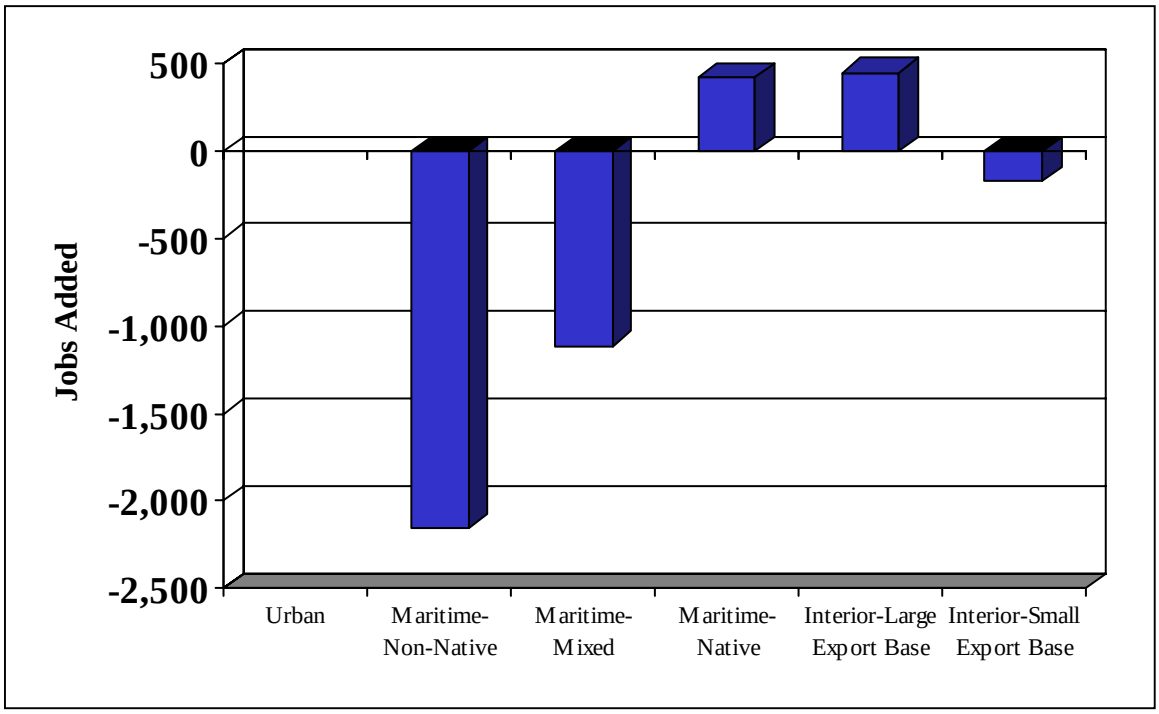
Growth in Transportation, Communications, and Public Utilities jobs was concentrated in Interior Alaska.

**Figure 33**
**Transportation and Utilities Jobs Added: 1990 to 1998**



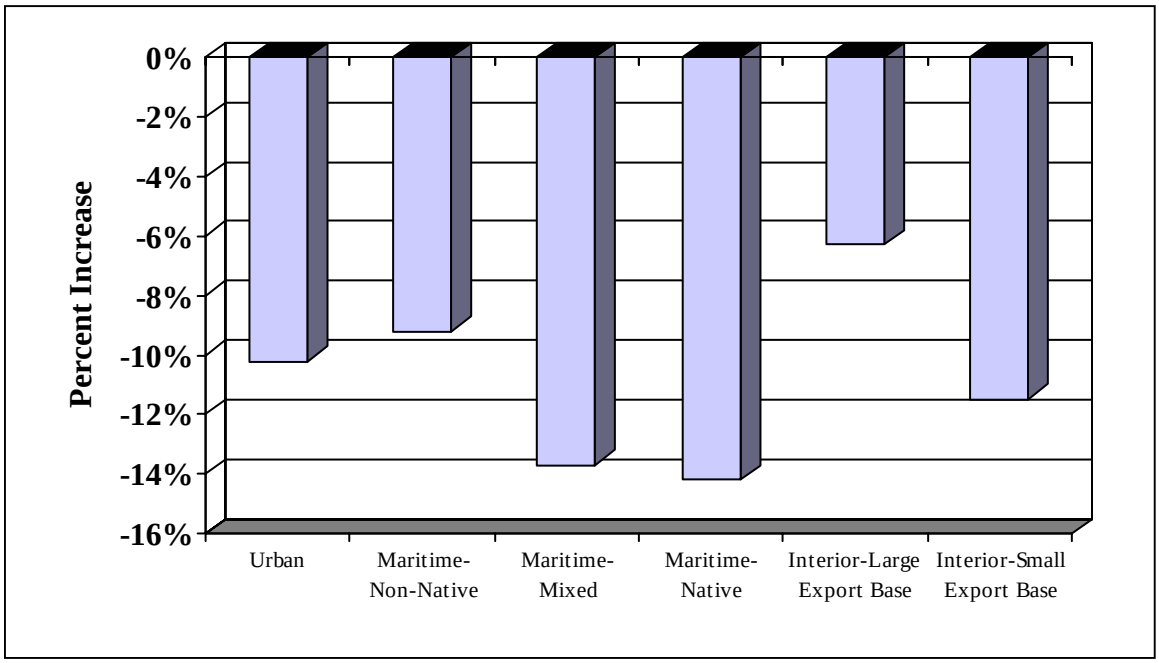
Rural Alaska lost 2,600 jobs in all other categories—Mining, Manufacturing, Construction, State Government, and Federal Government. The loss was concentrated in the Maritime regions where timber and military installations have been important parts of the economic base.

**Figure 34**
**Other Jobs Added: 1990 to 1998**



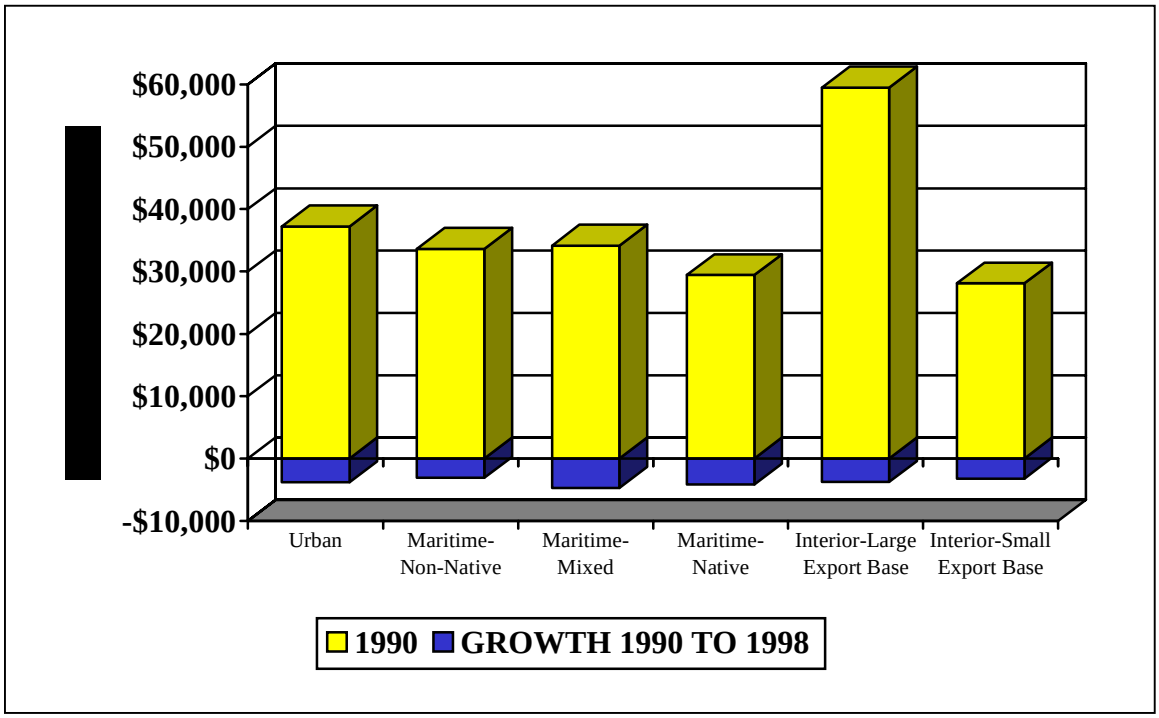
Statewide the real wage for the average worker fell about 10 percent in Alaska between 1990 and 1998, while it increased in the United States as a whole about 4%. The decline was spread throughout the state (Figure 35).

**Figure 35**
**Percent Increase in Real Average Wage: 1990 to 1998**



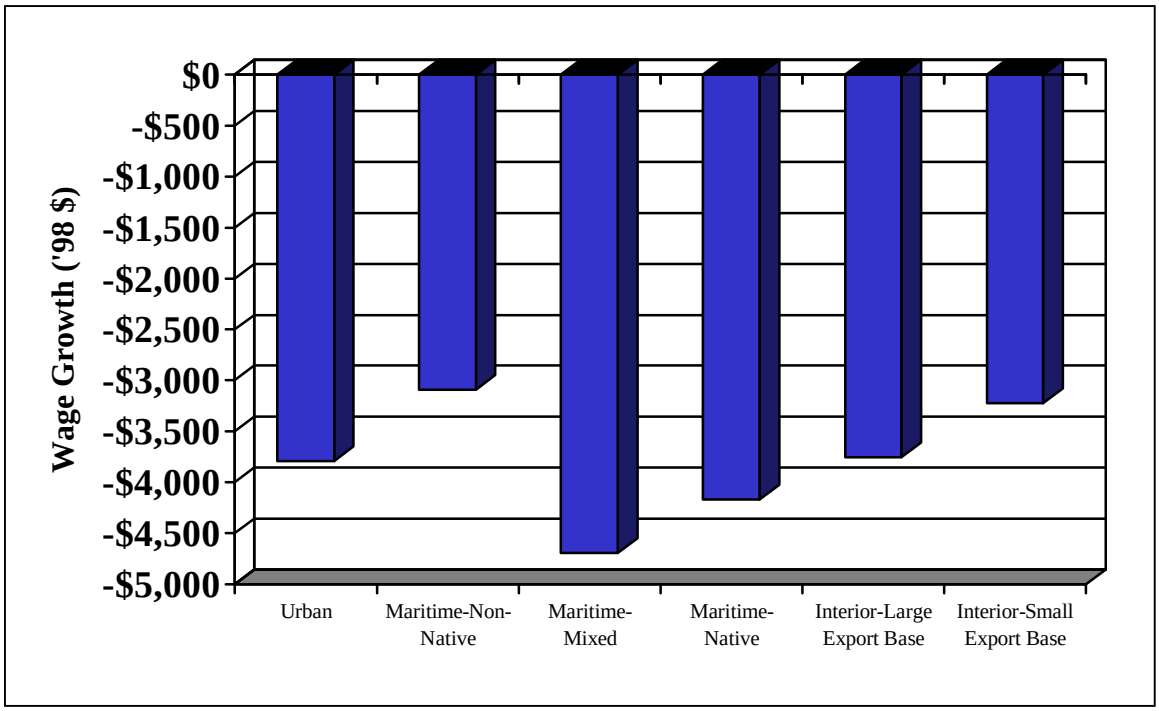
The fall in real average wage occurred in all regions independent of the level of the wage in 1990.

**Figure 36**
**Real Average Wage: 1990 to 1998**



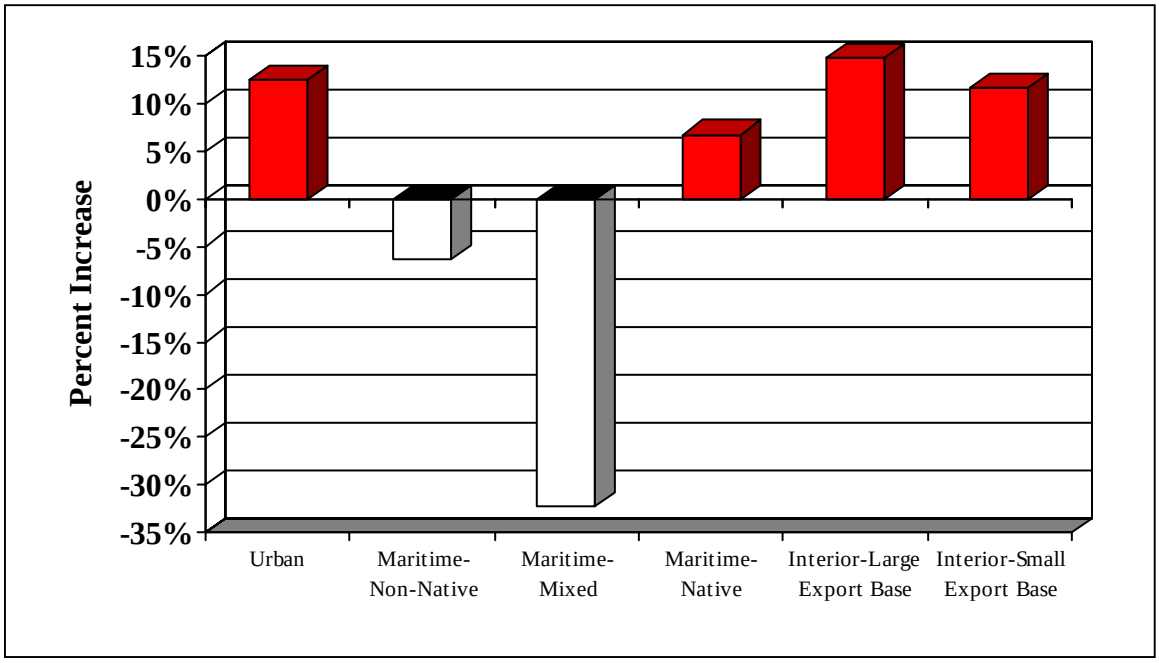
The drop in real average wage was similar across all regions of the state—between $3,000 and $4,500.

**Figure 37**
**Real Average Wage Growth: 1990 to 1998**



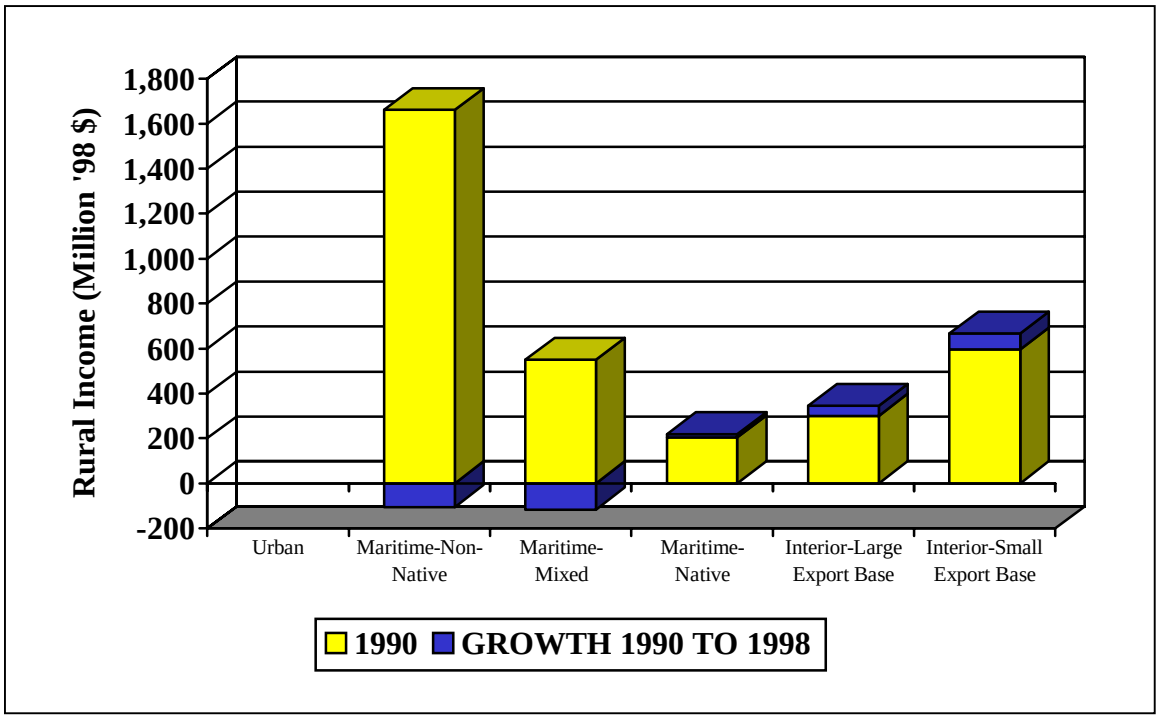
Statewide real income (personal income adjusted for inflation) in Alaska grew 9% between 1990 and 1998, compared to 23% for the US as a whole. Income growth was spread throughout most of the state except those parts of maritime Alaska most dependent upon forest products and military installations. Wage and salary employment has declined since 1990 in those parts of the state, particularly where the major military installation at Adak closed (Aleutians West within Maritime-Mixed).

**Figure 38**
**Percentage Increase In Real Income: 1990 to 1998**



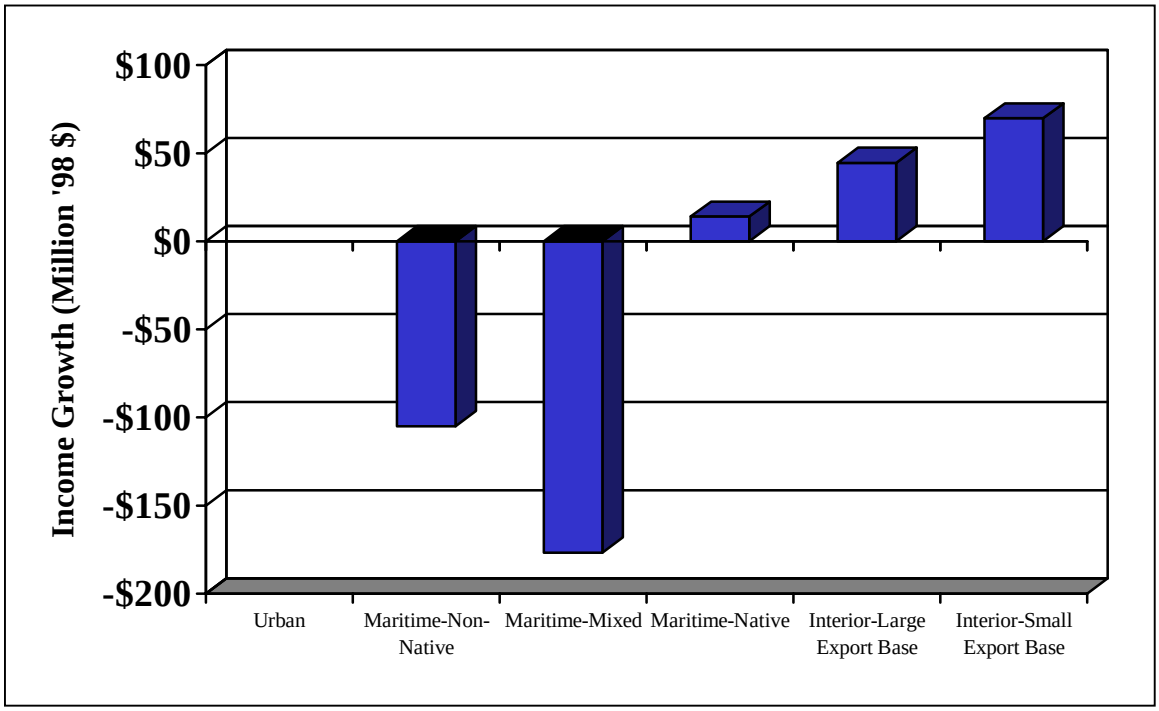
In Rural Alaska all the income growth occurred in regions where Natives predominate—primarily in the Interior.

**Figure 39**
**Rural Income: 1990 to 1998**



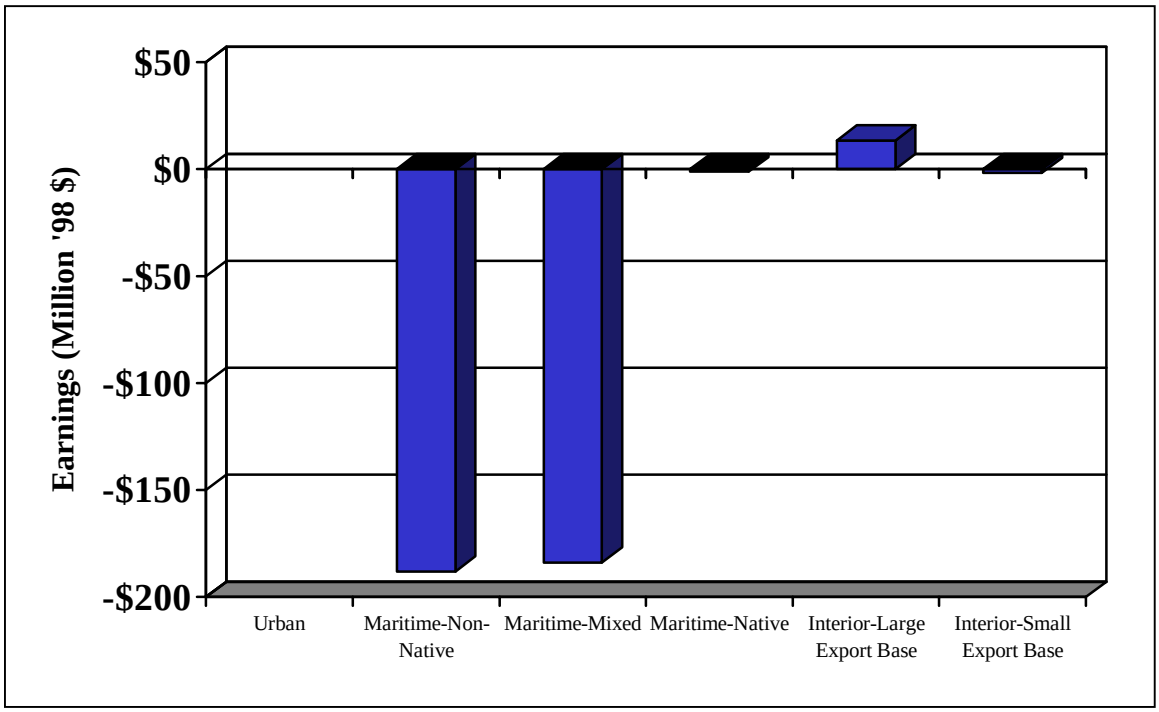
Overall, Rural Alaska lost about $150 million in income between 1990 and 1998. The increase in Income in the predominantly Native regions areas was about $125 million partially offsetting a loss of $282 million in the rest of Rural Alaska. Rural income was pulled down by a loss of wage income of $317 million, which was only partially offset by growth in government transfer income of $152 million. Income from investments increased by $56 million.

**Figure 40**
**Real Income Growth: 1990 to 1998**



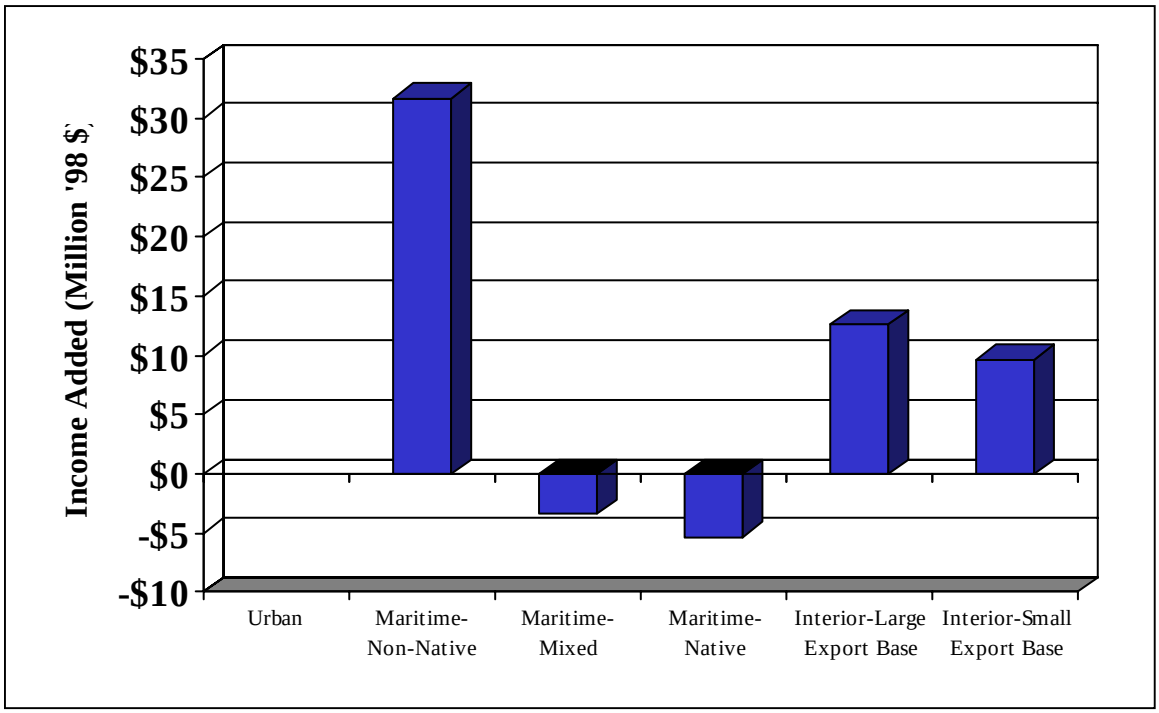
Net labor earnings (earnings after adjusting for residence) fell in most of Maritime Alaska and were essentially unchanged in the rest of Rural Alaska. This pattern of net labor earnings is due primarily to the reduction in the average real wage, and not to declining employment.

**Figure 41**
**Net Labor Earnings Income Added: 1990 to 1998**



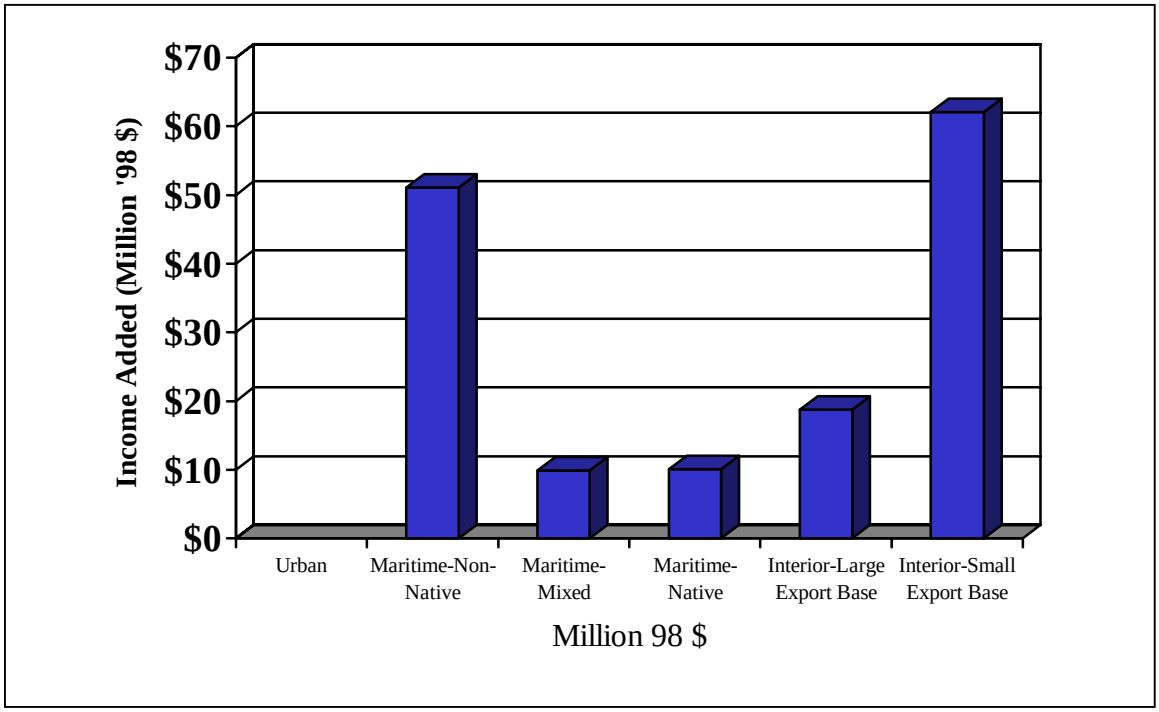
Income from assets (dividends, interest, rent) grew in parts of Rural Alaska, but fell in others.

**Figure 42**
**Investment Income Added: 1990 to 1998**



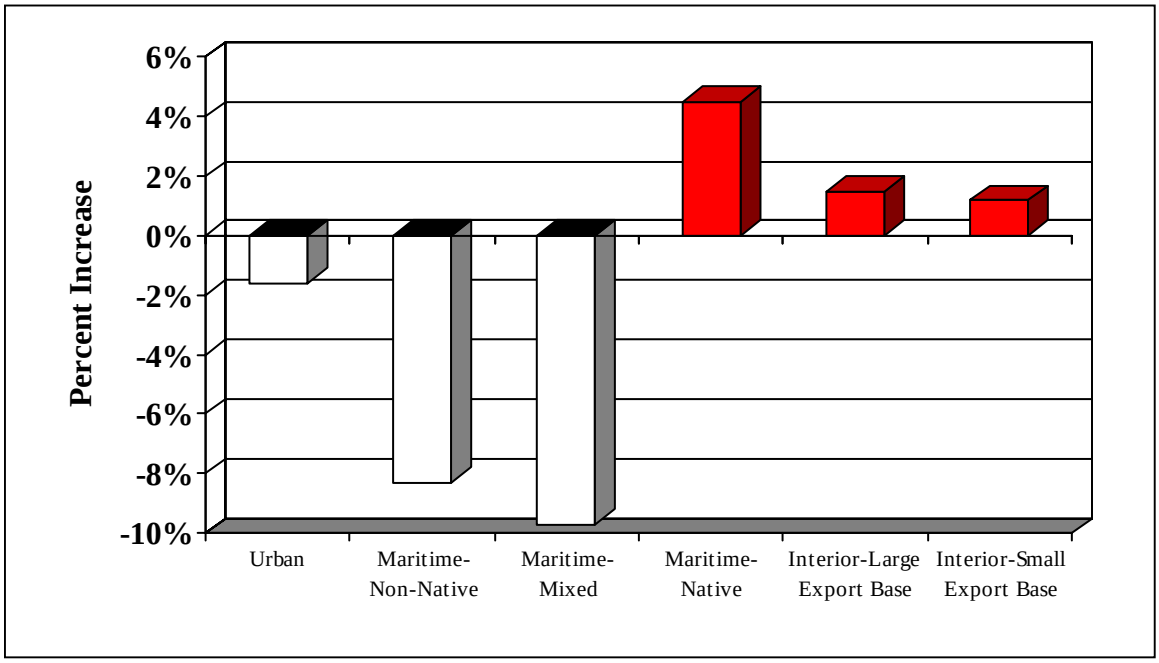
Government transfers, including the Permanent Fund dividend, contributed to personal income growth in every part of Rural Alaska. The transfer part of personal income consists primarily of the following categories: Public Employee Retirement (Civilian and Military) and Disability Insurance (Social Security), Medical Payments (Medicare), Income Maintenance, Unemployment Insurance, Veterans Benefits, Education and Training Assistance and the Permanent Fund Dividend.

**Figure 43**
**Government Transfer Income Added: 1990 to 1998**



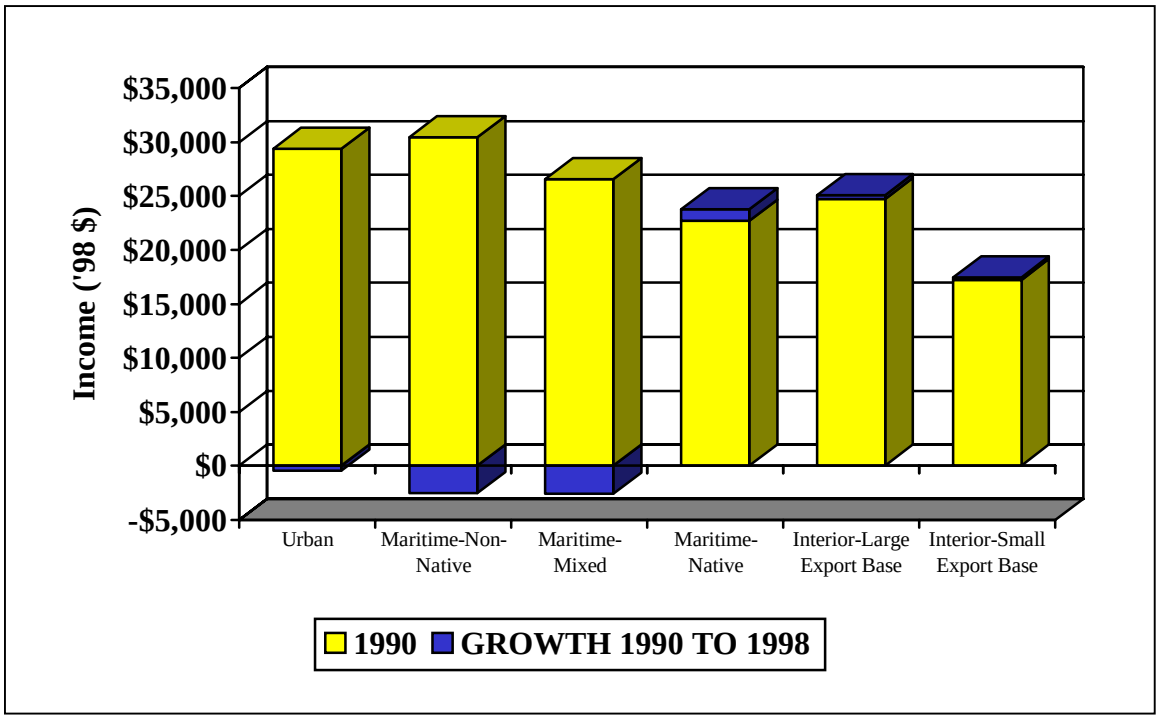
Statewide real per capita income (personal income adjusted for inflation) in Alaska fell 2% between 1990 and 1998, while it increased in the United States as a whole about 12%. The decline occurred in Urban Alaska and in those parts of Maritime Alaska most dependent upon forest products and military installations. Modest increases in per capita income occurred in the rest of Alaska.

**Figure 44**
**Percent Increase in Real Per Capita Income: 1990 to 1998**



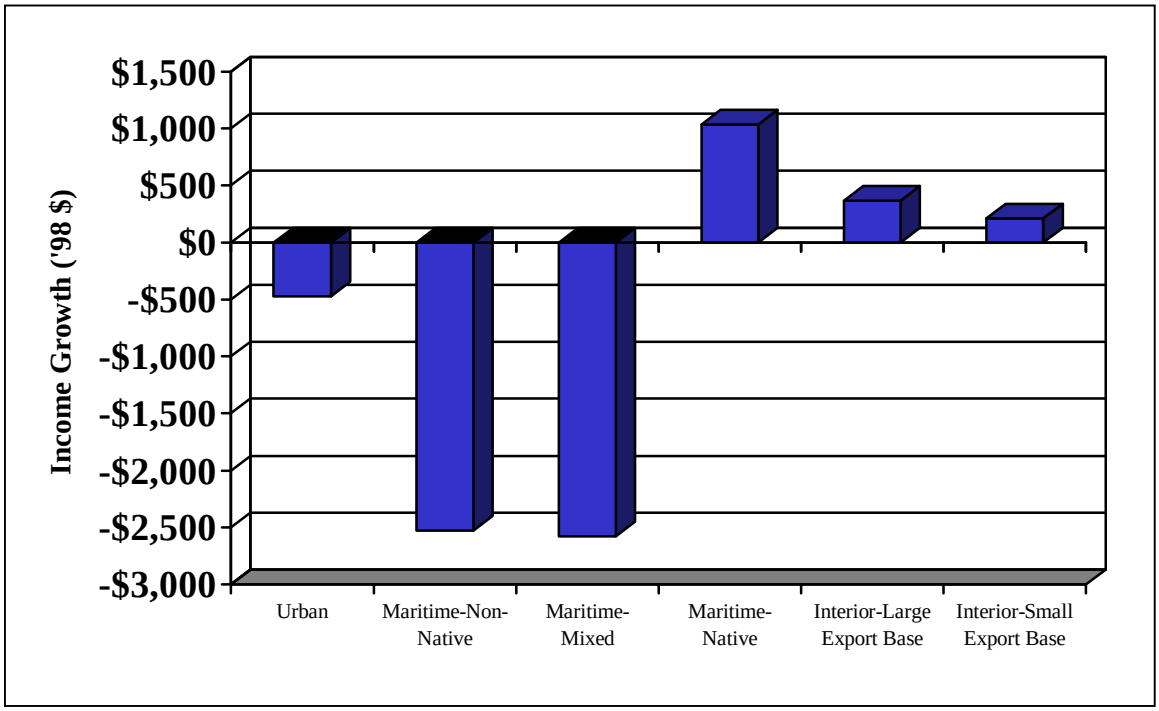
Real per capita income growth was concentrated in regions where it is lowest, but real per capita income in those regions is still below Urban and most of Maritime Alaska.

**Figure 45**
**Real Per Capita Income: 1990 to 1998**



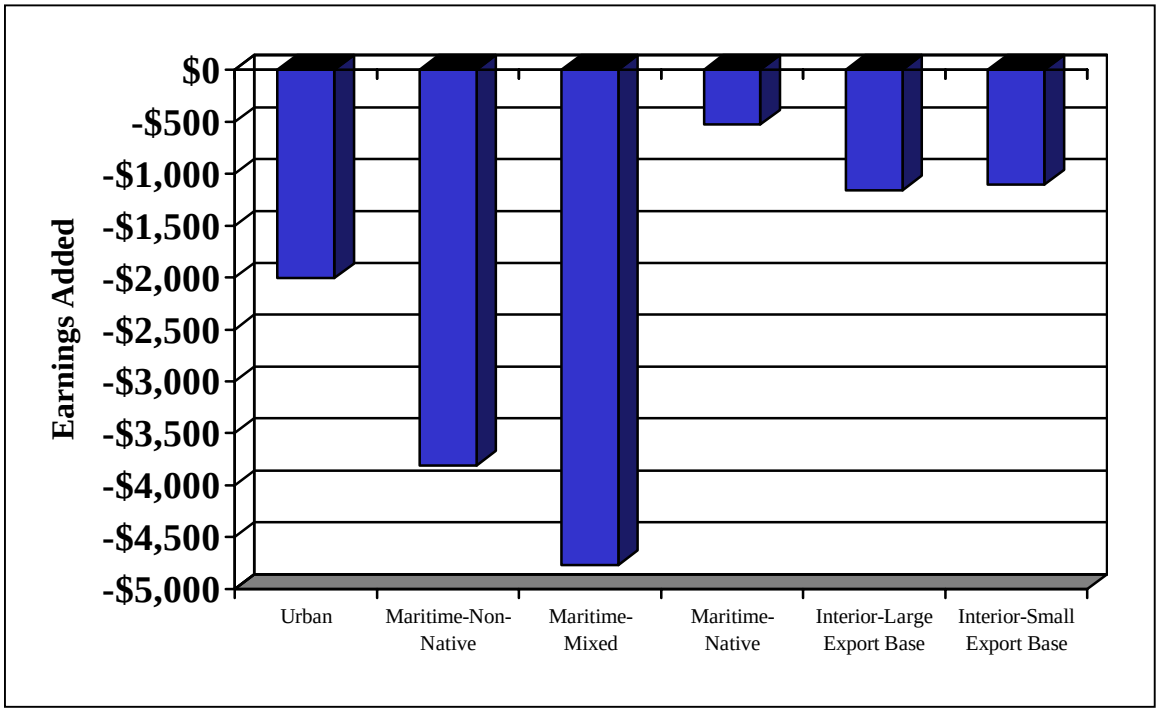
The drop in real per capita income in most of Maritime Alaska was significant, while the growth in Native regions of the state was modest. In Urban Alaska and most of the Maritime regions, the drop in net labor earnings was more than enough to make the change in real per capita income negative in spite of growth of investment income and transfers. Elsewhere in the state growth in investment income and transfers more than offset the decline in net earnings.

**Figure 46**
**Real Per Capita Income Growth:1990 to 1998**



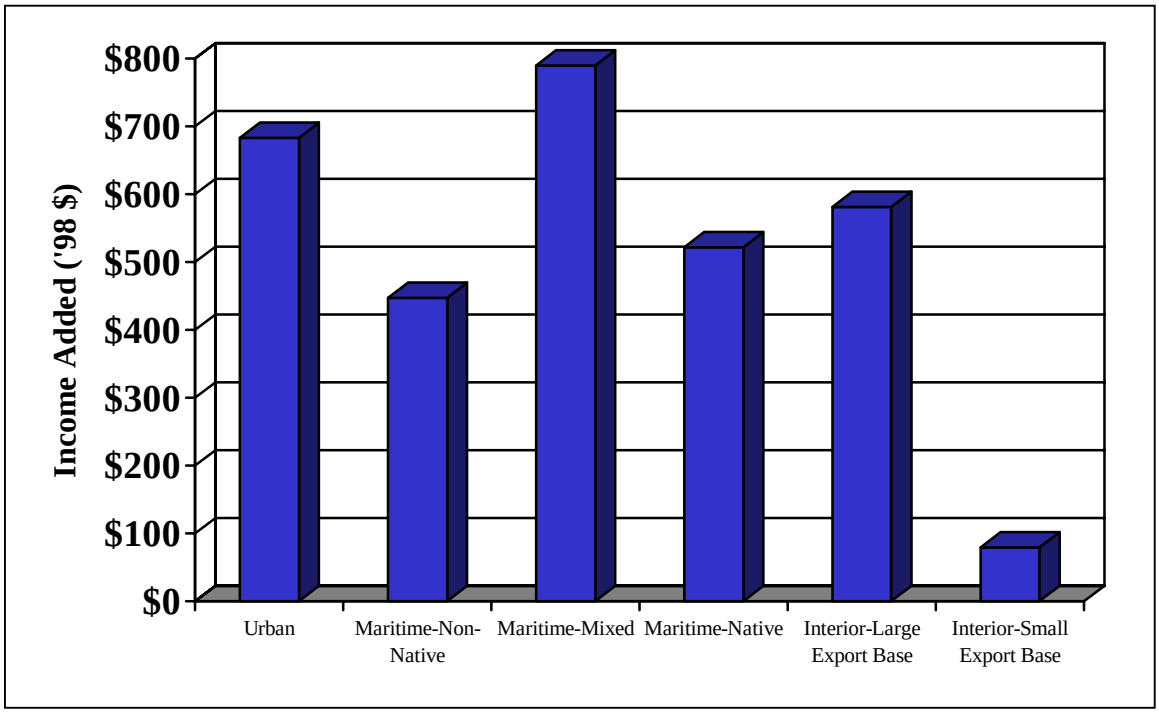
Net labor earnings per capita fell in all parts of the state.

**Figure 47**
**Per Capita Net Labor Earnings Added: 1990 to 1998**



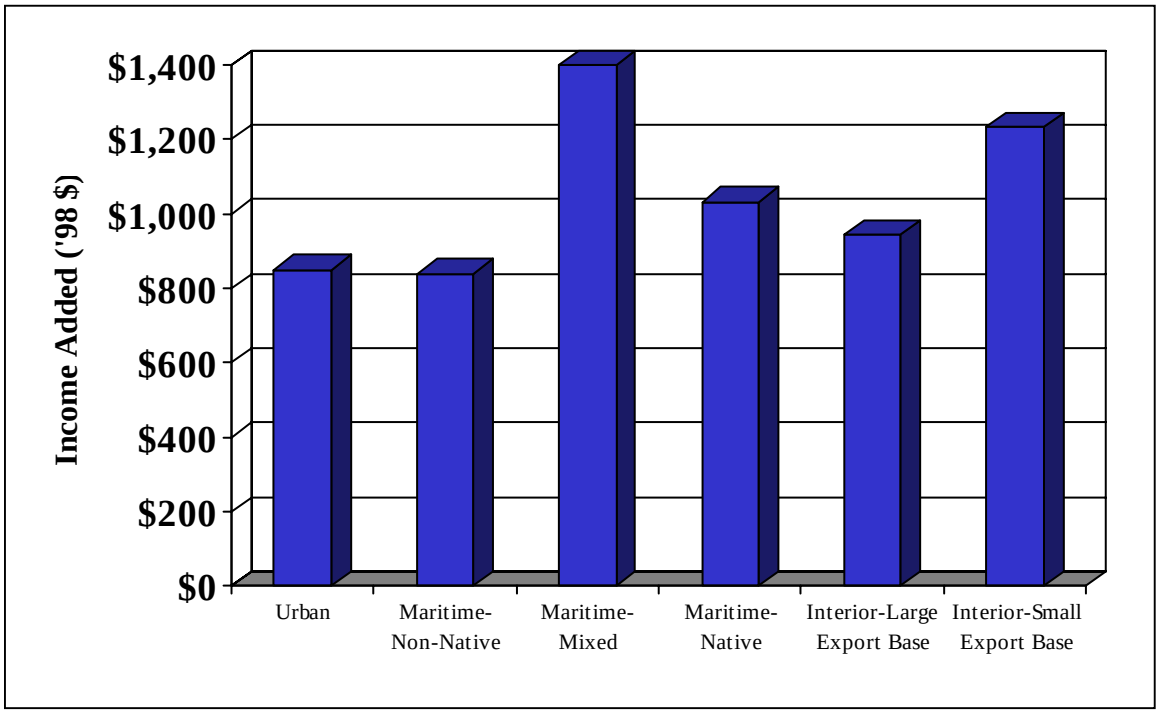
Investment income increased in every part of Alaska.

**Figure 48**
**Per Capita Investment Income Added: 1990 to 1998**



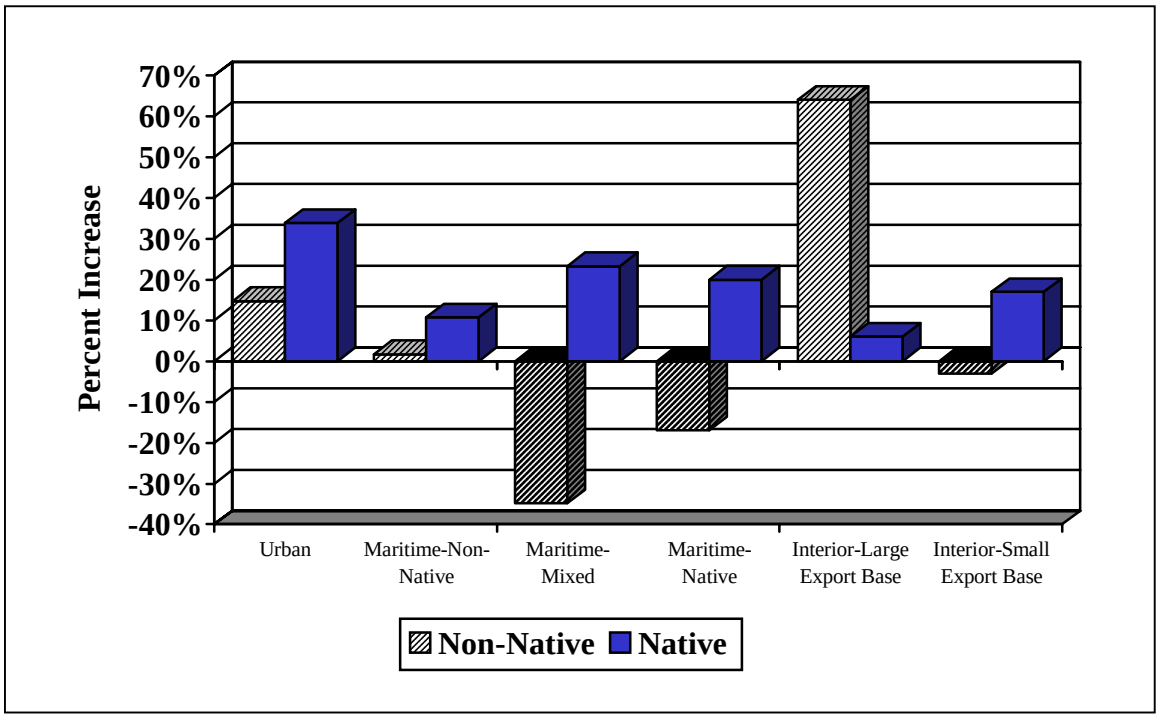
Transfer income was the most important source of growth in per capita personal income in every region of Alaska in the 1990s.

**Figure 49**
**Per Capita Government Transfer Income Added: 1990 to 1998**



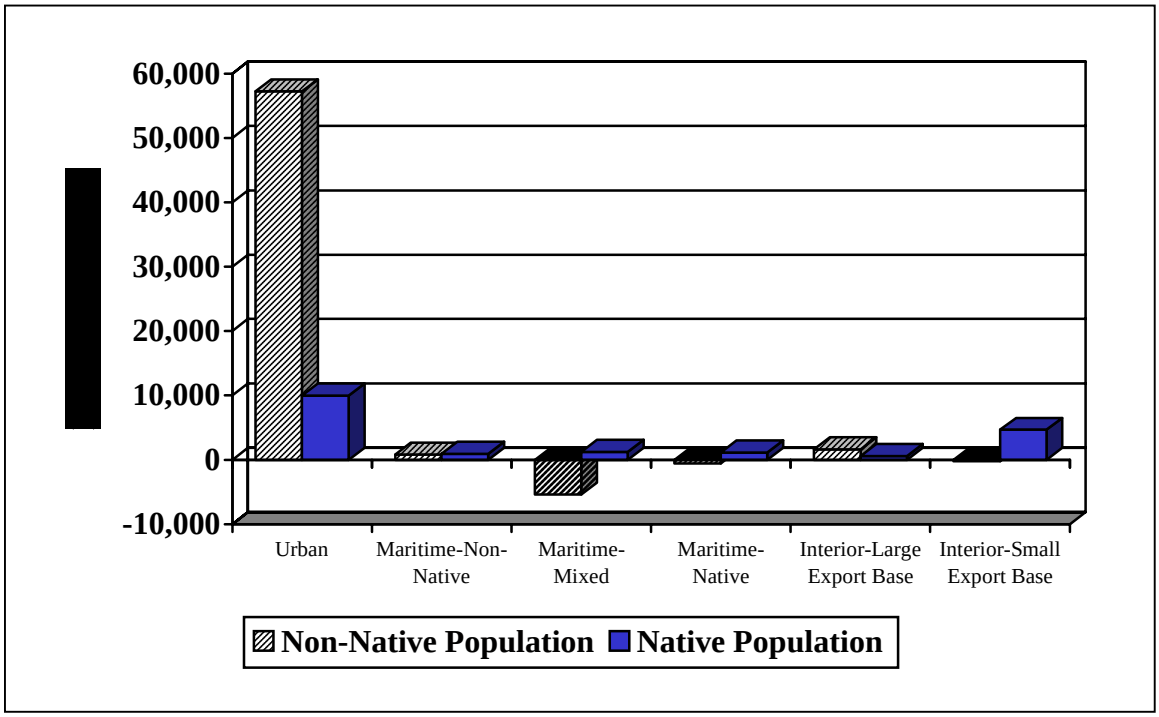
The Alaska population growth of 13% between 1990 and 1999 was distributed throughout the state except for declines in the Non-Native population in parts of Maritime and Interior Alaska. The Non-Native population growth rate was most rapid in those parts of Interior Alaska with a large export base (Northwest Arctic and North Slope Boroughs). The Native population growth rate was most rapid in Urban Alaska and slowest in those parts of Interior Alaska with a large export base. The Native population increased by 21% statewide and the percent increase in the Native population exceeded that of the Non-Native population in every part of the state except in those parts of the Interior with a large export base.

**Figure 50**
**Percent Increase in Population: 1990 to 1999**



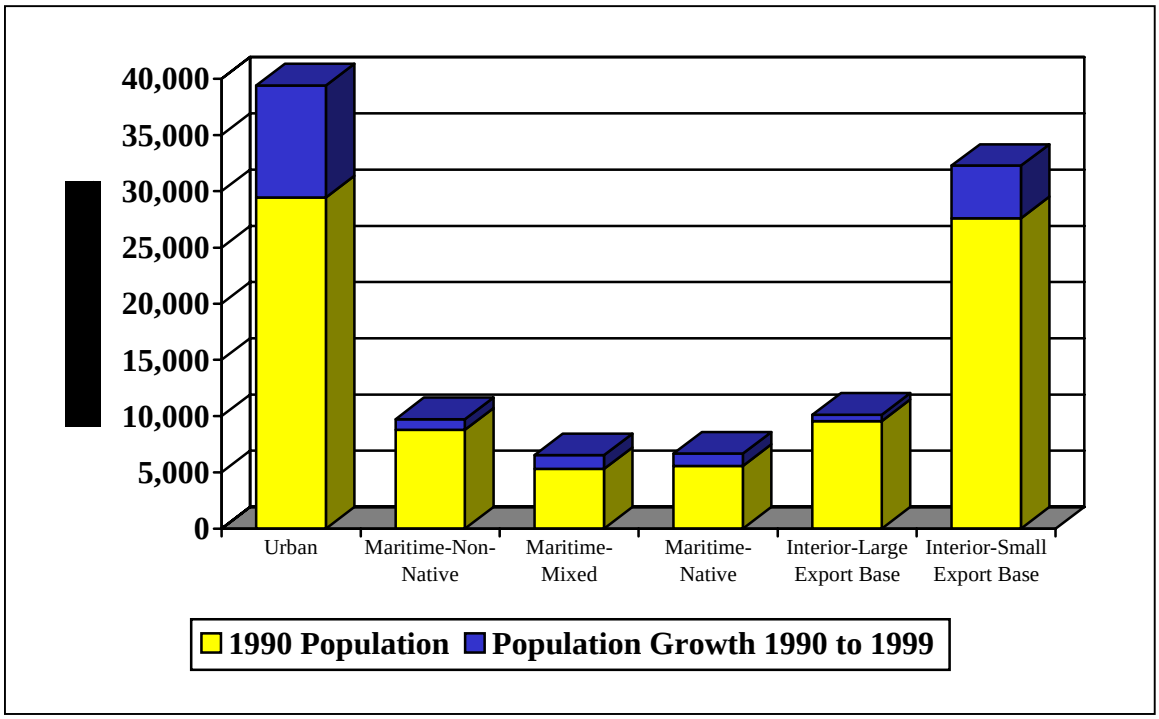
The Alaska population growth of 72,000 between 1990 and 1999 was concentrated in Urban Alaska which experienced an increase of 67,000. In Urban Alaska the increase was composed of 43,000 whites, 10,000 Alaska Natives, and 14,000 Other. In Rural Alaska growth was concentrated in the Interior. Almost all the increase is among Alaska Natives, with a small amount of growth in the Other category. The white population in Rural Alaska declined by 5,000.

**Figure 51**
**Population Change: 1990 to 1999**



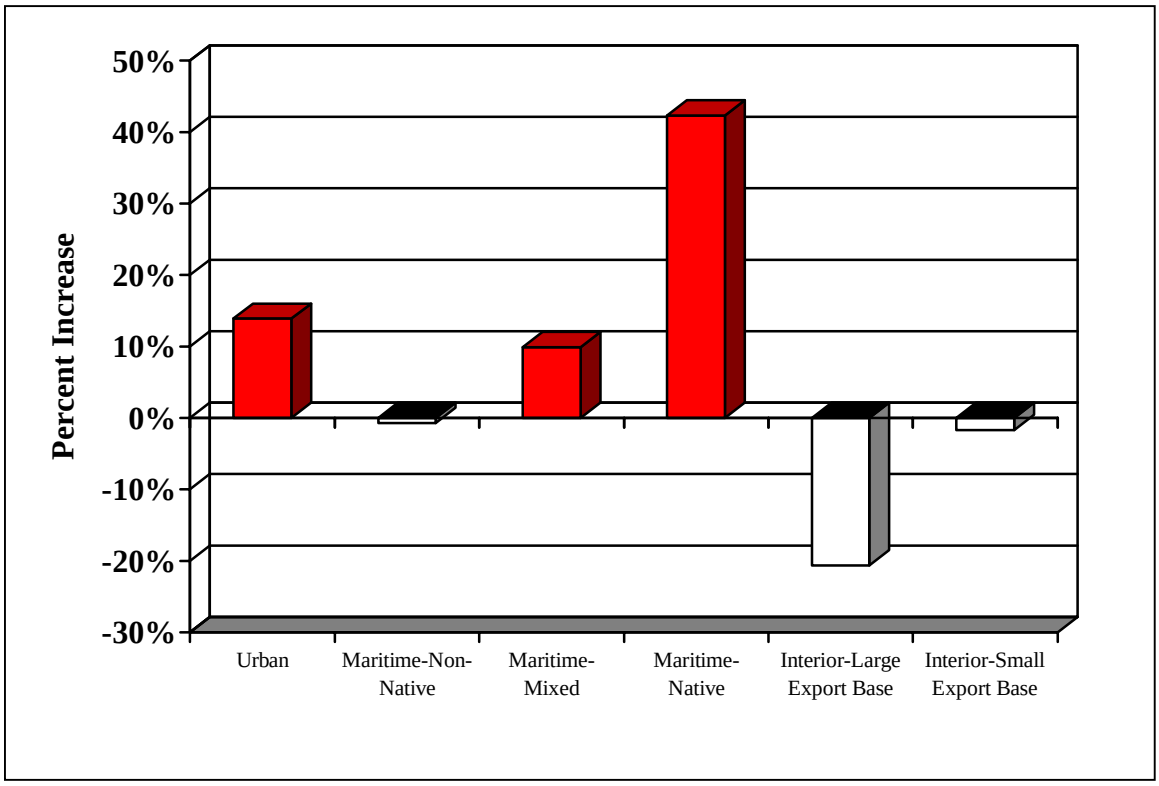
There was a marked movement of the Native population into Urban Alaska. It appears that most of this movement was from Interior Alaska and that the Native population of Maritime Alaska was stable. Further analysis will be necessary to confirm this as well as the age-sex composition of the movement.

**Figure 52**
**Native Population: 1990 to 1999**



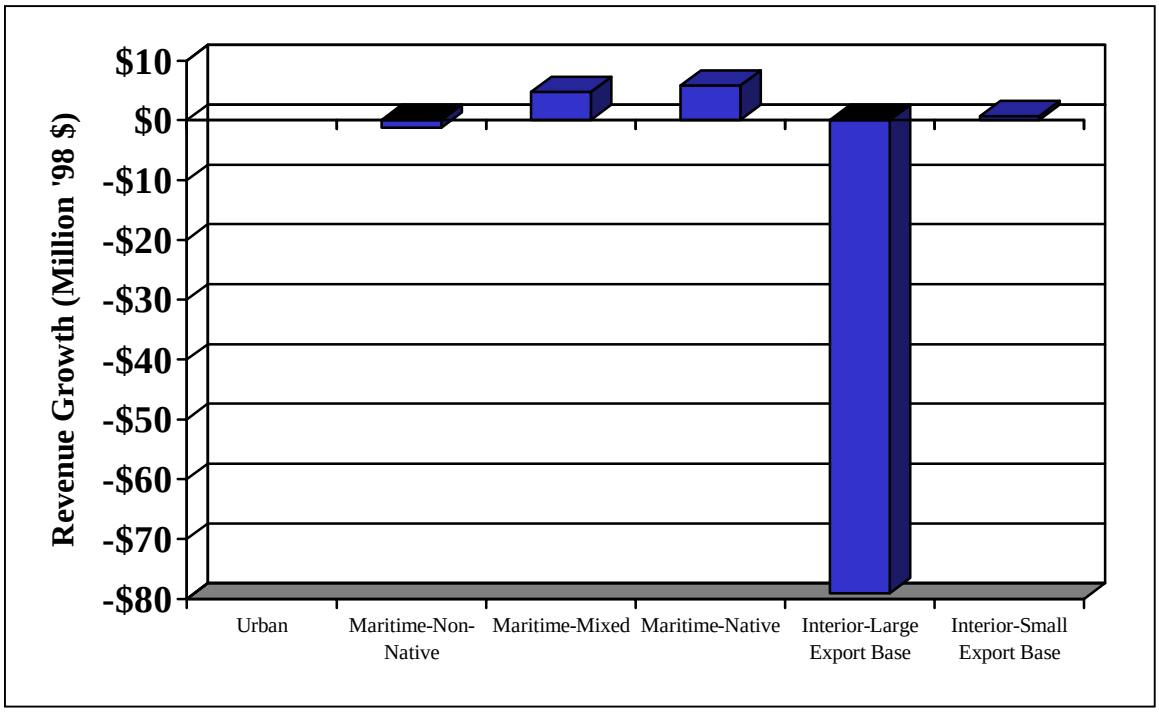
Revenues available to local governments from all sources grew in Urban and Maritime Alaska, but declined in Interior Alaska during the 1990s. This does not include the financial resources available to tribal governments.

**Figure 53**
**Percent Increase in Real Local Government Revenues: 1990 to 1998**



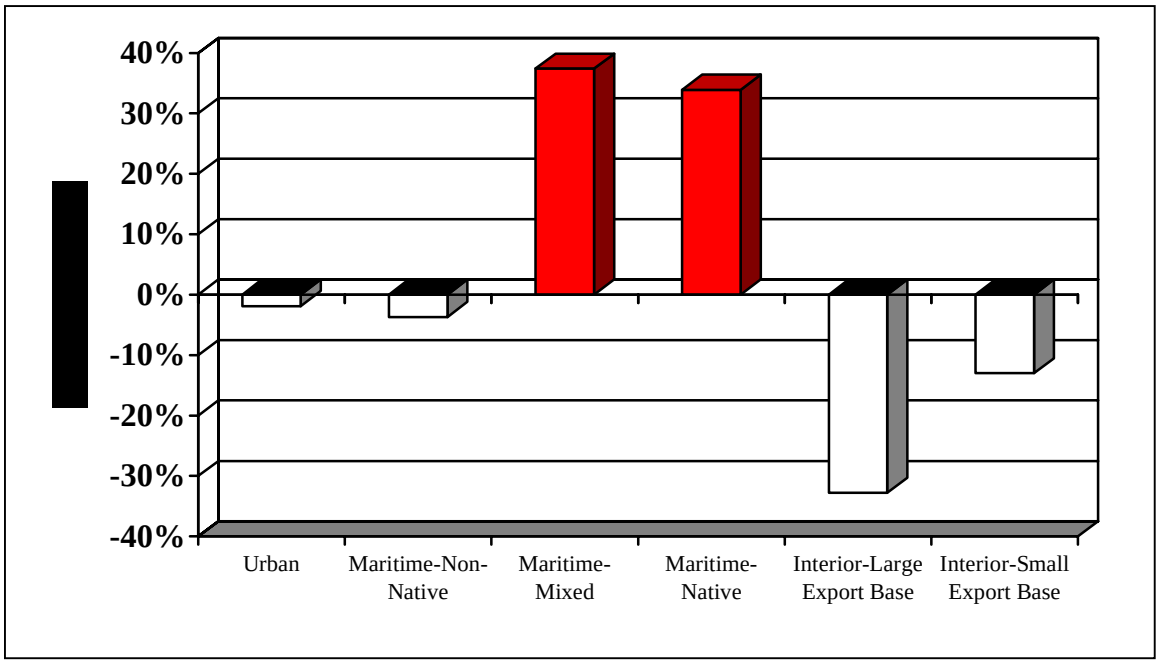
The decline in local revenues was most pronounced in the parts of Interior Alaska with a large export base. This was due to the decline in revenues to the North Slope Borough (Figure 54).

**Figure 54**
**Real Local Government Revenue Growth: 1990 to 1998**



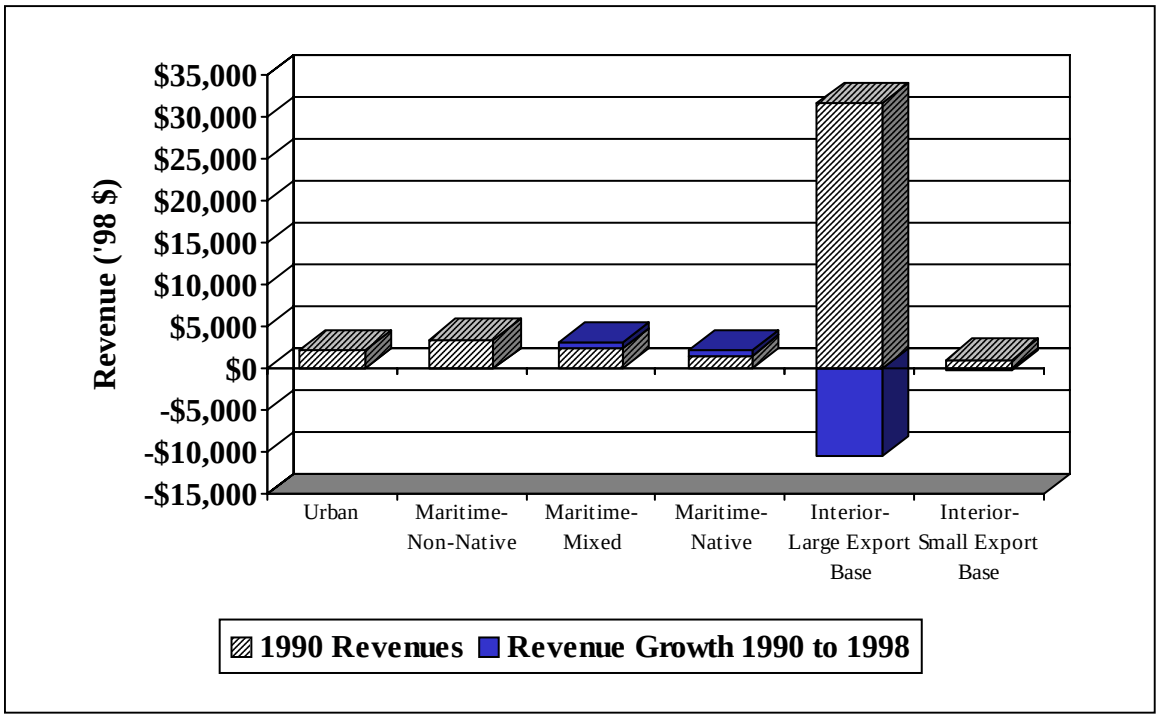
Real Per Capita Revenues available to local governments from all sources grew in parts of Maritime Alaska, but declined in the rest of the state (Figure 55).

**Figure 55**
**Percent Increase in Real Per Capita Local Government Revenues: 1990 to 1998**



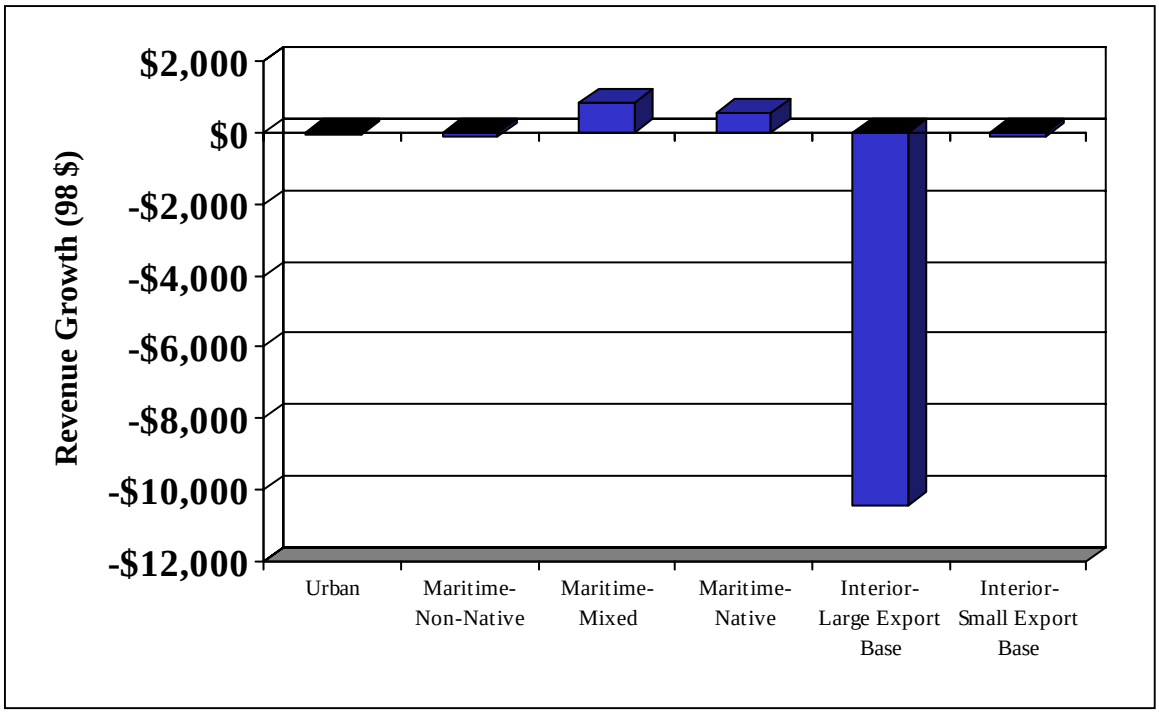
Real Per Capita Local Government revenues per capita continue to be unevenly distributed across the state. Interior Alaska has both the highest and the lowest real per capita local government revenues.

**Figure 56**
**Real Local Government Revenue Per Capita: 1990 to 1998**



The drop in real per capita local government revenues was most pronounced in Interior Alaska where there is a large export base.

**Figure 57**
**Real Per Capita Local Government Revenue Growth: 1990 to 1998**



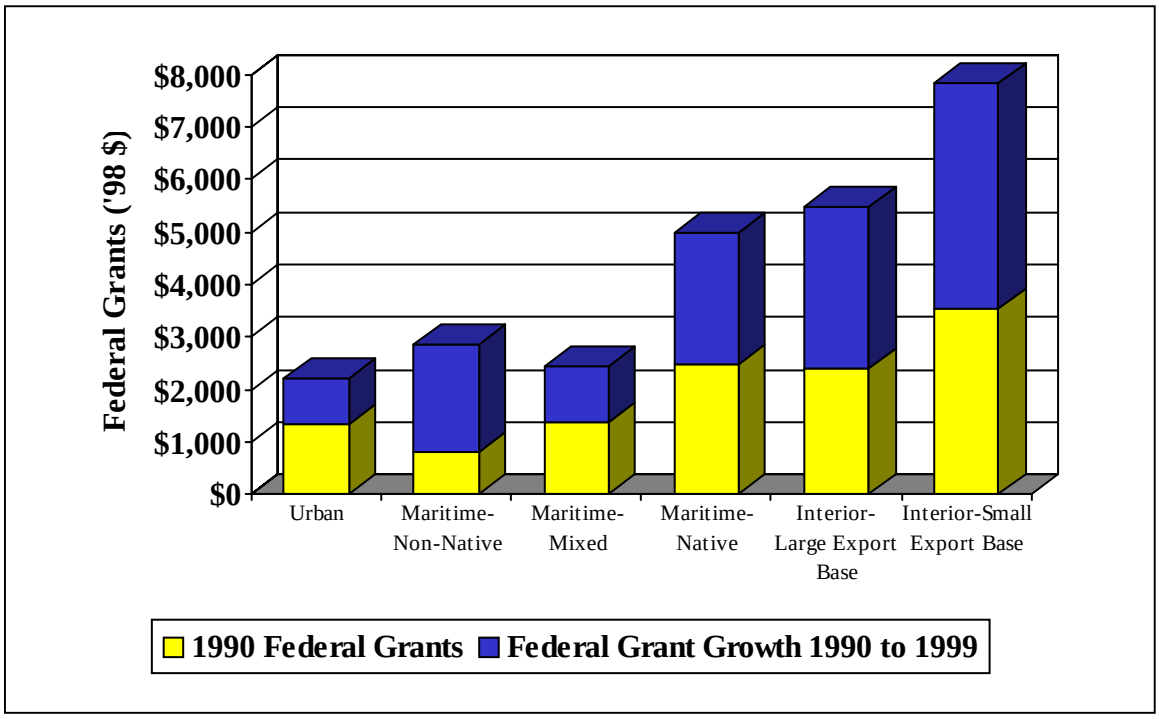

## *4.6 Tracking Dollars Into Rural Alaska*

Tracking dollars is the best way to see what is driving the economy of rural Alaska and how sustainable the economy of rural Alaska is. Unlike more developed economies, much of the economic activity in rural Alaska derives from transfers and grants that flow into the region from federal and state government as well as private sources such as Native corporation dividends and workers returning home with wage income.

There are three methods for tracking dollars flowing into rural Alaska. We could look at all the sources of dollars coming into a particular village by doing a detailed study of that place, but that would not tell us anything about other villages, or more generally about rural Alaska as a whole. A second way would be to add up the budgets of all the public and private agencies and businesses that delivery programs, services, and transfers to rural places. This would involve canvassing a large number of agencies and conducting very detailed analyses of the budgets of each. A third way is to concentrate on the flow of federal grants and transfers to Census Areas

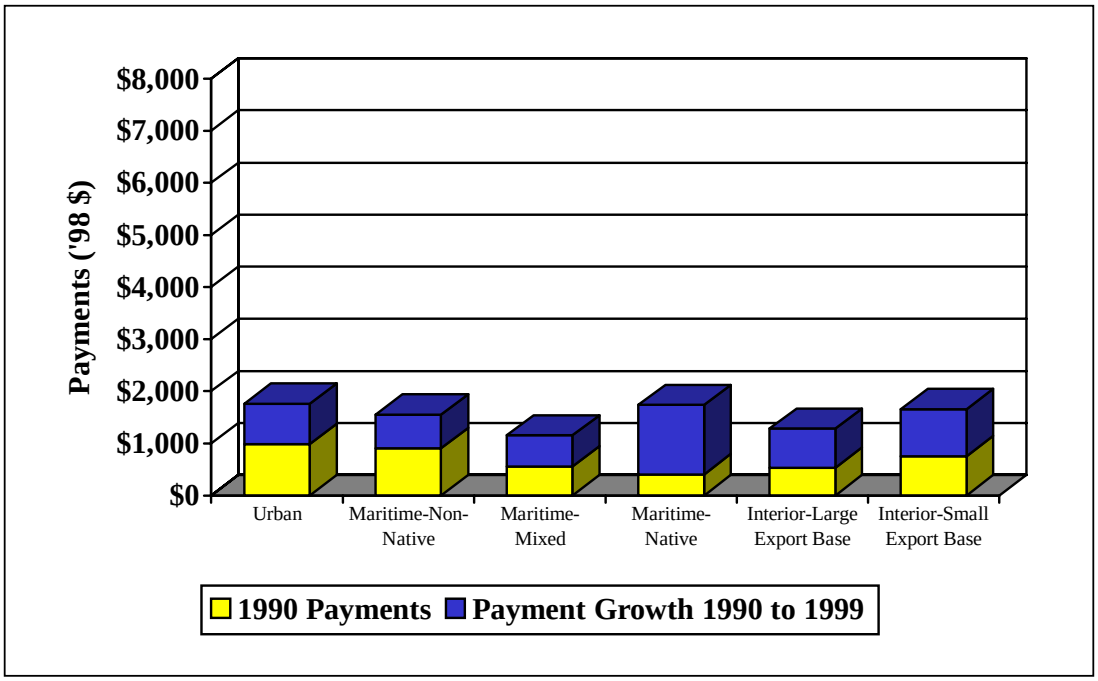
and places within them. The Consolidated Federal Funds Report (CFFR) of the US Dept of Commerce includes all federal grants and transfers to every community with considerable detail by agency and program. This is the easiest way to get a comprehensive picture of the importance of dollars flowing into rural Alaska that are not associated with the sale of the natural resources of the region. Alaska currently receives three times the national average level of federal grants per person partially due to the high level of grants to the Native parts of the state. Federal grants have increased dramatically throughout the state since 1995, but the increase has been fastest in Native Alaska (Figure 58).

**Figure 58**
**Federal Grants to Local Government Per Capita: 1990 to 1999**



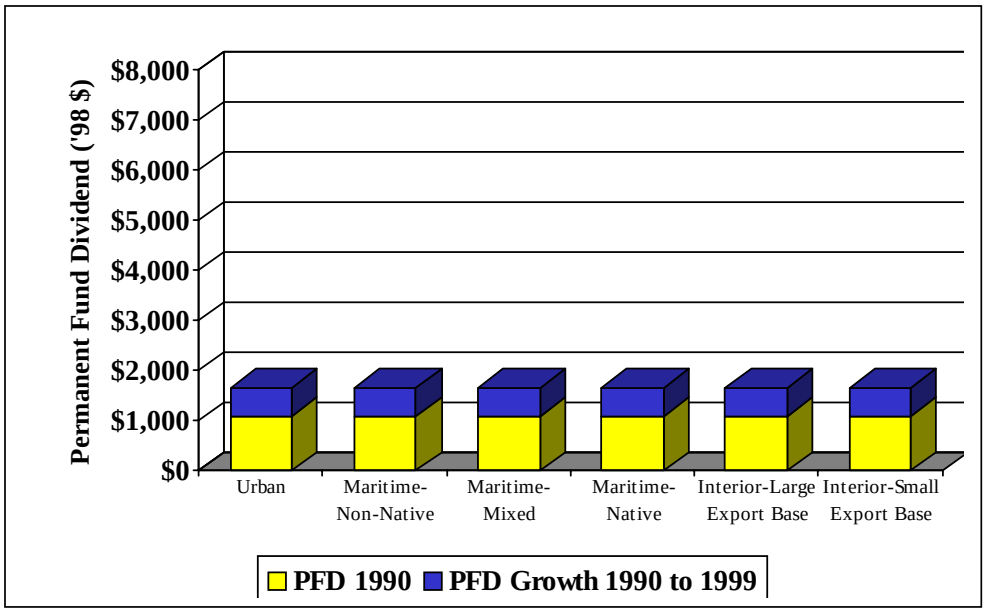
Federal direct payments to persons has also increased rapidly since 1995, although they are not nearly as significant as grants—particularly in Rural Alaska.

**Figure 59**
**Federal Direct Payments to Persons Per Capita: 1990 to 1999**



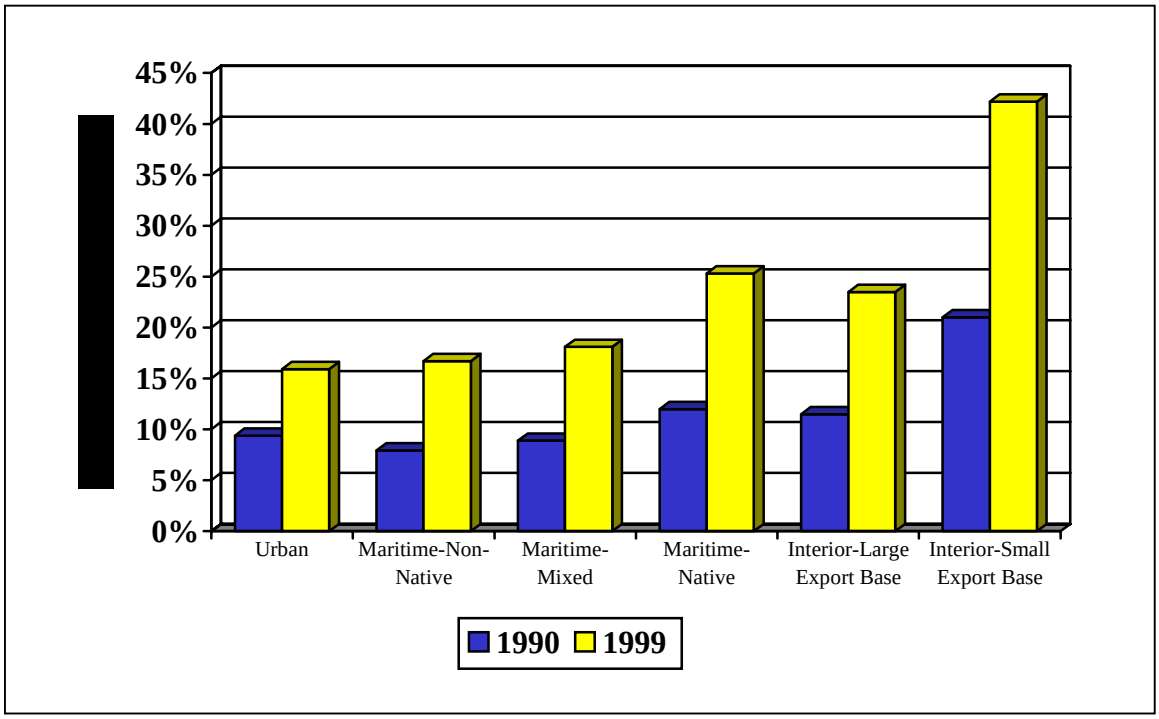

The Permanent Fund Dividend is similar in magnitude to federal transfers. It is distributed equally to every resident across all parts of the state (Figure 60).

**Figure 60**
**Permanent Fund Dividend (PFD) Per Capita: 1990 to 1999**



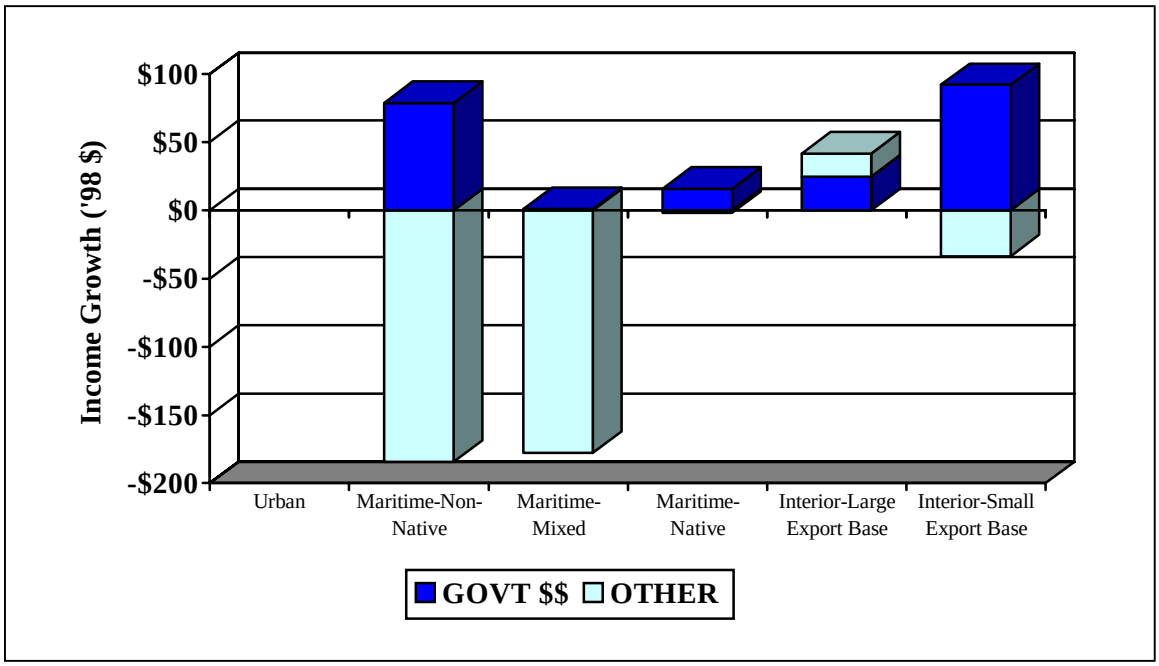
The combination of federal transfers, half of federal grants, and the Permanent Fund Dividend is a large share of total income throughout Alaska, but particularly in Native regions of the state. The increase in these sources of income, in relation to total income, since 1990 is dramatic. For example, in 1990 these income sources were equivalent to about 20% of personal income in Interior Alaska where there is only a small export base. By 1999 these income sources were equivalent to over 40% of personal income in this region.

**Figure 61**
**1999 Federal Dollars (Transfers and Half of Grant Dollars) Plus Dividends Compared to Personal Income 1990 & 1999**



Growth in the Permanent Fund Dividend, federal grants, and federal transfers to individuals (including the economic multiplier of these dollars) together were the largest contributor to personal income growth in every part of Rural Alaska. Excluding Interior Alaska with a large export base, non-government sources of growth were negative.

**Figure 62**
**Sources of Personal Income Growth: 1990 to 1999**

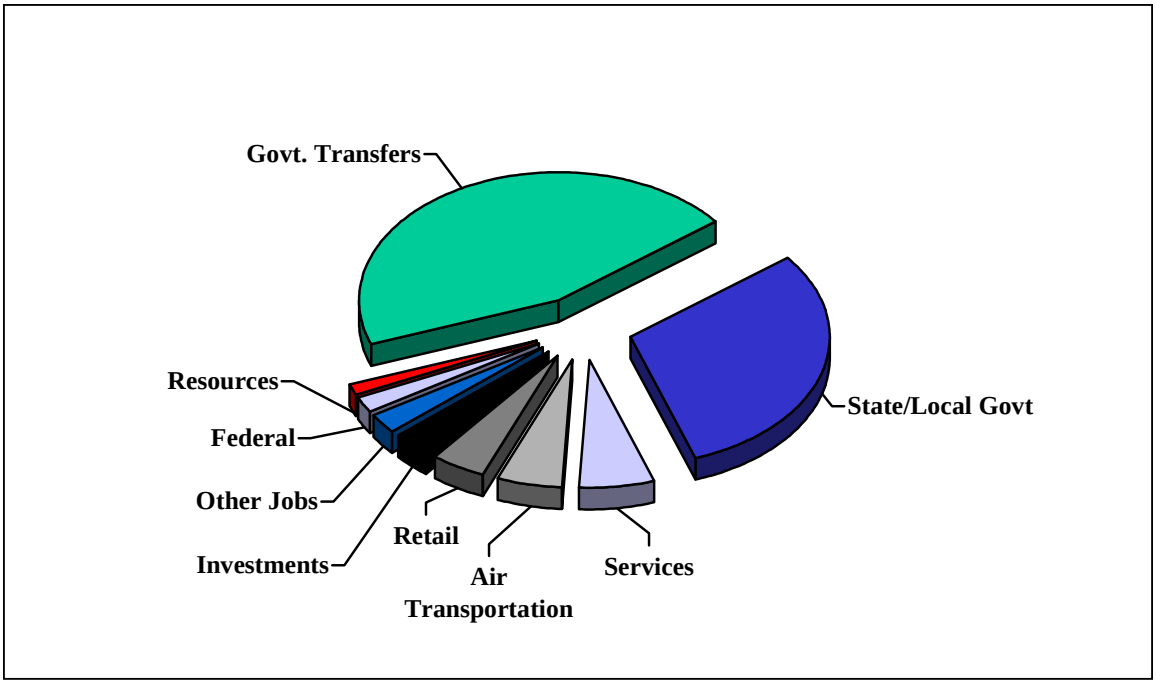


## *4.7 Wade Hampton: Example of a Particular Region*

Economic Indicators show that every region of the state is different, and even within regions there are considerable differences, thus making it difficult to generalize about the Rural Alaska economy or about its future prospects. An understanding of any Rural Alaska regional economy requires knowledge of the sources of activity in the market economy, as well as the subsistence sector. The total economic activity is the sum of the activity in the market economy and the subsistence sector.

About ¾ of the monetary income in the Wade Hampton Census Area comes directly from government transfers and state and local government employment. This income in turn supports most of the jobs that generate income in the services, retail, and air transport sectors. Indirectly most of the other jobs and income in the market economy are dependent on government in one way or another (Figure 63).

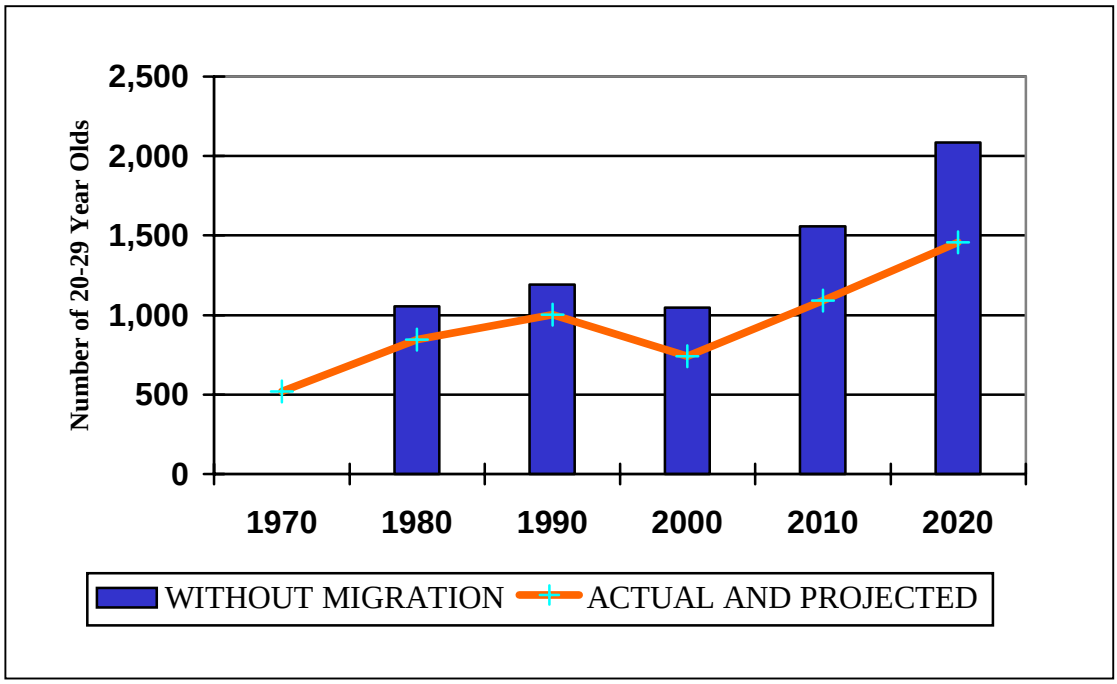
**Figure 63**
**Wade Hampton: Sources of Personal Income in 1997**




The demographic profile of the region determines the demand for public services, the supply of labor, and the pressures for migration into or out of the region. Out-migration of young adults has been happening for three decades and is projected to continue. Figure 64

shows what the population of 20 to 29 year olds would have been in 1980, 1990 and 2000 and what it would be in 2010 and 2020 without net out-migration during the previous 10 year period. Actual population is shown by the line. Net out-migration over each decade is the difference between the height of the bar and the line. For the projection we assume the same out migration rate as occurred during the decade of the 1990's.

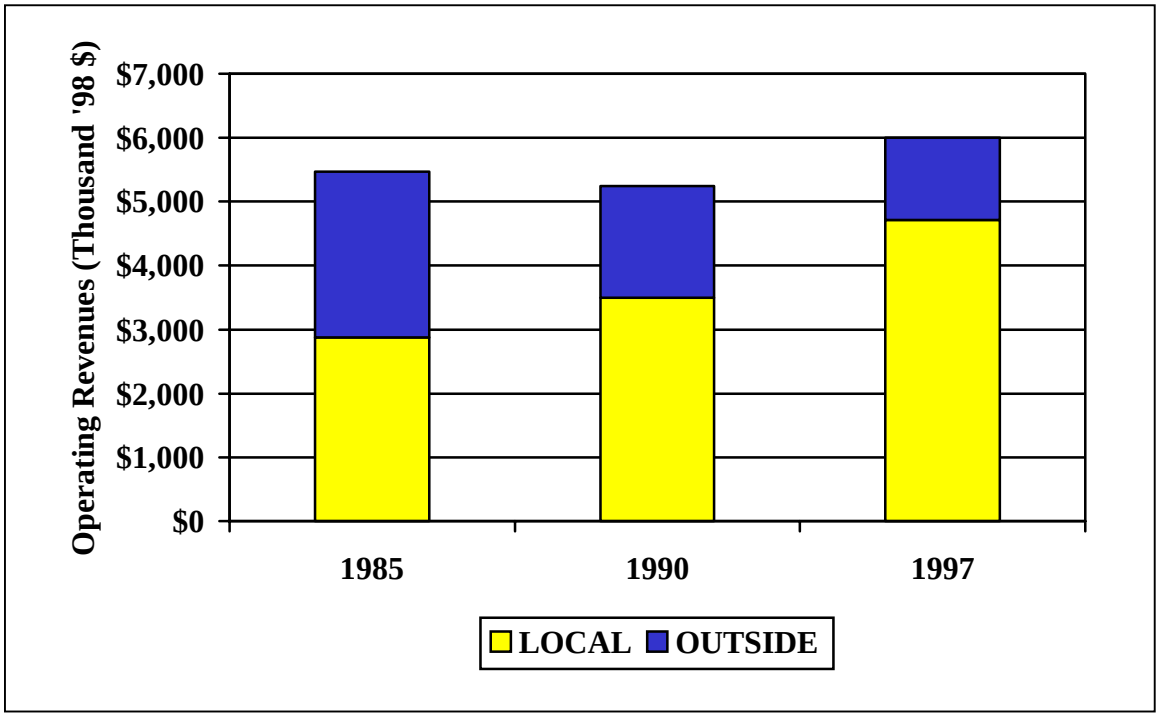
**Figure 64**
**Wade Hampton: Population of 20-29 Year Olds**




The local public financial picture depends both on the public services the community wants to deliver and the financial and other resources it has available to pay for those services. Public services are provided in rural Alaska by a variety of entities ranging from the state and federal governments to local government, tribal governments, regional and village corporations, and other local and regional groups providing particular services such as health and housing services and public utilities. No comprehensive picture of these entities and the resources they have at their continuing disposal has been developed. Information on local government finances is collected annually and does show the extent to which local government depends upon local versus outside revenue sources.

The Wade Hampton Census Area local governments have become more dependent on local sources of revenue over time. Total local government revenues have not been increasing.

**Figure 65**
**Wade Hampton: Sources of Local Government Operating Revenues**




## *4.8 The Hierarchy of Trading Centers*

Small places seeking economic development run up against the reality of the "Hierarchy of Trading Centers." The economic multiplier associated with dollars injected into a community depends upon the size of the local market. A small market means the multiplier is small and most of the money that comes into the community leaves almost immediately in the purchase of goods and services somewhere outside the community. Consequently full employment in a small community will depend directly on the dollars injected into the economy not on the re-circulation of those dollars within the community.

### The Hierarchy of Trading Centers

A. Hamlets (smallest form of trading center): These places have little more than a gas station, café, and grocery store.
   B. Minimum Convenience Center: Add restaurant, bank, hardware store, drug store.
   C. Full Convenience Center: Add facilities such as furniture, appliance, jewelry store, laundromat, dry cleaner, or department store, or lumberyard, funeral parlor, hotel, or farm supply center.

D. Partial Shopping Center: Add photographic studio, sporting goods, florists, music stores, children's wear, heating and plumbing equipment, stationery, and antiques.
E. Complete Shopping Center: Same categories as partial shopping center, but more shops.
F. Secondary Wholesale-Retail Center: Significant wholesale activities.
G. Primary Wholesale-Retail Center: At least 100 wholesale businesses.
H. Major Metropolitan Area.

## *4.9 Subsistence Values and the Noncash Economy*

More than 54 million pounds per year of fish, wildlife, and plants were harvested statewide for subsistence during the 1990s. On average, rural residents consumed 375 pounds of subsistence foods per person per year and obtained 35% of their calories and 100% of their protein needs from this source (ADF&G 1998).

According to the Alaska Rural Governance Commission (1999),

> Protecting subsistence is the top priority of rural Alaskans. Harvesting and consuming fish, game and other natural foods and resources for subsistence is the cornerstone of life in rural Alaska. These resources have great nutritional, economic, cultural and spiritual importance. (p. 12)

Rural Alaskans often face difficult trade-offs between the need for cash income and the need to participate in subsistence. This trade-off makes it harder for small rural utilities to keep trained operators on the job during all of the times when they are needed.[13] It also means that rural villages may not wish to generate as much *cash* income as they could, because their scarce time is better spent on subsistence. With less cash income, customers have a harder time paying utility bills.

### The Importance of Cultural Integrity and Self-Determination

Several recent efforts to document the challenges facing Alaska Natives in a time of rapid social change have noted the importance of both cultural integrity and effective self-governance. Drawing on the extensive empirical research by the Harvard Project on American Indian Economic Development, Sociologist Stephen Cornell *et al* (1998) noted that

> Native self-governance is not the whole answer to Native problems, but it is a necessary component in achieving sustained economic development,

[13] A Trade-off with subsistence is not the only reason why some utilities have difficulty retaining trained operators. Other reasons include low wages, poor benefits, competition from other local employers (such as the school), and competition from larger utilities in larger communities.

> in overcoming virulent social problems, in reducing financial burdens of social welfare programs, and in restoring health and dignity to Native communities.

The Alaska Commission on Rural Governance and Empowerment (1999) echoed this general principle while making a critical distinction between the services delivered by external agencies and the *manner in which* the services are delivered:

> The recent impact of (federal) government on Native villages, while often beneficial in content, has been destructive in process. Laws, regulations, appropriations, and service agencies….intent on helping people…reach right through community networks of obligation to deal directly with each individual. Little time or money was spent on supporting the village's innate capacity to take care of itself. Accordingly, local authority and responsibility for decisions had been usurped; Native people had lost control of their own communities and of their children's lives. The assumption that people cannot do for themselves, if continued long enough, becomes a self-fulfilling prophecy (p. 22).

These general observations are relevant to the challenge of establishing and nurturing sustainable utilities in rural Alaska because of the central role that community capacity plays in determining the success of a utility operation. This fact has been endorsed by several authors and work groups, most recently the Governor's Council on Rural Sanitation (1998) when it stressed that "Improved local capacity to manage and maintain completed sanitation facilities is key to eliminating the honeybucket by the year 2005" (p. 3).

The following statement, by a rural development specialist with international experience, eloquently summarizes the view that there is a critical linkage between outside influence, local capacity, and long-run prospects for sustainability:

> Nearly every action of an outside agency [interacting] with a Tribal government has the potential to either augment or diminish the governance and leadership of the tribe (Sarcone 2001).

According to this view, sustainability is as much about cultural survival as it is about economics. Therefore, the manner in which services are delivered and by which communities develop their general capacity for self-governance is equally, if not more, important to long run sustainability than the achievement of some predetermined standard of conduct or performance by a utility entity. A corollary viewpoint, adopted by the Governor's Council on Rural Sanitation, is that "Performance targets should be developed as a *collaborative effort* between the community and the funding agency" (p. 21, emphasis added).

Policymakers, funding agencies, and utility managers need to be aware of the possible differences between community or tribal values and modern western business practices. These differences can be managed and harnessed for the good of all concerned, but only if they are acknowledged. For example, in one village the utility operator appealed directly to a community meeting for people to pay their bills so that he in turn could be paid. The community responded to the appeal and the operator was paid.[14] This communication channel is obviously very different than the standard utility business practice of management sending individual reminders to customers or imposing late payment fees or threats of disconnection.

[14] Michael Black, Rural Utility Business Advisor Program, personal communication, 4/16/2001.

# 5. Utility Service in Other Places

## *5.1 Introduction and Summary*

The challenges of providing reliable utility services to remote villages with limited economies are not unique to Alaska. Countries throughout the world are struggling to provide, operate and maintain these services in both urban and rural areas. Our review of the experiences in advanced industrial northern nations such as Finland, Canada and other regions of the United States clearly shows that there are no "magic bullets" by which to overcome the problems of high cost, remoteness, and lack of economic base. Remote places with low populations consistently struggle to provide services that depend on economies of scale for affordability.

Three broad conclusions emerge from the review that follows. Subsidies, including infusions of volunteer labor, seem to be required to make up persistent differences between the total cost of water and sewer services and affordable rates in all places. A second persistent finding is the importance of local control and a sense of local ownership to progress. Finally, time itself has been an important ingredient of success in places such as Finland, where today's systems are the result of more than a century of slow but steady progress.

### Special Attributes of Alaska

Alaska is not alone in the struggle to provide utilities to its rural areas. It is, however, part of a select few places that must contend with formidable constraints caused by climactic and geological conditions that preclude the construction, operation and maintenance of less expensive and simpler water and sewer systems. The permafrost conditions, freezing temperatures, ice jams and flooding in the spring and limited accessibility make rural Alaska a difficult environment in which to build water and sanitation systems. As a result of these conditions the construction and operations and maintenance costs associated with these systems are much higher than the costs for systems in warmer climates.

As might be expected, the cold climate makes freezing an issue for water and sewer systems. Pipes must be heated and water circulated to prevent freezing. This increases the cost of the systems by requiring the use of boilers, circulating pumps, heat-tape, and heavily insulated, high-density polyethylene pipes that won't break if the water inside freezes and expands.

The permafrost, at times 300 feet thick, does not allow soils to percolate for septic systems, makes drilling and operating wells very difficult, if not impossible, and causes outhouses to be very shallow. The warmer permafrost soils create difficulties because they cannot be disturbed or they melt and collapse making it impossible to lay underground pipe or dig outhouses. Spring brings a host of other concerns as the rivers and oceans thaw causing ice jams and floods. River intake systems can be damaged by these occurrences and systems built to withstand such conditions become prohibitively expensive.

All of these conditions jointly contribute to increased complexity and cost for water and sewer system construction, operation and maintenance in Alaska's rural communities and increase the difficulty of achieving sustainable systems.

### Searching for Similarities

Much of the literature available regarding water and sewer utilities is for warmer climates. Many comparisons can be made to these systems, but in contrast, the building constraints in these locations are simple as compared to those in Alaska. There are, however, some aspects of their experiences that may be applicable to rural Alaska. Such issues as community support, project implementation process, agency involvement and community participation are all areas that transcend climate and geography.

## *5.2 Finland*

Finland has been working for many years to provide water and sewer services throughout the country. The first documented common piped water supply with several users was constructed in Ilmajoki in Ostrobothia in 1872. Rural water pipelines developed from small to larger systems over time serving multiple users (Katko, 2000). The original focus for rural areas in Finland was water supply with sewer services being developed later (Juhola, Hukka and Katko, 1999). The Finnish model of implementing water supply and sanitation services has largely been based on the cooperation of the public and private sectors (Katko, 2000). Rural water development in Finland, however, has not been a quick process. By 1980 only about 70 percent of the rural population of Finland was connected to a common water supply system (Katko, 1992a).

People living in rural areas of Finland initially relied on wells to tap groundwater resources. Rural water supply systems developed much more slowly than urban systems due to

increased costs associated with rural locations and a shortage of available pipe (Katko, 1992a). The rural water supply systems were developed using consumer organized and managed water associations. These associations were constituted using several institutional structures: partnerships, cooperatives, stock companies or bulk supply companies. The rural piped systems were exclusively based on consumers' needs and under their own ownership and management (Juhola, Hukka and Katko, 1999). When the need for improved water supply was recognized by a community an association was developed. The development of associations was gradual. Consumers had to select the type of association and be willing to participate in its development (Katko, 1993). Improvement of rural water supply has been based on consumers' own initiatives and priorities. *The gradual development of water systems has reflected local demand and economic potential*. The consumer-owned water associations were responsible for the implementation of systems and for the operations and maintenance of the systems (Katko, 1992a). These cooperatives provided flexibility, minimal bureaucracy and engaged high levels of community participation and commitment (Katko, 1993).

Lake drainage associations that were common in Finland in the 1700s and 1800s may have provided a historical precedent for the formation of the water associations in Finland. There are no water cooperatives in Sweden or Norway but they are present in Denmark where there are approximately 2600 cooperatives. Currently, water and sewer systems are typically not installed until people form a cooperative, assume the responsibility for the water and sewer system project and decide that the project should be completed (Katko, 2001).

During the development of a water association a "champion" was selected to promote, lead and manage the water supply system (Katko, 1993). The term "champion" "represents a highly enthusiastic and committed individual willing to take substantial risk to ensure success" (Katko, 1994). The champion plays a crucial role in the initiation, promotion and establishment stages of the water system. The champion typically is a person who initiates the water supply system and then volunteers as its manager. The position of champion has evolved from being a voluntary position to a part time or full time paid position (Katko, 1994). "Champions" have been used throughout Finland to promote system development and obtain community support.

Volunteerism has played a major role in the development of the rural Finnish water systems. Associations have used volunteers and half time employees for operating and maintaining the water systems. Community members supplied their local expertise to the utility

(Katko, 1992a). Systems with more than 2,000 customers would generally hire full time employees. Through these measures smaller rural areas often reduce system costs. Consumer management also reduced costs. Savings could also result from the appropriate technical design of systems to ensure they were not "overbuilt" for their use (Katko, 1992b).

Rural wastewater services were usually publicly owned (Kulo and Santala, 1998). The systems were initiated by consumers and supported through municipal taxes for sewer services. Sewer systems were developed by townships and paid for by tax revenues (Juhola, Hukka and Katko, 1999). Beginning in 1958 rural municipalities became responsible for developing sewage systems for rural centers (Katko, 1992a).

Government support for water systems began in 1951 (Katko, 2000). In 1950-51 only about 7% of rural households had piped water. In 1987 the Finnish government and municipalities began a project to develop water supply services in rural areas through pilot projects focusing on technology and implementation practices. The greatest amount of funding was put into water and sewer services during the 1970s and 1980s (Katko, 1992a).

Government support has been an important incentive factor for small rural systems that otherwise would not be able to support themselves (Katko, 1992a). Water associations in sparsely populated areas often need external support and more subsidies are being provided for small rural northern communities (Kulo and Santala, 1998). Since the mid 1970's an increasing number of small cooperatives have been established in low population rural communities, usually with considerable municipal support (Katko, 1993). Although governmental subsidies have been minor, government support has increased over the years for rural Finland (Juhola, Hukka and Katko, 1999). Piped water and sewer services have recently been constructed to serve tourist resort areas in Lapland with support from the central and municipal governments through investments (Katko, 2001).

Central government support for the systems has been minimal throughout the history of the Finnish water system. Support has primarily come from direct consumer payments of water charges and from municipal taxes for sewer (Katko, 2000). No government subsidies are available for operations and maintenance costs (Kulo and Santala, 1998).

Governmental support is often provided in the form of general grants or for water and sewer system construction funds. These subsidies are not fixed. Support varies depending on how funds are allocated annually by the government. In recent years the greatest amount of

support has been approximately 30% from municipalities and 30% from the central government with the remainder of the costs being supplied by the cooperatives. Users or cooperatives are responsible for 100% of all operations and maintenance costs. People want to join associations and pay for services in rural Finland. Rural low-income residents are able to afford to pay for all operations and maintenance costs in northern Finland. Certain areas in Lapland have recently received support from the European Union, but this is not likely to continue (Katko, 2001).

Most of the expansion of Finnish water and sewer systems took place between 1950 and 1970. During this era rural municipalities began to develop sewage systems supported by tax revenues as a public service. Municipalities began to build water services but most water systems were being developed and managed by consumer owned private associations on a non-profit basis. In the 1960's legislation changed that allowed government grants and interest subsidies to be given to utilities governed by public law. As a result, local governments become more active in and responsible for the development of both water and sewer services. In 1974 sewage utilities began charging for services with the Wastewater Surcharge Act. Water supply companies were operating on a full cost recovery principle by this time. Water and sewer utilities were merged to reduce financial pressures on sewage utilities. The result was two utilities that lost of all their financial autonomy and were governed by municipal decision-making (Juhola, Hukka and Katko, 1999).

There have been a variety of contributors involved in the development of water systems in Finland. Consumers have covered costs, contributed labor and materials and participated throughout the development of water systems. This consumer role has declined over the years but remains important. Water authorities today focus on a promotional and advisory role, explore ground water resources and direct the overall development and policy of the water system. The role of rural municipal authorities has expanded since 1950 and since 1983 they have supported water supply in sparsely populated rural areas. Health authorities' roles are expanding but are primarily limited to water quality issues. The private sector helps with the planning, implementation and operation of services (Katko, 1993).

Government subsidies for municipal services decreased during the 1990s. Water and sewer services were viewed as a means to support faltering municipal finances. If water and sewer services could be develop to a sustainable profitable state they could support local government finances. This desire to fund municipal government through water and sewer

services coupled with pressure to improve public and private partnership have continued the development of water and sewer services in Finland (Juhola, Hukka and Katko, 1999). In some cases water and sewer systems have been taken over by municipalities or private and municipal systems have merged. However, most new water cooperatives, which include sewer services, are developing in rural areas. Municipalities are often times not willing to take over the existing cooperatives if the cooperatives are able to manage their own systems. Municipal water utility management of the small systems would in most cases be more expensive than management by the cooperative. Municipal utilities in larger urban settings are often quite profitable whereas small rural systems profits are minimal if they exist (Katko, 2001). "The evolution of water supply and sanitation services has been a national civilization project, and it remains so today (Katko, 2000)."

## *5.3 Canada*

### Urban Canada

Currently Canada's urban water and sewer infrastructure is in need of upgrades. Large urban areas, such as Victoria, British Columbia, do not treat sewage before it is discharged into the Pacific Ocean. Ontario is in need of $9 billion dollars to fix the province's water and sewer system. In Vancouver the sewer system overflows 25-30 times a year depositing sewage into the ocean and local rivers. In some locations taxpayers will be expected to raise the majority of the necessary funds. Funding solutions may also be found by redirecting existing federal government subsidies or finding private sector companies that can provide capital investment funds in exchange for long-term business contracts (Canadian Press, 6/12/2000).

Municipalities in Ontario will be paying the majority of the costs for the water and sewer upgrades. The government is attempting to develop subsidy programs for those municipalities where costs will be exorbitant relative to the size and tax base of the municipality (Canadian Press 7/31/2000). Federal spending alone is not anticipated to cover all the needed repairs and upgrades. "[Canada] has large cities with no sewage treatment whatsoever" (Canadian Press, 6/20/2000).

## Rural Canada

### British Columbia, Alberta, Saskatchewan and Manitoba

Keeping the urban situation in mind, what is happening in rural Canada? Water shortages are not uncommon in Canada's rural areas where some voluntary water conservation is being practiced. Water is often of poor quality, unreliable and limited in quantity (Dolan, Kreutzwiser and DeLoe, 2000).

The Prairie Farm Rehabilitation Administration (PFRA) has provided funding and expertise since 1935 to improve water services for individuals, groups and small communities. In 1981 this program was expanded to include the development of rural water pipelines (Pochylko, Powley and Brandt, 2000). The PFRA, however, only services British Colombia, Alberta, Saskatchewan and Manitoba. It does not address water and sewer issues in the Northwest Territories or Nunavut.

To provide better quality, more reliable water on a continuous basis, pipeline water distribution systems are the preferred alternative for the Canadian prairie rural areas located in British Colombia, Alberta, Saskatchewan and Manitoba. There is a demand and willingness to pay for water services by rural customers.

Government funding for rural water systems has declined in recent years. Government subsidies have been traditionally used for capital funding of projects. The level of funding available for a system depends upon the location and local government policies (Pochylko, Powley and Brandt, 2000).

Rural pipelines have not been economically feasible until recently with the development of low flow/low pressure systems using low-cost plastic piping materials. Systems are usually located in areas where there are enough residents to make it feasible and alternative water sources are limited. Providing affordable water to dispersed consumers is a major challenge to rural pipeline systems. Innovative techniques have to be used to provide affordable water. Such techniques include customers' water needs being supplied over an extended period of time with customers being expected to install holding tanks, in-house pressure systems and treatment systems when necessary (Pochylko, Powley and Brandt, 2000).

Rural water systems are developed and operated by groups of local community members who cooperatively work to administer the development of the new system. These groups can be

in the form of cooperative associations, water-user associations, non-profit or for-profit societies, public or private utilities and companies. Operations and maintenance (O&M) of the system is also the responsibility of the community group that establishes the system. Attempts are made during system design to minimize the need for system maintenance and monitoring. Due to the volunteer nature of the group members, O&M is often overlooked. To facilitate system operations, comprehensive operations and maintenance manuals that include record keeping instructions and check lists are provided to the community groups (Pochylko, Powley and Brandt, 2000).

In the future, as a result of reduced funding, the Prairie Farm Rehabilitation Administration will limit their technical assistance to that of conceptual planning and design services and operations and maintenance expertise. PFRA will be examining systems that are currently in place to obtain a better understanding of flow patterns and consumption rates to promote rural water conservation and better system designs. PFRA will advocate water quality awareness, water source protection and water treatment (Pochylko, Powley and Brandt, 2000).

### Greater Northwest Territories

Piped systems in northern Canada are fraught with problems and are very uneconomical. The systems are exceptionally expensive to maintain in the northern climate. For this reason most communities use a truck haul system.

In the Greater Northwest Territories (GNWT) truck haul systems are the typical water and sewer service system for communities. Schools are an exception to this and may be equipped with piped systems. Houses, however, have holding tanks for water and sewerage. Trucks deliver water and pump sewage tanks for customers. The delivery and pumping services are often provided by a local business.

Government water subsidies were developed in the 1980s in Canada. Although government funding for rural water systems has declined in recent years, the GNWT government provides a substantial amount of subsidies for their water and sewer systems. Capital projects are typically funded 100% by the Territorial Government. Operations and maintenance costs are also heavily subsidized to varying degrees depending on the community. Approximately 80% of the GNWT's funding is transfer payments from the federal government. In essence, the subsidies are mostly 'pass through' monies from the Federal government.

The Greater Northwest Territory subsidies were developed by using the water and sewer costs of Yellowknife as a base economic rate. This economic rate included the full economic burden of the system. The total economic cost of providing water and sewer service was determined. A base residential rate that people could afford (.02 cents/liter) was established. Commercial rates were set at .04 cents/liter. The difference between these rates and the full economic cost was the amount of subsidy the government provided. Full subsidy of the systems in the GNWT became prohibitively expensive for the government with increased use and population growth. Systems are currently not fully subsidized in most cases and shortfalls must be recovered through user fees.

Communities are motivated to use the water and sewer subsidies as efficiently as possible because water subsidies are fixed for each community. Communities are responsible and accountable for their use of the water subsidies. If communities report a surplus of subsidies from year to year subsidies are reduced. Rate structures for communities are established formally and cannot fluctuate randomly.

There has been a transition from government run utilities to community managed and operated water and sewer utilities in the GNWT. The Department of Public Works and Government Services was the governmental agency that maintained water and sewer services for communities in the past. Today, larger communities in the GNWT, such as Inuvik with a population of approximately 2,500, often manage their own water and sewer services. Communities employ consultants when having their own staff is not cost effective.

It is more common for small communities to contract with consultants to maintain their water and sewer systems. Communities may contract with the Department of Public Works and Government Services or local contractors to provide operations and maintenance services. Water delivery and sewage pumping are services typically performed by local businesses in a community. These small businesses are guaranteed a specific contract length to enable them to amortize the costs of necessary equipment over time.

Local community governments in the GNWT may or may not own the community water and sewer utilities. When community governments do not own property the Territorial Government owns the utility infrastructure. The Territorial Government will train local government employees to take care of the operations and maintenance or the communities will contract out for these services. The Northern Territories Water and Waste Association is a small

professional organization of municipal plant operators and engineers that has existed for approximately eight years. They also provide northern technical expertise and most of the local training to water and treatment plant operators.

There are approximately five communities in the GNWT that did not choose to become a part of the water and sewer subsidy program. These communities felt it was not cost effective to maintain the extensive records required to be a part of the subsidy program. These communities do not charge for water and sewer utilities and rely on the territorial government to repair the systems when they fail.

Small communities in the GNWT do not differ greatly from small communities in rural Alaska. The unemployment rate is high in the rural GNWT communities and their overall economy is poor. Most communities are predominantly native.

(Phone conversation with Terry Brookes, Professional Engineer, Greater Northwest Territories, Canadian Municipal and Community Affairs, October 25, 2000.)

### Nunavut

Cambridge Bay, a typical Nunavut community, is struggling to provide affordable water and sewer services for its residents. The cost of living in Cambridge Bay is approximately 180% of the cost of living in Edmonton, Alberta Canada. Cambridge Bay has some of the highest costs of water and sewer services in Canada, $ 4.8 cents/liter Canadian Dollars. This cost is the full cost that reflects the capital investment in the water and sewer system and the operation and maintenance costs. Customers pay only $ .55 cents/liter for residential use and 1.1 cents/liter for commercial use. The subsidies currently being received by Cambridge Bay from the Territory of Nunavut do not cover the difference between the full cost of the system and the fees paid by customers. There is a shortfall. The subsidies received are monies that are provided by the Federal government of Canada to the Territory of Nunavut.

Cambridge Bay has a population of approximately 1,500 people. The operating cost of its water and sewer system was $106,526 Canadian dollars in September of 2000. The community only receives $16,822 Canadian dollars in subsidies from the Nunavut government. The additional funds have to be obtained through customer fees. An average bill for private residents is $75.00 Canadian dollars per month. An average monthly household income in Cambridge Bay is approximately $60,000-$70,000 Canadian dollars per year. People living in

government housing complexes do not have to pay for water and sewer services. Cambridge Bay is in need of capital improvements and will need to request additional subsidies to cover the capital costs of those improvements.

The water and sewer service in Cambridge Bay is a truck haul system. The community is attempting to increase the efficiency of the system to help save costs. They are attempting to do this is by increasing the size of the pumps used to fill the haul trucks with water. It will take less time to fill each truck using the larger pumps and will improve delivery times. The community would also like to lower maintenance costs. Maintenance costs currently run 10,000 Canadian dollars per year for equipment maintenance. Scheduling improvements, such as determining who needs water delivery each day as compared to those that do not, are taking place to eliminate unnecessary deliveries.

Cambridge Bay owns their water and sewer system and provides services to the community. They have found it to be more cost effective to have their own staff rather than contract out for services.

(Phone conversation with Mr. Elwood Johnston, Senior Administrative Officer, Department of Community Government and Transportation, Cambridge Bay, Nunavut, Canada, October 31, 2000.)

## *5.4 The Colonias*

"Colonia" is a Spanish term for neighborhood or community. In Texas it refers to an unincorporated settlement that may lack basic water and sewer systems, paved roads and safe and sanitary housing" (Federal Reserve Bank of Texas, no date). Colonias exist in Texas, New Mexico, Arizona and California along the United States-Mexican border. The majority of the colonias are found in Texas. Colonias are home to approximately 340,000 people in 1,412 colonias. Residents of the colonias generally have low paying migrant or seasonal jobs and low household incomes (Texas Low Income Housing Information Service, 1998).

The colonias were created by developers who have taken land that has no agricultural value or is located in floodplains or other remote rural areas and created unincorporated subdivisions to provide low-income housing. Developers have not provided basic water and sewer services as part of the subdivision development (Federal Reserve Bank of Texas, no date).

## Texas Colonias

Colonias in Texas have a high unemployment rate that has ranged from 20-60 percent. Residents cannot afford to install piped water and sewer systems and use septic tanks (which are often installed improperly or are too small), cesspools, outhouses or other means to dispose of wastewater and sewage. The predominantly clay soils that do not drain, poor drainage systems and topography combined with poor waste water disposal cause sewage to pool on the ground and in the ditches (Federal Reserve Bank of Texas, no date).

Funding is one constraint on residents' access to water and sewer services. Housing that does not meet building code requirements and therefore prevents access to waterlines is another (Federal Reserve Bank of Texas, no date). The fact that the colonias are unincorporated subdivisions without a political representation has made it difficult for them to obtaining funding to improve living conditions (Environmental Protection Agency, 1998).

"Colonia residents, nonprofit organizations, the private sector-including financial institutions [and] foundations, and local, state and federal government agencies are all involved in improving the colonia living conditions" (Federal Reserve Bank of Texas, no date). Programs such as the Texas Department of Natural Resources Conservation Commission's Texas Small Town Environment Program (STEP) are being used to form partnerships between local residents and agencies. The STEP program is a self-help program that helps communities that want to use local volunteers, materials and financial resources to solve local water and sewer problems. "A nonprofit community organization, Colonias Unidas, has aggressively sought technical and grant support from county, state, and federal sources to improve living conditions for residents in one of the nation's poorest counties" (Texas Natural Resources Conservation Commission (TNRCC), 1999). Community groups have to overcome residents' distrust of the government and rely on "sparkplugs," "strong community-minded leaders" to lead communities and coordinate with state, federal and private entities (TNRCC, 1999).

The isolation of the colonias has been a contributing factor to the lack of public services available to the communities. The isolation of the colonias has also made cooperation and coordination between colonias difficult. "The key to dealing with the problems in the colonias is to build effective leadership in the colonias" (Texas Low Income Housing Information Service, 1998). Community members have come together through self-help groups to improve water, sewer and living conditions in the colonias. It is a continual struggle for these groups to match

assistance programs designed for urban areas to the needs of their rural colonias. To help alleviate this, the Border Low Income Housing Coalition was formed as a policy roundtable for colonias' residents, policy makers and private entities to come together to ensure that programs work for the colonias (Texas Low Income Housing Information Service, 1998).

Texas is attempting to limit the growth of colonias through laws designed to prevent the development of new colonias by developers. Enforcement of these laws has been difficult. Some officials believe that the only way to improve the colonias situation is to increase regulation and stop growth of the communities. Others believe that with more funding, community self-help programs and county participation the colonias can become healthy communities (TNRCC, 1999).

### New Mexico Colonias

Individual wells are too costly for people in most New Mexico Colonias to be able to afford. Water rights are also difficult to obtain and not always available. Hauling water is the only practical alternative to a piped water system and this is costly, time consuming and difficult. Fees for a piped water system are less expensive than the fees incurred by hauling water. Sewer systems for Colonias residents are often septic systems with leach fields when they can afford them. New Mexico has focused on improved water service to the Colonias. Piped sewer systems are not expected for at least another five years.

The Colonias in New Mexico receive funding for water improvement projects primarily from the United States Department of Agriculture (USDA) Rural Development. This is a formal funding process. Colonias communities in New Mexico that desire to develop their own water resources with funding from USDA Rural Development are required by the USDA Rural Development to form Mutual Domestic Water Consumption Associations or Cooperatives. These associations and cooperatives are run by a board composed of volunteers. The water utility projects are community owned and run. The associations and cooperatives accept responsibility for the repayment of any loans associated with the projects and funding is only available for community water projects not private individual water services.

The water associations work with engineers from the outset of the projects. The engineering firms carry the costs of their work for the duration of the project and are paid at its conclusion. They work with the community groups to perform such tasks as applying for

funding, letting bids for construction contractors, providing preliminary engineering designs, submitting the required paperwork to the USDA Rural Development, obtaining necessary rights-of-ways, recommending customer fees and training the Mutual Domestic Water Consumption Association and Cooperative staff. Engineers work with the communities on all aspects of the utility system including training on how it works and how to maintain it both administratively and operationally. Community involvement is also a key factor throughout the course of the projects that helps keep people informed and facilitate the success of the project.

Funding for the projects is provided by state and federal appropriations. Grants rather than loans are available to communities that qualify. A community must have a specific proportion of their members at or below poverty level to qualify for grant funding. It is unclear if subsidies are or are not available for operations and maintenance fees for the systems. They appear to be available for exceptional cases.

The water improvement projects usually take one to two years to complete. The company offering the lowest sealed bid for construction of the project is awarded the contract. The Mutual Domestic Water Consumption Association or Cooperative is given ownership of and the responsibility for the water utilities after they are built. The groups often contract out for operations and maintenance services for the utility. The associations and cooperatives may contract with other utilities or with contractors to operate and maintain the communities' water systems. Contractors are also used for such things as electricity maintenance.

The operation and maintenance costs of the utility are factored into the fee structure and passed on to the customers. In the Desert Air Water Association, approximately 70 miles outside of Las Cruces New Mexico, customers pay $24.00 per month per household for water service. This is a base rate for 3,000 gallons of water per customer per month. Rates increase with increased consumption. Customers pay $1.00 per 1,000 gallons for the first 4,000 gallons in addition to the base amount, $1.25/1,000 gallons for the next 4,000 gallons, $1.50/1,000 gallons for the next 4,000 gallons and $2.00/1,000 gallons for any additional water consumed above 15,000 gallons. Most household incomes in this area are below the poverty level and have a gross annual income of approximately $15,000. These fees factor in the costs of the system as well as the projected number of connections to the system. The monthly rates have not been a problem for the customers in the Desert Air Water Association. Water rates in many locations promote water conservation to minimize costs and demands on the systems. Utility fees are

recommended by the engineering firms working with the associations and cooperatives, but are approved by the funding agency. The associations and cooperatives are run like businesses even though they are not-for-profits. If customers fall behind in payments they are served a notice and are then shut off from the service if they do not reconcile their accounts.

(Phone conversations with Manny Casada, Desert Air Water Association, New Mexico, November 2, 2000; Sandra Alarcon, Loan Specialist, USDA Rural Utility Service, New Mexico Field Office; November 7, 2000; Martha Torrez, USDA Rural Utility Service, New Mexico Field Office, October 27, 2000; and Adrian Widmere, Professional Engineer, Molzen-Corbin and Associates, October 30, 2000.)

## *5.5 Appalachia*

As defined by federal legislation, Appalachia contains 399 counties in 13 states. All of West Virginia, and portions of New York, Maryland, Virginia, Kentucky, North Carolina, South Carolina, Mississippi, Ohio, Pennsylvania, Alabama, Georgia and Tennessee are part of Appalachia as defined for the purposes of the Appalachian Regional Commission (ARC). The Appalachian Regional Commission is a regional development program created to "provide public works and economic development programs and the planning and coordination needed to assist in development of the Appalachia region." The ARC coordinates federal, state and local planning and brings together federal stature and funding, state governors and local development districts. It supplies federal funds for state priorities, helps build local capacity, and provides a venue for state and local preferences at the national level (Isserman and Rephann, 1995). The ARC has been involved in a variety of projects that have improved water and sewer systems in Appalachia (ARC, 1997).

The Appalachian Regional Commission is a funding source for a variety of projects in Appalachia. It partners with Federal and State agencies to combine funding for projects. The ARC funds both new construction projects and upgrades to existing systems. Funding is not provided for operations and maintenance costs. The local Public Service Authority is given ownership of the utilities and responsibility for their operations and maintenance costs once they are built. (Phone conversation with Molly Theobold, Director of ARC Goal 2, Physical Infrastructure, October 6, 2000.)

## 5.6 Virginia

Virginia is encouraging innovative projects that address the water and sewer needs of its rural residents. The state is encouraging residents to become involved in Self Help Virginia projects where residents can help themselves to improve their own water and sewer systems. The projects use volunteer labor and community involvement and coordination as their basis. Dealing with volunteers can be labor intensive and difficult but peoples desire to have water provides the motivation to complete the projects. Self Help Virginia projects started approximately three years ago. Texas was the first state to implement Self Help projects.

"Self Help Virginia is a resource for small communities to meet the challenge of creating viable and affordable water and wastewater systems. The Program operates within Virginia's Community Development Block Grant Program and uses a problem-solving, dollar saving approach that is outcome oriented. The goal is to tap neighborhood talent, manpower and creativity to provide water and sewer services in areas where those services are difficult to provide through conventional means. In the process, the Program stretches limited financial resources to assist more communities than would be otherwise possible." (Virginia Center on Rural Development, 2000.)

Self Help Virginia projects are designed to have a simple informal application process with minimal paperwork. The Self Help Virginia projects are projects that would otherwise not be funded through the traditional more complex competitive process. The projects are those that have not met the criteria for traditional funding and have little prospects for obtaining it. Funds for the low interest loans used for the projects are obtained from Community Development Block Grants, USDA Rural Development, and the Appalachia Regional Commission. General assembly funds may also be available. Projects can be funded 100% on a grant basis with no repayment necessary. Communities are obligated, however, to contribute money to their project. This is usually a small amount of $5,000 or less. User fees are used to cover any loan costs, when loans are obtained, and the operations and maintenance costs of the systems. Grants are available to subsidize rates to an affordable level for communities. Affordability is based on water and sewer costs being approximately 1% of the median household income. Self Help projects are typically only 45 % of the cost of similar conventional projects.

Self Help Virginia projects are done on a first come first serve basis. The process consists of the following steps:

1. Self Help projects are promoted throughout communities by the Public Service Administrations (PSA);

2. A community shows interest in a Self Help project;

3. An income survey is completed to identify if the community can meet the Community Development Block Grant criteria;

4. The Center on Rural Development meets with the community to discuss the project and assess the communities readiness to do the project and dedication to completing the project;

5. The community's capacity is evaluated. Are there enough people with the skills and abilities to complete the project? Are there spark plugs (person or persons, who are able to take an idea and make it work) to take charge of the project? If a community is not found to have the capacity needed to complete a project, the community is denied funding at that time, told what capacities they need to develop, and are encourage to reapply after they have developed those capacities;

6. The Virginia Department of Housing and Community Development conducts a cost estimate, preliminary engineering design work, conducts community training and assigns volunteer tasks.

There is a Public Service Administration (PSA) employee that oversees the project from start to finish. The Health Department is also involved early on to make sure the system meets all their requirements and so that the PSA engineer involved knows exactly what is expected so he/she can then develop a realistic budget. Funds are distributed by the Public Service Administration during project construction. The engineer involved relies on this PSA employee to relay project progress status to him/her so that he/she is able to stamp the project upon completion. The community has a vested interest in the project and they make sure it is completed per the specifications set out by the engineer to minimize delays. The Public Service Administration is given ownership of the utility upon the completion of construction.

The Self Help program in Louisiana encountered difficulties when contractors litigated against losing potential work to communities who were completing projects through the Louisiana Self Help program. The contractors sued the state and forced the state into soliciting bids on projects that were over $50,000 and not allowing the Self Help program to use the community volunteer base for these projects that could have otherwise been used.

(Phone conversation with Jimmy Wallace, Community Representative, Virginia Department of Housing and Community Development, October 6, 2000; Jim Spencer, Public Service Administration Administrator, Tazwell County, Virginia, October 31, 2000; and Self Help Virginia Program information packet adapted from materials developed by The Rensselaerville Institute as part of their Small Towns Environment Program.)

## Virginia Case Studies

Water and sewer systems throughout Appalachia are old and often inadequate. The following three cases studies describe how communities are attempting to help themselves to improve water and sewer services in rural Appalachia.

## Bishop and Amonate

The Appalachian Regional Commission helped fund the restoration of two communities' water supplies on the West Virginia-Virginia border. Community cooperation across state lines provided the basis for the success of the project. Both communities had deteriorating water supply systems that were originally maintained by the local coal companies. As the coal industry deteriorated the coal companies sold the utilities to private companies who over time stopped maintaining the systems due to failing economies (Hoffman, 1998).

The water supply for one community system was of good quality but was being contaminated by its holding tank, which was falling to pieces. The pipes for the system were so deteriorated that most of the water leaked out of the pipes before it reached customers. The other community water system treatment facility was failing. Chlorine was no longer being added to the water and there was no plant operator. The water supply was unreliable as was the quality of the water when it did flow through the system (Hoffman, 1998).

The project was complex as it had two water systems that each crossed state lines, two states involved, two counties, two health departments, two planning districts, two public service authorities, and two isolated communities with no budgets. It was determined that it would have been less expensive to move the communities than to fix the water systems. Moving the community, however, was not what anyone involved wanted. Innovation became the key to the success of the project. This innovation came in the form of one state administering another state's funds. The Virginia Community Development Block grant program administered federal funds that a West Virginia county obtained from the Appalachia Regional Commission. This

cooperation was essential as neither state was able to develop its own system and had to work together and share costs and facilities. The systems are now separate and both counties have reliable clean running water to drink, supplied by their original water sources. Water costs have substantially decreased and service is better than ever according to local residents (Hoffman, 1998).

### Smith Ridge

Over half of the residents of Smith Ridge Virginia cooperated to provide themselves with a public piped water system. The community set out to install the system and astonished agencies with their speed, efficiency and collective efforts. It was estimated that the project cost approximately 75 percent less than a conventionally installed system and took 80 days rather than six to nine months (Baldwin, 1998).

Prior to the project, residents in Smith Ridge used cisterns, wells and springs for their water supply. Mining activities were threatening the quality and quantity of the local water supply and catchment systems would run dry and had health risks associated with them. The Virginia Department of Housing and Community Development was looking for an opportunity to launch a new program entitled Self-Help Virginia. At the same time, Smith Ridge was trying to see how they could get a piped water system. Smith Ridge became the pilot project for the program. The Self-Help Virginia program is based on the Small Towns Environment Program (STEP) developed by the New York Rensselaerville Institute. The STEP program functions on the principle of communities reducing the costs of water and sewer projects by using volunteer labor (Baldwin, 1998).

The STEP program requires that a community must realize it has a problem, gather enough qualified volunteers to complete the project using more volunteer hours than paid hours, and identify a leader from the community who will spearhead the project by coordinating and motivating everyone involved until completion. The total cost must be at least 40 percent lower than the cost of the same system conventionally installed. Smith Ridge met these criteria. The local county Public Service Authority provided the heavy equipment necessary for the project, two people to operate the equipment and one construction supervisor. Technical assistance was provided by the Rensselaerville Institute's office in Austin, Texas. Almost all of the able-bodied adults in the community worked on the project. Work crews installed piping, volunteer cooks

provided meals for the work crews and a local grocery store and two fast food restaurants donated meals several days a week. Volunteers laid almost seven miles of pipe and connected 62 houses and 4 churches to the main line.

Tazwell County has a population of approximately 45,000. It is composed of communities with populations of 5,000-7,000 people and communities as small as 45 households. All of their water and sewer systems are piped systems. The annual median household income is $22,000-$24,000. The county attempts to keep water and sewer costs below 1% of the median household income. Currently, costs are $22.00 per month for water and $22.00 per month for sewer services. (Phone conversation with Jim Spencer, Public Service Administration Administrator, Tazwell County, Virginia, 2000.)

### North Carolina

Madison County in North Carolina developed a program that would eliminate the use of "straight-pipes" that pipe sewage and gray water directly from houses into streams and onto property. The program was carried out in cooperation with state, federal and local partners including conservation groups and the Appalachian Regional Commission. As of 1990, approximately 50,000 homes in North Carolina were not connected to municipal water or sewer systems nor did they have sufficient septic systems (Baldwin, 1999).

A local development district that represented several governmental units in four Appalachian counties coordinated the straight-pipe elimination process. Using state and ARC federal funds the district conducted a survey and a community planning process. An extensive list of partners including local community members coordinated an effort to test every building in Madison County that was not connected to the water and sewer system. Care was taken not to single out any particular portion of the community and to make the search for faulty systems fair for all of the residents. Health department employees went door to door to speak with residents. To the Health Departments' surprise, the cooperation of community members was overwhelming. Many residents did not understand their own waste disposal system and were not aware of the potential affects it could be having on the environment (Baldwin, 1999).

Finding funding for people to correct their waste disposal systems was tricky. Conventional funding sources through the county did not have the legal flexibility to provide the necessary loans. A statewide non-profit, the Center for Community Self-Help, that loans money

for community development was called upon. The non-profit made the loans from its funds and used the county's traditional loan fund as collateral. Although more complicated, this allowed riskier loans to be made to those people needing funds to correct their systems.

Madison County was able to set aside worries about making politically safe decisions and about admitting that it had a straight-pipe problem and made it possible for the community to pull together to improve water quality, financial responsibility and pride. Madison County's goal is to replace 130 straight-pipes by the end of 2000 (Baldwin, 1999).

## *5.7 Developing Countries*

Clean water and sanitary wastewater disposal are concerns of developing countries throughout the world. As of 1993, approximately one billion people did not have sufficient water supply services and 1.7 billion did not have sufficient sanitation services (World Bank 1992, Briscoe, 1993). The World Health Assembly passed a resolution in 1980 to provide safe water for all by the year 1990. This goal was not attained and the deadline was pushed back to the year 2000. There is a need for *affordable* safe water throughout the developing world. As one observer writes, "There are many ways to build a system and a modest program that can be executed is to be greatly preferred to an elaborate one that never gets off the paper" (Emmanuel, 1994). Water and sewer services increased in the developing world during the United Nations Water and Sanitation Decade during the 1980s. There is, however, still a great shortage of services, and systems that do exist are often poor and fraught with leakage and failure problems.

The World Bank (1993) found that most rural residents want and are willing to pay for relatively high levels of service and would pay substantially more for reliable service. More people would also be able to make use of services if flexible and innovative financing was feasible.

Providing affordable sanitation services to rural residents is a technical challenge, but several simple system types do exist. Pour-flush latrines and ventilated improved pit latrines are often used because they provide good service, privacy and have few odors and the cost is low in comparison to other technologies (Kalbermatten, Julius, Gunnerson, and Mara, 1982). Slab latrines are also a low cost option that is often used. Many countries are using an effluent sewage system, an innovative cross between a septic tank and a conventional sewer system. This technology prevents solids from entering the sewer system, allowing it to be constructed at lower

cost by using flatter gradients and fewer manholes. Simplified sewage systems similar to this have been used in the United States, Brazil, Pakistan, Australia, Argentina, Colombia, India, Mozambique and Zambia (Briscoe, 1993).

Chile has employed a tariff structure to impact the amount of wastewater produced by customers to reduce capital costs by reducing the volume of wastewater to be treated. The fee structure developed by Chile's Superintendencey of Sanitary Services calculates rates based on the replacement value of existing installations, expected service levels and a 15 year investment program. Maximum rates are fixed and are applied gradually over five years slowly increasing to eventually cover the full cost of the services. The program also incorporates subsidies for low-income consumers. The program is reported to be an effective method for building and replenishing water and sewer infrastructure (Looker and Burnside, 1998).

Greater involvement of the private sector in water and sewer systems development, operations and maintenance has also been found to be beneficial. The Cote d'Ivoire has been a pioneer of private sector operation of water and sewer utilities. The utility in Abidjan is considered one of the best-run utilities in Africa. Macao privatized its water utility in 1985 and showed substantial improvements in performance, consumption doubled and water that was previously unaccounted for fell by over 50 percent in six years. The financial condition of Guinea's water utility has improved due to increased collections rates since the leasing of the utility (Briscoe, 1993). In 1995, Brazil implemented the Concession Law for Public Services. The Concession Law allows municipalities to transfer the operations of public utilities to the private sector. Although the investments made into the new systems are to be recovered though fees over a 15-30 year period a major constraint on the implementation of the concession projects is a lack of financing resources (Looker and Burnside, 1998).

The experiences of the United Nations Development Programme-World Bank Regional Water and Sanitation Group have led them to suggest the following practices for water and sewer system development. Systems engineering must employ a flexible design practice by which past experiences and the experiences of others must be drawn upon to ensure successful implementation of a system and liaisons to bridge community agency relationships are necessary. Excessive bureaucracy should also be avoided as it hinders the development, operations and maintenance of systems. Programs have also encouraged inter-regional communication and the exchange of experiences and ideas (Dayal and Lochery, 1994).

The Community Water Supply Management Project in Kenya's Western Province is designed to increase community management skills for the implementation, operation and maintenance of water facilities. The International Water and Sanitation Center was requested by the Finnish government to organize a workshop to allow the exchange of ideas from others in the Kenya region given that the issues facing Kenya are similar to those being faced by other surrounding nations. People working in community based water projects from Ethiopia, Kenya, Namibia, Tanzania, Uganda and Zambia participated in the workshop. The workshop allowed participants to discuss their experiences and share information regarding successful management systems and the pitfalls that often arise in developing water and sewer systems.

It is widely noted that a positive and productive partnership between communities and governments and participatory community involvement at all levels of the water and sewer development process is crucial to the sustainability of the systems. Powers (1994) notes that "for international aid projects to be successful, they must engage the input and commitment of the entire community." The key to the long-term use and maintenance of wells in Ghana has been giving villagers a sense of responsibility and empowerment from the outset of the project to improve water and sewer systems. Villagers in Ghana were taught how to repair wells and proper maintenance. "This helps them see the project as belonging to them, and if they don't feel that way, the wells break down and the people go back to the old way of doing things." (Josephine Allen of Cornell University as quoted by Mike Powers, 1994).

Sri Lanka has committed to providing complete water supply and sanitation coverage throughout the country by the year 2010. Project efforts there have found that project planning that does not involve local beneficiaries of the services causes problems for system implementation and limits the effective use and maintenance of the system due to a lack of ownership. Service was sustained in the sanitation improvements where community members took a leading role (Pinidiya and Minnatullah, 1994). A development program in Sarvodaya, Sri Lanka is using an integrated development model that builds community psychological infrastructure, social infrastructure, community services and financial capacity. In this development model funds supplied by the government for water and sewer system development are complementary to the funds, materials and labor that villagers can provide. All critical decisions about the system are made by the community. This integrated approach to the

improvement of water and sanitation services has been successful in Sarvodaya (Ariyaratne and Jayaweera, 1994).

The Department of Water Affairs and Forestry in South Africa is involved in a program of local government support of water and sanitation services development. South Africa's constitution requires the "real engagement of local people in governing and running their own affairs" (Abrams, 1996). Abrams (1996) suggests local capacity building as a means, in part, to accomplish this mandate. "Experience throughout the world indicates that where local people are not responsible for local services, sustainability of development is not achievable." Communities all have some level of capacity and capacity building is merely the process of building on those existing skills, abilities and knowledge. It is important for sustainable water and sewer system development, operations and maintenance that a community has the necessary minimum threshold levels of technical skills and abilities, public awareness, economic health and support infrastructure. The threshold capacity must be maintained in all of these areas. If it is not maintained in all areas a "domino" effect often takes place where the capacity in one area falls below the allowable threshold, other capacities follow and the system fails. Water supply and sanitation development cannot be undertaken in isolation from other development issues in communities (Abrams, 1996). Substantial institutional strengthening is often necessary to help local governments deal with the new administrative and financial responsibilities associated with water and sewer system development (Looker and Burnside, 1998).

## *5.8 National Park Service*

The National Park Service (NPS) is working with gateway communities to solve park and community shared utility issues. At Glacier Bay National Park, the Park Service is working with the community of Gustavus to treat community sewage along with Park sewage. Gustavus has no community water and sewer system. Water is obtained mostly via individual wells and septic tanks are used for sewage disposal. The community has no sewage pumping facilities and contracts with the NPS to pump the septic tanks and take the sludge to the park treatment facility. The NPS treats the sewage in the shoulder seasons. This increases the treatment plant efficiency and provides an increased food source for the bioorganisms at the plant. The NPS and Gustavus are also working together to develop a solution to the community's and park's solid waste disposal issue. They are working toward a system that would allow the community to process

both community and NPS solid waste in the community landfill or in the Park Service incinerator if it is moved onto community property.

Cold climate issues have generally not been a problem for the National Park Service. Typically they do not need to install water and sewer systems in areas with permafrost. A site in Yukon Charley National Park is an exception to this. The National Park Service needed to install water and sewer service at a site in the park and encountered permafrost and poor soils. Due to the remote location and because the nearest other water source was over 25 miles down water gradient from the site they are inquiring about a waiver from the Department of Environmental Conservation that would allow for an outhouse and gray water discharge to a leach field for the site. The Park Service is, however, phasing out pit toilets.

The NPS often generates electricity for parks and buys fuel under government contract. In Jacksonville, Wyoming and Yellowstone, Montana the National Park Service is trucking in natural gas for fuel rather than diesel because it is a cleaner fuel. Some parks have switched to propane, which is also cleaner than diesel. The National Park Service is considering alternative technologies such as wind energy, sewage composting and using ultraviolet treatments for sewage in remote locations.

(Phone conversations with Dutch Scholten, Facility Manager Specialist, Denali National Park, October 5, 2000; Tim Hudson, Chief of Maintenance, Yellowstone National Park, October 6, 2000; Bill Heubner, Civil Engineer, National Park Service, Alaska Support Office, October 5, 2000.)

# 6. Current Subsidies and Incentives in Rural Alaska

## *6.1 Introduction and Summary*

This section considers current subsidies and assistance programs and their incentive effects on the behavior of utility managers. All of the major utilities are subsidized, to some degree, in both urban and rural Alaska. The Power Cost Equalization Program (PCE) is highly visible but has an economic present value of less than $7,500 per recipient, compared with more than $10,000 per resident of the Four Dam Pool service territory. More than $1.5 billion has been spent on rural water and sewer capital projects, but Anchorage also benefited from more than $200 million in water project funding during the 1980s. While provided by private firms, telecommunications are also highly subsidized, with rates held down by the annual inflow of about $120 million from out of state ratepayers and federal sources. There has been little previous cash expenditure on bulk fuel and solid waste subsidies, but current estimates indicate a backlog of several hundred million dollars in needed repairs and replacements.

Current rural utility subsidies and assistance programs have seven major incentive effects. First, they are biased toward capital-intensive water and sewer technologies. Second, understaffed agencies are under extreme pressure to move large amounts of money and to measure success by the number of projects completed. In this environment, it is very difficult for agencies to devote resources to the community planning and interaction required for sustainability. Third, current programs tend to respond to perceived “needs,” rather than rewarding sustainable performance. Fourth, the programs provide large amounts of targeted support for capital construction, but little or no targeted support for preventive maintenance. Fifth, PCE rules reward high-cost operations and encourage the loading of general government costs onto the electric utility. Sixth, cost-saving innovation is discouraged. Finally, current subsidies focus on the supply side and can penalize efficiency improvements.

## *6.2 Current Utility Subsidies*

### Electricity

Power Cost Equalization (PCE) is an ongoing, visible state support program that provides about $15 million per year to partly defray the cost of electricity to about 80,000 rural Alaskans. For the first 500 kWh per month purchased by each residential customer of an eligible utility, PCE reimburses the utility for up to 95 percent of the eligible costs that fall between a "floor" amount and a "ceiling" amount. For FY2000, the floor was set at 12 cents per kWh and the ceiling at 52.5 cents per kWh. Community facilities as a group can also receive the monthly credit applied to up to 70 kWh per person. PCE operates using a maximum total funding amount. In recent years, this amount has not been sufficient to allow 95% reimbursement, despite increasing restrictions on program eligibility. In FY99, for example only 85% of the difference between actual costs and the floor amount was reimbursed for most of the year.

**Example of how PCE Works**

Assume that total allowable cost of power = $.40
and customer uses 400 kWh in a given month. Then,

| | | | |
|---|---|---|---|
| PCE Credit per kWh: | .95 x (.40 - .12) = .95 x .28 = | $ 0.266 | per kWh |
| Electricity Charges: | 400 kWh @ $.40 per kWh = | $ 160.00 | |
| less Total PCE Credit: | 400 kWh @ $.266 per kWh = | (106.40) | |
| Equals customer's electric bill: | | $ 53.60 | |

Currently the PCE subsidy amounts to $437 per household, which amounts to about $225 per *person* per year. If the program continues forever, it has a maximum possible net present value of $7,500 per person (assuming a 3% discount rate). Railbelt intertie projects, with a present value cost amounting to about $1,000 per person served, are also a significant source of subsidy to urban consumers. At the end of the spectrum, the Four Dam Pool hydroelectric projects had a total one-time grant-funded cost of $300 million, or about $10,000 of net present value per person served.

A 1997 analysis for the Governor's Blue Ribbon Panel on Power Cost Equalization reported the following summary of energy-related subsidies flowing through the Division of Energy.

**Table 6**
**Energy Funding to Rural, Railbelt, and Four Dam Pool Populations**

| Group | Energy Funding ($ Millions) | 1997 Population | Funding Per Capita |
|---|---|---|---|
| Rural | $399.5 | 98,087 | $4,073 |
| Railbelt | $562.7 | 439,572 | $1,280 |
| Four Dam Pool | $338.4 | 35,095 | $9,642 |

Note: Four Dam Pool funding in this summary includes 26.5 million in withheld debt service and 13.5 million designated for the Southeast Energy Fund.
Source: Alaska Division of Energy, 1998. Tabulation of energy subsidies prepared for Governor's Blue Ribbon Panel on PCE. Supporting data available from ISER or the Division.

Within the sphere of rural electricity, stand-alone village utilities are not the only recipients of capital subsidies. Our analysis (see the following section) shows that regional coops and communities served by private sector firms are also recipients of these subsidies.

### Water and Sewer

While more than $1.5 billion has been spent on rural water and sewer capital projects during the past 30 years, urban areas have also received substantial capital subsidies for their sanitation projects. Between 80 and 95% of Anchorage water and sewer capital infrastructure has been publicly funded, with more than $200 million of state and federal dollars spent between 1979 and 1985. In addition, a critical exemption from Clean Water Act requirements allows Anchorage to discharge its sewage into Cook Inlet without incurring the significant cost of secondary treatment.

Very little is spent on rural operations and maintenance support, in contrast to the large sums spent on capital construction. The Remote Maintenance Worker (RMW) program now costs about $1.2 million[15] and serves about 170 villages,[16] while the Rural Utility Business Advisor Program (RUBA) also costs about $1.2 million and serves about 50 villages.

[15] About 75% of this amount was federal funding in FY2000.
[16] According to the RMW Program 2000 Annual report. Some observers have suggested that fewer than 170 villages are actually served in a substantial way.

Both the RMW and RUBA programs have demonstrated their ability to make measurable improvements in management and maintenance practices. In a recent survey,[17] 52 communities served by the RUBA program reported the following improvements due to RUBA assistance:

- 20 out of 52 water/sewer utilities became completely self-supporting (excluding capital replacements). More than 20 others demonstrated an ability to become self-supporting with limited subsidies from local sources.
- 41 of 42 utilities reported a significant decline in service interruptions and improvement in service reliability.
- 29 of 34 utilities owing back payroll taxes became current with the IRS.
- 46 of 52 utilities implemented or improved an accounting system.
- 17 of 23 utilities retired significant amounts of debts owed to vendors.
- 44 of 47 utilities collected payments owed to them.

## Telecommunications

Telecommunications are often thought of as a good example of a utility service efficiently provided by the private sector. However, it is important to note that telecommunications are among the most highly subsidized of all major utilities. Based on a review of rate filings and other cost data, we estimate that more than $120 million flows into Alaska from lower 48 ratepayers and federal taxpayers to support our telecommunications infrastructure. These inflows are the result of two factors. The first is a set of regulatory mechanisms (such as the universal service fund and "geographic averaging") that basically seek to equalize rates across state lines. The second factor is the direct provision of capital equipment such as satellites. In rural Alaska we estimate that more than 85% of the total cost of residential telephone service is subsidized, thereby reducing the cost of telephone service by about $1,000 per year for a typical rural household. The substantial subsidy pool makes it attractive for private firms to enter and serve this market.

## Bulk Fuel and Solid Waste

Between 1992 and 1999, at least $23 million of mostly federal funds was spent on piping and tank farm replacements and upgrades (Division of Energy 1999). Beginning in FY1999, the Denali Commission identified bulk fuel as a priority funding area. The commission estimates that more than 45 million gallons of bulk fuel storage capacity need repair or replacement, while

[17] Results from a 10-question, closed ended survey administered to 52 communities served by the RUBA

the Division of Energy estimated the cost of these repairs at approximately $4 per gallon of capacity, *not counting* associated environmental remediation. These figures imply a total required subsidy to bulk fuel storage of at least $200 million if the systems are to be brought into compliance with current safety and environmental codes. Originally, Denali Commission bulk fuel projects were selected based on a state-generated list based on health and safety. This original list did not address long-term strategies for O&M. The Denali Commission now requires that new bulk fuel project recipients develop a business plan as part of their project implementation. The Commission intends to refine and strengthen their commitment to O&M strategies based on information and potential policy changes associated with this study.

The situation is much the same for solid waste: While little cash subsidy has been provided in the past, the identified future cost of converting open dumps to satisfactory alternatives is likely to exceed $60 million, according to the Indian Health Service Sanitation Deficiency System.

## 6.3 Rural Utility Funding Priority Processes

Summarized below are the processes used by several funding agencies to determine funding priorities for utility upgrades in Alaska. The Alaska Industrial Development Authority, Alaska Energy Authority, Denali Commission, Alaska Native Tribal Health Consortium, Village Safe Water Program, and the Environmental Protection Agency were contacted to obtain this information.

This review indicates that the major funding agencies use a common sense approach to project funding decisions, with significant use of qualitative factors and professional judgment. This is particularly true when considering operations and maintenance capability and community commitment. Both of these areas are of course extremely difficult to objectively measure. The other major conclusion from this review is that some notion of need drives the process. Need is probably easiest to assess for water and sewer upgrades, since many communities still have not made the initial quantum jump from honey buckets to some other system. Applying the criterion of “need” becomes more difficult for electric and bulk fuel systems, because most communities already have *some* form of central power generation, and it is possible that current need is a function of past neglect.

---

program during year 2000, provided by Michael Black, Alaska DCED, April 2001.

## Alaska Industrial Development Export Authority (AIDEA)[18]

AIDEA funding priorities for bulk fuel and electric utility upgrades are based on need. Communities that demonstrate the greatest need for funding are allocated funding prior to those demonstrating less need. The physical condition of a facility has been the primary basis for project selection for bulk fuel storage. Those communities with tank farms in the worst average condition are at the top of the funding list. These priorities can be modified based on a number of additional factors, which include but are not limited to:

- The availability of supplemental funding for a particular project. For example, if a local government has obtained an Indian Community Development Block Grant from the Department of Housing and Urban Development for a consolidated tank farm, AIDEA may move it up on the priority list to take advantage of the time-sensitive opportunity.
- Federal tax liability. AIDEA will not go ahead with a project if the local government is in arrears to the Internal Revenue Service (e.g. for taxes that should have withheld from employee pay)
- Community cooperation. For example, the proposed tank farm participants need to agree on a site and project configuration in a timely fashion.

The condition of existing electrical utility facilities has also been the primary factor used to prioritize AIDEA's electric utility projects. AIDEA's rural electric utility database includes information on the physical conditions of virtually all rural communities' electric utilities and also includes some indicators of the utility's recent operations maintenance and management (OMM) performance. AIDEA's current intent is to prepare two separate rankings of rural communities. One ranking will be based on the physical condition of facilities and the other based on the operations maintenance and management indicators. This information will then be brought to the Denali Commission so they can determine if they want to blend these two ranking methodologies and, if so, what weights they wish to place on the OMM ranking and the physical condition ranking.

[18] AIDEA information provided by Richard Emerman, via e-mail and interview.

## Alaska Native Tribal Health Consortium (ANTHC)[19]

There are three primary funding allocation systems in Alaska. Approximately 85-95% of the funds allocated for water, sewer and solid waste utilities are allocated through the Village Safe Water program and the Indian Health Service sanitation deficiency system and the housing priority system programs. The remaining 5-10% are miscellaneous funds from sources such as the Department of Transportation funds for roads and boardwalks, Housing Authority subdivision funds, Community Development Block Grants and Municipal Improvement funds.

The Indian Health Service (IHS) and the Village Safe Water (VSW) funding programs are closely related. Both VSW and the IHS Sanitation Deficiency System (SDS) funding systems evaluate projects based in part on operations and maintenance capabilities and the existence of matching funds. Often the matching funds for a project under the IHS program are funds from VSW and vice versa. Unlike VSW, IHS also scores projects based on the cost per household. Projects with lower costs per household get higher scores. The SDS scoring system also scores the deficiency level of the existing services. The lower the service the higher the score. As a result of this, SDS funding favors funding projects that address low service levels as opposed to projects that propose to renovate higher service systems that are in need of repair. The IHS allocates funds through the Sanitation Deficiency System and the Housing Priority System (HPS). The SDS allocates IHS regular monies, EPA Clean Water Act Indian set aside funds and EPA Safe Drinking Water Act tribal set aside funds for existing Native homes. The Housing Priority System allocates funds from the IHS housing funds. The HPS provides funding for water and sewer hook-ups or wells and septic for like-new or new homes.

The total identified sanitation need in Alaska is approximately 850 million dollars. This is determined every year by the IHS. Recently the SDS program has been allocating $21-$26 million and the Housing Priority System (HPS) approximately $6 million. Current need for the HPS funds is approximately 70% of the available funds. The remaining HPS funds may be used for core infrastructure improvements.

In addition to several major projects, IHS funds approximately 75-100 projects each year under one million dollars. These projects are usually each a piece of a larger project. The IHS funding systems do not consider the overall cumulative cost of a set of a project. Projects are

[19] Bill Griffith, telephone interview, February 2001

typically funded in individual phases over time and the overall costs are not evaluated when considering additional phases. IHS does not formally consider what communities can afford in relationship to the type of system being funded.

### Village Safe Water (VSW)[20]

Priority Criteria for Village Safe Water's (VSW) capital budget is based on six main categories and is divided between planning projects and construction projects. Planning projects are automatically considered fundable and are not scored. This is to encourage planning prior to construction. Construction projects are scored and the highest scoring projects are funded first. The six main categories used to score projects for funding priority are:

1) The problem being addressed
2) Project development status;
3) Other funds involved;
4) Operations and maintenance capabilities;
5) Relationship to other project phases;
6) Community resolution supporting the project as a community priority.

Project proposals receive points for addressing public health and pollution concerns; preparing engineering plans, feasibility studies or comprehensive plans; confirming federal matching funds; employing trained or certified operators; adopting rules and fee schedules or ordinances; identifying operations and maintenance costs; complying with state drinking water turbidity and bacterial sampling requirements; demonstrating how the proposed project relates to other community projects, community economic development and school/community facility consolidation; and providing a resolution signed by the community council that states the projects is their number one priority.

### Environmental Protection Agency (EPA)[21]

The Environmental Protection Agency system is closely tied to the Indian Health Service Sanitation Deficiency System (SDS). The SDS is used to establish funding priorities for the EPA. Funding priorities focus on the provision of clean and safe water. Tribes submitting projects to the Indian Health Service initiate the funding process. Projects are scored based on

[20] Lori Telfer, email exchanges, February 2001

the health improvements they will provide, the cost to the community and the systems' operation and maintenance capacity. The highest scoring projects are funded first. The scoring system is a nationwide system. Health impacts and operations and maintenance capacity categories are Alaska-specific. Proposals for the construction of new systems or the repair of failing piped systems are typically ranked with a higher funding priority than system upgrade projects that do not have as great an impact on health improvements.

### Denali Commission[22]

The Denali Commission generally uses the priority systems of other state and federal agencies to determine funding priorities. The commission may make recommendations or express concerns about others' prioritization mechanisms.

The following funding criteria used by the Denali Commission are intended to foster careful and systematic planning and coordination on a local, regional and statewide basis for infrastructure and economic development, and to strongly support local involvement in project planning and implementation. Projects should be compatible with local cultures and values; provide substantial health and safety benefit, and/or enhance traditional community values (these will generally receive priority over those that provide more narrow benefits); be sustainable; and have broad public involvement and support. Evidence of support might include endorsement by affected local government councils (municipal, tribal, etc.), participation by local governments in planning and overseeing work, and local cost sharing tied to the ability to pay.

Priority will generally be given to projects with substantial cost sharing and a demonstrated commitment to local hire. Commission funds may supplement existing funding, but will not replace existing federal, state, local government, or private funding. The Commission will give priority to funding needs that are most clearly a federal responsibility. Additional criteria for infrastructure projects include:

- A project should be consistent with a comprehensive plan.
- Any organization seeking funding assistance must have a demonstrated commitment to operation and maintenance of the facility for its design life. This would normally include an institutional structure to levy and collect user fees if necessary, to account

[21] Information from Dennis Wagner, phone interview, February 2001.
[22] Information from Charlie Walls and Joel Neimeyer via telephone and e-mail.

for and manage financial resources, and to hire and retain trained and certified personnel necessary to operate and maintain the facility.

- Proposals should include a cost breakdown by phase including breakout for design, construction and annual operations and maintenance.

Additional criteria for economic development projects include:

- Priority will be given to projects that enhance employment in high unemployment areas of the state, with emphasis on sustainable, long-term local jobs or career opportunities.
- Projects should be consistent with statewide or regional plans.
- The Commission may fund demonstration projects that are not a part of a regional or statewide economic development plan if such projects have significant potential to contribute to economic development.

The Denali Commission has opted to develop partnerships and act through its partners, such as the Alaska Energy Authority (under AIDEA) for energy projects. The Commission, in the area of energy, relies on the Alaska Energy Authority to do the planning, identify the state's rural energy infrastructure priorities and request funding for specific projects. To date the Commission has set aside $37.5 million for Alaska Energy Authority funding requests. This funding has been mostly for bulk fuel upgrade projects.

The Denali Commission is currently attempting to develop a process for funding “small” rural health clinics (typically a facility that serves a community with less than 750-year round residents). This funding process consists of ten steps: 1) Commission and other partner funding levels are determined and a short list of projects is developed; 2) communities are invited to participate in the funding process; 3) communities decide to participate in the project process, or not; 4) ANTHC, as one of the commission’s health facilities partners, initiates code and condition surveys and alternative site evaluations; 5) a request for proposals (RFP) is issued to the communities by the commission; 6) the commission determines if a community is eligible for new clinic construction or a renovation to the existing clinic; 7) technical assistance and workshops are provided to assist communities in responding to the RFP; 8) communities submit a proposal responding to the RFP; 9) proposals are evaluated and final design/construction lists are provided to ANTHC; and 10) ANTHC and the community begin the project as approved.

Initially approximately 50 out of 288 communities will be invited to submit proposals for funding for the small clinic program. The clinics that submit proposals must demonstrate their ability to sustain their programs over time and their ability to supply health care services. Funding will be available in the future for large clinic and projects dealing with the repair of existing facilities (short of major renovation). Funding priorities will be based on need and efficiency. A project must demonstrate a need for improvements to their existing health care facility or a new facility and the ability to make use of the funding quickly and efficiently.

## Sample Agency Criteria Lists

### AIDEA – Electrical Emergencies Program

The Alaska Industrial Development Authority provided the following Capital Budget Request information for electrical emergency funds for fiscal year 2002.

**Fiscal Year 2002 Capital Budget Request**
**Purpose of the Appropriation**

The Electrical Emergencies Program provides funds and technical support when an electric utility has lost the ability to generate or transmit power to its customers and the condition is a threat to life, health, and property in the community. Emergencies of this type result in the loss of communications, lights, refrigeration systems, washeterias, water and sewer systems, and the use of other basic infrastructure and equipment. Extended power outages can be costly and hazardous during winter months: water and sewer systems are subject to freezing and bursting, fire hazards increase, medical clinics and other public facilities may close, and public safety can be compromised. Based on past experience, out of the 80 small independent utilities in the state, assistance is provided to an average of 7 or 8 utilities per year.

Last year, AEA emergency response included the following:

- Diesel engine failures in Buckland, Akhiok, Chefornak, Nikolski, Ouzinkie, and Platinum.
- Distribution system failures, including downed poles and broken lines, caused by an avalanche in Cordova and by winter storms in Girdwood, Hope, Naknek, New Koliganek, Chignik Lake, Ekwok, and Koyukuk.

Capital appropriations in Fiscal Year 1998, 1999, and 2000 for the electrical emergencies program have been expended. AS 42.45.400 requires that catastrophe prevention programs be in place to assist rural electric utilities.

AEA attempts to obtain community contributions for emergency repairs although such contributions are not required. Many small communities served by the program have very little in the way of reserve funds that can be used to pay for emergency repairs nor can they ordinarily obtain third-party financing.

AEA contracts the emergency repair work to the private sector and provides contractor oversight to ensure that problems are corrected. Contractors travel to the site, providing technical assistance and procuring replacement parts and equipment as necessary. The appropriation covers the cost of contractors, local labor, procurement of materials, and AEA staff time required for contractor oversight and related work.

Emergencies are unpredictable and may result at any time from failure of old equipment, from human error, or from extremes in weather conditions. Repair costs are also unpredictable. Each emergency is priced by itself using standard construction practices for immediate repairs and follow-up repairs to ensure permanent performance. In cases where major expenditures are required, the system is repaired to perform at least through the winter months while AEA assists the community in obtaining funds for a permanent solution.

**Total Capital Appropriation Requested: $350,000**

## Department of Environmental Conservation – Village Safe Water Program

The following Priority Criteria have been provided by the Department of Environmental Conservation

VILLAGE SAFE WATER
PRIORITY CRITERIA
CAPITAL BUDGET
SFY 2002

**I Problem Addressed**

A. Public Health

1. An existing human disease event exists (documented by a recognized public health organization and reviewed by ADEC). Construction of the request capital project will correct the existing problem.

2. Current conditions are sufficiently severe that a disease event could occur but it has not been reported.

3. Conditions are not probable for a disease event to take place. The capital project is required to prevent or minimize the possibility of future public health problems.

B. Environmental

1. A documented pollution event has taken place and construction of this facility will correct the existing problem.

2. Current conditions are sufficiently severe that a pollution event could occur but it has not been reported.

3. Conditions are not probable for a pollution event to take place. The capital project is required to prevent or minimize the possibility of future pollution events.

**II. Project Development Status**

| | | |
|---|---|---|
| A. | Engineering Plans and specifications have been prepared. | 100 |
| B. | Feasibility study or facility plan has been prepared. | 50 |
| C. | Comprehensive study or master plan has been prepared which compares the need for the project with other community needs. | 25 |
| D. | No documentation has been prepared. | 0 |

**III. Other Funds**

| | | |
|---|---|---|
| A. | Confirmed federal funding available to match or complete project. | 100 |

**IV. Operation and Maintenance Capabilities**

| | | |
|---|---|---|
| A. | Trained operator or utility manager employed: Name and training date and sponsor, **and/or** | 75 |
| B. | Certified Operators:<br>1. State certified primary operator employed. Name and certification number.<br>***Operators must be certified by October 1 to receive points in this category.*** | 150 |

2. State certified backup operator employed. Name and certification number. 100

***Operators must be certified by October 1 to receive points in this category.***

C. Rules, Fee Schedules or User Fee Ordinance adopted. Copy submitted. 50

D. Operation & Maintenance costs and funding identified. 50

E. Compliance with State Drinking Water program turbidity and bacti sample submittal requirements for at least 9 of 12 months. 75

**V. Relationship to other Project Phases**

A. This project is needed to make the initial project phase functional. 150

B. This project is needed to promote economic development and local employment opportunities. Specific economic development potential must be identified or provide an explanation of how this project fits into long range utility plan. 100

C. Project construction coordinated with other projects and funding sources to promote cost efficiencies. Projects/funding such as ISTEA and AEA should be identified. 50

D. Village and school facility consolidation. 150

**VI. Resolution signed by council quorum submitted identifying project as the number one community priority.** 50

For questions regarding the above VSW Priority Criteria, please contact Greg Capito, Program Manager, Department of Environmental Conservation, Facility Construction and Operation/Village Safe Water; 410 Willoughby Avenue, Suite 105, Juneau, AK 99801-1795. Telephone: (907) 465-5137; Fax: (907) 465-5177.

## *6.4 Incentive Effects of Current Subsidies*

Current utility subsidies and assistance programs have at least seven major incentive effects:

- They are biased toward capital-intensive water and sewer technologies.

- Understaffed agencies are under extreme pressure to move large amounts of money and to measure success by the number of projects completed. In this environment, it is very difficult for agencies to devote resources to the community planning and interaction required for sustainability.
- Current programs tend to respond to perceived "needs," rather than rewarding sustainable performance.
- They provide large amounts of targeted support for capital construction, but little or no targeted support for preventive maintenance.
- PCE rules reward high-cost operations and encourage cost shifting and discourage cost cutting.
- Cost-saving innovation is discouraged.
- Current subsidies focus on the supply side and can penalize efficiency improvements.

We now describe each of these effects in more detail. It is critical to remember that these effects are generally the unintended outcomes of complex political and administrative systems. They are *not* the result of ill will or incompetence.

First, current subsidies are heavily if not totally weighted toward capital projects. This is especially true for water and sewer systems, for which ratepayers pay none of the capital costs but essentially all of the operating and maintenance costs. In addition, capital projects provide jobs and income to ratepayers -- as well as engineers and consultants -- during construction. It is easy to see that under these incentives it is rational for users to choose piped systems, which provide high levels of service, deliver more construction jobs, and tend to have lower day-to-day operating costs than flush haul systems. Unfortunately, the higher capital cost of piped systems means that that fewer can be built for a given amount of government funding.

Second, current agency structures reward direct accountability to the external agencies rather than to the communities they serve. Because their mission is construction-driven, the primary agencies do not have the focused resources to provide a distinct community planning function, which requires a different professional skill set than project-oriented scoping and design. In addition, most existing engineering staff are spread so thin that they simply do not have the time for meaningful interaction with communities. The project-based program structure and the extreme pressures to move large amounts of money through the system mean that

success is measured largely by dollars spent and the number of projects completed. A broader definition of success that placed more weight on long-term sustainability would likely lead to more attention to community planning, participation, buy-in, and up-front capacity development.

Third, current subsidies to rural Alaska utilities are generally designed to address some form of "need." In some situations, need reflects the total lack of utility infrastructure, and the current funding criteria are both ethically sound and responsive to the goal of providing basic services. However, current need may also reflect system failure due to past neglect of prudent maintenance. In extreme cases, current programs can reward the failure to maintain capital by replacing that capital when it fails, while offering little or no incentive for preventive maintenance prior to failure.

Fourth, there is little or no external support for proactive preventive maintenance of water and sewer facilities. In spite of this lack of support, many communities make heroic efforts to maintain their systems despite the high relative cost of doing so, knowing that if they fail, it could be many years – for water and sewer – before the system is replaced. In theory, the system further discourages preventive maintenance because it requires ratepayer money up front while "emergency" repairs are often provided by external agencies at no cost to the user. However, we find little direct evidence that this incentive is significant.

Fifth, for electricity the PCE reimbursement formula sends mixed messages to utility managers because PCE reimburses a portion of all types of costs. Those who view utility operations as a source of jobs and local income have a positive incentive to incur additional costs, but little incentive to incur those costs in a way that improves service or better preserves capital infrastructure. In theory, PCE reimburses 95% of allowable incremental cost, but in practice payments only cover about 75% of costs due to overall budget caps. This means that ratepayers or local sources must cover 25% of additional O&M costs, which probably acts as a significant brake on spending for purely utility purposes. However, the program structure encourages utility managers and municipal officials to "load" the cost of shared human resources such as clerical support onto the electric utility function. To the extent they are successful, public resources are diverted away from utility O&M and toward the support of rural employment.

The fifth major effect of current subsidy and assistance programs is that they discourage cost-saving innovation. Electric utility managers stand to lose up to 75 cents of PCE support for

every dollar of costs that they manage to cut.[23] Water and sewer planners and designers are also discouraged from aggressive technical innovation. Other things being equal,[24] innovations that reduce capital costs and/or complexity also tend to reduce fees for private sector designers and local construction employment and payroll.[25] As one publicly funded program manager put it,[26] "I have seen [publicly funded] construction engineers *forcing* designers to design simpler, winter hardy systems" (emphasis added).

Professional risk aversion can also retard innovation. The *Cold Regions Utilities Monograph* (ASCE 1996) defines the prevailing industry standards for design and construction. Innovation under this broad umbrella is generally limited to: 1) adjustments for local conditions, 2) selection of specific products such as pumps, and 3) system integration and control. There is some evidence that technical innovation is subject to professional inertia even when it reduces costs *and* increases system resilience. A good example of this is the length of time (several years) that it took to adopt "freeze-friendly" plastic pipe technology. Although plastic pipe reduced both labor and materials requirements, the use of iron pipe was a well-established national practice.

Finally, current subsidies are almost completely directed toward the production side of the utility system. There are few rewards for efficiency improvements in homes and buildings. The most striking example of this is the fact that total PCE reimbursements to a small utility will go *down* if the utility helps its customers invest in more efficient appliances or light bulbs. That's because total sales eligible for PCE will probably drop. In addition the utility's fixed cost will be spread over fewer kWh, driving up the average cost to other ratepayers.

---

[23] The exact amount depends on how many total kWh sold are eligible for PCE credit and how many are not. Cost reductions are spread over *all* kWh when determining a utility's total allowable costs for PCE purposes.

[24] In reality, system complexity is heavily determined by the local water quality and operating environment (Dan Easton, personal communication, 5/9/2001).

[25] Financial incentives for public sector designers and engineers are clearly different. In the short run, agencies have an incentive to innovate toward simplification in order to spread a given amount of funding over more communities. In the long run, however, the total size of an agency budget is often linked to the number and complexity of projects it delivers.

[26] Pete Wallis, Director, Office of Environmental Health and Engineering,

## *6.5 Changing the Incentives: Lessons from the PCE Efficiency and Staffing Standards*

### Introduction and Summary

In 1988 the Alaska Legislature required the Alaska Public Utilities Commission, the APA, and the Department of Community and Regional Affairs to consider modifications to the PCE program that would encourage fuel efficiency and other forms of savings. The APUC responded with prescriptive fuel efficiency standards for generation and adopted a standard of "reasonableness" for personnel costs, but declined to go further towards performance-based approval of expenses.

Roughly 1/3 of the all-diesel generation utilities that applied for PCE in the years 1990 – 1995 did not meet the generation efficiency standards adopted in 1989. A decade after adoption of the efficiency standards, roughly 23% of the all-diesel utilities still failed to meet the standards. In short, a net of 15 utilities moved into compliance over the decade out of a total of roughly 90 utilities that were not in compliance at the beginning of the decade. Aggregate generating efficiency did improve during this time, probably due to the replacement of older generating units with newer, smaller units that were more efficient and better matched with system loads.

Thus while a prescriptive standards approach to rural Alaskan utilities may appear attractive on its face, evidence from the PCE experience suggests that at best standards can only be considered part of a larger program to improve performance and at worst standards may lead to punitive results for individual utilities.

Based upon the mixed success of the history and implementation of prescriptive standards for rural utilities in the PCE program, it may be useful to consider alternative approaches including:

- Descriptive standards similar to the American Public Works Association accreditation program
- Performance based regulation where utilities are provided with incentives to improve efficiency – allowing the utility to share a portion of the cost savings it achieves

## PCE Efficiency Standards

The Power Cost Equalization Program was established in 1984 to equalize the electricity cost per kilowatt-hour statewide. The program was designed to pay a significant portion, 95%, of the APUC/RCA approved costs between the urban average cost of electricity of then 8.5 cents per kWh and a ceiling of 52.5 cents for rural Alaskan utilities.

As of July 1999, the urban average floor was set at 12 cents per kWh, subject to annual upward revision by the Regulatory Commission of Alaska in the event the weighted average cost of electricity in urban areas exceeds 12 cents per kWh.27

Residential customer PCE support is limited to the first 500 kWh per month of consumption.28

Local community facilities are eligible to receive PCE support for actual consumption of not more than 70 kilowatt-hours per month for each resident of the community. Community facility means a water and sewer facility, public outdoor lighting, charitable educational facility, or community building whose operations are not paid for by the state, the federal government, or private commercial interests.29

As noted by the State Division of Energy on its web page describing the PCE program, PCE is a core element of the financial viability of centralized power generation in rural communities.30

## Promulgation of PCE Efficiency Standards

In 1988, through legislative intent language, the Fifteenth Legislature required the Alaska Public Utilities Commission, the APA, and the Department of Community and Regional Affairs to:

> Review and evaluate possible modifications to the Power Cost Equalization Program and Report to the Legislature. Specific consideration should be given to the establishment of guidelines or standards for participation in the program including fuel efficiency and administrative expenses. Specific consideration should also be given to the

---

27 See AS42.45.110(c)(1)

28 See AS42.45.110(b)(2)

[29] See AS42.45.110(b)(1)

[30] see http://www.aidea.org/pce.htm

restructuring of PCE payments in order to provide incentives to make efficiency improvements.

In October 1988, the APUC issued a notice of inquiry and proposed regulations for comment. After receiving oral and written comment and allowing time for feedback from the legislative staffers involved in the drafting of the legislative intent language, the Commission issued an order in April 1989 adopting regulations that, among other things:31

1. Demand, facilities, and customer charges were excluded in calculating average electric rates for the purpose of a state funded power cost equalization program
2. In determining electric utility fuel costs for purposes of a state funded power cost equalization program, (1) an inventory capacity of 10% was found appropriate; (2) labor, dock, storage, and wharf costs were excluded; and (3) a market standard was applied to purchases from affiliated suppliers.
3. Generating efficiency standards for electric utilities generating with diesel fuel for all power requirements and separate standards for partial diesel or power purchase utilities were adopted reflecting consideration of the efficiency of the generator, transmission and distribution line loss, and station power needed to run the power house.
4. Allowable line loss standards for electric utilities were adopted.
5. Standards for limiting personnel and consultant costs in determining power cost equalization were rejected in favor of a "reasonableness" standard.

In short, the Commission established standards for some areas (fuel inventory capacity, local fuel handling costs, generating efficiency, and line loss) and declined to set standards for personnel and consulting costs in favor of ad-hoc “reasonableness review.”

## Minimum Efficiency Standards

The fuel efficiency standards were designed to set a target that should have been achievable for “the vast majority of the utilities by adhering to reasonable operating and maintenance practices.”32

[31] See APUC Order No. R-88-6(5), dated April 13, 1989.

[32] As articulated by Commissioner Sokolov in a separate statement to APUC Order No. R-88-6(5), April 13, 1989.

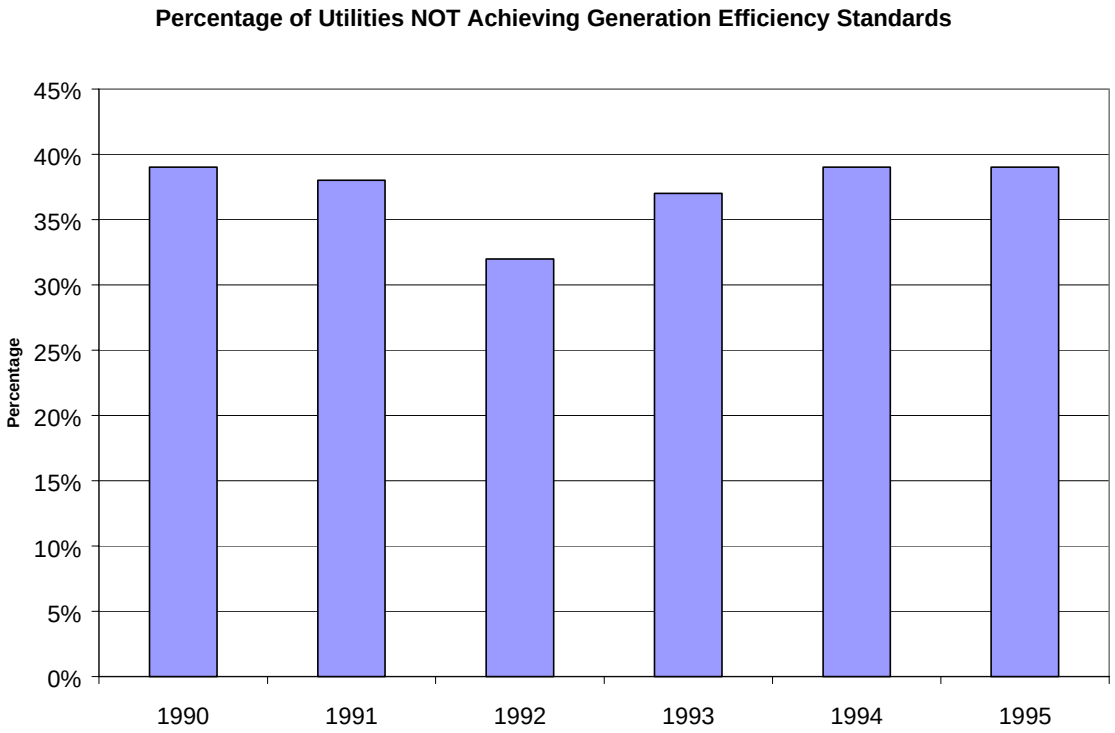
**Table 7**
**Minimum Efficiency Standards for Utilities that Rely on All-Diesel Generation**
(Annual kWh sold per gallons consumed)[33]

| | Less than 100,000 kWh sold annually | 100,000 to 499,999 kWh sold annually | 500,000 to 999,000 kWh sold annually | 1,000,000 to 9,999,999 kWh sold annually | 10,000,000 or more kWh sold annually |
|---|---|---|---|---|---|
| Beginning October 1, 1990 | 6 | 7 | 8 | 9 | 10 |
| Beginning October 1, 1991 | 7 | 8 | 9 | 10 | 11 |
| Beginning October 1, 1993 | 8 | 9 | 10 | 11 | 12 |

As it turned out, roughly 1/3 of the all-diesel generation utilities that applied for PCE in the years 1990 – 1995 did not meet the generation efficiency standards adopted in 1989. There does not appear to be a discernable trend over the period 1990 – 1995 among those all-diesel generation utilities that failed to meet the generation efficiency standards.

[33] See 3 AAC 52.620.

**Figure 66**
**Compliance with Generation Efficiency Standards**




Source: Barbara O'Hara Fuel Efficiency Database (1990-1995)

Perhaps, as Commissioner Sokolov noted:34

> The regulations by themselves, however, will not succeed in achieving their intended goal. They must be supplemented by a comprehensive program which addresses small utility operations. Routine maintenance and other operating practices of many village utilities should be improved; inefficient and unsafe plant should be upgraded or replaced. Power system parameters may forewarn of major breakdowns. Systematic engine oil sample testing and incentive programs directed at improving maintenance may also provide some answers in bettering power plant operations.

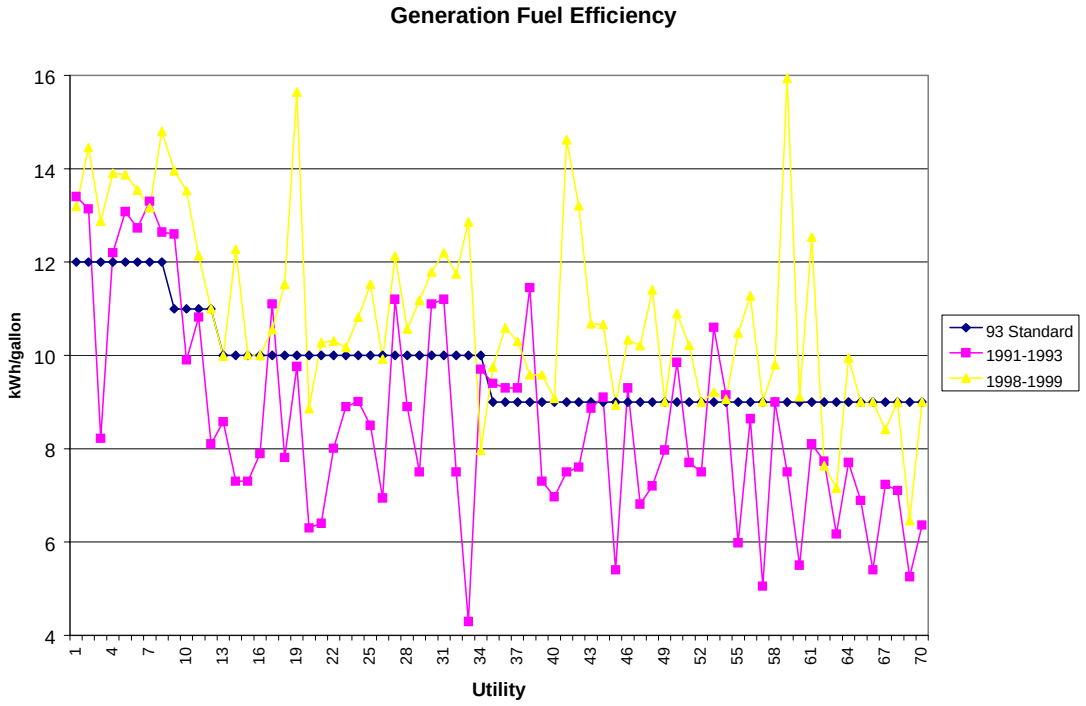
## The Effect of the Standards

A decade after adoption of the efficiency standards, roughly 23% of the all-diesel utilities still failed to meet the standards. In short, a net of 15 utilities moved into compliance over the

34 Ibid.

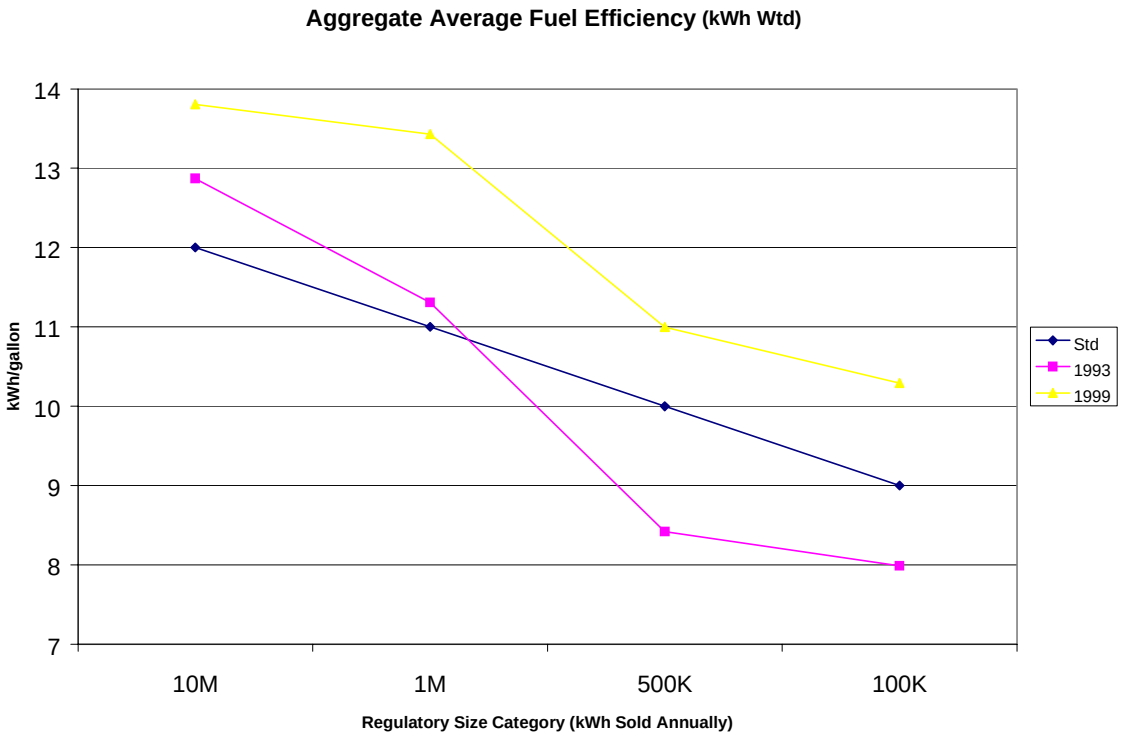
decade out of a total of roughly 90 utilities. With the exception of the 10,000,000 kWh a year or larger size category where all utilities are now in compliance, the remaining size categories contain non-compliant utilities.

**Figure 67**
**Changes in Generation Fuel Efficiency**




Noncompliance has moved from being distributed among all size levels toward further concentration in the less than 500,000 kWh a year group. Overall, the kWh weighted average fuel efficiency for each size category has clearly moved upward for the time period 1993-1999.

**Figure 68**
**Improvements in Average Fuel Efficiency Between 1993 and 1999**




It appears that the smaller size utilities (less than 1,000,000 and 500,000 kWhs a year) have experienced dramatic improvements in aggregate efficiency over the previous decade. Anecdotal evidence suggests that improved load matching practices combined with the installation of new generating units with overall higher efficiencies and improved partial load efficiencies have been major contributors to the overall fuel efficiency improvements.

## The Effect of Newer and better Matched Generating Units

In the two largest size categories, the number of utilities that did not meet the standard was de minimis and yet the aggregate fuel efficiency improved significantly in both categories over the 1990s – suggesting that the fuel efficiency standards, in and of themselves, were not a significant factor contributing to the improvements.

## Ad-Hoc Reasonableness Review

A prominent example of the on-going ad-hoc reasonableness review of non-fuel expenses by the Commission was a review of personnel costs of the North Slope Borough that took place

in the early 1990s. The Commission reduced personnel costs from $1,266,442 to $681,067 -- reducing allowable personnel costs from 12.7 cents per kWh to 6.8 cents per kWh.35

Moving forward to 1999, the NSB requested total personnel costs of $2,751,200 on total kWh sales of 23,463,352, or 11.7 cents per kWh. The Commission reduced this amount to $1,273,377, or 5.4 cents per kWh to comply with the precedent set in 1993 on FY92 data.

### Classification Practices Complicate Comparisons

It is also important to note that the NSB has filed for labor associated with office services and customer service in the personnel category while other utilities have filed the costs for these functions in the category of general and administrative. To illustrate, the NSB has classified roughly 96% of its non-fuel costs into the personnel category, while Galena has classified 40% of its nonfuel costs into the personnel category.

To further complicate personnel cost comparisons, Rural Utility Service funded utilities like AVEC and THREA use the RUS chart of accounts that does not utilize a separate classification for personnel costs in PCE nonfuel cost reports. These utilities have thus been excluded from personnel cost comparisons because of the difficulty of obtaining comparable data.

Thus, in order to develop a meaningful comparison with other utilities, especially utilities that utilize a different chart of accounts, the nonfuel costs are best reviewed at the higher level of account aggregation where all personnel and office expenses are captured. This firm level cost data is then broken down into each community based on annual kWhs sold.

The nonfuel costs, *excluding capital*, allowed by the RCA for comparable sized villages (2 million to 8 million kWhs per year) over the PCE panel data period (1997-1999) are compared on the following page.

The North Slope Borough's communities, under a Commission ad-hoc reasonableness test, which may have been relevant in 1993, appear to have been allowed significantly lower nonfuel costs excluding capital relative to the rest of comparable sized villages receiving support from the PCE program in 1999.

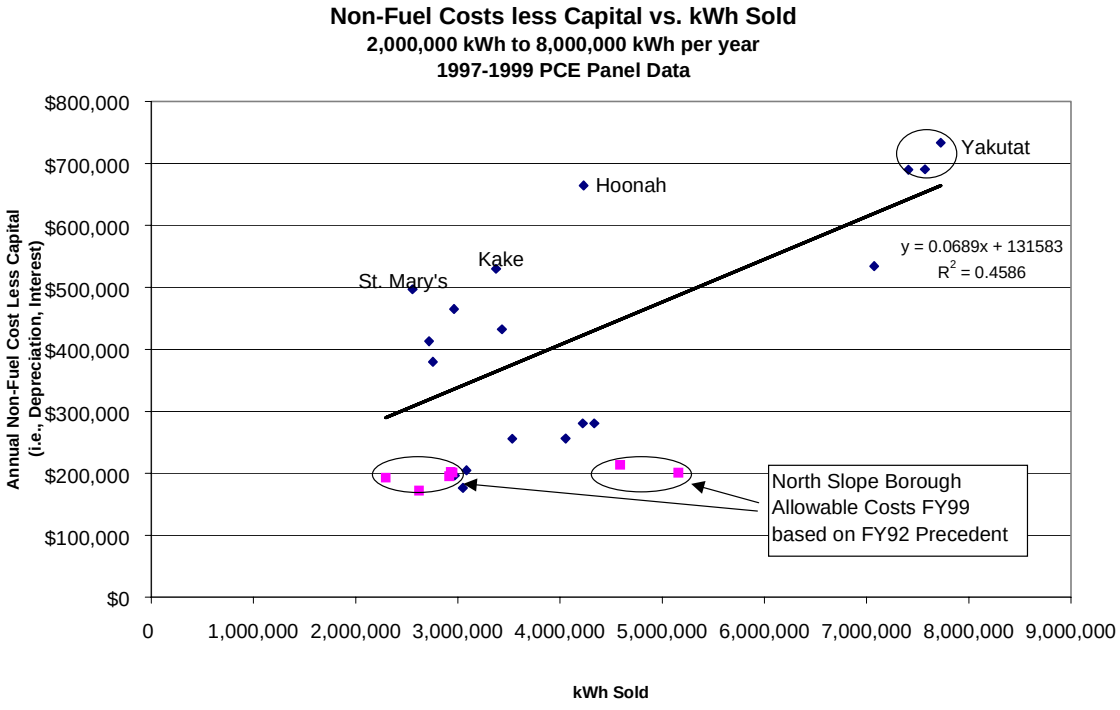
---

35 See APUC Order U-91-55(4) Appendix A.

| NSB Non-Fuel Costs Allowed | NSB Non-Fuel Costs Predicted by Regression on Comparables | Shortfall |
|---|---|---|
| $1,377,134 | $2,537,706 | $1,160,572 |

Thus the application of ad-hoc personnel standards that might have been appropriate in 1992 does not appear to be appropriate over time – leading in this one case to a shortfall of roughly $1 million a year for one utility relative to allowable costs for comparables.

**Figure 69**
**Nonfuel Costs Excluding Capital vs. Kwh Sold**




## Conclusion

The promulgation of cost standards for the PCE program – fuel efficiency and personnel costs – appears to have a mixed track record of success. The adoption of an ad hoc standard of reasonableness for one category of cost – personnel – appears to have had a significant punitive effect on one utility singled out for what appeared to be high costs in one area at one point in time.

While fuel efficiency standards on their face seem to have been more equitably allocated, they do not, in and of themselves, appear to have been a significant contributing factor to the efficiency improvements that the PCE utilities experienced in the 1990s. Instead, it appears likely that the replacement of older generating units with newer, smaller generating units that were more efficient and more closely matched with system loads may be a more significant factor contributing toward the aggregate efficiency improvements that have been realized.

Thus while a prescriptive standards approach to rural Alaskan utilities may appear attractive on its face, evidence from the PCE experience suggests that at best standards can only be considered part of a larger program to improve performance and at worst standards may lead to punitive results for individual utilities.

## *6.6 Role of the School*

Conventional wisdom suggests the local school is a large anchor tenant customer that should be able to provide economies of scale for local utility systems – electric, water, sewer, and bulk fuel storage facilities – enabling lower costs for both the school and the local village system. While this conventional wisdom appears to be widely expressed by utility managers, it does not appear to be as widely embraced by school principals and school maintenance personnel based on the interviews we conducted.

In the communities we visited, the schools have been designed as self-contained camps, complete with stand-alone fuel storage, electrical generation, water and sewer systems. The principals and school maintenance personnel expressed a strong interest in being able to maintain their "stand-alone" capability for three main reasons:

- Convenience & control (including bargaining power)
- Reliability
- Cost

The school principals expressed the general belief that they were being asked to pay a high price for low quality utility service because they were large, reliable, paying customers. However, they also acknowledged a need to work with the local community in order to establish and maintain a healthy working relationship that would encourage local support for the school and its educational mission.

## The Labor Market, Convenience & Control

The school appeared to be the employer of choice in the communities we visited. School utility operators are paid 30-50% more than local village utility operators and also receive retirement benefits which local village utility operators do not receive. Local utility managers do not believe they can afford to match this level of employee compensation.[36]

As a result, the school principals believed they had the best personnel available from the labor market and that their people provided the school with reliable service and immediate responsiveness in the event of problems. Thus, the principals could focus on their mission – education – and did not have to worry about utility services. In short, the customer was willing to pay a premium for reliability and responsiveness – and did so by hiring their own employees and paying them good wages and premium benefits relative to the market.

Finally, if a principal did purchase utility services from the local village system, having a stand-alone capability (both capital and labor) enabled the principal to bargain for a discounted price, and keep the school running in the event of either planned or unplanned outages. For example, Napaskiak charges the school a rate of 40 cents per kWh, 5 cents below its standard rate of 45 cents per kWh. The discount was attributed to the bargaining of the local school principal. It should be noted, however, that detailed cost allocation studies often suggest that large customers should pay a lower rate per kWh when there is no explicit customer charge in the billing structure.

## Reliability and Cost

In Napaskiak and Tuntutuliak, the school was the single largest customer of the village electric system, representing roughly ¼ to ⅓ of the electric system revenue for the year. In both communities, during the course of our two-day site visits, the local village electric system experienced intermittent unplanned outages, requiring the school to bring its generators on-line to keep the school running. In Napaskiak, the school maintenance person was called upon to help trouble shoot the local village generation problem along with a mechanic flown in from Anchorage.

[36] These descriptions were common in both Napaskiak and Tuntutuliak where there appeared to be cordial relations between the school and its community.

The school's incremental cost to produce power appeared to be largely the cost of fuel since it was already paying for maintenance of the generator sets for back-up power – covering what appeared to them as the fixed costs of personnel, parts, supplies, administration, operations and maintenance. Even assuming a relatively low fuel efficiency of about 8kWh/gallon and a price of $1.30 a gallon, the incremental cost of power generation is about 16¢ per kWh to the school.

So, while the village utility might be charging the school the same rate as residential customers -- 45¢ per kWh or a discounted rate of 40¢ per kWh (5 cent discount from residential rate) – the school receives a short-run *savings* on the order of 25 to 30¢ per kWh during local village system outages. This phenomenon arises because the school treats its capital and O&M costs as essentially fixed, due to the perceived need to maintain self-generation capability for reliability reasons.

## Cost-Effectiveness of Self-Generation

Even in villages where the school is the single largest purchaser of utility service, it often maintains a back-up capability for reliability and convenience. The question remains whether this back-up capability is worth the expense.

If we assume an incremental capital cost of roughly $50,000 spread over 10 years for backup generation capability, or roughly $5,000 a year, doubling that to account for the time value of capital yields an annualized amount of roughly $10,000 a year.

Assume that the value of keeping the school open is equal to or greater than the cost of the salaries of its teachers and staff – on the order of $150 an hour for five teachers, an administrator, and support staff. Add the perceived electrical savings for self-generation of $12 - $15 an hour. The perceived cost of not being turned on may be on the order of $165 an hour. Given a school year of 36 weeks, one would have to average around 1.7 hours a week of outages (planned or unplanned) to justify the backup generation – roughly 99% annual availability of the village utility system. Anecdotal evidence from our site visits and conversations with utility managers suggests that village electric system outage rates may well be roughly 2 to 10 times higher than this break-even amount, with annual availability of the village utility system running from 90% - 98%.

Add to that the compounding inconvenience of intermittent outages, it is not difficult to imagine that many schools will find the value of maintaining backup is worth the expense. Conversely, the incremental cost to increase the village electrical system annual availability from 98% to 99.5% may well be more than $10,000 per year.

## Conclusion

Schools have a perceived need for high reliability – a level that may exceed that for which the entire village is willing to pay. To meet this need, they often feel compelled to invest in the fixed cost of self generation capability. But once this cost is paid, it is in the school's economic interest to self generate – incurring the incremental cost of fuel while saving the full amount of the village utility's retail rate. There is no easy solution to this problem unless the village utility can bring its reliability level up to levels significantly above 99%.

# 7. True Cost, Book Cost, and Revenue from Rates

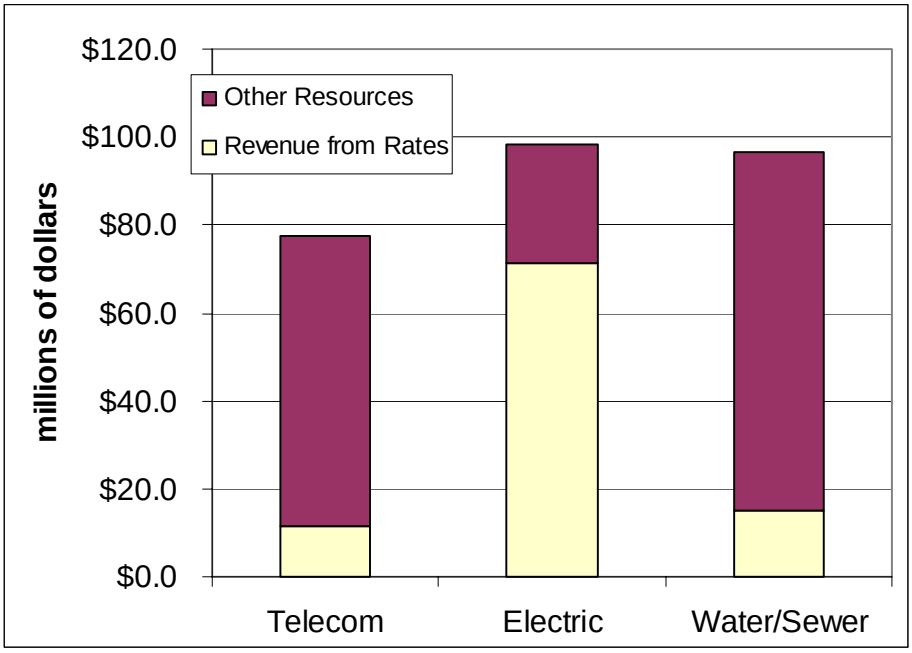
## *7.1 Summary of Findings*

The total true costs of electric, water and sewer, and telecommunications utilities in rural Alaska are surprisingly similar – between about $80 million and $120 million per year. The true cost of electricity to PCE communities is between $100 million and $120 million per year (depending on how interest rate subsidies are counted). The true cost of water and sewer is between $90 million and $120 million (depending on definitions of capital equipment and the discount rate applied to constructed facilities). The true cost of telecommunications is about $80 million. Although they are provided by private sector firms, telecommunications costs are highly subsidized in both urban and rural Alaska through various mechanisms that serve to bring ratepayer dollars into Alaska from other states.

Utility rates often bear little or no relation to the cost of service. As Figure 70 shows, consumers pay only about 15% of the cost of telephone and water/sewer costs through rates, but they pay between 60 and 75%[37] of electric costs. The remaining costs are covered by explicit subsidies such as PCE, government-funded capital projects, implicit subsidies from out-of-state ratepayers, and the deferral or avoidance of maintenance.

[37] The range in this number results from counting or not counting low interest loans as a form of subsidy.

**Figure 70**
**True Cost of Major Rural Utilities and Fraction Covered by Rates**




Source: PCE database, FCC filings, Author calculations (omm_draft8.xls)
Notes: Electric cost includes all PCE communities; Water/Sewer is an estimate for all VSW communities

## *7.2 Introduction*

The purpose of this chapter is to identify the full or "true" cost to provide utility services in rural Alaska, to contrast the true cost with the costs that are currently shown on utilities' books, and to compare the true cost to the revenues currently being recovered from local communities in utility rates. The chapter is divided into the following subsections:

- Electricity
- Water & Sewer
- Bulk Fuel
- Refuse Collection & Disposal

### True Cost of Service Methodology

The true cost of utility service includes reasonable and prudent operating and maintenance costs plus some measure of the cost of providing, renewing, or replacing capital equipment. The cost of capital includes a replacement component (depreciation) as well as a "return on investment" component that reflects the time value of money. All utilities incur these

costs, whether they are operated by Municipal, cooperative, tribal, or private for-profit entities. However, some of these costs may not be accounted for in a utility's financial records (the utility's "books").

There are two primary ways in which true cost can exceed book cost. First, a powerhouse or water plant that is funded by a grant of public money will often not be shown as an asset on a small utility's books. Hence, a utility in that situation will probably not include on its books the annual depreciation, interest, or return on capital expenses associated with that asset.[38] Second, a cash-strapped utility may simply seek to defer or avoid some maintenance expenses. This neglect will sometimes show up as a costly failure at some later date.

For the purposes of this analysis, we have adopted a modified "rate base / rate of return" methodology to develop the true cost of service.

| | | |
|---|---|---|
| True Cost of Service | equals | Operating Expenses |
| | plus | Annual Depreciation Expense (Return **of** capital) |
| | plus | Return[39]. |

In most rural Alaskan communities, service is provided by tax-exempt non-profit entities (municipalities, cooperatives, etc.). While they are not required to pay taxes and earn a return per se, they are typically required to maintain revenues at a certain multiple above their interest payments on debt in order to attract and retain capital for their systems (often expressed in a Times Interest Earned Ratio). In other words, instead of taxes and return, the non-profits have to generate sufficient operating margin to meet the interest coverage requirements of their debt covenants.

[38] Such allocations are not allowable expenses or the PCE program. Although it would be possible for a utility to keep a separate set of books that included the amortization of grants as an expense, the utility would have very few reasons to take on this extra and potentially confusing task.

[39] Return is used here to mean return on investment (interest, interest coverage or return on equity and tax allowance).

**Table 8**
**Components of the True Cost of Service**

| Cost of Service Component | For-Profit Utility | Non-Profit Utility | Modified True Cost of Service Estimate |
|---|---|---|---|
| Operating Expense | Operating Expense | Operating Expense | Operating Expense |
| Replacement of Capital | Depreciation | Depreciation | Depreciation |
| Return on Capital Investment | Allowable Return<br>=<br>Rate of Return X Rate Base<br>+ Tax Allowance | Interest +<br>Interest Coverage Ratio | Interest + Interest Coverage Ratio<br>or<br>Return + Taxes<br>or<br>Return Surrogate |

## *7.3 Electricity*

### Methods and Data Limitations

In order to characterize the true cost of electricity service for Rural Alaska, we reviewed the reported costs filed with the Regulatory Commission of Alaska in order to participate in the Power Cost Equalization (PCE) program. The resulting data set is based upon the approved costs from the annual update filings for regulated and unregulated utilities that participated in the PCE program during the period 1997-1999.

While an effort is made by the RCA to verify legitimate costs, staffing and travel budget constraints limit the level of detail that might be reviewed. As a result, some utilities may be receiving higher levels of approved costs than others because of their ability to fill out forms and create an adequate paper trail. Conversely, some utilities find the level of effort required to fill out the paperwork and herd it through the process to justify specific items to be more trouble than it is worth resulting in lower reported costs than are actually being incurred in the field. Finally, allocations of labor, support facilities, and fuel handling activities to the PCE program vary widely.

The cost of service for non-regulated utilities is updated annually. The cost of service for regulated utilities is only updated upon the completion of a rate case. The data for non-regulated

utility costs and kWh sold are therefore closely matched. In contrast, many of the regulated utilities have not had a rate case in over ten years – so while kWh sold data is current, the cost of service per kWh is often quite out of date.[40]

The PCE program specifically disallows recovery of contributed plant (generally, government grants) and return on equity or interest coverage. In addition, a number of government programs provide support (operations and maintenance, emergency repairs, low interest loans) that is not reflected in reported or so-called "booked costs." In order to develop an estimate of the true cost of service, we have attempted to capture the following "off-book" costs as described in detail below:

- Government provided grant funding – Alaska Energy Authority and Denali Commission
- Government provided operations and maintenance support – Alaska Energy Authority Circuit Rider and Emergency Assistance Programs
- Government subsidized low interest loans – Rural Utility Service (RUS formerly known as the REA), Municipal tax exempt financing

## Government Capital Grants

We obtained a listing of AIDEA's small electric utility capital projects for 1995-2000 by community[41]. Capital projects were directly assigned to the appropriate community electric utility. Emergency projects were depreciated over five years. All other "non-emergency" capital projects were depreciated over ten years. In addition, for those utilities which received contributed capital from government grants, we attempted to capture the return on capital with the addition of a return surrogate of 25% applied to an average net plant estimate of contributed capital.[42]

The total capital contribution amounts to around $18 million and was directly assigned to 131 individual villages – roughly $137,500 per village.

---

[40] As a result of this "regulatory lag," it is likely that the booked non-fuel allowable kWh for the regulated utilities is high relative to actual costs. When the actual costs are greater than allowable costs, regulated utilities typically file rate cases. When the actual costs are less than allowable costs, regulated utilities often build up cash, invest in plant, or pay a dividend rather than file for a rate *decrease*.

[41] Source: Dick Emerman, AIDEA, January 2001, Capital Projects List for 1995-2000.

[42] The return surrogate was added to all capital support received from the Division of Energy for the time period 1995-2000. We adjusted the cumulative capital grant data for 1995-2000 (six years) to match the ten year time horizon for depreciation on the assumption that the capital grants were, in aggregate, a level stream over ten years. Then we calculated depreciation (10 years on standard projects, 5 years on emergency projects) and applied the return surrogate of 25% to an estimate of the average net plant = 50% of the "grossed-up" capital grant.

While this averages $22,900 per village in *annualized* capital contributions, it should be noted that since capital projects were directly assigned to villages, there is a tremendous variation of "off-book" capital contributions when one looks at individual villages. As one example, the annualized cost paid by grant-funded capital is about 40 times higher in Venetie than in Shageluk. If this cost were added to rates, it would raise the rates in Venetie by up to 50 cents per kWh.

**Table 9**
**Examples of Cost Implications of "Off-Book" Capital Additions – Alaska Energy Authority Projects**

| | Capital Grants | Depreciation | Return Surrogate | Total Annualized Capital Cost | Annual kWh sold | Capital Cost in ¢ per kWh |
|---|---|---|---|---|---|---|
| Shageluk | $17,368 | $1,737 | $2,171 | $3,908 | 317,464 | 1.2¢ / kWh |
| Venetie[43] | $556,749 | $184,699 | $69,619 | $254,318 | 508,779 | 50¢ / kWh |

We also reviewed the first three years of funding provided by the Denali Commission for electric and bulk fuel planning and capital projects. After removing "non-rural" projects (most notably the $77 million for the Tyee-Swan Lake Electrical Intertie for Ketchikan), we found $53.5 million spread out over 81 villages over the three years for which we have data (FY99-FY01) or $660,500 per village. To take into account the shared nature of the bulk fuel projects, we assigned half of bulk fuel projects to the electric utilities and assumed the remaining 50% was used for other services. We assigned those bulk fuel and electric utility costs directly to villages in the form of depreciation and return surrogate consistent with the methodology for the Alaska Energy Authority capital grants discussed above – bulk fuel projects depreciated over twenty years, electric power projects depreciated over ten years. The annualized amount averages $82,200 per village – roughly four times the amount on an annualized per village basis as the Alaska Energy Authority capital grants.

**Table 10**
**Examples of Cost Implications of "Off-Book" Capital Additions – Denali Commission**

| | Capital Grants | Depreciation. | Return Surrogate | Total Annualized Capital Cost | Annual kWh sold | Capital Cost in ¢ per kWh |
|---|---|---|---|---|---|---|
| Elim – Bulk Fuel + Power Plant | $3,600,000 | $223,800 | $336,500 | $560,300 | 861,341 | 65¢ / kWh |
| Arctic Village – Bulk Fuel | $1,864,114 | $46,603 | $116,507 | $163,110 | 197,399 | 83¢ / kWh |
| Buckland – Bulk Fuel | $2,310,000 | $57,750 | $288,750 | $346,500 | 963,989 | 36¢ / kWh |

## Government Subsidized Operations & Maintenance Programs

We allocated the cost of the Alaska Energy Authority Emergency, Technical Assistance, and Circuit Rider Programs to electric *utilities* with less than 2,000,000 kWh a year in sales. This estimate of "off-book" O&M amounts to roughly $750,000 a year spread over nearly 80 villages or roughly $9,375 per village per year. These villages represent a total of over 25,000,000 kWh per year.[44] These "off-book" operational support programs in total add about 3¢ per kWh to non-fuel costs for small villages that are not affiliated with a regional utility.

## Government Subsidized Low Interest Loans

For those utilities receiving low interest government subsidized loans from the Rural Utility Service (formerly known as the REA), we adjusting their cost of interest and interest coverage ratio to reflect market rates based. The average interest on long-term debt on the books was roughly 3%, while the market rate in 1999 was in the 9% range. The nominal cumulative

[43] The replacement of the Venetie Power House was classified as an "emergency" project and depreciated over five years since the Power House was replaced as a result of a fire. Also note that there is a small capital grant of around $6000 that is classified as "non-emergency and depreciated over ten years.

[44] The population of utilities that is covered by this "off-book" cost assignment closely overlaps with those utilities that have participated in the Alaska Energy Authority circuit rider program.

market interest amounts to 3.5 times the book interest. The following table provides an illustration:

**Table 11**
**Estimate of Interest Rate Subsidy on $1 million Loan at 3% Interest over 30 years**

| | Book | Market | "Off-Book Subsidy" |
|---|---|---|---|
| Debt | $1,000,000 | $1,000,000 | 0 |
| Interest Rate | 3% | 9% | 5.83%[45] |
| Loan Term | 30 | 30 | - |
| Cumulative Interest Payments | ($509,135) | ($1,812,013) | ($1,302,878) |
| Market/Book Interest Ratio | | 3.55 | |

Both AVEC and THREA are significant recipients of low-interest loans. These interest subsidies reduce the AVEC non-fuel cost of service by 25% and the THREA cost of service by almost 50%.

[45] The calculation is [(1.09)/(1.03)]-1 = 5.83%.

**Table 12**
**Estimate of Interest Rate Subsidies to AVEC and THREA**

| | AVEC 99 | THREA 98 |
|---|---|---|
| Total Non-Fuel less Interest | $14,167,269 | $2,905,508 |
| Booked Interest | $926,511 | $397,710 |
| Interest Market Rate Multiplier | 3.5 | 3.5 |
| Market Interest | $3,242,789 | $1,391,985 |
| Interest Coverage Ratio | 1.5 | 1.5 |
| Market Interest + Coverage Ratio | $4,864,183 | $2,087,978 |
| Total kWh Sales | 54,014,277 | 16,040,461 |
| Booked Capital Cost per kWh | $0.02 | $0.02 |
| True Capital (Interest + Coverage) Cost per kWh | $0.09 | $0.12 |
| Booked Non-Fuel Cost per kWh | $0.28 | $0.21 |
| True Non-Fuel Cost per kWh | $0.35 | $0.31 |
| True to Book Percentage Difference | 25% | 47% |

In the analysis that follows, where data was available we have added the "market rate" interest and associated interest rate coverage to the true cost. Where data was not available, we have 1) estimated the value of the subsidy on a per kWh basis by interpolating between the data points we do have and, 2) applied that estimate to all village, municipal, coops, and government authorities.

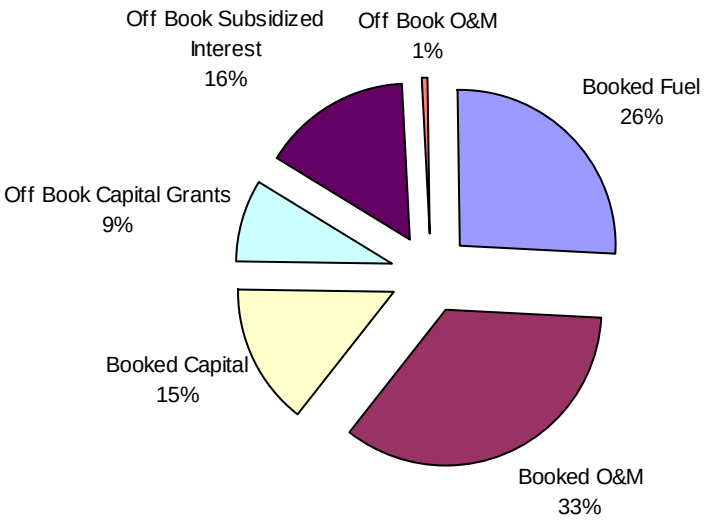
## Statewide Electricity True Cost

The true cost of rural electric utility service runs from 17 cents per kWh for larger regional center communities (Naknek) up to around 180 cents per kWh for small remote communities (Pedro Bay and Chalkyitsik). The true cost of rural electric utility service for 90% of rural Alaska villages runs less than 45 cents per kWh.

On a statewide basis (considering all PCE communities), the major costs are fuel and booked operation and maintenance, which together account for 59% of total cost. Capital costs carried on utility books account for 15% of cost. The remaining 26% is "off-book" and consists

almost completely of government-funded capital construction. Government funded O&M assistance accounts for less than 1% of the total true cost of electricity.

**Figure 71**
**Components of True Cost of Electric Service**



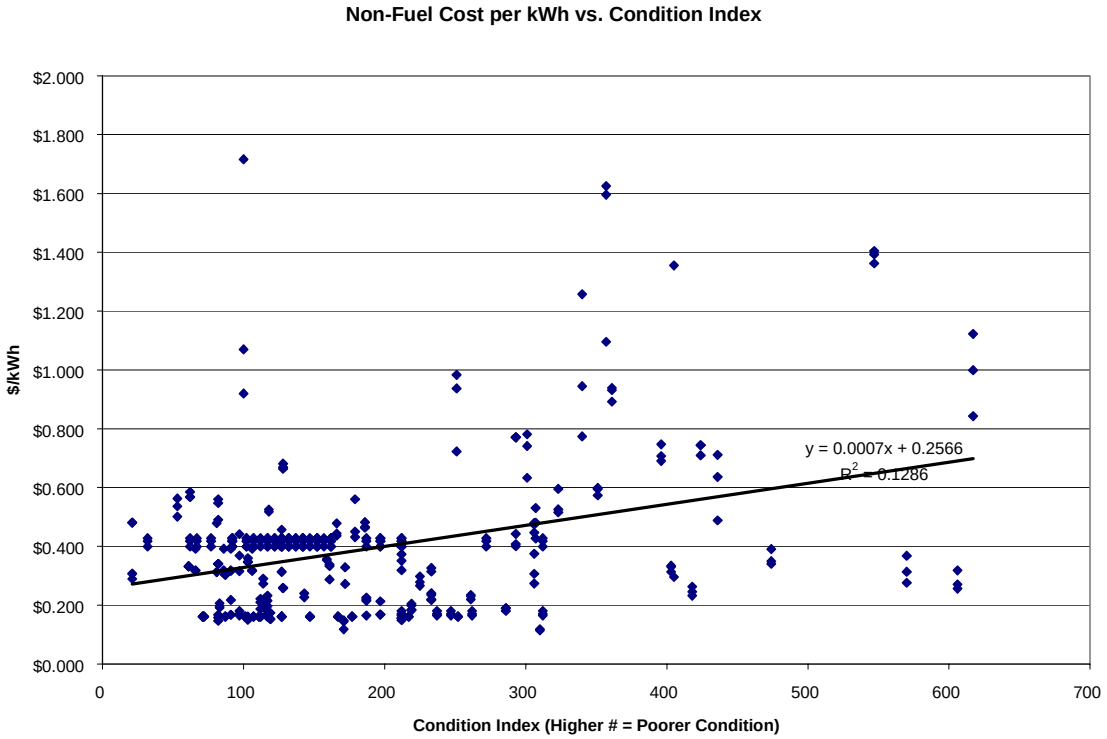

## Deferred Maintenance and System Condition

The true cost of electric service could be even higher than calculated above if significant costs are slowly accumulating due to the neglect of facilities. The cost of past neglect already shows up to some degree in the capital grants numbers. What we don't know is whether a significantly increased future liability is being generated due to current neglect.

The AEA recently completed a comprehensive electric utility condition assessment of almost 150 small utility systems. By using the recently-completed electric utility condition assessment data, we can investigate the hypothesis that utilities that are *apparently* low cost actually are incurring higher overall true costs by systematically avoiding necessary maintenance. The following figure shows that utilities with lower reported costs (adjusted to include our adjustments for off-book capital) actually tend to have utility plant that is ranked in

slightly better condition. This evidence does not support the notion that some utilities are hiding or shifting costs by avoiding prudent maintenance. The conclusion is not definitive, since it could be the case that utilities who avoid maintenance have newer equipment as a result of more frequent failure and replacement.

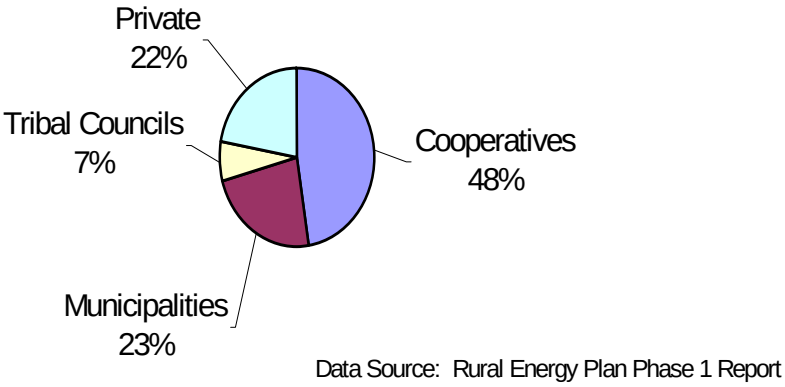
**Figure 72**
**Non-Fuel cost vs. System Condition Number**
(higher condition number means poorer condition)




## True Cost vs. Type of Utility Management

As Figure 73 shows, there are four major types of electric utility management structure: Cooperatives, tribal, municipal, and private.

**Figure 73**
**Population Served by type of Electric Utility Management**




The average electric system condition number does depend strongly on the type of utility management structure. Stand-alone community utilities as a group have a condition number about 20% higher (worse) than the overall average, while regional coops and private utilities have numbers between 35% and 50% lower (better) than the average.

**Table 13**
**Electric Utility Condition Number vs. Size**
**(higher number means poorer condition)**

| Utility Management Structure | Average Condition Number | Relative to Overall |
|---|---|---|
| Overall Average | 214 | |
| Community standalone | 256 | 20% |
| Regional | 141 | -34% |
| Private | 114 | -47% |

However, multiple regression analysis shows that our estimate of the true accounting cost of service is statistically unrelated to management structure, with one significant exception: After controlling for utility size and condition of facilities, Alaska Power Company (the electric subsidiary of Alaska Power and Telephone) has average nonfuel costs that are about 15 cents per kWh lower than other utilities. There are no other statistically significant relationships between cost and management structure. Specifically, neither regional utilities nor private utilities other

than APC show a systematic cost advantage compared to standalone community utilities. The following two figures demonstrate that the true nonfuel cost of electricity per kWh is largely a scatterplot, especially within a given range of kWh sales. Figure 74 shows the data for utilities with annual sales up to 10 million kWh per year, while Figure 75 focuses on smaller utilities with sales of less than 2 million kWh per year.

**Figure 74**
**True Nonfuel Cost of Electricity vs. Annual Sales**
(Village Level Data
Places with Less than 10 million kWh/yr)

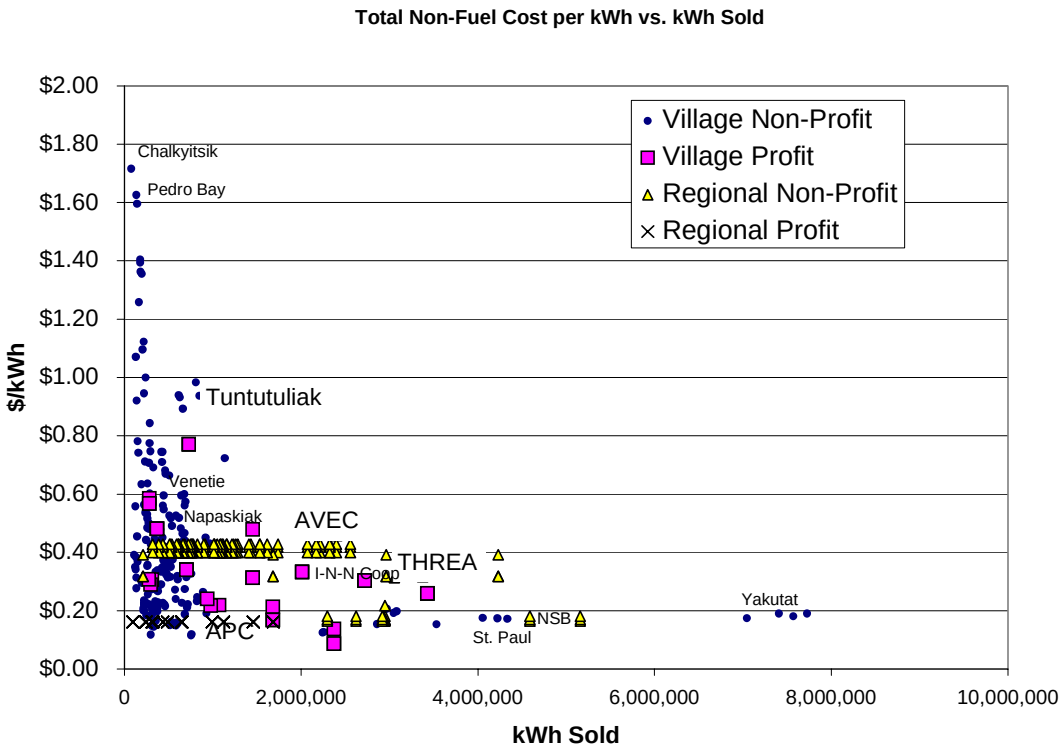
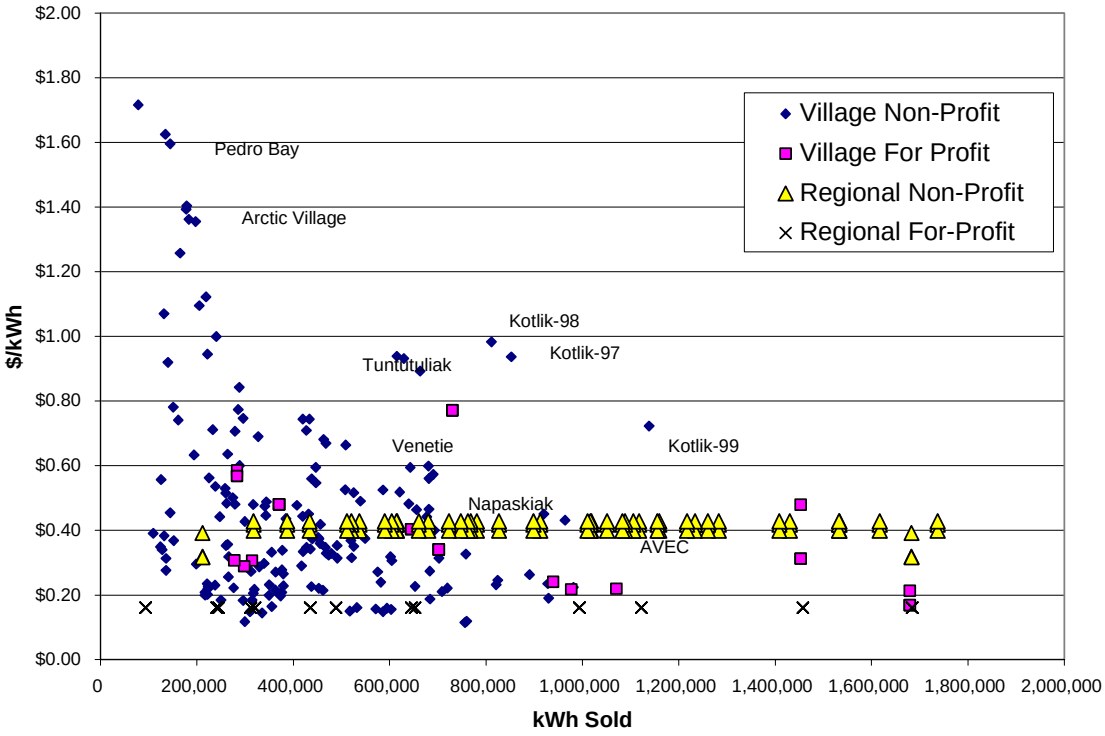


**Figure 75**
**True Nonfuel Cost of Electricity vs. Annual Sales, for Different Management Structures**

(Village Level Data
Places with Less than 2 million kWh/yr)




## Electric Utility Costs vs. Utility Rates

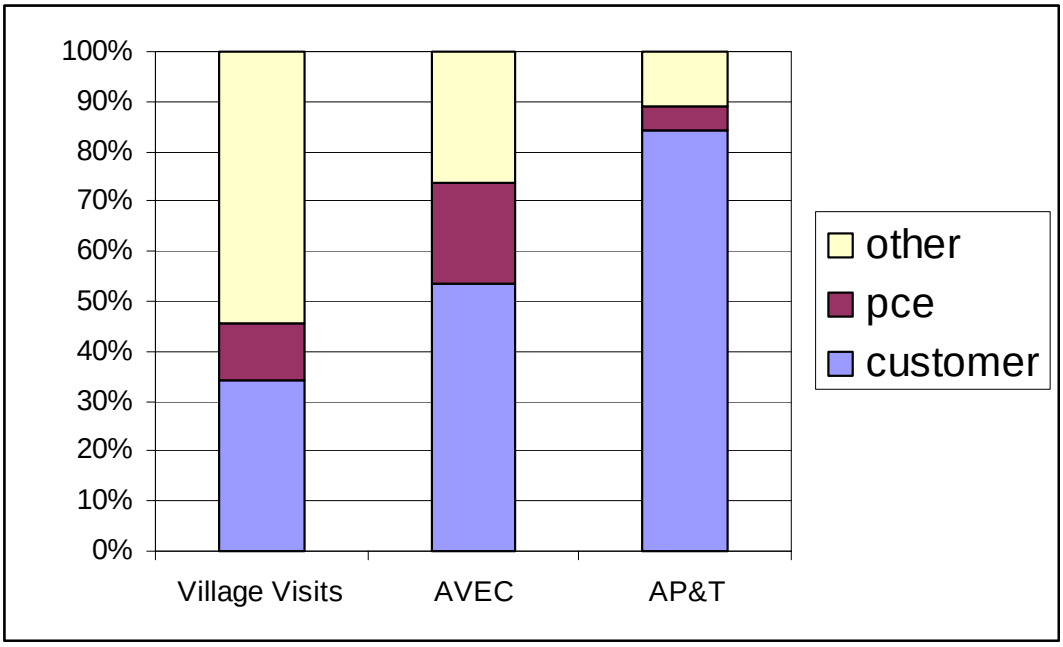
Utility rates in rural Alaska often do not reflect the true cost of utility service, and they sometimes fail to reflect even those costs that are carried on the utility books. For many public and non-profit electric utilities, rates are set to recover operating expenses, depreciation on utility-funded capital, and interest. Customers receive a credit on their bill reflecting the PCE program support. In many cases, the interest rates on long-term debt remain significantly below market rates, reflecting a long-standing federal commitment to fund rural electric utilities through taxpayer as opposed to ratepayer support. Private sector electric utilities set rates to recover the full cost of service including operating expenses, depreciation on utility-funded capital, and a return on debt *and equity capital* invested. However, even private utilities

sometimes obtain government-funded capital, and typically do not recover the cost of that capital, thus shielding ratepayers from the full cost of service.

There is no systematic statewide data set on electric utility rates compared to costs. For our village case study communities, we estimate that only about 45% of the true cost of electric service is accounted for in rates and paid for either by customers (34%) or by the PCE program (11%). The remaining 55% is paid for by government capital grants (54%) and O&M programs (1%). For an established regional coop such as AVEC, the numbers are substantially different: about 54% of the true cost is covered by customer payments, about 20% by PCE, and about 26% by government capital subsidies, mostly in the form of low-interest loans.[46] The figure also shows an estimate of cost coverage for a private utility, Alaska Power and Telephone. AP&T customers pay about 84% of total cost, PCE pays about 5%, and other sources (chiefly low interest loans) account for the remaining 11%. The most likely explanation for this difference is that AP&T has a smaller fraction of costs covered by PCE because its total costs are low and because it serves larger communities in which the majority of kWh sold are not eligible for the PCE program.

[46] The value of this interest rate support is significant. For example, the effective interest rate of regional non-profits like AVEC and THREA was on the order of 3% in 1999, while the market rate was on the order of 9.25% (National Rural Utility Finance Corporation). In nominal terms, this amounts to a difference of [(1.0925)/(1.03)]-1 = 6.07%. With long-term debt ranging between 56¢/kWh and 92¢/kWh, this difference amounts to roughly 3 to 6¢ per kWh on total non-fuel costs of around 25 to 30¢ per kWh. See Chapter 5 for more details.

**Figure 76**
**Sources of Funds to Cover Cost of Electric Service**

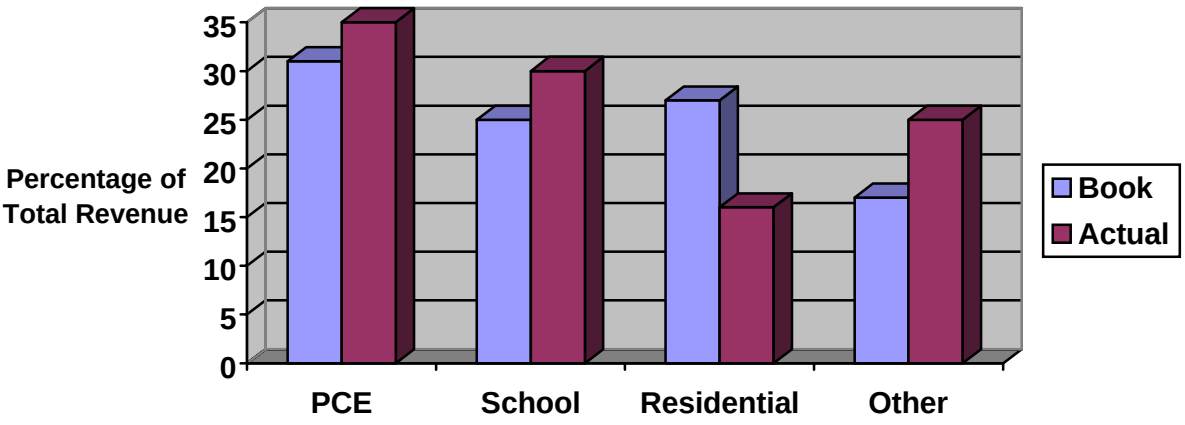



## Customer Collections

For many rural electric utilities serving small remote villages, collecting revenue from residential customers remains a challenge, especially in economically depressed areas. In many cases, the local community is suffering from repeatedly poor fish returns over several years. In contrast, government agencies, most notably the local school, appear to consistently pay their bills.

Thus, while on paper the school may represent one quarter of the electric utility revenue, the reality is the school may represent one third to one half of the cash that is consistently received by the electric utility.

**Figure 77**
**Revenue Sources to Cover Full Cost of Service (Booked vs. Actual)**




Source: Composite of site visit information. Other includes non-school government and business customers

## *7.4 Water & Sewer True Cost*

In order to characterize the full cost of service for water and sewer service in Rural Alaska, we reviewed prior studies, Rural Utility Business Advisor (RUBA) rate studies, and capital cost estimates and actual capital costs where available.

Unlike the extensive cost data available from the PCE program, the cost data for water and sewer utility service is limited to anecdotal data from a relatively small sample.

Based on site visit information from Napaskiak and Tuntutuliak, the true cost of flush haul systems – including incremental capital cost -- appears to be in the range of $200-$400 per household per month with the high end of the range representing households where a room had to be added to provide for a toilet, sink and shower stall.

**Table 14**
**Estimated True Cost of Small Flush/Haul System**
(Small Village Example: 60 to 80 Households)

| | Flush Haul – Low | Flush Haul-High |
|---|---|---|
| Operating Expenses | $ 87 | $ 87 |
| Depreciation | $ 85 | $169 |
| Return | $ 64 | $127 |
| Total Cost | $236 | $383 |
| Rates | $115 | $115 |
| (Shortfall) | ($121) | ($268) |

Colt (2000) analyzed actual operating cost data for four flush-haul systems, based on Woodlee's (see Haley 2000) data collection. This analysis suggested that the apparent true *operating* cost (excluding buildings capital but including haul vehicle depreciation) ranged from about $250 per household per year to about $1,000 per household per year. The most important finding from Woodlee's careful data collection is that households seek to economize on their bills by reducing the number of haul trips. As Table 15 shows, less than 2,400 gallons per *household* per year (or 6.6 gallons per household per day) was delivered by the utility service in all places studied. People may be self-hauling water and sewage, using less water, or disposing of graywater directly onto the ground. Since medical data suggest a strong correlation between water use and the prevalence of disease when use drops below 8 gallons per *person* per day (ASCE 1996), these data suggest that one component of the true cost of flush haul systems could be increased disease and/or health care costs.

**Table 15**
**Operating Cost Estimates for Four 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 |
| | | | | |
| | 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 |

In a separate analysis of piped systems, Colt (1994) considered the Emmonak vacuum sewer system. This analysis showed that the initial capital cost is about $100,000 per house. When amortized, even at a low real interest rate of 3%, this equates to almost $7,000 per house per year. The overall true cost of this system is therefore at least $660 per house per month in inflation-adjusted dollars. Using a higher "nominal" interest rate that is not inflation-adjusted would increase the true cost of piped systems to well over 1,000 per household per month.

**Table 16**
**Estimated True Cost of Vacuum Piped Sewer and Water System**

| | | |
|---|---|---|
| Initial Capital: | $100,000 | per house |
| amortized capital | $6,722 | per house per year |
| annual O&M | $1,200 | per house per year |
| Total Annual Cost | $7,922 | per house per year |
| **Total Monthly Cost** | **$660** | **per house per month** |

## Water and Sewer Rates and Collections

For many rural non-profit water & sewer utilities, rates have been set to recover operating expenses with some recovery of depreciation on equipment for flush-haul systems (four wheeler or six wheelers). In some instances, water is being charged out at a per gallon rate designed to recover direct operations and maintenance expenses.

Rural utilities typically do not attempt to recover depreciation of government-funded capital and do not cover a return on that capital.

In some communities, customers are not charged for water and sewer service. The local government supports the ongoing cash expenses of the water and sewer operations out of revenue generated from gaming (bingo and pull tabs).[47] Essentially an entertainment tax is being assessed and collected by the local village to cover water and sewer operating expenses.

In a recent analysis of the 1999 RUBA survey, Black (2000) concludes that

> 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. …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.

For many rural water & sewer utilities serving small remote villages, revenue collections from residential customers remains a challenge, especially in economically depressed areas

[47] This appears to be the case in Napaskiak.

suffering from poor fish returns over several years. In contrast, government agencies, most notably the local school, appear to consistently pay their bills.

The edited volume *Financing Water and Sewer Operations and Maintenance in Rural Alaska* (Haley 2000)[48] contains an excellent set of case studies and analysis of water and sewer finance issues.

## 7.5 True Cost of Bulk Fuel

In order to characterize the true cost of service for bulk fuel service in Rural Alaska, we developed estimates based upon projected fuel volumes and actual project costs for specific tank farms. The following example is based on our site visit to Tuntutuliak, augmented by design data for a proposed new project.

**Table 17**
**Estimated True Cost of Bulk Fuel Storage**

| | | |
|---|---|---|
| Capital Project Cost: | $1.6 Million | |
| Estimated Life: | 30 years | |
| Annual Depreciation: | $53,333 | |
| Avg. Annual Interest | $80,802 | ($1.6 million, 20 yrs, 9%)[49] |
| Projected Fuel Volume: | 160,000 gallons per year | |
| Capital Cost Per Gallon: | $0.84/gallon | |
| Operations & Maintenance | $20,000 per year | |
| O&M Cost per Gallon: | $0.12/gallon | |
| Spill response capability: | $0.60/gallon | |
| **TOTAL COST** | **$1.56/gallon** | |

Given that the cost of fuel *delivered to the villages* in the Yukon-Kuskokwim River Delta may be running around $1.08 per gallon,[50] the full cost of these new bulk fuel facilities adds almost 90% to the total delivered cost of bulk fuel in the local community.

[48] Available at www.iser.uaa.alaska.edu under "Native and Rural Studies"
[49] Return on capital = average annual interest payments assuming 100% debt financing with 9% interest, $1.6 million over 20 years.
[50] Reported cost of delivered fuel by Tuntutuliak in PCE filings in 2000.

Why is the cost of bulk fuel storage in these communities so high? Bulk fuel storage facilities are largely fixed cost installations whose cost is driven by the design capacity of the facility. Thus, *the unit cost of service ($ per gallon) is highly dependent upon the number of times the volume of the tanks is expected to turn over each year.* Facilities designed to hold a full year of storage – considered a prudent practice in many rural Alaskan settings – have approximately 12 times the capital cost per gallon delivered than urban facilities designed for only one month of storage.

Given an average fuel efficiency of 12 kWh/gallon for new generator sets, the $1.56 cents per gallon to recover the bulk fuel storage facility and handling costs would amount to roughly 12 cents per kWh in the cost of electricity generated from fuel stored in these tanks. That is, if the electric utility had to pay a fuel cost that reflected the true cost of the tank farm and had to recover those costs from rates, the electric rates would increase by about 25%.

### Bulk Fuel Rates Pricing and Collections

Rate practice appears to vary considerably from village to village. In three field investigations (Venetie, Napaskiak, Tuntutuliak), all of the fuel system operators appeared to charge prices based on a simple mark-up on the fuel that was being dispensed – typically in the range of 10 cents a gallon – that appeared to be designed to cover an estimate of annual operations and maintenance costs.

After field investigation, it remained unclear whether charges for fuel were consistently collected from residential customers. It appeared that larger commercial customers and the schools have historically purchased and stored their own fuel. Going forward, some new tank farms (for example, Tuntutuliak) are designed to accommodate the fuel requirements for the entire village, including the school. Based on the interviews with the school principals where they expressed concerned about the price and reliability of service that would be provided by the local village, it will be interesting to see whether the school completely abandons their existing tank farm facilities when they participate in the new consolidated tank farm or whether they retain their own separate fuel storage capacity – similar to their continuing to maintain their own electrical generating capacity even when the village system has sufficient capacity to serve the school.

## *7.6 Solid Waste*

In order to characterize the cost of service for solid waste collection & disposal service in Rural Alaska, we developed estimates from interviews with local community personnel and verified the magnitude of the costs against actual costs studies from refuse hauling and landfill operations in larger communities.

Cost:

| | |
|---|---|
| Hauling (Tuntutuliak) | $32,000 per year [Salaries, Four Wheeler, Fuel] |
| Estimated Landfill Capital Cost | $30,000 per year [$500,000 / 25years / 3% real] |
| Total: | $62,000 per year |

### Rates and Collections

Overall, rates were designed to recover annual operations and maintenance (collection personnel salaries, four wheeler depreciation, fuel).

Rates were designed to encourage use of the village four-wheeler collection service – rates for self-hauled material deposited at the landfill were set at twice the rates for material hauled by the village service.

| | |
|---|---|
| Self-Haul per bag (33-gallon trash sack) | $1.00 per bag |
| Village Haul per bag (33-gallon trash sack) | $0.50 per bag |

It was unclear whether and how often self-haul customers were billed. It appeared that efforts were made to bill for the services provided by the village. We were unable to verify whether billings were collected.

### Environmental Cost and Unmet Needs

Rural Alaska is just beginning to tackle the problem of poorly contained solid waste, as epitomized by open dumps. Most communities have Class III landfills that do not meet the requirements of the federal Resource Conservation and Recovery Act (RCRA). Approximately ninety percent (90%) of the villages in rural Alaska use open dumps to dispose of solid waste (Sarcone 1999). There are not sufficient funds to close open dumps that may present health and environmental risks, and existing funding for solid waste projects is inconsistent making

community planning difficult (Sarcone 2001). The level of need for solid waste funding has not been carefully assessed, making it difficult to know exactly what funds are necessary to carry out needed open dump closures, solid waste management planning and new landfill development. By one measure, the Indian Health Service Sanitation Deficiency System, there is a backlog of at least $60 million just to close down open dumps in Alaska.

It seems clear that based on this unmet need to bring village solid waste facilities up to a minimally adequate level of service, the "true cost" of solid waste on a statewide basis is being paid to a great extent in the form of health and environmental risks rather than dollars.

Chapter 9 contains additional discussion of solid waste issues.

## *7.7 True Cost of Telephone Service*

Rural Alaska telephone service has been and still is heavily subsidized.

Alaska's long distance telephone system was built and owned by the U.S. Air Force up until 1971, when the system was sold to RCA, d.b.a. Alascom. From 1971 through 1979, when the system was in turn sold to Pacific Telecom, interstate long distance rates fell 50%, or roughly 4.7% per year.[51] Rate declines have been attributed to substantial improvements in system economies of scale and density as volumes increased dramatically due to rapid expansion in oil industry activity. Advances in technology have also contributed to declining unit costs.

After the purchase of the RCA Alascom system in 1979, Pacific Telecom received "transitional supplement" payments from AT&T to help lower rates in Alaska toward national average rates. These payments amounted to roughly $150 million from 1980-1984. After the breakup of AT&T into the long distance and local Regional Bell Operating Companies in 1984, a transition to new arrangements occurred. Under the new Joint Services Arrangements, AT&T argued that it paid Alascom an annual contribution of roughly $80 million a year until regulators sought to phase out the "subsidy" as being incompatible with the emerging competitive marketplace.[52] During the phase out of the subsidy, AT&T agreed to purchase Alascom for a purported $365 million in 1995.

---

[51] See National Regulatory Research Institute Report on Privatization of The Alaska Telecommunications Network, verify citation.

[52] See "In the Matter of Integration of Rates and Services for the Provision of Communications by Authorized Common Carriers between the Contiguous States and Alaska, Hawaii, Puerto Rico and the Virgin Islands", FCC Federal State Joint Board, Final Recommended Decision, CC Docket No. 83-1376, October 29, 1993.

General Communications Incorporated entered the interstate long distance market in the early 1980s and the in-state long distance market in the early 1990s. Before, during, and after the advent of GCI's competitive entry in the long-distance markets, prices for service continued to fall. While competition has certainly contributed to the continuing decline in prices, ongoing advances in telecommunications technology and changes in regulatory policy have also played a role in reducing the price of long distance service.[53]

## Telecommunications Support In Alaska

Local and long distance communications in Alaska in 2001 continues to be supported by substantial implicit and explicit support mechanisms including geographically average rate requirements, access charges, universal service, schools, library, health care, and advanced services programs. The aggregate level of support coming into Alaska from all of these support mechanisms is estimated at around $120 million a year which amounts to roughly 12% of the annual revenue that the telecommunications sector generates in Alaska.[54]

Rural Alaskan villages receive a significant share of the annual telecommunications support. A typical village household in the Yukon-Kuskokwim River delta may receive *direct federal* support that totals on the order of $600 per household per year for local and long distance service – including high cost support, long-term support, and switching support.[55] *Indirect* support through the regulatory policy of national geographic rate averaging may be worth on the order of $40 per month for a typical household and as much as $160 for a household with family in Anchorage and the lower 48. A typical Y-K village household may pay on the order of $350-$450 per year in rates for local and long distance telecommunications services.

In summary, a rural Alaska household may be paying roughly 40% of the cost of local and long distance service while 60% is being supported through various subsidy mechanisms and the total cost of service may be on the order of $1000-1200 per household per year.

---

[53] See for example The Failure of Antitrust and Competition to Establish Competition in Long-Distance Telephone Service, by Paul W. MacAvoy, MIT Press, 1996.

[54] Telecommunications Addressable Market estimate of $1 billion a year is collaborated by ACS and GCI SEC filings. Estimate of aggregate level of support from various subsidy programs is an independent estimate developed by the author based on compilations of FCC, RCA, SEC, RUS, and direct Federal appropriations data and an estimate of the implicit support value of geographically averaged rates.

[55] Sources: FCC Common Carrier Bureau Monitoring Report, September 2000.

## Penetration Rates – Cable TV vs. Telephone

Consistent with studies of lower 48 households in the first and second quintiles of income, the penetration rates for cable TV service appears to be higher than telephone service in the communities where we conducted site visits.[56]

Contributing to the high cable TV penetration rates were apparently low on-going monthly prices. In some instances, cable TV service appeared to be offered by the local government or village council and it was unclear whether end-users were paying for the service. It was also unclear to what extent the local systems were paying programming fees.

In the village of Napaskiak, the village elders did not support the policy of providing cable TV to the village, so many households have installed direct satellite TV dishes.

Contributing to the relatively low telephone penetration rates in the rural Alaska communities where we conducted site visits, local telephone service was priced at $20 - $30 a month while it still competes against VHF Radio systems that have no noticeable monthly cost -- electrical usage and battery back up costs appear negligible. Local utility managers suggested "almost everyone has a VHF" (confirmed by antennae on houses) while roughly 2/3 to 3/4 of the households appears to be wired for the local wire line phone service.[57]

[56] Cite National Consumer Law Center Reports and Testimony (verify citation)
[57] Tuntutuliak interviews and observations.

# 8. Effective Management Practices for Rural Alaska Utilities

## *8.1 Introduction and Summary*

### The Utility Management Challenge

From a business management standpoint, the fundamental challenges facing utilities in Rural Alaska are daunting. The customer base typically consists of large residential households with low average and seasonally variable disposable incomes; the single largest customer is often the local school which may represent as much as one third to one half of the potential revenue. Capital costs per customer for micro scale utilities serving less than 100 households may be up to 10 times as high and operating costs up to three times as high as for a utility serving a small rural community with a population of 30,000.[58] And even among similarly small places, costs for remote rural villages in the extreme climate and geography of Alaska may be two to four times those of a similarly sized village in a temperate climate of moderate geography.

Employees – especially with managerial, administrative, financial, operational skills necessary for the increasingly complex requirements of rural utilities – are in short supply and turnover quickly. Capital is primarily provided by government grants and subsidized loans – private capital is often limited due to the risks of a highly variable small market along with government policies that discourage a return commensurate with risk.[59] Upstream utility service and input product markets (engineering design, construction, equipment suppliers, and contractors – managerial, financial, legal, operational) are small and not very competitive – suggesting higher costs and variable performance. Finally, rural utilities are often relatively new organizations with policies that continuously evolve to meet rapidly changing local social, political and economic conditions.

What is the role of management in this environment? In general, the role of management is to:[60]

- Develop the organization that fits the task

[58] See National Regulatory Research Institute, NRRI 91-17, Viability Policies and Assessment Methods for Small Water Utilities, Table 2-10: Mean Financial Statistics by Water System Size.

[59] For example, the PCE program does not allow a return on equity or an interest coverage ratio in the determination of allowable costs.

[60] See Management Challenges for the 21st Century, Peter F. Drucker, HarperCollins, 1999, Chapter 1 "Management's New Paradigms."

- Lead people with the goal of making productive the specific strengths and knowledge of each individual
- Understand and meet the needs of its customers by providing a service that the customer (or its surrogate supplier of subsidy funding) is willing to pay for
- Focus on operational results that drive the price and performance of the service being provided to customers – regardless of whether it is directly under management control or not, i.e., fuel costs for electric utilities

Thus, the challenge facing the management of rural Alaskan utilities is to bring together people and capital to provide its customers with valued services – under extremely difficult circumstances that are often outside of management's direct control.

## Basic Policy Alternatives to Improve Management

What can policy makers do to help utility managers meet the challenges of building effective organizations, attracting and retaining skilled employees, attracting capital, and meeting the needs of their customers?

## Building Effective Organizations

Policy can attempt to *prescribe organizational development* by tying funding to organizational development standards – typically measured by paperwork compliance with mission statements, bylaws, financial statement compliance, insurance. This approach may present a bias toward paperwork performance that favors regional utilities that can draw upon paperwork compliance specialists in regional government hubs.

Policy could also attempt to *enable* organizational development by providing templates and training as part of funding of capital projects. It could reward utilities for continuous improvement (not just compliance with a particular requirement at the time a program is implemented). It could reward top performing employees by sending them to annual industry conference where they can teach others in their division about what they did to improve. And policies could directly share the financial rewards of improvements with the utility through incentive regulation.

Effective organizations require:

- **Organizational Capability** – attract and retain boards who work together to provide insight and assistance to managers in attracting people and capital to the enterprise and understanding the needs of customers

- **Management Capability** – Attract and retain experienced managers with a track record of building successful teams who meeting or exceed financial, public health, safety, and environmental goals.
- **Technical Capability** – Attract and retain experienced operators with a track record of successful performance in meeting or exceeding safe, reliable service standards and achieving compliance with government regulations.
- **Financial Capability** – Attract and retain experienced administrators, bookkeepers, accountants, financial officers, and lobbyists with a track record of successful performance in meeting or exceeding financial goals.

## Attracting and Retaining Skilled Employees

There is little better basic management practice advice at any stage in an organization's development than to *build a team of successful people.* Given this premise, a fundamental challenge facing rural utilities is the daunting combination of thin labor markets and limited ability to pay or offer amenities to attract and retain employees with skills in the operations, maintenance and management of rural utilities.

What can policy makers do to help utilities attract and retain skilled employees?

- Prescribe skill levels – certification program (operators, managers, administrators)
- Enable utilities by helping expand supply of and demand for labor.
    - **Supply**. Expand the supply of skilled labor through providing:
        - Training Programs
        - *Incentives* for sharing of school maintenance personnel with local utilities
        - *Incentives* for women to participate in management of utilities[61]
    - **Demand**. Increase demand for skilled labor through providing:
        - Incentives for utilities to join retirement program pools
        - Provide an operations and maintenance subsidy to help fund personnel costs and associated pensions

[61] In interviews with government program administrators, rural business and maintenance personnel, and water and wastewater engineers, the question was asked, "Among the utilities that have improved over time, what are the common elements that you associate with why those utility improved?" A common theme of those responses was that an expanded role of women in the management of the utility leads to significant improvements in performance. Interviewees describe a linkage between the women's interest in raising healthy children and the improvements in

### Attracting Capital

What can policy makers do to help utilities attract capital?

- Provide government funded capital grants
- Encourage private capital through "neutral subsidies" that do not favor government vs. private capital formation, one technology vs. another, debt vs. equity financing, etc.
    - Provide direct subsidies based on affordability criteria to help fund ongoing costs of capital including depreciation, interest, interest coverage ratios, and return on equity
- Encourage utilities to participate in conferences and training on grant applications, raising capital from private sector equity (investors) and debt (banks) sources

### Meeting the Needs of Customers

What can policy makers do to help utilities meet the needs of their customers?

- Enable local customers to participate in policy decisions concerning price and performance of service – either on governance boards or advisory boards
- Avoid "one size fits all" price and performance standards absent clear and compelling evidence of externalities, i.e., let customers decide what level of performance best meets their need for the price they are willing to pay
- Provide incentives for women to participate in management and board governance[62]

## *8.2 Overview of "Best Practices" Concepts*

### Introduction

Management of a modern utility enterprise is a complicated and challenging endeavor. It requires balancing myriad interests and issues – customer demand, new technology and legacy

---

children's health attributable to well run water and sewer utilities. [See also Evaluation of the Alaska Native Health Board Sanitation Facility Operation and Maintenance Program]

systems[63], volatile capital markets (both public and private), generally increasing government regulation, suppliers, employees, and potential competitive pressures.

Given the complexity of the enterprise, it is not difficult to appreciate the wide variety of management approaches to running a modern utility – and a corresponding wide variety of suggestions for managers on how to run their business – some invited and some not. Some of the invited suggestions take the form of a management consulting engagement and recommendations.

During the 1990's, management consulting practice has honed four basic concepts that may be relevant to the challenges facing rural Alaska utilities:

- **Quality Management -** a management approach that focuses on continuously improving customer service, business processes, and empowering employees to make decisions. [A process]

- **Best Practices** –quantifiable and transferable business practices used by high performing organizations. [A goal]

- **Benchmarking** – the process of identifying and importing best practices to improve performance. [A process tool]

- **Generic Descriptive Management Practice Approaches** – sometimes known as "appropriate management practice" and carried out through manuals, self-assessments, workshops. An Alaskan example is the Introduction to Utility Management manual and associated training distributed by the [former] Department of Community and Regional Affairs (now DCED). Another example is the American Public Works Association Public Works Management Practices Manual. [A tool]

### Concept 1: Quality Management

Quality management focuses on measuring processes and performance and seeking continuous feedback and improvement. Measurement is used to identify when a process is not achieving desired results and to set a basis for comparing current results to prior performance. Among the tools used to seek continuous feedback and improvement are customer surveys and benchmarking. Benchmarking is a process for identifying and importing best practices to improve performance.

---

[62] See also footnote 49. Enlarging the role of women in the management and governance of rural utilities is highly likely to lead utilities to a better understanding the diverse needs of their customers and to better meet those needs.

[63] Legacy systems generally refers to existing computer hardware, software, and communications support systems.

## Concept 2: Best Practices

The term "best practices" means different things to different people. Many have used the phrase to mean simply comparing and sharing practices. More recently, a lot of management consulting advice has focused on characterizing best practices as the goal of a systematic, disciplined *and continuous* approach to finding and importing the best business process from other places.

Some common definitions of best practice include:

- A best practice is anything better than the current practice. Also known as a better practice.
- A best practice is declared by the media or a public relations department. Otherwise known as propaganda.
- A best practice is an award-winning success. Examples include: the Malcolm Baldrige National Quality Award, the Carl Bertelsmann Prize, Rutgers University's Exemplary State and Local Awards (EXSL), and the National Performance Review (a.k.a. "The Gore Report"). These often involve a process that achieves a performance breakthrough for the organization involved, but may or may not be transferable to other circumstances.

The following criteria capture the more developed definition of best practices as it is deployed in the public sector today:[64]

- A best practice must have a proven track record
- The success of a best practice must be quantifiable
- A best practice should be recognized by its peers as being creative or innovative
- If quantifiable results are limited, a best practice may be recognized through other positive indicators such as favorable impressions from critical peer groups or customer focus groups.
- A best practice should be repeatable with modifications. It should establish a clear road map, describing how the practice evolved and what benefits are likely to accrue to others who adopt the practice.
- Best practices have local salience to the organization searching for improvement.
- A best practice may have evolved as a result of unique circumstances, but is should be transferable, with modifications, to organizations with different circumstances.

[64] See Coopers & Lybrand, *Best Practices of Improvement Driven Organizations: How Today's Top Performers Produce Results*. (1990s) and Keehley, Medlin, MacBride, & Longmire, *Benchmarking for Best Practices in the Public Sector* (1997).

## Concept 3: Benchmarking

Benchmarking is a process for identifying and importing best practices to improve performance. Benchmarking is often viewed as a "surrogate for the competitive forces that push businesses to achieve higher levels of quality and productivity."[65]

A typical benchmarking process consists of the following steps:[66]

1. Determine purpose and scope of project. Set boundaries of the time, expenditures, number of benchmarks, number of partners, number of internal processes to be reconfigured, number of people to involve on the work team and oversight committee.
    a. Decide which processes are candidates for benchmarking
    b. Assign rank order priorities
2. Analyze internal processes to get a thorough understanding of how things are done
3. Research and identify potential partners
4. Choose performance measures that are comprehensive yet common enough to be likely to generate valid and insightful comparisons
5. Measure current performance
6. Collect data from partner organizations
7. Conduct gap analysis. Prepare work group and oversight committee for the possibility of unpleasant results and reactions. Present results to management and share results with partners.
8. Import practices where appropriate in order to close performance gaps. Borrow, adapt, and adopt the processes to fit the local conditions.
9. Monitor results. Improvements in performance measures should indicate a closing of the gap between "best practices" and local firm performance.
10. Recalibrate annually.
11. Return to the initial process triage in step 1 and move to the next level of process candidates for improvement and run through the process again.

---

[65] William Gay, *Benchmarking: A Method for Achieving Superior Performance* (1992).
[66] Keehley, et al., *Benchmarking for Best Practices in the Public Sector*, Chapter 5.

## What Benchmarking Is Not

Benchmarking is not just a simple comparative study. The process does not begin with data collection and does not end with data analysis. What sets benchmarking apart from comparative studies is the borrowing, adapting, and adopting of the methods of others, not just reviewing their outcome data.

Benchmarking is not simply copying practices from other organizations. Copying practices from other organizations, without analysis, understanding, and adaptation is *as likely to hurt performance,* as it is to improve it. And even when a newly copied practice improves performance, it was probably found through mimicking the apparent successes of others rather than through the systematic process of benchmarking.

Benchmarking is not performance assessment. Performance measurement or assessment is one element in the benchmarking process. It lays the foundation of data on which an organization will act to improve a process.

## Common Responses to Benchmarking

The International Institute for Learning has grouped common organizational responses to benchmarking into the following clusters:[67]

1. *Skepticism and distrust*. Colleagues receiving benchmarking results that they are not prepared to accept will immediately enter a state of denial.
2. *Shoot the messenger*. The team presenting the performance comparison between the existing organization and top performing organizations will be shot at upon revealing what appears to be low performance. The entire benchmarking effort may collapse if the comparison data are not accepted by key decision makers.
3. *Not invented here*. Some may discredit any method that was not designed in-house and tailored to meet their unique circumstances.
4. *But we're different*. Similar to the not-invented-here response, this reaction accuses the presenter of comparing apples and oranges. The underlying rationale is "they don't provide the same service we do, so any technique they have, no matter how outstanding, is irrelevant to our situation."

[67] International Institute for Learning, *Breakthrough Results with Benchmarking*, Pamphlet, 1995.

5. *We'll look into it*. This response displays adequate appreciation to the team for all its hard work, but then the results are left to gather dust on the shelf.

In addition to this set of reactions to the presentation of performance measurement in a benchmarking process are the standard playing cards of those who are looking to get to "no":

1. *We cannot afford it*. Budgets are already stretched to the limit and no one is willing to step forward to sacrifice their resources for the sake of benchmarking.
2. *We do not have time*. All available personnel are already spread way too thin. Every precious second is dedicated to a task of greater value than benchmarking.

For a benchmarking process to be successful, these attitudes and reactions need to be proactively addressed by focusing on the likely process gains compared to the total cost of implementation. Herein lies a significant challenge for those seeking change.

## Organizational Readiness

Organizations must be fundamentally ready to accept the changes brought by benchmarking and the importation of best practices. Their existing business processes must be minimally compatible with the processes being imported. The culture of the organization, and its surrounding community must be amenable to the importing of processes or ideas from without. The organization must be operationally and technically ready to actually carry out the new process and to monitor its effectiveness.

## Benchmarking and Rural Alaska Utilities

In order for benchmarking to be effective for rural Alaska utilities, many of which serve extremely small markets, a benchmarking process needs to be:

- Likely to be extremely cost effective
- Readily understood by the local employees and the local community
- Readily supported by the local community leadership
- Promoted by at least one internal champion, but preferably a local team who wants to change the ways things are done
- Lead by someone charged with management of the utility who can identify, measure and improve operations and maintenance practices and who feels that it is their best interest to do so.

## Concept 4: Generic Descriptive Management Practices

A number of generic descriptions of appropriate management practices may be consulted in an effort to improve management. Appropriate management practices provide guidance on *what* a utility should be doing – not *how* it should be done. This descriptive, *as opposed to prescriptive*, approach allows each utility to tailor their practices to meet their local conditions – organizational, geographic, climatic, political, or community related.

This approach is exemplified in the American Public Works Association *Management Practices Manual*. This manual is used for:

- Informal program or organizational evaluation
- Self Assessment
- Peer Review
- Accreditation

Several sections below build upon the trade association education model – where the trade association is responsible for drawing upon the expertise of its members and developing a management practices manual that can be used by utilities according to their specific circumstances to improve their management.

In contrast to this model, efforts to improve management of rural utilities in Alaska today are being provided by local utilities themselves and by the Rural Utility Business Advisor program. In addition, efforts are being made by capital funding agencies to reward certain management practices with higher priority funding and to require management training in conjunction with the completion and hand-off of construction projects to local personnel.

## Summary -- The Importance of Human Resources

Regardless of the current state of a utility's organizational capability, basic management practices generally boil down to:

- Organizational Capability - Attract and retain boards who work together to provide insight and assistance to managers in attracting people and capital to the enterprise and understanding the needs of customers
- Management Capability – Attract and retain experienced managers with a track record of successful performance in meeting or exceeding financial, public health, safety, and environmental goals.

- Technical Capability – Attract and retain experienced operators with a track record of successful performance in meeting or exceeding safe, reliable service standards and achieving compliance with government regulations.
- Financial Capability – Attract and retain experienced administrators, bookkeepers, accountants, financial officers, and lobbyists with a track record of successful performance in meeting or exceeding financial goals.

In short, the essence of "best" management practice advice at any level in an organization is to attempt to *build a team of successful people*. Given this premise, *the fundamental challenge facing rural Alaska utilities is the daunting combination of a limited labor pool and limited ability to pay or offer amenities to attract and retain skilled employees.*

Current approaches to address this fundamental challenge consist of:

- Training programs to improve the overall skill level of the thin labor pool
- Prescriptive lists designed to help managers comply with generic notions of what constitutes good management practice
- Circuit Riders – publicly funded skilled maintenance personnel who travel to multiple communities and provide direct maintenance of electric systems
- Rural Utility Business Advisors (RUBA) – essentially public funding to provide a supply of consultants with basic management skills for rural utilities.
- Remote Maintenance Workers (RMW) - essentially public funding to provide a supply of basic operations and maintenance consultants for rural utilities. RMWs also provide training directly and indirectly.

## Policy Responses to Promote Best Practices

Given the high cost and high risk of providing utility service to remote rural Alaskan villages, there are two basic approaches to encourage the adoption of best practices among rural utilities. They can be characterized as:

1. Spend more
2. Spend more efficiently

## Spending More

Additional resources could be spent on the "demand side" of the labor market. Greater subsidy support for general operations would allow utilities to better compete with schools for qualified operators. Funds could also be targeted at specific compensation problems. For example, public funds could be used to establish and fund a retirement benefits pool for utility operators.

A complementary approach is to increase funding on the "supply side" of the market. For example, increased support for the RUBA or RMW programs would allow more time to be spent improving the average skill levels of existing employees.

### Spending More Efficiently

The basic idea behind spending more efficiently is to empower the utility management to reap the full marginal benefit of actions that reduce costs, and to force them to face the full economic impact of actions that increase costs. To do this, existing subsidy and support schemes must be reconfigured to include a significant portion of fixed payments or block grants. This is a specific case of the lesson from Economics 101 that fixed amounts of transfer payments are economically efficient because they do not distort behavior.

In theory, the fixed payments or block grants could be given to utility consumers on the grounds that they know best how to make tradeoffs between more reliable utilities and other goods. In practice, the fixed payments would need to go to the utility itself, due to the public health and safety benefits of having widespread service and the pre-existing subsidies of major capital construction. (We assume that the project based "public works" model of major capital improvements is not likely to change significantly; only the support for O&M is amenable to changes)

## *8.3 Detailed Example of Generic Basic Management Practices*

The material in this section is modified from the American Public Works Association, Public Works Management Practices Manual, Third Edition, August 1998.

1. **Organizational practices and policies –** Organization of the utility is the expression of the authority and responsibility through which the management of the utility operates on a day to day basis.

   1.1. Mission, vision, value statements

   1.1.1. Mission – Does the organization have a concise description of the fundamental purpose for which the organization exists?

   1.1.2. Vision – Where is the leadership of the organization taking the organization?

   1.1.3. Value – What are the core values (culture) of the organization that describe how employees are expected to act?

1.1.4. Exit Strategy – Does the organization have an exit strategy – a way to go out of business if the customer market revenues and outside capital financing sources are insufficient to sustain on-going operations?

1.2. Description of Organization

1.2.1. Is a description of the organization available and current?

1.2.2. Does the organizational description describe responsibility and authority of each element and person within the organization?

1.3. Review of Organization Process

1.3.1. Does the organization routinely or in response to major changes review its mission, vision, and value statements?

1.4. Organizational Policies/Practices

1.4.1. Are the organization's policies, procedures, and practices consistent with the Mission, Vision, and Values?

1.4.2. Do the organization's policies, procedures, and practices provide a framework for decision-making and action?

1.5. Code of Ethics (policy, practice)

1.5.1. Does the organization have a code of ethics (standards, guidelines) including political involvement, acceptance of gifts, and conflict of interest?

1.6. Personnel Management (Is the utility the employer of choice in the community, region, state?)

1.6.1. Classification Plan

1.6.1.1. Does the organization have a plan that groups every job into position descriptions by similarities in duties, responsibilities and qualifications?

1.6.1.2. Does the organization have classification plan provisions related to reclassification?

1.6.2. Compensation Plan

1.6.2.1. Does the organization have a compensation plan that establishes salary ranges, promotions, overtime pay, compensation time, and bonuses?

1.6.3. Benefits Plan

1.6.3.1. Does the organization have a benefit package that describes vacation, benefits, sick leave, paid holidays, retirement, health insurance, disability & death benefits, educational benefits, leave allowances (jury duty, bereavement, parental leave, military duty)?

1.6.4. Working Conditions

1.6.4.1. Are adequate work space, equipment and tools provided?

1.6.5. Temporary Assignments

1.6.5.1. Does the organization have a procedure for special situations, such as an emergency, in which temporary revisions to the organizational structure may be required?

1.6.5.2. Are the lines of authority and responsibility well understood under temporary assignments?

1.6.6. Personnel Rules

1.6.6.1. Are the rules governing employee conduct explained to each employee?

1.6.7. Training & Career Development

1.6.7.1. Career Development practices and procedures

1.6.7.1.1. Does the organization have a career development program that identifies the procedures for advancing within the organization?

1.6.7.1.2. Does the organization have opportunities for individuals to improve overall job satisfaction and performance?

1.6.7.2. Registered or certified employees

1.6.7.2.1. Does the organization comply with requirements to have registered or certified employees where required?

1.6.8. Training goals

1.6.8.1. Does the organization have training goals that are consistent with the mission, vision, and value statements?

1.6.8.2. Do the goals provide for evaluation of the training performance?

1.6.9. Training activities

1.6.9.1. Does the organization have ongoing training program activities that include a list of training functions, list of training programs, training records, attendance records, dates of certification, renewal dates, and evaluations?

1.6.10. Training personnel/contractors

1.6.10.1. Does the organization have training personnel or contractors identified and properly qualified?

1.6.11. Training evaluation

1.6.11.1. Is the training program routinely evaluated, updated and revised?

1.6.12. Individual training report

1.6.12.1. Does the organization keep track of each employee's training program attendance and dates?

1.6.13. Recruitment - Application, Hiring Process, Orientation

1.6.13.1. Does the organization have a procedure to publicize employment opportunities?

1.6.13.2. Is a standard application form used?

1.6.13.3. Is there a policy that assigns responsibility for the selection process, determines which forms must be completed prior to hiring, and appoints an authority to make final decisions on employment actions.

1.6.13.4. Are employees provided with an orientation that provides them with all the necessary information to begin their assignments? (Policies, procedures, practices, organizational structure, mission, vision, values, general information, supplies, forms to be completed and processed)

1.6.14. Performance Evaluation – pay, promotion/demotion, terminations, resignations

1.6.14.1. Are performance evaluations conducted? Is the relationship between employee performance and pay outlined? Is there a process for promotions and demotions? Is there a process for terminations and resignations?

1.6.15. Employees – grievance, discipline, collective bargaining

1.6.15.1. Are there procedures for grievances, disciplinary action, and treatment of collective bargaining activities?

1.6.16. Supervision – internal communications, supervisory training

1.6.16.1. Does the organization distribute important information to employees? Do all supervisors receive training in supervision, leadership, and technical areas?

1.6.17. Employee recognition

1.6.17.1. Do employees receive recognition for individual and team accomplishments?

1.7. Planning

1.7.1. Strategic Planning Process

1.7.1.1. Does the organization regularly review the level of service it provides, establish and review long-range goals and objectives consistent with the mission, establish short term goals and objectives to move the organization toward its long-range objectives, regularly evaluate strategic opportunities and pursue a portfolio of opportunities that are likely to provide value?

1.7.2. Levels of Service

1.7.2.1. Does the organization establish a level of service to be provided to the customer base for each functional responsibility? Is this level of service communicated to customers for their review and approval? Is the level of service established/revised in conjunction with an annual, open-to-the-public budget process?

1.7.3. Planning Goals & Objectives

1.7.3.1. Are long-range goals and objectives are established and are consistent with the mission, vision, and values statements and include designation of the levels of service to be provided? Are managerial and organizational needs addressed?

1.7.4. Plan Monitoring

1.7.4.1. Is progress toward goals and objectives reviewed regularly? Are changes to the goals and objectives made as circumstances change?

1.7.5. Plan Documentation

1.7.5.1. Are organizational planning documents maintained and accessible to all appropriate personnel?

**2. Finance –** Finance and budgeting are central to the decision making process and include: revenues, expenditures, budgeting, accounting, capital budgeting, borrowing, debt management, cash managements and finding resources that may be available from various government programs

2.1. Control

2.1.1. Has the organization established clear lines of responsibility for the management of finances and budget? Are internal controls established and followed for revenues and expenses?

2.1.2. Are late-payment and failure to pay procedures established and followed? Are customers appropriately notified of failure to pay and disconnect procedures?

2.2. Budget Preparation & Presentation

2.2.1. Are responsibilities for budget preparation and presentation to customers and the board clearly established and followed?

2.2.2. Is the budget presentation well developed and understandable? Are all costs for each activity or project accounted for?

2.3. Variance Analysis

2.3.1. Are explanations for variations from the established budget provided and does management take action, if required, when variances are identified?

2.4. Cost of Service

2.4.1. Are costs generally categorized into capital, operations and maintenance and are unit costs of service identified to help guide the allocation of resources?

2.5. Rate Setting

2.5.1. Are prices for services (both internal and external customers) set according to financial objectives, equity, efficiency and administrative feasibility?

2.6. Forecasting

2.6.1. Are budget forecasts updated? Is the responsibility for budget forecasting clearly assigned and is the forecast kept up to date?

2.7. Capital Planning & Improvement Program

2.7.1. Does the organization have a capital plan?

2.8. Capital Selection Criteria

2.8.1. Does the organization have measurement guidelines established and are they used to evaluate, compare, and identify priorities between project proposals?

2.9. Assessments

2.9.1. Is there a line extension policy and is it followed? How are the benefits and costs shared between user groups and between current and future customers? (See also Alignment with Community Vision category of measures.)

2.9.2. Does the organization have a procedure to collect assessments for new developments that use previously developed facilities? Are the assessments collected?

2.10. Right-of-way Acquisitions

2.10.1. Does the organization have a process for acquiring right-of-way? Is it followed? If, when right-of-way conflicts arise, how quickly and equitably are they resolved?

2.11. Purchasing

2.11.1. Does the organization have a standardized purchasing procedure for ordering, accepting or rejecting materials and services? Is an established procedure followed in soliciting service maintenance and professional service contracts?

2.12. Operating Inventory

2.12.1. Does the organization maintain a level of parts and supplies necessary to meet the needs of the operation? Has there been an analysis of the anticipated volume of usage, operating costs of carrying the supplies, costs and availability of funds to invest in supplies, anticipated future price changes, cost of alternatives to maintaining local, regional, state, or vendor inventory?

2.13. Alternative Service Methods

2.13.1. Does the organization examine alternative methods of supplying needed services including building expertise in-house, contracting with public agencies, contracting with other utilities, contracting with vendors, or contracting with private sector providers of services? Does the organization have an equitable evaluation method for selecting the best option for the community?

**3. Risk Management & Legal Review** – Risk management is the protection of people and property in order to reduce the probability of accidents. By providing adequate resources to reduce risks and prevent losses, not only the number but also the amount of money and frequency of lawsuits is minimized.

3.1. Claims – Are claims against the organization processed in accordance with an accepted procedure?

3.2. Worker Compensation Claims – Are worker compensation claims reviewed by professional claims administrators?

3.3. Accident Reporting Claims – Is evidence in both property damage and personal injury incidents reported and substantiated according to an established procedure?

3.4. Legal Review – Does legal counsel review contracts, permits, resolutions, ordinances, bylaws, and other agreements?

3.5. Legal Records – Does legal counsel provide guidelines for record retention for evidence in litigation?

3.6. Ordinance and Regulations Enforcement – Does legal counsel review policies concerning the enforcement of ordinances, bylaws and regulations?

3.7. Legal Review of Regulation – Is legal counsel consulted about the interpretation and impact of federal, state, and local laws and regulations?

**4. Communications** – Organizational communications are those communications that take place in the normal performance of utility services. They encompass virtually every kind of communication medium including written, verbal, and telephone.

4.1. Internal

4.1.1. Are methods and timing of communications with governing board detailed and consistent?

4.1.2. Are methods and timing of communications with employees detailed and consistent?

4.1.3. Are staff meetings scheduled and conducted regularly? Do the meetings provide an opportunity for interaction and coordination?

4.2. External

4.2.1. Are procedures for communicating with the public established and followed?

4.2.2. Are records kept listing all key names and numbers of all radio, TV and print media to enable dissemination of timely accurate information? Does the utility have a regularly updated web page?

4.2.3. Is a policy established on who has the authority to represent the agency to the media?

4.2.4. Are Board Meetings open to the public and scheduled and noticed in a manner that enables public participation?

4.2.5. Are Advisory Board Meetings open to public and scheduled and noticed in a manner that enables public participation?

4.2.6. Does the organization have a policy established on public participation in the development of major projects?

4.2.7. Does the organization have a procedure established for handling and responding to verbal or written complaints, inquiries, and requests for service?

4.2.8. Does the organization render regular and accurate bills? Do customers pay in a timely fashion? Are the aged accounts receivable comparable to industry standards?

4.2.9. Disconnect process for failure to pay

4.2.10. Does the organization communicate and coordinate its projects and initiatives with other utilities in the community and with other appropriate entities (local government, funding agencies, etc.)?

**5. Communications Systems** – The communication equipment must be able to satisfy the needs of the utility during regular and emergency conditions. An adequate system that operates well will speed critical responses during emergencies and improve the use of resources during normal operations.

5.1. Does the organization maintain accountability for the communications function within the organizational structure (radio, telephone, system & alarm monitoring, dispatch, cell phones, portable computers, secure computer network)?

5.2. Does the organization provide resources and management to operate, inspect, test, calibrate, maintain and upgrade the communications system?

5.3. Does the organization provide regular testing of the system and alarm monitoring? Are logs of test results and remedial action status maintained?

5.4. Are procedures established for logging and responding to trouble reports? Is 7X24 telephone access provided to the public for emergency assistance?

5.5. Are procedures established for notifying stand-by employees, supervisors, and other appropriate services in the event of an emergency?

5.6. Are accurate up-to-date service area maps readily available to dispatch and emergency personnel?

**6. Records –** Utility records are maintained in a variety of forms including permit applications, tax records, meter reading and bills, purchase orders, inventories, maps, plans, specifications, as-built drawings, time cards, complaint forms, and land use records.

6.1. Is a policy established on records management which addresses record retention and retrieval, storage, security, and format (paper, disk, CD)

6.2. Are public records available and a process developed an implemented to allow the public access to records?

6.3. Does the daily work crew record activities, repairs, costs, and locations?

6.4. Are service requests / trouble reports kept in records that include the date, time, name address, phone number, problem, location of problem and response status?

6.5. Is a library maintained (paper or electronic) for current technical literature and reference material?

6.6. Is a practice in place to ensure periodic reporting of planned activities and accomplishments?

6.7. Are complete personnel files maintained in one centralized location for all employees?

6.8. Does the organization have a policy that defines and determines access to personnel files?

6.9. Does the organization have a policy determining the content of personnel files?

6.10. Does the organization maintain a personnel leave reporting system?

6.11. Are maps updated on a regular schedule and available to the public?

6.12. Is a record of the infrastructure assets maintained and updated on a regular basis? Does the infrastructure record contain accurate location and condition information?

6.13. Does the organization maintain a record of non-infrastructure assets (property, equipment, vehicles, cell phones, etc.)?

7. **Computer System** – Computer systems are becoming increasingly critical not only to create distribute, and retain data, but also to integrate with the telecommunications system to communicate increasingly complex information

   7.1. Are computer user needs assessed to ensure productive and effective design and implementation of information systems?

      7.1.1. Customer Records – order taking, processing, installation/change, trouble reporting, billing

      7.1.2. Management Systems – financial, personnel, procurement

      7.1.3. Are procedures in place to provide for the integrity, security, and efficiency of databases?

      7.1.4. Are documentation policies and practices established for computer programming, system development and user documentation?

      7.1.5. Are procedures and practices established for the acquisition, development, testing, and use of computer programs?

      7.1.6. Are computer user responsibilities identified and are all users kept informed of current policies?

      7.1.7. Are computer hardware, software, and networking systems routinely maintained to meet operating specifications?

      7.1.8. Is training for information systems provided to users on a regular basis?

8. **Emergency Management** – Emergency Management plans are necessary to ensure continued performance of critical utility services during times of significant community hazard

   8.1. Is a comprehensive multi-hazard emergency plan adopted, tested, and maintained?

   8.2. Does a procedure statement govern operations during and following a disaster event?

   8.3. Does the organization maintain contingency arrangements for use of equipment and other contracted resources?

   8.4. Does the organization participate in emergency exercises?

   8.5. Are personnel trained in emergency procedures and operations?

   8.6. Is communication and coordination maintained with other emergency service providers?

9. **Resource Management** – Among the critical factors affecting how a utility responds to emergencies is the utility's ability to gather and analyze information and apply appropriate resources.

   9.1. Emergency equipment is tested and storage facilities are monitored to ensure operational readiness and availability for use

   9.2. Mutual aid arrangements are established in order to expand resources (both emergency and "routine")

   9.3. Source listings for emergency supplies, equipment, and contractual services are maintained

9.4. Employee procedures are established for emergency events

9.5. Is the organization capable of quickly mobilizing when needed?

9.6. Are natural and manmade hazards identified and analyzed for the development of risk mitigation measures?

9.7. Effective procedures are established for timely restoration of community lifeline and other facilities following disaster events

9.8. Procedures are established to obtain adequate financial resources to fund repairs and restoration

9.8.1. Post-disaster recovery and restoration is very costly, usually beyond normal community financial resources. Federal, state, regional grant or loan assistance may be available. Disaster event records are organized and completed to fully support applications for assistance. Specific staff is assigned to prepare and pursue assistance applications

**10. Safety** – Attention to occupational safety and health can aid in reducing accidents, accident costs and improving productivity. Utility operation often involves hazardous work environments. These activities can entail a high level of risk if work is poorly managed.

10.1. Individuals responsible for safety and health training are identified and properly instructed

10.2. A safety program is established (rules, reporting procedures, forms, reviews, evaluations, manual)

10.3. Occupational safety and health performance is systematically measured and reported and reviewed.

10.4. Good safety performance is recognized, recorded, and rewarded

10.5. Hazardous materials are handled in accordance with approved directives

10.6. Procedures pertaining to safe working conditions in excavations and confined spaces are established and followed

10.7. Procedures pertaining to signage and barricading of work zones are established and followed

10.7.1. Employees receive job-related safety and health training

10.8. Community Infrastructure

10.8.1. Infrastructure plans are developed, documented, explained to the community, and shared with other utilities and agencies

10.8.2. Engineering studies are conducted to determine projects and programs that most effectively meet community objectives

10.8.3. Accepted engineering practices are used in the design of facilities and programs

10.8.4. Project management procedures are established to ensure effective delivery of construction services

10.8.5. Community wide programs are in place to guide and coordinate the various individual organization operations

10.8.6. Community wide programs are in place to provide for and coordinate the maintenance of facilities within the utility organizations

**11. Engineering Design** – The function of the administration of design is to coordinate the design responsibilities of all utilities and public works (board walks) and ensure that accepted design procedures are in use.

11.1. Organizational policies assign design responsibilities for streets, bridges, alleys, sewers, drainage, water supply and distribution, wastewater treatment, public buildings, parks, lighting, gas and electric utilities, public transportation, and airports.

11.2. Project teams are assembled. Authority and responsibility are delineated.

11.3. Design work is coordinated with appropriate groups

11.4. Qualified design people are on staff or contracted

11.5. Design standards are developed, adopted, and used

11.6. Project scoping is conducted to ensure that sufficient detailed information is provided to allow clear statement of project objectives and assess alternative approaches, environmental issues, ability to implement (time, budget, public acceptance), site review, availability of utilities, and preliminary cost evaluations.

11.7. Design parameters are prepared considering schedules required, budget limitations, and the intended use of the new facilities

11.8. A site survey includes control, boundary, and physical data surveys

11.9. Guidelines define preliminary design standards and methodologies

11.10. Design reviews are conducted by designated reviewers at accepted frequencies as design progresses

11.11. Design specifications are used to develop construction plans, reviews and project schedules

11.12. The design and construction of new or rehabilitated structures includes a quality assurance plan, including peer review for major project work

11.13. Standard design techniques and standard construction specifications are established and applied to all projects. Exceptions are justified

11.14. Standards for construction drawings and graphics on plans and drawings are established and applied to all projects. Exceptions are justified

11.15. Standard construction specifications include bidding requirements, contract forms, and standard general conditions

11.16. All applicable projects include work zone traffic control

11.17. A final plan review is scheduled prior to bidding, and the plan is amended according to review results

11.18. An agreement between the contracting agency and the contractor lists the conditions of work and the rights and responsibilities of both parties for completion and quality control

**12. Bid Process** – Construction maintenance and service contracts are complex, involving many conditions under which work is to be performed and payment is to be made. The utility must provide detailed information through contract documents, plans and drawings.

12.1. Bid Advertisement – The requirements for official notices are established, including where and how long to post advertisements. Advertisements should include the type of work involved, where work is to occur, and the date, time, and place for receiving bids.

12.2. Pre-Bid Meeting – A pre-bid meeting provides prospective bidders with detailed information regarding the bid process.

12.3. Qualifications and performance of prospective bidders is investigated if allowed by applicable law.

12.4. Bid opening procedures are established

12.5. Bid evaluation criteria are established for all bid proposals

12.6. A set procedure is used for formal award of contracts and the rejection of bids

12.7. Contract award involves verification of necessary bonds and insurance

**13. Construction** – The purpose of construction management is to facilitate and control the execution of the construction contract so that the intended work will be completed within a reasonable amount of time and within the planned expenditure.

13.1. Duties and responsibilities of the construction engineer are determined and are applied to staff or outside consultant assigned to the specific project.

13.2. Project monitoring ensures that all projects are proceeding in accordance with contract documents

13.3. Preconstruction conferences are required. Scheduling and logistical considerations should be clearly described.

13.4. A notice to proceed is required prior to construction and includes special instructions or revisions to the construction schedule

13.5. A uniform method of payment covers mobilization by the contractor

13.6. A single department or individual is responsible to administer and coordinate work in the public right-of-way

13.7. A procedure is established for inspection of all contracts and of the projects in progress to ensure that construction work is completed in accordance with project plans and specifications

13.8. A policy defines materials testing and other testing to assure that the materials and equipment which are incorporated into the construction project meet the accepted standards

13.9. A specific unit of work or unit of materials is detailed in the specification and measured and paid in a specified method

13.10. The contract procedure manual includes forms necessary and procedure for processing additional or lesser amounts of work due to changes in work conditions or requirements

13.11. Procedures are established for acceptance of the project and final payment

13.12. The contract procedure manual includes a procedure for tracking warranties on construction projects to ensure that they will be inspected before the warranty period has expired

13.13. A procedure is established to compile, file and retrieve as-constructed, as-built, or record drawings

13.14. The firm establishes procedures for resolving conflicts that arise during construction. Including identifying causes of conflict, filing and handling claims, determination of damages, time issues, use of consultants in resolving conflicts, negotiation, and arbitration

**14. Right-of-Way** – Right-of-way permits are useful administrative tools specifying the terms and conditions under which certain land can be used.

14.1. The firm works within the established procedures for working within public rights-of-way

**15. Utility Coordination** – Utility coordination requires participation of utilities, governments, villages, regulating bodies, highway departments (boardwalks), property owners, and other interested groups.

15.1. The utility firm develops appropriate means to consult, cooperate and establish effective liaison with all public and private utilities including water, drainage, sewer, wastewater, gas, electric power, diesel fuel storage, street lighting, municipal communication, telephone, and cable television.

15.2. The utility works within the policy establishing location and priority for placement of utility lines (underground, utiliduct/utilidor, and overhead)

15.3. A policy establishes how decisions will be made on when to place utility facilities underground, at ground level, or overhead in order to ensure that the life-cycle cost of the facility is minimized.

15.4. Long-range utility plans are coordinated with appropriate local, state and federal agencies

**16. Records** – Utility location and coordination efforts cannot be effective without the development and maintenance of records. Records are required for planning new, replacement or relocating facilities, as well as for emergency repairs.

16.1. Records and maps of utility facilities are maintained

**17. Damage Prevention –** Damage prevention includes those efforts that reduce or prevent damage to utility lines.

17.1. Clearance requirements are established for overhead, on grade, and underground facilities

17.2. Excavation procedures are developed and implemented

17.3. Owners and operators of facilities participate in One-Call systems where facility owners are notified of excavations near their lines in a timely manner.

17.4. The Uniform Color Code for Temporary Marking of Underground Facilities adopted by the American Public Works Association is used to minimize damage during excavation.

**18. Buildings & Facilities** – The most basic goal of facility maintenance is to preserve and maintain all facilities in a manner that provides a safe environment for the various uses of the facilities.

18.1. The utility complies with all building codes, regulations, and environmental laws with regard to the design, construction and maintenance of buildings and facilities

18.2. Plans and specifications for remodeling, renovation and small construction projects. Plans and specifications are reviewed for new buildings. Improvements are recommended for existing buildings.

18.3. A maintenance program establishes and addresses all building and facility maintenance functions including routine, cycled and planned maintenance activities. Deferred maintenance should be cost accounted and addressed as maintenance funds are provided.

18.4. A preventive maintenance (PM) program is established for building systems.

18.5. Trained individuals are assigned to respond to emergencies and information is available at a central location where emergency orders are dispatched.

18.6. The quality of all repairs and maintenance work is inspected and controlled.

18.7. A plan establishes evaluation and replacement of building components

18.8. Energy audits are performed. Annual review of energy consumed (electricity, natural gas, diesel fuel) and energy lost allows operational or equipment changes that will assist in minimizing energy consumption.

18.9. A procedure outlines the authority and responsibility of individuals responding to requests for maintenance.

18.10. An inspection program is developed and periodically reviewed and updated.

18.11. A schedule determines the frequency of alarm testing. A log or records of the test results is maintained.

18.12. An inventory of all facilities includes details on major facility components.

18.13. All improvements, replacements, or renovations of building systems comply with applicable building codes

18.14. Custodial methods are established for each facility. Custodial inspection programs are maintained for all facilities.

18.15. An inspection and testing program is established for all life and safety components located in the facilities.

18.16. A security policy details the provisions to be made to prevent thefts, damages, assaults, and disruption of life and safety systems.

**19. Equipment** – Equipment services is responsible for maintaining the equipment management information system which provides effective equipment services by maintaining equipment and parts inventories, performing equipment inspections, scheduling preventive and normal maintenance, recording maintenance history, analyzing equipment costs and defining replacement cycles, drafting specifications, and procuring and maintaining all mechanized equipment.

19.1. Services

19.1.1. Equipment is efficiently maintained and operated to provide the reliability and capacity desired. Efficiency is evaluated in terms of the life-cycle cost to provide the service.

19.1.2. Automated or manual EMIS allows management to maintain cost accounts for personnel and equipment and control daily maintenance work flow.

19.2. Inspections

19.2.1. Equipment inspections are performed by scheduled maintenance and servicing equipment at intervals compatible with manufacturers' recommendations or based on equipment usage. Scheduled inspections are common associated with preventive maintenance (PM) programs. Preventive maintenance inspections are generally divided into three classes:

19.2.1.1. Class A – All lubrication and mechanical services recommended by the manufacturer and all components and parts related to the safe operation of the equipment.

19.2.1.2. Class B – All Class A service *plus* a check and inspection of components having a high rate of wear or deterioration

19.2.1.3. Class C – All Class B service *plus* a thorough check and inspection of all remaining components and assemblies of the unit.

19.3. Operator Qualifications

19.3.1. The firm develops procedures to ensure equipment operators have appropriate training and certification

19.4. Equipment Inspection Responsibility

19.4.1. Personnel responsible for inspecting equipment and vehicles are identified

19.5. Operator Daily Inspections

19.5.1. Operators are required to perform and log daily inspections of their equipment

19.6. Maintenance Inspection & Maintenance Records

19.6.1. Required safety and condition inspections and their frequency for all mobile vehicles and equipment, and stationary and portable equipment are identified in writing, and records of inspections are kept current and are retained

19.7. Inspection Reports Analysis

19.7.1. Equipment condition is monitored and EMIS reports are reviewed to identify excessive costs and downtime that would indicate a deviation from the norm

19.8. Safety Improvements Review

19.8.1. A procedure establishes safety reviews to determine the adequacy and appropriateness of equipment

19.9. Defects Reports

19.9.1. Material and equipment defects are reported, and reports are investigated

19.10. Preventative Maintenance (PM)

19.10.1. Effective equipment management requires that repairs be made before equipment fails. This involves a preventive maintenance (PM) approach to provide for systematic, periodic servicing of equipment to facilitate operations with a minimum of downtime. Well planned preventive maintenance programs which follow the manufacturer's recommendations and schedules is likely to result in dependable equipment with extended life and lower life-cycle operation, maintenance, and repair costs. Planning and scheduling PM activities requires providing the right maintenance at the right time at the lowest overall life cycle cost.

19.10.2. A preventive maintenance program is developed for all equipment and includes preventive maintenance scheduling, recording performance, and monitoring the PM program.

19.10.3. A PM schedule is developed for all equipment

19.10.4. A routine evaluation of the PM schedule is performed to ensure timely and effective program administration

19.11. Scheduled Maintenance

19.11.1. Schedule maintenance is the systematic inspection and servicing of equipment at intervals compatible with manufacturers' recommendations for lubrication and mechanical services.

19.11.2. An established equipment maintenance plan includes all equipment

19.11.3. All non-emergency maintenance activities are scheduled for maximum shop efficiency

19.11.4. The maintenance program is evaluated to ensure the program is performed and administered in an effective manner

19.12. Equipment Inventory

19.12.1. Equipment inventories are needed for fleets, tools (including hand tools, shop tools, test equipment and fixed shop equipment), portable and stationary equipment, fuels, liquids and parts. Inventories are useful in tracking the size the

distribution of vehicles, parts, liquids and their rate of use. A properly developed inventory can be used to reduce equipment downtime.

19.12.2. An inventory program tracks the equipment that is owned or leased and where and how it is used.

19.12.3. A fluids inventory tracks the use of fuels, oils, lubricants and automotive fluids.

19.12.4. A parts inventory tracks new and used parts, tires, and batteries used in the maintenance and repair of equipment

19.12.5. A procedure identifies the disposal method for parts and materials in an environmentally sound manner

19.13. Replacement

19.13.1. Equipment should be replaced at the most economical point in its life cycle which implies the development of a planned, well administered turnover that will be relatively consistent from one year to the next. The economic life of equipment refers to the length of time over which the average total unit cost is lowest. Total unit cost encompasses all costs associated with ownership of the equipment.

19.13.2. A replacement policy establishes equipments, parts, and supply replacement cycles which are clearly defined

19.13.3. Replacement policy and cycles are reviewed at assigned intervals to verify replacement analysis and economic modeling procedures (life cycle costing review).

19.14. Specifications

19.14.1. Specifications provide a basis for obtaining a product or service to satisfy a particular need at an economical cost

19.14.2. Formal specifications are used to define the minimally acceptable configuration of the unit to be acquired

19.14.3. All equipment specifications and bids are reviewed by designated employees who will be using the equipment

19.15. A policy establishes procedures for the installation, inspection, maintenance, and removal of underground storage tanks

19.16. A procedure is used to mark, identify, and inventory equipment used by the firm

19.17. Equipment manufacturer warranties are monitored. Firms that fail to meet their warranty commitments on equipment are identified and the information is considered in future equipment acquisition

## 20. Solid Waste Management

20.1. Integrated Solid Waste Management (ISWM) requires the technologies of recycling, composting, waste-to-energy (WTE) and landfilling to work together to meet waste abatement goals. ISWM assumes that more than one program or technology is or will be useful in managing solid waste. ISWM systems include alternatives but

recognize that some wastes are most appropriately managed via landfilling or not being generated at all in the first place.

20.2. ISWM involves the development of processing and disposal options and considers the economic and political requirements of waste management. In order to implement ISWM across the nation, U.S. EPA established a hierarchy of preferred solid waste management technologies. Many similar public guidelines can be found in state waste management acts [Verify existence and scope of Alaska]. Most ISWM hierarchies include the following steps in descending order:

20.2.1. Waste reduction at the source

20.2.2. Recycling and reuse, include yard waste composting

20.2.3. Resource recovery including Waste to Energy and Municipal Solid Waste Composting

20.2.4. Landfilling

20.3. The organization has adopted an integrated solid waste management plan

20.4. A policy is in place that describes techniques that will be used to reduce the amount of waste material placed for collection

20.5. Duly enacted procedures establish a program to identify, monitor, and control all generators of solid waste

20.6. Procedures identify environmentally sound methods for the collection, transportation and disposal of solid wastes

20.7. A program for the disposal of household hazardous wastes is established to minimize the risk of inadvertent contamination of the municipal solid waste stream.

**21. Solid Waste Collection**

21.1. Collection practices are selected based on an analysis of the ultimate processing/disposal methods, health and environmental concerns, population density, public expectations, on-site storage capability, local customs, climate, and distances to transfer, processing, or disposal facilities.

21.2. The frequency of service needed to meet the goals and objectives of the adopted solid waste management plan is determined and stated in a policy document. This document is available to the public and includes a listing of both those materials that are collected, as well as those which are not.

21.3. Regulation of the types, number and sizes of storage receptacles promotes compatibility within the system

21.4. A scheduled designates the time and frequency of collection for all classes of users

21.5. Route design plans are determined by collection areas, crew sizes, materials collected and equipment needs

**22. Solid Waste Transfer**

22.1. Delivery of solid waste to remote processing or disposal sites may necessitate the use of transfer facilities. A transfer station is a supplement transportation system which adds flexibility to the collection operation. Route vehicles typically empty into large trailers, with or without compaction, to reduce haul distances for collection vehicles

22.2. An operational and economic evaluation of the use of a transfer station versus direct haul to the disposal facility is conducted

22.3. Transfer stations are designed to ensure sufficient capacity for the handling of solid wastes

22.4. An operational plan describes routine and emergency procedures and facilitates meeting of federal, state, borough, and local directives

**23. Solid Waste Processing**

23.1. Recycling

23.2. Recycling Service Level

23.3. Source Separation

23.4. Recycling Collection

23.5. Processing

23.6. Purchasing Policies

23.7. Recycling Program Review

23.8. Composting (Southeast vs. Southcentral vs. elsewhere)

23.9. Resource Recovery

23.9.1. Resource Recovery Material Supply

23.9.2. Resource Recovery Operations

23.9.3. Resource Recovery Monitoring

23.9.4. Ash Disposal

**24. Solid Waste Disposal**

24.1. Landfill Design

24.2. Impervious Liners

24.3. Environmental Monitoring

24.4. Methane Recovery and Venting

24.5. Landfill Operations Plan

24.6. Incoming Wastes

24.7. Drainage Control

24.8. Leachate Control

24.9. Compaction

24.10. Cover Systems
24.11. Inspections
24.12. Litter Control
24.13. Pest Control
24.14. Tourist Control
24.15. Disease
24.16. Aesthetics
24.17. Odor
24.18. Landfill Closure
24.19. Cover Material
24.20. Landfill Landscaping
24.21. Post-closure Monitoring
24.22. Financial Assurance
24.23. Land Application

**25. Potable Water**

25.1. Potable Water Source and Use
25.2. Water Quality or Quantity Changes
25.3. Infrastructure Location & Condition
25.4. Infrastructure Management
25.5. Potable Water Treatment
25.6. Energy Audits
25.7. Fire-flow requirements
25.8. Operation and Use of Water Resources
25.9. Water Distribution System Operation & Maintenance
25.10. Cross-connection Control
25.11. Inspection Schedule
25.12. Meter Reading
25.13. Pumping Operation
25.14. Disinfection Procedures
25.15. Public Notification Procedures
25.16. Potable Water Source Protection
25.17. Sampling & Testing
25.18. Public Education & Water Conservation Program

25.19. Long-range Water Resource Plan

25.20. Incentives for Water Conservation

25.21. Customer Service

**26. Wastewater**

26.1. Wastewater Treatment Requirements

26.2. Illegal Discharges

26.3. Pretreatment Program

26.4. Inflow and Infiltration (I&I)

26.5. Operations Manual

26.6. Records

26.7. Energy Audits

26.8. Peak Flows

26.9. Residuals Management

26.10. Safety

26.11. Collection and Treatment Facility Maintenance

26.12. Infrastructure Management

26.13. Infrastructure Condition

26.14. Infrastructure Location

26.15. Long Range System Planning

26.16. Customer Service

**27. Electric**

27.1. Capital Infrastructure

27.2. Generation

27.3. Distribution

27.4. O&M

27.5. Fuel Storage

27.6. Long Range Planning

27.7. Customer Service

27.8. Other

## *8.4 Utility Performance Measures*

### 8.4.1 Generic Indicators:

- Ratio of revenue $ to personnel $
- Ratio of O&M $ to Capital $

### 8.4.2 Selected Utility Sector Indicators:

Publicly Owned Electric Utilities (less than 5,000 customers)[68]

| | |
|---|---|
| Net Income Per Revenue Dollar - | $0.037 |
| Uncollectible accounts per revenue dollar - | $0.0008 |
| Retail customers per non-power generation employee – | 262 |

[68] Selections from American Public Power Association, *Selected Financial and Operating Ratios of Public Power Systems, 1991* (Washington, D.C.: APPA, March, 1993).

# 9. Solid Waste Challenges

## 9.1 Introduction and Summary

A community of 100 people can generate on average 600 pounds of garbage per day from residences alone. This does not include businesses that may generate additional waste (ADEC, 2001). Most communities have Class III landfills that do not meet the federal Resource Conservation and Recovery Act (RCRA). Approximately ninety percent (90%) of the villages in rural Alaska use open dumps to dispose of solid waste (Sarcone 1999). There are not sufficient funds to close open dumps that may present health and environmental risks. Funding for solid waste projects is inconsistent making community planning difficult (Sarcone 2001). The level of need for solid waste funding has not been assessed, making it difficult to know exactly what funds are necessary to carry out needed open dump closures, solid waste management planning and new landfill development.

In the long run, the major challenge for rural Alaska is to make the transition from open dumps to sanitary landfills with adequate containment of solids, liquids (leachates) and gases. Given the widespread solid waste management problems and the lack of funding to address them, this transition may take considerable time (Sarcone, 1999). The long-term nature of the problem can be viewed as an opportunity – an opportunity to combine sound initial design with proper support for long-term operations and maintenance. For example, solid waste facilities could be used to pilot the concept of maintenance endowments (annuities).

## 9.2 Current Challenges

Rural Alaskan communities face a variety of political, fiscal and environmental challenges when dealing with their solid waste management and disposal. In response to a course entitled Introduction to Tribal Solid Waste Management conducted by the Institute for Tribal Professionals at Northern Arizona University, Sarcone (1998) noted that "With little exception, all of the villages face significant solid waste management challenges and identified those challenges as priorities. The problems stated by the participants were very fundamental, for example, the lack of cover materials, inadequate access to disposal sites, bears, inadequate local revenues for operations, and limited opportunities for recycling. The resources that are

available at the federal, state regional and local level, especially the financial resources, are very limited." Solid waste management and disposal training is also a need in rural Alaska.

A community must have a location for its garbage. Locating a site for a landfill is not an easy task. A landfill must be located on deeded property if state or federal funding will be used for landfill development and management. Agencies will not provide funds for sites with no site control. Soils, terrain, land ownership and local weather conditions such as precipitation can all hinder landfill location and management.

Rural landfills pose a variety of health risks to communities. Open dumps can attract unwanted and disease carrying wildlife and insects such as bear, fox, and flies to a community. Fox often carry rabies, flies can carry salmonella and bear encounters can be fatal. Precipitation, if allowed to wash through a dump, creates leachate that carries toxins washed from the garbage into surrounding soils and surface and subsurface water bodies. This can have serious repercussions if the leachate is allowed to contaminate the drinking water of a community. Open dumps can be sources of potentially toxic air pollutants as trash is burned, as well as sources of methane gas and hazardous wastes (ADEC 1998).

Table 18 presents an estimate of the open dumps in the United States and their associated potential threat to health and the environment. A total of 151 open dumps are listed for Alaska with 136 of those having a moderate threat level to health and the environment.

**Table 18**
**Indian Lands Open Dump Sites—Potential Threat to Health & Environment**

| Area | High Threat | Moderate Threat | Low Threat | Threat Undetermined | Total |
|---|---|---|---|---|---|
| Aberdeen | 14 | 11 | 25 | 2 | 52 |
| Alaska | 7 | 136 | 6 | 2 | 151 |
| Albuquerque | 1 | 9 | 6 | 8 | 24 |
| Bemidji | 4 | 4 | 0 | 0 | 8 |
| Billings | 14 | 19 | 0 | 0 | 33 |
| California | 6 | 25 | 26 | 32 | 89 |
| Navajo* | 0 | 1 | 240 | 0 | 241 |
| Nashville | 22 | 35 | 6 | 0 | 63 |
| Oklahoma | 44 | 69 | 21 | 0 | 134 |
| Phoenix | 13 | 77 | 62 | 2 | 154 |
| Portland | 8 | 12 | 44 | 0 | 64 |
| Tucson | 9 | 47 | 35 | 0 | 91 |
| Total | 142 | 445 | 471 | 46 | 1104 |

Source: Indian Health Service 1998 Report: Open Dumps on Indian Lands (August 1999)

Rural dumps are becoming full and old sites have to be closed and new sites developed. Solid waste management plans that address the siting, management and maintenance of a landfill are important. For example, the community of Deering is currently using their second open dump and should be developing a third soon. The first dumpsite was located too close to the community and their drinking water source. The community growth has surrounded the old landfill with homes. The current landfill was located farther from the community but water contamination is still a problem. Deering has received a total of $230,000 from the Environmental Protection Agency (EPA, the Bureau of Indian Affairs (BIA) and the Indian Health Service (IHS) as part of the Tribal Open Dump Cleanup Project (ISER, Deering site visit, March 2001).

Rural communities also face the challenges of meeting both federal and state regulations in a physical and fiscal environment that is not conducive to doing so. Joe Sarcone, Rural Sanitation Coordinator, Alaska Operations Office, EPA, has noted that the State of Alaska has attempted to take a realistic approach to solid waste regulation through a Class III permitting process that is geared toward very small communities. The federal government does not recognize Class III permits. Table 19 outlines the differences between the federal Class I and II permits and the State of Alaska Class III permits.

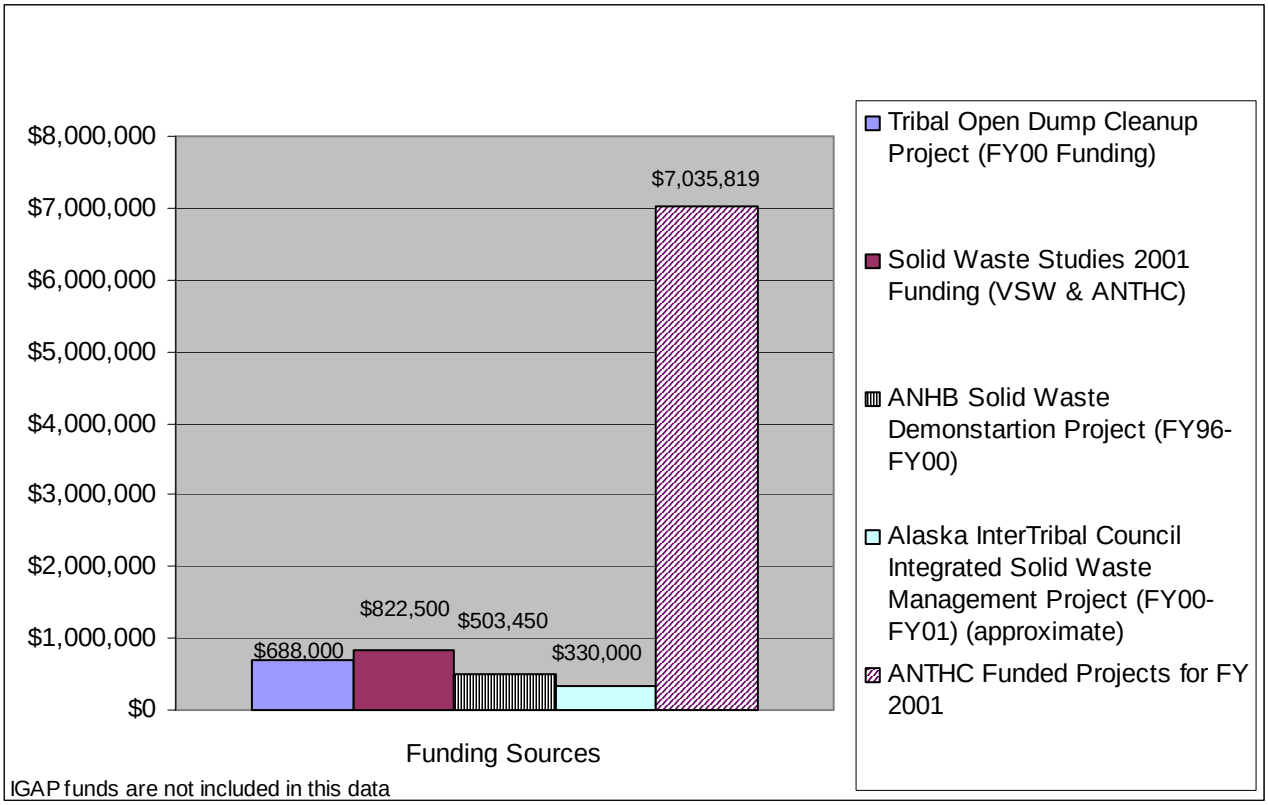
## Table 19
## Differences Between Federal and State Solid Waste Regulations for Small Community Landfills in the State of Alaska

| Regulation | Federal Requirements (Self Implementing) | State Requirements 18 AAC 60 (Permit Required) |
|---|---|---|
| Landfill Categories | Recognizes two classes of community landfills (Class I & II)<br><br>Class I landfills accepting 20 tons of municipal solid waste daily; and<br><br>Class II landfills, accepting less than 20 tons of waste daily | Recognizes three classes of landfills (Class I, II & III)<br><br>Class III landfills accept less than 5 tons of waste a day (typically communities with populations less than 1,500) |
| Bottom Liner Requirement | Required at Class I & II landfills | Same for Class I & II;<br><br>Typically not required at Class III unless demonstrated need |
| Gas Monitoring; methane monitoring and collection | Required at Class I & II landfills | Same for Class I & II<br><br>Not required at Class III |
| Leachate monitoring & collection | Required at Class I & II landfills | Class I and II required to remove all ponded water in contact with waste within 7 days; required to prevent, contain or control visible seeps at boundary of the waste management area<br><br>Class III landfills shall minimize contact between storm water and waste. Required to prevent, contain or control visible seeps at the boundary of the waste management area ***if the department determines that leachate control measures are necessary to prevent potential threat to public health, safety or welfare.*** |
| Ground water monitoring | Required at Class I landfills;<br><br>Required at Class II landfills located in areas that receive greater than 25 inches of total precipitation each year | Not required at Class III landfils, unless the department has credible evidence that the state water quality standards have been violated in a surface water body or an aquifer, or conditions at the landfill are likely to result in harm to public health or the environment |
| Location Restrictions | Landfills prohibited from being located within 200 feet of a fault which has had displacement since the Pleistocene to the present, unless demonstration is made that all structures will withstand maximum horizontal acceleration of 250 through site specific seismic risk assessment.<br><br>Landfills prohibited from being located in seismic impact zones unless lined and structurally designed for statewide seismic conditions | Class I landfills must demonstrate that an alternative design or a setback of less than 200 feet from a fault area, seismic zone, or unstable area will prevent damage to the structural integrity of the landfill and protect public health and environment.<br><br>Class II and III landfills shall consider engineering measures necessary to ensure that the structural components will not be disrupted. |
| Financial Assurance | All landfill owners are required to establish financial assurance and provide for continuous coverage for the costs of closure of the landfill | Class I and II landfill owners are required to establish financial assurance and provide for continuous coverage for the cost of closure of the landfill.<br>Not applicable to Class III landfills |
| Working Cover | Landfill operators are required to place at least 6 inches of earthen cover material over waste daily | Same for Class I & II landfills;<br><br>Class III landfills must cover as necessary to prevent odors, and vector attraction |

## 9.3 Current Funding

Solid waste funding is typically either for planning or for the construction or implementation of a landfill (ITEP, 1999). Funding for rural landfills is inconsistent and limited (Sarcone, 2001). Funding for solid waste management, planning, disposal, open dump closure and technical assistance comes from a variety of sources (Figure 78). The total amount of funding allocated to solid waste projects from the various sources in Figure 78 from 1996 to 2001 was approximately $9,204,769. It should be noted that $175,000 of funding for Aleknagik is present in both the Alaska Native Tribal Health Consortium (ANTHC) funded projects and the Solid Waste Studies Funding in Figure 78. The total allocated funding amount of $9,204,769 does not double count the Aleknagik funds.

**Figure 78**
**Alaska Solid Waste Funding**




The Alaska Native Health Board (ANHB) distributed $503,450 to 63 communities including city governments and native councils for their Solid Waste Management Demonstration Project since 1996. ANHB awarded grants for the Solid Waste Management Demonstration Project ranging from $2,000 to $10,000 each to approximately 15 Alaska villages

on a yearly basis for locally designed solutions for solid waste management within the communities (ANHB, 1998).

The Tribal Solid Waste Interagency Workgroup was established in 1998 and seeks to fund proposals that support the development and strengthening of tribal or multi-tribal solid waste management programs. The purpose of the Tribal Open Dump Cleanup Project is to help tribes with closure or upgrade of high priority waste disposal sites as well as demonstrate the Federal government's ability to provide comprehensive solid waste funding and technical assistance to tribes (Tribal Solid Waste Interagency Workgroup, EPA, BIA and IHS, 1999).

A solid waste project may have a variety of funding agencies. The City of Deering received a two year grant to upgrade the current open dump with funds allocated from the BIA ($58,000 for materials and shipping), EPA ($41,000 for design and labor) and IHS ($131,000 any remaining costs).

Figure 1 does not capture all solid waste funds in Alaska. The Americorps program funded by EPA and Administered by Rural Cap also contributes to the funding of solid waste projects. The Bureau of Indian Affairs' and Tlingit Haida Native Council's Cooperative Long-term Solid Waste Management and Facility Improvement Project is funding waste disposal site assessment and site improvements for three demonstration villages and a tribal cooperative study that will develop a database with information on all tribal waste sites.

Other programs such as the Indian General Assistance Program (IGAP) Grants help fund solid waste efforts in communities. The IGAP grants focus on a variety of rural issues and are directed toward capacity building, planning, community education and training. IGAP grants have not funded specific solid waste projects. IGAP has funded environmental specialists and technicians to work in rural villages to evaluate and survey community issues regarding the environment and health. The role of the IGAP funded employees is changing as of April 17, 2001. IGAP employees will then be allowed to expand their roles in communities and work directly on projects such as recycling programs and the clean up of open dumps. IGAP funds are used by some communities more than others and most funds are not directly related to solid waste projects. It is therefore difficult to estimate the amount of IGAP funds funding solid waste issues in rural Alaska. $26,470,000 of IGAP funds were allocated for numerous projects addressing various rural issues such as water and sewer services from fiscal year 1991 to fiscal year 1999.

## *9.4 The Cost of Solid Waste Management*

The IHS information presented in the following graph and tables is not based on an in-depth survey of all open dumps in the United States. Limited existing resources were used by IHS to gather as much information as possible. The data are considered to be preliminary by the IHS and require additional evaluation and analysis (IHS, August 1999).

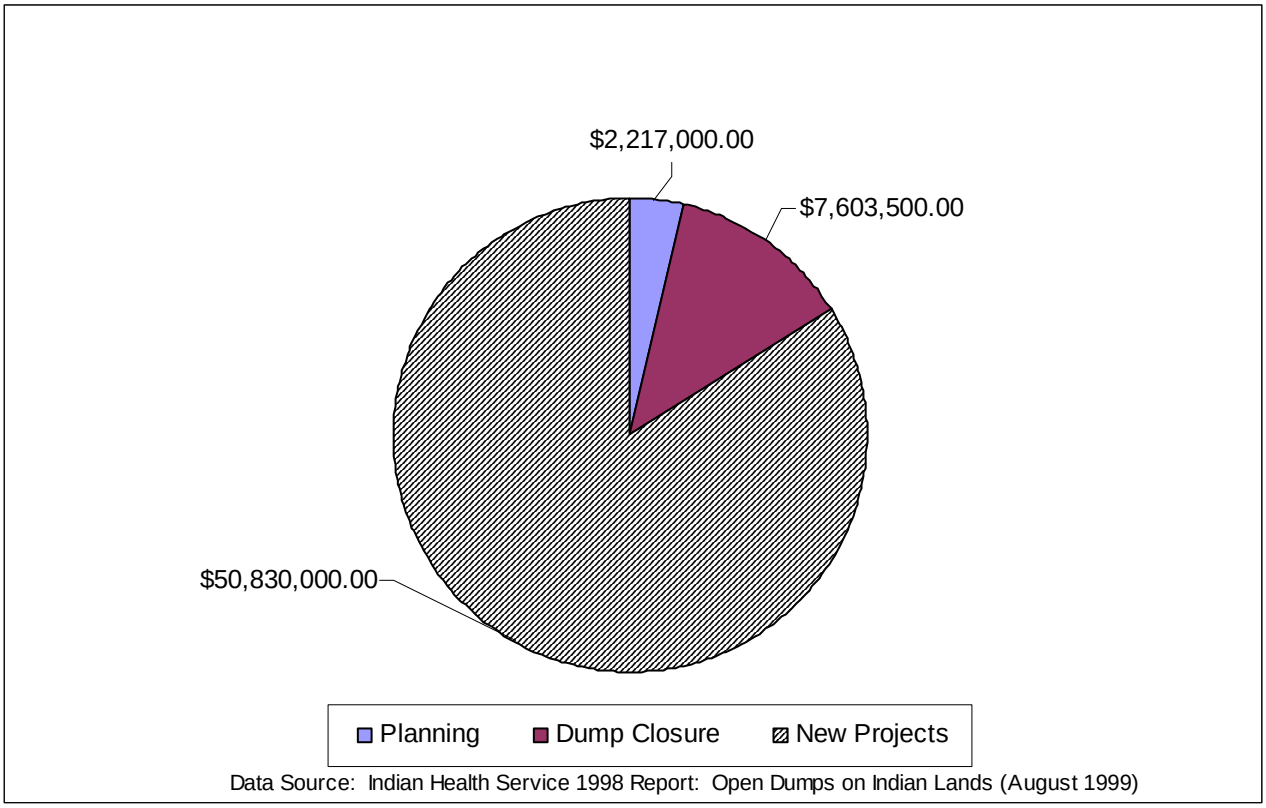
Table 20 illustrates the solid waste funding requirements as estimated by the Indian Health Service. The funds required greatly exceed the funds available. In Alaska alone, IHS estimates that $60,650,500 are required to fund solid waste planning, dump closure and new solid waste projects (Figure 79). Alaska requires the greatest amount of funding of those listed by the HIS. Alaska's estimated funding requirement is almost four times as much as the next highest funding requirement.

**Table 20**
**Sanitation Deficiency System Solid Waste Funding Requirements by Area**

| Area | Solid Waste Management | Solid Waste Alternative | Closure Cost | Total Funding Required |
|---|---|---|---|---|
| Aberdeen | $375,000 | $5,852,000 | $2,753,000 | $8,980,000 |
| Alaska | $2,217,000 | $50,830,000 | $7,603,500 | $60,650,500 |
| Albuquerque | $0 | $1,173,000 | $2,210,000 | $3,383,000 |
| Bemidji | $40,000 | $227,000 | $813,500 | $1,080,500 |
| Billings | $0 | $2,690,000 | $1,060,000 | $3,750,000 |
| California | $15,000 | $1,236,500 | $1,835,500 | $3,087,000 |
| Navajo | $477,500 | $3,250,000 | $12,057,500 | $15,785,000 |
| Nashville | $26,500 | $1,035,500 | $2,453,400 | $3,515,400 |
| Oklahoma | $137,000 | $1,123,000 | $1,598,900 | $2,858,900 |
| Phoenix | $90,000 | $2,985,000 | $7,069,000 | $10,144,000 |
| Portland | $502,000 | $4,692,500 | $4,493,000 | $9,687,500 |
| Tucson | $0 | $539,900 | $2,335,735 | $2,875,635 |
| Total | $3,880,000 | $75,634,400 | $46,283,035 | $125,797,435 |

Source: Indian Health Service 1998 Report: Open Dumps on Indian Lands (August 1999)

**Figure 79**
**Solid Waste Project Costs in Alaska from the Sanitation Deficiency System**




Communities are having a difficult time addressing the costs associated with solid waste facilities. Expenses may include transportation, land (loss of future use), time, equipment, facilities, environmental monitoring, dump closure and liability risks (environmental cleanup) (Stocks and Rozmyn, 1996). Villages deal with the lack of funding in a variety of ways. Napaskiak does not charge for dumping, Tuntutuliak charges less for residential pick up than self haul to discourage self-haul and Unalakleet funds their operation and maintenance costs through a 2% city sales tax dedicated to the costs associated with their baler facility. Businesses are also charged a commercial rate in Unalakleet. Many communities are not meeting their operations and maintenance costs of their solid waste facilities (Sarcone, 1998). Simply increasing fees for dumping is not necessarily the answer to covering solid waste management and disposal costs. The community of Haines increased its waste disposal fees by 90% and that resulted in an increased amount of illegal dumping that has the potential to increase health and environmental risks (Bureau of Indian Affairs and Tlingit Haida Native Council, 1999).

## 9.5 Improving Solid Waste Systems

Fiscal and environmental constraints appear to be the greatest obstacles to the improvement of rural Alaska solid waste utilities. This does not differ greatly from rural Alaska water and sewer utilities.

The three Rs of solid waste management are reduction, reuse and recycling. Communities must consider the three Rs when attempting to improve solid waste management and disposal in rural Alaska. The less waste being produced by a community, the less waste there is to dispose of, the longer the life of the landfill and the lower the costs. Costs are also reduced by having to handle less waste. Reusing items and recycling materials also contributes to the goal of less waste in the landfill (ITEP, 1999). Recycled goods can also be a source of revenue for communities although it is minimal. Incinerating wastes using burn boxes and incinerators is also another means to dispose of waste or reduce the amount of waste entering a landfill (ADEC, 2001).

Collection programs that maintain the integrity of the disposal system help to reduce health and environmental risks. A solid waste disposal system should provide for the proper disposal of special and or hazardous wastes such as used motor oil, batteries and refrigeration coolants by having separate appropriate containment for these wastes (ITEP, 1999).

Agencies are working together to help rural Alaskan communities improve their utilities. The Rural Utilities Service and the Indian Health Service have entered into a memorandum of understanding to provide assistance to American Indians and Alaska Natives in the development and operation of water, waste water and solid waste facilities. A variety of agencies are working together on the Tribal Open Dump Cleanup Project to simplify the funding request process. The Tribal Open Dump Cleanup Project has been developed in a way that villages can apply for funding from a variety of agencies through one contact as opposed to having to solicit funds from each individual agency. This simplifies the funding request process for villages.

A variety of projects are being funded to help communities improve their solid waste management and disposal programs. The Alaska Native Health Board is funding projects for community recycling, education, used oil burners, transfer station design, balers, composting, landfill management, garbage bins and barrels, burn boxes and crushers and fencing improvements (ANHB Grant Summary, 2001). The Environmental Protection Agency has funded the Alaska Tribal Waste Management Initiative to work with the State of Alaska Denali

Commission to leverage funds and cooperation for tribal waste management issues, provide opportunities for capacity building and training, develop Alaska specific waste management tools and to provide statewide outreach for all tribes.

Communities and tribes are taking an active role in the planning and management of their utilities. The City of Galena and the Louden Tribe agreed to establish a partnership through a memorandum of understanding for the management of water and sewer services, solid waste and hazardous waste in 1998. The Galena Waste Management Steering Committee was formed as a result of the MOU. Member organizations seek solutions to specific and common waste management and related programs (Galena Waste Management Steering Committee, April 1998).

Waste management practices can also be improved with the development of community solid waste management plans. Plans should assess the waste management problems, describe the need, list applicable government requirements, note the types and quantity of waste generated, list alternatives for solid waste collection and disposal, look at opportunities for waste reduction and recycling, list preferred alternatives for collection and disposal, note the necessary operation and maintenance of the solid waste management system, address the management of special wastes, discuss the closure of existing dump sites, list financing, grant writing and opportunities for partnership, develop a public awareness and education plan and note any necessary code development, compliance and enforcement procedures (ITEP, 1999).

Communities may also want to consider partnering with other communities and state and local governments to increase communication and share resources. Through this partnering communities can share resources and form municipal solid waste management projects that may otherwise be to expensive for any one community or tribe (EPA December 1997). Due to the remoteness of rural Alaska communities and the distance between most villages this may be realized best through shared experiences, open communication, technical assistance and joint training programs rather than common facilities or equipment.

## *9.6 Success Stories*

### 9.6.1 Kipnuk

The Kipnuk Traditional Council passed a resolution to charge a recycling fee on aluminum cans that is refundable when the used cans are returned for recycling. The Traditional

Council wanted to improve the living conditions of its tribal members and had concerns regarding the impact of solid and hazardous waste on the environment (Kipnuk Traditional Council, Resolution 98-01).

### 9.6.2 Unalakleet

Unalakleet began efforts to improve their solid waste disposal system in 1990 after recognizing that their current dump had problems including a potential threat to their drinking water source. By July of 1996, the community built a new solid waste baler facility, developed a new balefill site, closed out their old dump site, established commercial user fees, and increased the city sales tax to support operations and maintenance costs.

The community decided on a self-haul baler facility with a balefill site outside of town. The balers reduce the volume of the garbage disposed by approximately 30% and economize landfill space. Residents self haul their garbage to the baler facility and a city employee transfers the bales to the balefill site. As of 1994, the City of Unalakleet had an operator certified as a Manager of Landfill Operations. The operator also completed training provided by the Solid Waste Association of North America.

Unalakleet received $1,734,000 for the upgrades to their solid waste disposal system. Over the life of the project this money earned $63,392 in interest. The total capital costs for the project were $1,645,000, leaving $31,832 to help pay for the systems operation and maintenance costs. These costs were estimated at approximately $102,000 per year.

The community realized that they would need to generate revenues to keep the facility running. In 1993, they passed a 2% increase in the city sales tax (from 3% to 5%) specifically dedicated to funding the operations and maintenance of the solid waste disposal system. They instituted monthly fees and tipping fees for commercial, industrial and institutional customers. Residential customers are not charged for use of the disposal system.

An analysis conducted in 1996 to determine if Unalakleet collected enough revenue from water, sewer and solid waste charges and dedicated taxes to cover the costs of the utilities found that the solid waste utility was underfunded by 34%. The analysis recommended a residential fee. Unalakleet opted instead to increase commercial fees, effective July of 1996.

A variety of entities were involved in the planning, design and construction of the facility including engineering firms, the city Council, community members, Village Safe Water and the Department of Environmental Conservation (ADEC, 1997).

### 9.6.3 Kake[69]

The City of Kake and Kake Tribal were awarded a grant from the ANHB Solid Waste Management Demonstration Grants Project in 1998 to install a used oil burner in the community. The 2,000 gallon tank that the community stored used oil in was not performing well and there was a concern that it would overflow or leak. Shipping the used oil out of town was too expensive. The community realized that the used oil could be reclaimed and used as an energy source and save the community money.

The proposal to install a used oil burner had six immediate benefits to the community:

- "Salvaged oil would provide heat to the City's shop plant"
- "Shipping used oil out of the village would no longer be necessary"
- "Burning used oil as a fuel would keep it out of the landfill"
- "Less fuel would have to be drawn from original sources"
- "The project would sustain itself for as long as fossil fuels are commonly used"
- Once in place, the burner would complete the village approach of efficient used oil"

The City of Kake, Kake Tribal and AmeriCorps worked together to develop a plan to solve the community's used oil problem. They used community education to inform the entire community about the problem and how each resident could help. The community formed the Environmental Focus Group to maintain long-term support of the project. "As a result, [of their efforts] the community is well informed on the need for a comprehensive used oil management plan, and understands that each resident has a part to play in the plan's success." (ANHB, 1999)

[69] Alaska Native Health Board Solid Waste Management Demonstration Grants' Fact Sheets from January of 1999.

This page intentionally blank

# 10. Field Visit Notes

Venetie

Napaskiak

Tuntutuliak

Deering

## *10.1 Venetie Site Visit Notes (Summary)*

Field Notes from Venetie site visit, 11/18/00 – 11/19/00
Site visit conducted by Brian Hirsch (ISER) and Mark Foster (MAFA)
Prepared by Brian Hirsch

Venetie Village Council owns and operates all utilities in the village: electric, water/washeteria, solid waste (landfill), tank farm, flush-and-haul system for health clinic, and sewer and water to the school.

Currently, most (all?) residences use outhouses, or at least do not have any sewage treatment or even a lagoon. Water is provided from a single community well and piped and pumped to the washeteria.

### New Projects

Almost all utilities in the village are in the process of being replaced, repaired, or upgraded. These include:

- **Electricity**: new diesel generators are scheduled within two years; new solar panels (photovoltaics) to supplement current system are scheduled for next spring.
- **Sewer and water**: an approximately $2 million system for residences is slated for the next two years. The current design calls for individual wells and septic systems.
- **Bulk fuel**: a new $500,000 facility is scheduled for next year to supplement and partially replace the current system.

- **Landfill**: community is currently looking for planning money to close the present landfill and open another one.
- **Airport**: a new $4 million airstrip is scheduled to begin next year. This is not "officially" considered a utility that we are investigating, but in terms of scale and level of public service, it arguably fits the bill, and in my opinion is something we should consider looking at in all study communities.

### Current and Past Problems

A sewer system was installed for the entire village in 1980. Half of it irreparably froze in 1981; the other half followed suit in 1982. No village-wide system has been attempted since then. The current proposed system—individual wells and septic systems—is in large part a response to the past failures: people want to minimize amount of pipe and maintenance costs and are skeptical of a large, integrated system with many possibilities of failure. There have been some drilling core samples taken that apparently indicate wells and septic are technically possible in some areas, but it is not clear that this will work for the entire village. Some even say that the current community well is in danger of being lost from river bank erosion and that in the past, several wells were attempted that did not produce water. Thus, the technical feasibility of the new project remains to be fully evaluated.

Washeteria facility loses approximately $10,000 annually.

At least two significant leaks/spills have occurred in the bulk fuel storage facilities. The facilities still leak, but slowly, and it is hoped that the new upgrade will eliminate the need to use the tanks that continue to leak.

The school purchases power, water, and sewer services from the Village, but this is a constant source of conflict. The school does not like the terms of the arrangement and regularly threatens to generate its own power and re-negotiate the cost of the water and sewer services.

## *10.2 Napaskiak Site Visit Field Notes*

Napaskiak, Alaska

Site visit, 1/23/01 – 1/24/01

Conducted by Amy Wiita (ISER) and Mark Foster (MAFA)

Valerie Maxie, City Clerk

- Electricity goes out often
- Only have one generator working
- People work in Bethel and commute back and forth
- Collections—some people pay and some don't
- Internet service is good
- Telephones are good
- Doesn't know if people are paying for flush tank haul service

Phillip Nickolai, Jr., Tribal Administrator & Johnny Evan, RUBA

### General

- About 88 households in community (use the Slavic (Russian Orthodox Christmas) records because it lists every household)
- Trying to recycle aluminum
    - It's a free service
    - Airlines backhaul to Anchorage when have room
- RUBA feels that Phillip is very reliable and organized
- Bingo helps subsidize only the water and sewer in Napaskiak
- The memorandum of agreement between the city and the tribe for utility management is working well
- City employs about 3 people
- Tribal government employs about 30 people
- ¼ of the work force commutes to Bethel

    - This is a recent occurrence
- Some kids go off to college and return
    - ~1 person/year goes to college & then return
    - Rest of kids stay in community or commute to Bethel
- Johnny Evan (RUBA) gets quarterly financial statements from Tribe

### Water & Sewer system

- All current water and HB services are paid for by gaming revenues
- They have little turn over in key staff on the water & sewer utility
    - The administrative team is managed by Phillip
    - Johnny Evan—
        - Phillip has a good philosophy as a manager
        - he is good to work for
        - He respects and trusts the community
        - Management needs to be based on respect and trust—if manager doesn't have trust & respect of community he will fail
- There are two watering points.
    - Newer one is farther out of town (down past the school near the new housing), this is the preferred water of the two sources
    - People still cut ice for water and like the taste of it better
    - Older point is in center of town
        - People don't like the smell and taste of it
    - Run out of water frequently, 2-3 times a week
    - Laundromat is very water intensive
    - Storage capacity for water is low—storage was designed for fewer people
    - Plan to upgrade both watering points with bigger holding tanks
    - Currently all water is free
- Have typical problems with the plastic bags from honey buckets in the sewage lagoon as well as aluminum cans
- Fixed insulated hoppers for honey bucket dumpers, dispose/empty with a pump like Tununak---transition from HB container haul system to FTH system

- Currently (HB) hopper emptying is free
- Wish they hadn't originally put the sewage lagoon in the middle of town.
    - Eventually it will be moved about 1½ to 2 miles away from town on the other side of the creek

### Flush Haul

- It's a VSW demonstration Project for FTH
- No training provided for residents (note: Village Safe Water is schedule to go back and train residents the week of ~January 29, 2001)
- Observations
    - Units put in right before Christmas and people were in a rush
    - Napaskiak is Russian Orthodox and celebrates Slavic beginning of January (not a good time for training)
- Need rate analysis
- Week of January 16 Village Safe Water (VSW) engineer came out and inspected the units and found shortcomings
- No complaints from customers yet
- No bathtubs were hooked up the units just sinks and toilets
- Plan on installing another 30 units, perhaps by next fall
- Plan on making upgrades to the watering sources
- Plan on moving the sewer lagoon farther away from the community
    - Currently when the floods come the lagoon over flows and distributes both liquids and solids throughout the community
- Water demand of the units is about 5 liters
- Only planned on six units initially due to the water demands
- Hope to have entire community on flush haul system in the next few years
- Recent Community Survey
    - 60 households
    - 2 households wanted piped system
    - Couple of households wanted container haul

    - Rest wanted flush haul
    - People weren't told the differences in costs between the system options available
    - 4-5 years ago community meeting was held to see what kind of system they wanted
        - Discussed pros and cons of all system options
        - Almost no one wanted a piped system (current survey reiterated this)
        - Didn't want pipes because of costs (~$120-$150/month), would clutter up the village and would be difficult to traverse
- Currently pay $25 per water delivery and per tank haul (should be $50-$75/mo on average per household)
- Started to install original flush haul units in October
- So far so good, people are paying $25 per haul
    - 85-90% collection rate
    - This fee is based on what they found other villages were charging
    - RUBA Rate analysis came up with $15-$45
        - Suggested rates are:
            - $35 for water delivery
            - $44 for sewer haul
- Haul trailers they use
    - Don't have mechanisms exposed to the sewage
    - Operated by vacuum & air pressure
    - Easy to use
- New FTH system is currently being subsidized
    - Want it to be self-sustaining in the future from user fees
- Johnny Evan (RUBA)—often in communities with gaming the gaming is used to support the O&M, with no gaming it's difficult to support systems otherwise
- 90% of households would be willing to pay for a service fee for flush haul service

## Electric System

- Power outages currently are about 3-4 times a day

    - Recent mechanical problems (for past couple of weeks)
    - Bringing in a mechanic from Anchorage
    - Outages used to be about 1 time per week
- Electrical costs are about 40 cents/Kwh after PCE
- Flush haul systems have been in the houses for about a month
    - There has been a slight increase in electrical usage but few KwH
    - ~ $10-15 more a month
- Electric Utility Operators
    - Self trained
    - No training except for in-kind services
    - Operator has been doing this for many years
    - He does some line work
    - Generator & electric utility area is fenced with barb wire
    - Lots of outages lately because the generator is grounding out for some reason
    - Operator is waiting for a mechanic from Anchorage to arrive
    - Sometimes he has to wait 3 days to a week for a mechanic
    - Linemen and mechanics are hard to find and are expensive
    - Only have two operators for electric utility
        - One just started in January and is brand new
        - Recent high school graduate—is seeing if he likes this kind of work
        - There is also one alternate operator
    - Operators hook up houses to electricity also as well as run system
    - Collection rates are good
        - Have had to shut off some households but not too many (Note: this info. did seem real reliable, appeared he didn't want to have to say people didn't pay their bills and had to be shut off)
    - The operators follow the maintenance books schedules and perform regular maintenance
    - Generators will last ~15 years with proper maintenance
    - They currently have three generators but all of them are small

    - Generators are not sufficient for the population
    - Getting new larger generator (in the spring?)
- Operator does a lot of reporting and recording of maintenance etc.
    - Everything is recorded—fixes, maintenance, outages, etc.
- They have a fare amount of spare parts and have a spare parts list
- Thing he likes the least about his job is shutting people off
- He learns from his mistakes and reads the manuals
- Running the utility is based on experience
- Gets answers on how to do things from the step-by-step manuals

### School

- Own their own well & sewage lagoon
- Once village upgrades their water system they hope to have school use the community system and only use the school system for back-up
- Phillip—
    - School will subsidize the future system somewhat
    - Not looking to cheat anyone
    - Won't rely on the school for all of the O&M costs etc.

### Telephone & Internet Services

- Phones are reliable
- Phone is considered a life line and community want to make sure costs stayed low especially for elders and those on welfare
- ~70% of households have phones
- VHF is still more common than phones, 100% of households have
- Internet got better after Unicom put in more modems
- Internet is on a yearly contract
    - Allows ~25 hours/ month
    - ~$155/year
    - ~20 households have computers in homes (not all have internet)

    - Napaskiak has a local dial-up which makes it more cost effective than places where dial-up isn't local (Tuntutuliak is monthly fee plus long distance fees)
    - School has direct cable connection

### Fuel

- Fuel is barged or trucked in
    - In extreme circumstances it is flown in
    - Method depends on season
    - Supplier is Yukon Fuels d.b.a. Bethel Fuel
        - ~$90/drum of stove oil
        - $120/ drum of gas
        - Up river prices =$2.84/gallon at pump for gas
- Getting new tank farm and an operator just for the tank farm
    - Up till now has been the electric utility operators responsibility

### General Comments Received

Joe Pavila (teacher/home school coordinator/"truancy officer"/basketball coach?)

- Too many studies have been done and not enough implementation has taken place
- Napaskiak and surrounding villages on the tundra are in bad shape
- Community w/~70 people to the north is in worse shape—they dig holes and bury waste
- Napaskiak should have a flush system of some sort
- FTH system is ok so far
    - He has one in his house
    - Toilet is hooked up
    - Sink & tub are not hooked up yet
- Governor needs to act on his comment about putting the honey bucket in the museum
- Community needs a new sewage lagoon
    - When floods come it carries both liquid and solid waste through the community
    - Sewage lagoon smells in the summer
        - Smell permeates clothes etc.

        - This is not right and unacceptable
- Villages with better soils by the Kuskokwim are in lots better shape

School teacher

- Wants running water in the houses
- Teachers don't drink the water
- They use drip filters in the teachers lounge to filter the water
- Teachers take showers at the school using unfiltered water that has arsenic in it.

School Principal

- Have had a lot of outages with the electricity run by the community
- Has one maintenance person at the school plus one district level maintenance person that comes by periodically as well.
- School doesn't plan to become a customer on the new community water and sewer system
    - Feels that they will be charged too much
    - No good reason to join system
- School is doing well currently with its own water and sewer
- School uses community electric and uses their own generators for back up.
- School uses arsenic filters and backwashes the system per schedule
- School maintenance people are easy to keep on because it's a good paying job ~$48,000 not including benefits (as compared to a teacher at $29-30,000 not including benefits—for 9 month position)
- Maintenance person receives at least two trainings per year and more if needed and available
    - Water treatment training
- Doesn't know the total cost to run the school utilities off hand
    - Electric costs for FY01 as of October were ~$11,664.00
- Needs reliable high quality electric service due to computer use

- School is federally funded for the internet
- Don't offer a shop class any more---community electrical system couldn't handle the drain
- When water system is running well, kids won't drink the water (due to taste)
- Problems with headaches after people take showers
- Skin problems that are patches that look like ring worm but aren't
- Lots of iron in water---have to use iron out, clothes life is short as a result
- Most people collect rainwater in summer for clothes washing
- Principal has a composting toilet (Sanicore)—works well if you use them correctly
- Rest of school housing uses honey buckets (luggable loos)
- Principal never drinks the water
- School has a laundry facility for staff
    - Two washers & two dryers
    - Locals tend to burn up machines because they overload them
    - Good to keep school employees happy by allowing them to use the machines but is becoming expensive due machines burning up
    - Costs $5.00 per wash load in Bethel
- Kids have lots of boils due to steam baths
- Impetigo is a problem
- No hepatitis yet
- Otitis media (ear infection) is a major reason kids miss school
- Steam baths are major part of culture and community just accepts the health risks and boils that result
- Kids are very clean considering there is no running water in the homes
- Teachers only use the school facilities
- School is well integrated and well supported by the community, kids are supported by parents in the school and school is also supported by the parents
- Things are better now that they were in the 60s—used wood heat only, hepatitis, river water was bad, water wasn't even good after being boiled for 30 minutes

- Community is trying to be forward in its thinking, trying to look ahead at planning & building a future
- Community is growing—last year 119 kids, this year 137 kids
- School has pretty good relationship with the elders
- NO ONE crosses the elders
- It's a cautious community—try to balance caution with forward thinking
- Most employment
    - Commuters to Bethel
    - School
    - State police
    - Clinic
    - Tribal council
- Connection to Bethel is both good and bad
    - Bootleggers, drugs, alcohol
- Most kids have snow machines but few have boats to get across river in summer
- Life is rough—don't get too many chances when things go wrong
- Graduates
    - Very few leave the community
    - Some train and return, work for the utilities
    - Some leave—usually don't come back because they are ostracized and it's difficult to return to the community
    - Relatives pull people back from leaving in the first place
- There is a leveling affect that exists when kids are making too much of themselves—they get leveled back down to where everyone else is—this is not unique to Napaskiak
    - When native kids do well, the parents sometimes sabotage them because they know they will loose the kid if they don't
- Attendance was 91% last year
    - This year will probably have 3 drop outs
    - Community is saddened by drop outs—they understand the connection between a diploma and jobs
    - Church and community both deal with the drop outs over time gradually

- School board
    - Supportive
    - President is a Deacon
    - Vice-President is an Arch Priest
    - Secretary is head of ladies group (like ladies home society)
    - Another member is a Bethel priest
    - Another is an influential elder (Jerry Evan)
- Priest comes to school to talk to kids
- Suicide rate is lower now than in the past
- Men's and women's roles are changing
    - Men's roles being altered more with advents of new times and societal changes
    - Women's roles not changing as much—they're allowed to succeed
    - Most school boards are women
    - Women are still expected to marry , have kids a lead a traditional lifestyle—this can inhibit them from attain other goals
- Have to build traditions into school
    - Need to build a connection with the community
    - Build the heart of the school
    - Develop yearly activities for kids and people to associate with
- TV and internet influence—new words in village, kids dress like anyone else
- Elders will not allow cable TV into village, satellites are o.k. and internet is not viewed to be as threatening
- School is getting computers into community through raffles
- Could get cost of school utilities from the district office
- Floods inundate the whole community
    - Not many systems could survive the floods

## *10.3 Tuntutuliak Site Visit Notes*

Tuntutuliak, Alaska

Site visit, 1/24/01 – 1/25/01

Conducted by Amy Wiita (ISER) and Mark Foster (MAFA)

Johnny Evan

- He does all the rate studies for the area (Napaskiak, Tuntutuliak and other villages)
- Napaskiak uses gaming to pay for water & sewer—Tuntutuliak does not, very traditional, no gaming and no dancing
- He has presented to the community what gaming could pay for but they don't want it because they view it as money the families can use for better things
- Tuntutuliak—water isn't free. Operator has to turn it on at the watering point so people can purchase it by the gallon
- Tuntutuliak—garbage is 50 cents a bag pick up and should be $14/month according to his rate study

Robert Enock, General Manager, Tuntutuliak Community Service Association

### Community General

- ~78 households, ~30 of these have someone employed in the household, rest are entirely unemployed households
    - household incomes fluctuate & most people can get caught up with their bills over the course of a year. Usually catch up in summer with fishing---this even has been difficult in recent years due to fish disasters
- The basic necessities should be the first things paid for in a household---households are struggling for basic needs
- Community is frustrated that agencies like to do things for the community too much rather than allowing them to do things for themselves
- Agency people also do not listen to local input and knowledge

- Other people in agencies like to do too much for the villages
    - Need to learn to do things for themselves
    - Agency people need to listen to the communities—communities often have valuable insight
- TCSA does own some equipment for snow removal and soil moving
- State needs to listen to what village wants as it is the village that has to live with the systems

### TCSA/Utilities in General

- Tuntutuliak Community Association (TCSA) runs all of the utilities except the bulk fuel
- Utility's philosophy is to keep costs low and serve the community well
- Robert is trying to change people's attitudes towards the utilities and have them value them more
    - People are not used to these sorts of systems
    - Customers expect the utility to take care of the system for them
- Robert maintains good ties with other operators as resources for information and expertise
- This is TCSA's sixth year
- Lots of problems over the years
- Difficulty—have to request funding from the state each year for projects.
    - Don't get enough money the first year to finish the project and just because community gets funds to start a project doesn't mean they'll get the funds the following year to continue it or finish it.
    - Funding is not guaranteed
    - State needs to fund projects to completion
    - Year by year funding is difficult
- Maintenance
    - Village decided this month (January 2001) that maintenance couldn't be free anymore
    - Charging customer's for labor costs=wages + taxes and parts

    - Tool expenses are covered in the water and sewer costs
    - Next month will be the first billings for maintenance
    - Customers think this is so that the utility can make more money rather than to cover costs
- Robert is trying to get people interested in supporting the utility
    - During oil rich period people got spoiled as everything was paid for
    - Used to have a watering point and no one had to pay for it
    - People got used to things being free
- Electric utility had problems with collections initially too
    - This changed over time as people understood that they need to support the utility
    - Electric utility employed a collection agency to get bills paid (still use them)
    - Today the electric utility has good collection rates

### Electric

- Unicorp community aid funds were used to build the electric system
- The traditional council was not eligible for funds so created TCSA ~ 1980
- May 1982 city incorporated
- First year $250,000 for electric start up Operations and Maintenance only
- Only grant funds were used for electricity
- Electric utility is self-sustaining with the use of the Power Cost Equalization program (PCE)
- Not easy for everyone to pay their bills
- PCE is helpful but need to be stable not year to year—difficult to depend on yearly monies
- Electric utility usually shows a little bit of surplus at the end of the year
- Commercial electric accounts are—school, post office, DOT bldg., & the armory—all are good customers
- Residential rate is 46 cents/kWh
- Commercial rate is 38/kWh cents for the school

- Currently electricity costs 46 cents/kWh without PCE and about 21 cent/kWh with PCE, this fluctuates and averages about 20 cents/kWh
- Biggest customers are the school & uses about
    - 3,500-6,500kWh in winter
    - 9,360 kWh in summer
- Washeteria uses ~2,267 kWh in winter/month
- Phone ~ 2,267 kWh/month
- New runway lights will use a little more electricity
- Recently, almost every day they only have 1 good generator—other two can't stay on all day
- Are getting a new power plant with new generators—so not overhauling the old ones
    - Building comes with 4 new generators
    - Money is coming from the Denali Commission ~$368,000
    - Alaska Energy Authority will pick up the rest of the costs
    - Should be completed and on-line in March
    - Equipment has not arrived yet
    - Not sure how getting heavy equipment in (only generators will fit on planes)
    - Alaska Energy Authority (AEA) is administering the project—difficult to get a hold of Anchorage people, field people are good
    - AEA is doing the progress using force account labor (3 local people & 3 AEA)
- Administration is the biggest challenge
    - Liabilities are getting in the way of the progress
    - Village now has to plan for liabilities
- Have 2 operators that alternate weekly, 42 hrs/week, $15.60/hr
    - Hourly rates are based on trying to keep the customer rates down
    - They're struggling to keep the rates down
- Need training—linemen training is only available in Washington or Oregon and is agency specific
- Have to bring in a technician for major work & repairs
- Trained local people would be cheaper and better for the community
- Electric utility uses about 55,000 gallons of fuel on average in one year

    - Holding capacity is ~75,000
    - Currently only need ~60,000 gallons
- New plant is fully automated
- Generators usually last for ~1200-1500 hours
    - oil the seals between overhauls
    - Do major overhauls (pistons, etc.) when begins to eat up oil and oil changes become more frequent
    - All generators have lasted longer than the expected 20,000-30,000 hours
    - One John Deer is running at 208,000 hour
    - Maintenance is important

### Bulk Fuel

- New tank farm is a consolidated tank farm (except for the school)
- District level people for the school don't like community interaction
- Local principals don't have any authority
- School tank farm funds were put in community funds but it's being worked on separately
- Money coming from block grants, fish disaster funds, Denali Commission, Alaska Energy Authority & State Revenue Sharing
- Mikunda Cottrell is doing the accounting
- Tank Farm & Powerhouse ~$3,326135 combined funds
- Capacity of new tank farm is about ~180,000 gallons
- Tank farm is flooding because it was put in the wrong location
    - Side rock is eroding away & exposing fabric due to the flooding
- Oil spill was ~400-450 gallons spilled
    - Clean up picked up 430 gallons
    - Recent flood didn't bring up any more oil

### Washeteria

- Washeteria was shut down in 1985 due to a lack of funds from the traditional council

- 1992 council asked TCSA to reopen it
- TCSA reopened it in 1993 and its been self sustaining ever since
- Have same basic rates as originally were implemented by tribe
- Last year it experienced a loss because water and sewer system was using water from washeteria and didn't pay for it
- Washer fees—
  - $4.00 for double capacity
  - $2.75 for top load
- Dryer fees—
  - Tokens provide 15 min. at $2.00 for first token
  - Each additional token costs $1.00
  - Usually takes about 3 tokens to dry a full load
- Washer and dryer fees are cheaper than in Bethel
  - Takes about $7-8 to wash and dry a load
  - $5/load to wash in Bethel and dryers are coin operated
- Kongiganak and Kwigillingok come to Tuntutuliak to do laundry

### Flush Haul System

- This year a certified water operator is a priority
  - The current operators licensed lapsed and can't seem to get another
  - Was state operator of the year in 1992 w/o certification
- Flush haul equipment is outdated & not designed for heavy continuous residential use
- Operations & Maintenance is a problem
  - Equipment is cheap
  - Get what you pay for
- State had there plan when services were put in but community wasn't required to have a plan
  - Community should have been required to have a plan
- 14 more homes in Tuntutuliak want flush haul systems
  - Only have enough money currently for 6 more units

    - Village Safe Water came up with a rate of $55 per household for the flush haul water and sewer services—they never explained how they came up with this number
- Rates
    - Last March community adopted new rates
        - $44 for sewer (300 gallons)
        - $35 for water delivery (140 gallons)
        - Based on 30 units in place
    - $5 flat rate for trash didn't work
        - now trying out house to house pick up service
        - trying to change the rate before they start this service
        - haven't started service because they know it won't work at the current $5 rate
        - Want to pick up trash from each household (78) once a week
- Water & Sewer operators have to do the disconnects for non-paying customers
    - Had one last year and non so far this year
    - After 30 days behind customer doesn't get the next service they request until they pay their bill
    - Use payment plans with some people—people usually get caught up during summer when there is more income
        - This has been a problem for the past couple of years due to poor fishing
- Don't know if sickness rates have improved with the new flush haul units
    - Yukon Kuskokwim Health Corporation just received funding to look into this in general for a village with water and sewer as compared to one without
    - He hasn't observed a significant change in his household and he has 6 kids with a toilet and sink
    - They use steam bath or tub in house (not frequent due to lack of water)
- Governor should put the flush haul equipment in Tuntutuliak in a museum alongside the honeybucket
    - It's not built for constant residential use
    - Built for periodic cabin type use

    - They are making the equipment work for now
    - Household equipment has had a lot of problems
    - Expensive to keep equipment working
    - Equipment is being installed that is no longer being used other places
- Village Safe Water showed community three systems and village chose the one that uses less water
    - Village didn't do their own research on the systems
    - Village Safe Water didn't give both positives and negatives—only gave negatives
    - Sanitation master plan was not required to put in the systems
    - Very little room for input by the community to the Village Safe Water engineer
    - Village Safe Water engineer supposedly knew what was best for the village
    - Village couldn't work with the Village Safe Water engineer and it took three months to get a new one assigned to the project after much consternation
- Currently there are 58 households on the flush haul system, 21 not on the system, and 14 (as of August) who would like service.
    - 14 who want service are ~$30,000 unit installations
    - Takes about ~$27,000-$30,000 to get units functional (if need to add units to house, "add-ons")—equipment, labor, etc. depending on the household it's being installed in
    - AVCP housing where there is already bathroom space set aside and homes can be retrofitted it costs ~$8,700-$9,000/household to get units functional
- FH Unit Tanks hold 300 gallons
- Home owners are conserving the use of the bathrooms and so their purpose is somewhat defeated
    - Rates are preventing people from fully utilizing the system
- Flush Haul Units—what's wrong with them:
    - Next year wants to see redesign of components in the bathroom, overall design is adequate except for foundations
    - Pumps are o.k. but they are plumbed wrong
        - No check valve

        - Pumps had to be primed if they ran out of water and this used about 1/3 of the tank capacity
    - Electric in back of toilet is too flimsy for everyday use—more for cabin type use
    - No drains at the bottom of the water tanks for cleaning purposes
    - Nothing to control overflow when filling
    - Had to put in systems controls to shut off the system when sewage tank gets full and for overflow purposes
    - Pipes in the wall have almost no insulation and this causes freeze ups
    - Wasted space for a closet area in the units
        - These are never turned into shower space
        - Most people do nothing with the space
        - Some have put in shelves for storage
        - Louvered doors never work and fall off right away
    - Water heater leaks at the pressure relief valve
        - Heating coil has rubber seal that can't withstand the maximum heat setting for the water so it deteriorates quickly
        - Replaced the original ones with electric heaters—don't heat the water as hot but don't leak either
    - Units smell at times due to the way they plumbed the sink drains--if the plumbing is moved just the slightest amount the seal breaks and it smells
    - Have maintenance logs with the problems that have occurred
        - Problems that homeowners are dealing with themselves are not listed
    - Fill valve and over flow valve were backwards (fill on the bottom and overflow on the top so get water all over)
    - People lost jobs because they wouldn't install things the wrong way as they were instructed so they got people to install things wrong
    - Fiberglass shell was not measured to the houses so there is a step down into the bathroom
        - Trying to do stick built units now so won't have the step down
    - Frost heave problems because units not attached to houses properly and foundations aren't connected

        - Units are only connected to the houses at the wall
        - No cross bracing underneath or anything
        - Biggest problem is foundation pulling house and bathroom apart

### Boardwalks

- 1995 built boardwalks
    - 1996 finished board walks and connected homes to it
- Boardwalk Maintenance
    - Bureau of Indian Affairs has road program and some of these funds can be used for maintenance for boardwalks
    - This funding is inconsistent
    - 638 funds would help the customers

### Internet/TV

- No internet access in Tuntutuliak
- Have cable TV and satellites dishes in Tuntutuliak

### Labor

- Training
    - Department of Community and Economic Development and Alaska Energy Authority funds used to train 2 water and sewer people in Bethel
    - 1 operator for the tank farm—attended two week tank farm operators training
        - Sending another in March
    - Two trained backup operators for electric utility and 2 operators that work one week on and one week off
    - One person for the tank farm and power plant
- Students—can't get funding to pay them to see if they could intern for the utilities and see if they would like to work for the utilities
- School maintenance person is better paid and has benefits that TCSA employees do not have

    - Difficult to compete with the school as TCSA can't provide benefits and the same amount of pay
- Need a statewide benefit system for utility operators and staff
- TCSA board will not approve a benefits system
    - Board's focus is on keeping cost down so customers rates will stay as low as possible
- Best jobs in the village today are with Yukon Kuskokwim Health Corporation, Lower Kuskokwim School District, & the phone company
- Have used state student work programs before for administrative assistants

### Ideas for Water & Sewer funding

- Water and sewer is like electric in the villages so it would be good to have funds like the PCE for water and sewer
    - It is a basic necessity
    - More expensive in the villages
- What do you like and not like about the PCE?
    - Positive--It helps make it easier for customers to pay bills
    - Positive--Helps accounts receivables from going up too fast
    - Negative--Amount you get is dependent on reporting—annual filing and how good your records are—this makes the system unfair and for an uneven distribution
        - Villages with the same amount of costs, population, etc. can get different amounts of funding based on paperwork
        - Need regionalized formula to reduce paperwork inequitably
        - Need to streamline process and make it fair
    - Negative—Needs to be permanent
        - Without PCE no one could pay 46 cents/kWh
    - Negative—Monthly reports are cumbersome and if you don't submit your monthly reports you don't get PCE subsidies the following month

        - Things don't change from month to month but rather from season to season and are fairly consistent
    - Positive—PCE doesn't pay on a person's account if they don't stay current with their bills and this helps keep customers up to date with their payments
- Need to apply a PCE type system to water and sewer services
    - Reoccurring costs need to be included in formulae same as PCE
    - Fuel, equipment, labor costs, parts, supplies would be eligible
    - All water and sewer expenses should be eligible for depreciation
- Currently when do annual filing we don't get the full amount of repair, only get depreciated amount e.g., for a $10,000 repair get $2,000 each year for 5 years
    - It would be better to have overhauls expensed rather than capitalized/depreciated
    - Repairs don't prolong life just maintains expected life as opposed to no maintenance where life expectancy of equipment is shortened
- Would a block grant of $100/mo/household be good for water and sewer?
    - Yes

## School

- School likes to function separately from the community system
    - Reluctant to go on community electric service
    - School could produce electricity cheaper (36 cents/kWh) than the 46 cents /kWh it costs the community so they negotiated a 38 cent/kWh fee for the school on the community electric system
    - Had to negotiate with the Bethel office
    - School is reluctant to go on the community water & sewer
        - Their sewage lagoon is in the middle of the village and will be shut down soon
        - Could use pump stations or may have to haul it to the community lagoon
        - School doesn't use that much water

        - Going on community system would be cheaper for the school than what it costs them currently and it would help reduce community costs (economy of scale)
        - Maintenance and labor costs would be cheaper for the school
        - Nearby ponds are contaminated with untreated sewage from the school
    - Every spring the school lagoon overflows and it needed to be pumped somewhere
        - Tribe didn't want sewage pumped on village land
        - EPA gave school a permit to discharge waste into the river
        - Tribe didn't want river contaminated so allowed it to be pumped to a pond on village land instead
        - Didn't want to risk the fresh water fishery
    - School has money to do a study on the situation of the sewage lagoon
    - School and community get along
    - District school office gets in the way of progress

## *10.4 Deering Site Visit Notes*

By Brian Hirsch, UAA/ISER

The site visit was performed on Friday and Saturday, March 9 and 10, 2001.

I met with several people including representatives of the Deering City Council, Deering IRA Council, Ipnatchiaq Electric Board of Directors, plant operators, community members, school employees, Maniilaq Association, and others.

The main focus of this investigation was the operation of, and situation with the village solid waste utility, better known as "the dump." The sewer and water systems, the electric utility, and bulk fuel storage were also researched. The remainder of this report is divided into sections by utility system, followed by conclusions.

### Solid Waste

What people referred to as "the old dump" was shut down in the mid-1980's. That area, clearly delineated on local maps, was covered over with dirt and other materials and has posed problems ever since. Perhaps the largest problem is its location, which is quite close to the now-larger village. The old dump site has constrained housing and other village expansion and has resulted in the village essentially surrounding the old site, i.e., there is construction on both sides of the covered over dump, with a buffer around the site.

A newer landfill—the one currently in operation—was sited "over the hill" behind the village. Presumably it came on-line in the mid-1980's when the old one was shut down. It was renovated in 1995 and is now bermed and fenced through funding from the state. However, in some ways, the current dump is even more of a problem than the old one. In particular, the dump was sited within the local water table and water currently flows in and around the dump and leaches into the main creek right next to the village. This creek was used long ago for drinking water but is

no longer, however, the creek feeds right into the surface waters and the coastline bordering the village.

The current landfill has no paid or trained operator and individuals and families are responsible for transporting and depositing their own waste at the landfill. There is now talk of trying to re-direct the surface waters so they do not run through the landfill and then right next to the village, but it is not clear what actions have or need to be taken to implement this goal. There was also discussion of the need for an experienced and trained person to manage and maintain the landfill, but people felt like there was no funding for a job like this. As well, it was mentioned that Deering had tried to get training for somebody to run the landfill, but they were unable to locate any training courses in the state of Alaska and out-of-state training was both expensive and insufficient considering the permafrost and other climactic and geological challenges faced by rural, northern communities. People specifically stated that they felt there was a need that was not able to be met for in-state and site-specific landfill O&M training.

Another safety issue is that last year some village kids ran into a bear at the dump and people felt is was unsafe for kids to be there. Further, some believed that the landfill was possibly attracting bears closer to the village than they otherwise would be and that with subsistence harvests in the summertime—especially fish and other traditional foods—this was potentially a dangerous and disastrous situation if people lost their food heading into the winter.

The land itself on which the current dump is located was owned by NANA regional corporation but was given over to the City of Deering. However, the Deering IRA has been the most active in addressing the problems at the landfill and recently received a combination of grants to upgrade the current dump. Specifically, it is a two-year grant, begun on November 1, 2000, for a total of $230,000, split between BIA ($58,000), EPA ($41,000), and IHS ($131,000). The BIA funds are for materials and shipping, the EPA funds are for design and some labor, and the IHS funds are for “the rest.”

The primary goal of the renovation is to line the dump and better control the hydrology, however, many people feel like this is at most a short-term solution and that the longer-term

strategy needs to be to close this dump as well and find a better site that is not so closely tied to the surface and ground water table and not so close to town. At the last two annual meetings, community members have clearly identified landfill issues as a top priority, with the majority voicing a desire for a new dump. However, people also mention quite strongly that they don't want to destroy any more land, which poses what seems to be an unsolvable dilemma.

Under the current new grant for landfill renovation, all the funding will be directed through the IRA Council. The main administrative goals of the grant are to hire almost exclusively locally for construction, including a project manager from Deering. The hope is that the project manager will become the Environmental Coordinator under EPA Indian General Assistance Program funding. There is a small amount of money for operation of the dump, but that will only last for the duration of the grant, and there will again be a need for operation money. The village wants to control access to who dumps what where and when, i.e., they want to have a trained operator and a collection system so that not everybody goes to the dump, but rather, only the city or tribal employee goes to the dump with people's waste at approved times. It is recognized that this is a goal but not within reach in the near future, however, it could tie into the village utility board, which will be discussed in more detail in the following sections.

### Sewer and Water

A new flush vacuum sewer and water haul system is still under construction and is slowly coming on line throughout the village. It has been a five year project and is now in its final year.

In general, people were very frustrated with the progress and performance of the system. When asked how much it had cost, people rolled their eyes and said "probably about $10 million over the years." It was my sense that the project had been so drawn out that it was difficult to account for all the costs, and people were very clear that whatever dollar amount was put on the project, this did not account for their time and effort and all that was volunteered to make the project work. It was also stated quite clearly that people felt as if the technology was sub-standard and that this was a direct result of cost-cutting on the part of the government agencies. Further, the

cost-cutting required extra design work, repetition of activities, and delays that ended up costing the project probably more than if the construction was state-of-the-art from the beginning.

### System Specifics

The new system consists of a water intake that is approximately two miles "upriver" from the village, but the current intake already needs to be moved since it was built a few years ago because of erosion at the intake location. The new intake is now being built about 600 feet up from the current one. It was not clear to me if this water source is the same creek that the old or current dumpsites have contaminated, though the water intake is on the Inmachuk River and the dumps were said to be contaminating "creeks."

The water is brought into a water treatment facility that uses both fluoride and chlorine. The water is eventually stored in a 400,000 gallon tank, and then is piped into the washeteria. The washeteria is the dispensing point for water to be distributed to individuals and families in the village.

Funding contributions for the water and sewer system have been provided through the state's Village Safe Water (approximately 75% of total) and EPA and ANTHC (approximately 25%). The system is run with two certified Level 1 operators, and monthly collections have paid for their training. There were several additional elements of the system that people wanted but that it was clear were too expensive and would not get funded, so they implemented a detailed prioritization process that eliminated several of these items from the system design.

It is VERY important to note, it seems to me, that despite all of this cost and time and effort, people don't drink the water provided by this $10 million system! Instead, people individually haul water and ice from a nearby river or snow pile because they don't like the chlorine and fluoride and whatever else they feel is put into the treatment of the water.

The sewer and water system is operated under the Ipnatchiaq Electric utility, which is city-owned and discussed later in this report. Each household pays $55 per month for sewer

regardless of amount of use, while water is purchased on a cash basis for $20/100 gallons. If people are two months behind on their payments, they receive a disconnection notice, and after the third month, they lose service.

Ipnatchiaq Electric has paid out of its own revenues for electrical inspection of the water treatment and sewer facilities, which was a cost that should have been covered by the grant but the funding agencies wouldn't pay for it. It is expected that once the water and sewer systems are fully operational, village electric demand will increase by about 10%.

### Electricity

Ipnatchiaq Electric (IE) is a city subsidiary but run by an independent utility board. Previously, IE only ran the electric system for Deering, but it is now involved with the sewer and water project as well, though the relationship and responsibilities are still getting worked out, specifically regarding O&M of the sewer and water.

Electric meters are read monthly by IE employees, and a retail residential rate of 38.5 cents per kWh is charged. Disconnect notices are issued after 30 days of non-payment, though state law does not allow for disconnection during cold winter months. However, in the summer, if people don't pay, they do get disconnected. As a result, IE is not in debt and in fact, is doing quite well. It appears to be a very well-run village scale utility. They also receive PCE payments. (I did not discuss the financial details of this with the General Manager because I knew we could get these figures through the electronic database.)

Two diesel operators run the facility, alternating every four days. The entire diesel electric system has recently been upgraded through funding from the Denali Commission, and they now have four new generators of the following sizes: 100kW, 145kW, 180kW, and 180kW. They are having difficulties integrating all the generators together, and some cannot run while others are operating. These technical difficulties are still being worked out.

IE is also pursuing the development of wind power to reduce diesel fuel use. This effort is in its very early stages, i.e., they are collecting wind data and intend to design a system to inter-connect with the current diesel configuration.

Administratively, the City applies for grants and IE administers them. IE also employs two administrative people—a General Manager and a bookkeeper. An annual budget and capital improvements are approved by the IE Board on a yearly basis. The Alaska Energy Authority has been administering the funds for the recent system upgrade and this has been a source of some frustration because of the lack of control at the local level.

### Bulk Fuel

The tank farm is located on city land, though the IRA owns the actual facility. There is a single tank farm for the entire community, which has a 192,000 gallon capacity. This amount of fuel lasts the village for an entire year. Fuel is delivered by barge through Kotzebue. The IRA sells gasoline to individuals at the tank farm.

IE is also involved with management and operation of the tank farm and is developing operating procedures and manuals to comply with EPA and Coast Guard regulations. Specifically, IE is creating an Oil Spill Response Plan and Operations Manual, and planning for an inspection from a Professional Engineer this spring or summer to bring them into compliance. As well, they are aware of some code violations in their current piping system and they have had some minor spills, but nothing major. IE electric plant operators transfer fuel from tanks to the power plant.

The village is looking for funding to address spill clean-up and improve operator training. They expect to bring this up at the next quarterly meeting of the Northwest Arctic Borough. Alaska DEC in the regional office has been supportive of Deering's efforts to comply with EPA and Coast Guard, but previously EPA and Coast Guard were threatening that they were going to start fining Deering if they didn't develop the Response Plan and Operations Manual. Deering still needs additional data on the construction of the tank farm and more inspections.

## School

The school purchases electricity and sewer and water services from IE at pre-negotiated rates and terms of service. Specifically, the school pays 34.5 cents per kWh for electricity, $500/month for sewer and water is purchased annually at 15 cents per gallon for 70,000 gallons.

There are also apartments next to the school that provide housing for the teachers. The apartments pay regular residential sewer rates, but the electricity and water for the apartments are tied into the school purchase.

This arrangement causes several problems. The first is that money from the school education budget is diverted to pay for water and electricity for the teachers. The community made an explicit decision to charge less to the school so more money can go into the children's education, but the school chose to subsidize the water and electric for their teachers. It is widely perceived that this money that is providing "free" electricity and water for the teachers could be going to the students' education. The teachers have no incentive to conserve electricity or water. As well, there are several teachers who are either from the community or would choose to live in the community, but this arrangement is not fair for them. The teachers who choose to live in the community do not get subsidized electric and water, so most or all of the non-local teachers live in the apartments and stay segregated, while community members who are teachers do not receive the subsidy.

## Conclusions

The community is very aware of the quality of life provided by effective and efficient utility services, and they have done a good job of securing the best services they can. Leadership in the community revolves around involvement with utility services, and many of the best jobs in the community are provided by the utilities. IE is an excellent community institution that provides reliable service and is respected by most or all of Deering's residents. As well, controlling and managing IE has been a source of pride and direction for people in the community. The General Manager of IE has been in that position for quite some time, though she is now pregnant and will

be stepping down in a few months. There has been a long lead time in training the next General Manager, and she also seems quite capable, intelligent, and excited about taking the position.

Taking responsibility of the sewer and water services is a large new initiative for IE, but they seem to be managing it well so far. However, it appears from some of the early financial projections that the monthly collections for sewer and water may not meet the monthly expenses, and it is not clear if the revenue surplus from electricity will go towards subsidizing the sewer and water or if something else will be devised. As well, the entire development process of the sewer and water left many people feeling as if they were not fully included, their input was discounted, and as a result they are left with an inferior technical system and one that does not provide adequate quality drinking water. This could become a bigger problem in the future.

## References


Abrams, Len. *Capacity Building for Water Supply and Sanitation Development at Local Level: The Threshold Concept*. Paper delivered at the 2nd United Nation Development Programme Symposium on Water Sector Capacity Building, Delft, Netherlands. 4-6 December 1996.

Ahmed, F. and M.D. Hossain. 1997. "The Status of Water Supply and Sanitation Access in Urban Slums and Fringes of Bangladesh." Aqua V. 46, No. 1: pp. 14-19.

Alarcon, Sandra. November 7. Loan Specialist, USDA Rural Utility Service, New Mexico Field Office. Phone conversation regarding Rural Utility Service funding of water and sewer projects in the Colonias.

Alaska Business Monthly. "Types of Sewer Systems." V. 15, No. 6: p. 25.

Alaska Department of Community and Economic Development, Municipal and Regional Assistance Division, Rural Utility Business Advisor Program. 1999. *Alaska Sanitation Planning Guide for Small Communities.*

Alaska Department of Community and Economic Development, Municipal and Regional Assistance Division, Rural Utility Business Advisor Program. 1999. *1999 RUBA Utility Management Survey: Summary of Regional Results*, Anchorage.

Alaska Department of Community and Economic Development. June 1999. *Sanitation Planning Guide for Small Communities, Technical Appendices*.

Alaska Department of Community and Regional Affairs and Alaska Department of Environmental Conservation. 1998. *A Plain English Guide to Alaska Drinking Water and Wastewater Regulations for Rural Utilities Serving 25 – 1,500 People.* Researched, written and designed by Williwaw Publishing Co., Anchorage, Alaska Department of Community and Regional Affairs, Municipal and Regional Assistance Division, Rural Utility Business Advisor Program.

Alaska Department of Community and Regional Affairs, Division of Energy. February 1999. *Bulk Fuel Storage, Electric Utilities, Alternative Energy,* Anchorage, Alaska.

Alaska Department of Community and Regional Affairs, Division of Energy. June 15, 1999. *Division of Energy: Active Projects Status Report*, Annual report, Anchorage, Alaska.

Alaska Department of Community and Regional Affairs, Division of Energy. May 21, 1999. *Rural Energy Plan, Additional Information on Alternative Energy*, Anchorage, Alaska.

Alaska Department of Community and Regional Affairs, Division of Energy. May 1999. *Statistical Report of the Power Cost Equalization Program*, Fiscal Year 1999, Annual report Anchorage, Alaska.

Alaska Department of Community and Regional Affairs, Division of Energy. May 1999. *Energy Update*, Anchorage, Alaska.

Alaska Department of Community and Regional Affairs, Division of Energy, Alaska Public Utilities Commission. July 1997. *Power Cost Equalization Program Manual*, Anchorage, Alaska.

Alaska Department of Community and Regional Affairs, Division of Energy. June 1995. *Alaska Rural Energy Initiative*, Anchorage, Alaska.

Alaska Department of Community and Regional Affairs, Division of Municipal and Regional Assistance, Rural Utility Business Advisor Program. *RUBA Quarterly Report, October 1 – December 31, 2000*. Anchorage, Alaska.

Alaska Department of Environmental Conservation. 2001. *Burning Garbage in Rural Alaska, a Publication for Small Alaskan Communities Considering Incineration and Energy Recovery, DRAFT.*

Alaska Department of Environmental Conservation. January 2000. *Municipal Water, Sewerage and Solid Waste Matching Grants, Fiscal Year 2001 Community Grant Requests*. Prepared by the Division of Facility Construction and Operation.

Alaska Department of Environmental Conservation, Citizen Advisory Board. 2000. *Draft Report of Findings on Improving the Technical, Managerial and Financial Capacity of Alaska's Public Water Systems.*

Alaska Department of Environmental Conservation. January 2000. *Village Safe Water, Fiscal Year 2001 Community Grant Requests*. Prepared by the Division of Facility Construction and Operation.

Alaska Department of Environmental Conservation. January 1999. *Rural Landfill Design and Operations Video Study Guide*. Division of Environmental Health, Solid Waste Program.

Alaska Department of Environmental Conservation. 1998. *Down with Dumps* a video. *Part I: Rural Landfills Design and Operations*. *Part II: Rural Landfills Design and Operations*.

Alaska Department of Environmental Conservation. 1997. *Final Report, Solid Waste Baler and Balefill, Unalakleet, Alaska*.

Alaska Department of Environmental Conservation. No date. *Resource Guide to Financial and Technical Assistance for Water and Sewer Projects, a Resource for Rural Communities*. University of Alaska Southeast—Sitka Campus, Environmental Technology Program, 1332 Seward Avenue, Sitka, Alaska 99835. May be downloaded at http://www.water-alaska.org.

Alaska Division of Policy, Office of the Governor. July 1989. *Regional Electric Utilities in Rural Alaska*.

Alaska Legislative Digest. "Rural Sewer/Water: Real Progress!" Special Rural Community, Schools & Municipal Supplement. V. 13 (March 2000): pp. 1-4.

Alaska Native Health Board. 1999. *Solid Waste Management Demonstration Grants' Fact Sheets*, January 1999.

Alaska Native Health Board, *Rural Sanitation Facilities Operation and Maintenance Demonstration Project: Interim Project Report*, prepared by Nina R. Miller and Joe Sarcone, Anchorage, Alaska Native Health Board, April 20, 1999.

Alaska Native Health Board. 1998. *Solid Waste Management Demonstration Grants' Project Request For Proposals, 1998*.

Alaska Public Utilities Commission. 2001. *Power Cost Equalization Program, Fiscal Year 2000, July 1, 1999-June 30, 2000*.

Alaska Regional Electric Cooperative Association. *Keeping Alaska's Future Bright*, Monthly Newsletter, December 1999-April 2000.

Alaska Rural Electric Cooperative Association. January, 1999. *Electric Utility Industry Restructuring in Alaska: Overview and Issues to Consider*, Anchorage.

Alaska Rural Electric Cooperative. 1994. *Northern Lights, a Brief History of Alaska's Electric Cooperatives*. Anchorage, Alaska.

Alaska Systems Coordinating Council and Alaska Department of Community and Regional Affairs, Division of Energy, co-sponsors. September. 1996. *Alaska Electric Power Statistics, 1960 – 1995*, Anchorage, Alaska.

Alaska Village Electric Cooperative. 1998. *AVEC Energy Generation Efficiency*. A presentation for the Division of Energy Conference, Rural Alaska Power, Challenges and Opportunities. October 12-13, 1998. Anchorage, Alaska.

Alaska Water and Wastewater Management Association, *Fifth Annual Research and Development Conference on Rural Sanitation, April 25-26, 2000*, edited by Craig R. Woolard, Lisa A. Woolard and Daniel M. White. Fairbanks, Alaska.

American Public Works Association. 1998. *Public Works Management Practices Manual.* Third Edition, August 1998.

American Society of Civil Engineers. 1996. *Cold Regions Utility Monograph.* Third Edition. American Society of Civil Engineers, 1801 Alexander Bell Drive Reston, Virginia 20191-4400.

Ammons, David D. 1996. *Municipal Benchmarks: Assessing Local Performance and Establishing Community Standards*, Sage Publications.

Anderson, E. Grant. 1998. *How Carefully Siting Landfills Can Protect Your Environment, Simplify Operations, Eliminate Need for Complex Engineered Containment Systems and Significantly Reduce Costs*. Paper presented at the Organization of American States Inter-American Program for Environmental Technology Cooperation in the Key Industry Sectors Roundtable On Municipal Solid Waste Management in Salvador, Brazil, 27-28 September 1998.

Anderson, E. Grant. 1998. *Privatizing Management of Solid Waste in Developing Countries, the Malaysian Experience*. Paper presented at the Organization of American States Inter-American Program for Environmental Technology Cooperation in the Key Industry Sectors Roundtable On Urban Solid Waste Management in Salvador, Brazil, 27-28 September 1998.

Appalachian Regional Commission. 1997. "Setting a Regional Agenda, ARC Strategic Plan: 1997-2002." Appalachian Regional Commission web site: http://www.arc.gov/aboutarc/abtstpln.htm

Ariyaratne, Vinya S. and Palitha Jayaweera. 1994. *Sarvodya's Integrated Approach to Water and Sanitation*. Paper presented at the 20th Water, Engineering and Development Center Conference, Colombo, Sri Lanka.

Arthur Young and Company. April 1979. *A Discussion of Considerations Pertaining to Rural Energy Policy Options*. Prepared for the State of Alaska, Department of Commerce and Economic Development, Division of Energy and Power Development.

Asian Development Bank. 2000. "Asia's Water Situation 'A Human Tragedy,' Says Asian Development Bank Annual Report." News Release No. 36/00.

Baldwin, Fred. 1998. "The Town That Helped Itself—to Water." Appalachia Magazine September-December Issue. Appalachia Regional Commission web site: http://www.arc.gov/infopubs/appalach/sepdec98/s-d-98tc.htm

Baldwin, Fred. 1999. "Cleaner Water: North Carolina's Straight-Pipe Elimination Project." Appalachia Magazine September-December Issue. Appalachia Regional Commission web site: http://www.arc.gov/infopubs/appalach/sepdec99/pipe.htm

Barnett, Richard and Mark Dalton. 1999. "Conquering the Cold: Alaska's frozen soils, short construction seasons, and isolated communities challenge engineers to use specialized skills and innovative technologies." *Civil Engineering* V. 69, No. 9: pp. 52-58.

Beecher, Dreese, Stanford. 1995. *Regulatory Implications of Water and Wastewater Utility Privatization*. National Regulatory Research Institute. NRRI 95-09.

Becheer, Janice A., G. Richard Dreese and James R. Landers. June 1992. *Viability Policies and Assessment Methods for Small Water Utilities*. The National Regulatory Research Institute, The Ohio State University, 1080 Carmack Road Columbus, Ohio 43210.

Beecher, Mann, Landers. 1990. *Cost Allocation and Rate Design for Water Utilities*. National Regulatory Research Institute, NRRI 90-17.

Beecher, Mann. 1989. *Deregulation and Regulatory Alternatives for Water Utilities*. National Regulatory Research Institute. NRRI 89-16.

Beecher, Zearfoss. 1992. *1992 NRRI Survey on Commission Ratemaking Practices for Water Utilities*. National Regulatory Research Institute. NRRI 92-09.

Beecher. 1996. *The Regionalization of Water Utilities: Perspectives, Literature Review, and Annotated Bibliography*. National Regulatory Research Institute. NRRI 96-21.

Benander, Lynn. 1997. *Energy Co-op Development in the Northeast*. Cooperative Development Institute. Internet publication.

Benchmarking Study Report, National Performance Review. June 1997. *Serving the American Public: Best Practices in Performance Measurement*.

Bettine & Associates. 1993. *Calista Regional Electric Utility Feasibility Report, Final Draft Report*. Prepared for Calista Corporation.

Blatchford, Edgar. "Working Together for Community Economic Development in Rural Alaska." Economic Development Review. Winter 1994. Volume 12, No. 1: pp. 41-43.

Bomer, Elton. 1999. *Eyes of Texas Focused on Border Colonias*. Texas Secretary of State, Editorials, June 1999, web site: http://www.sos.state.tx.us/from/editor/colonias.htm

Boudreaux, Greg. 1999. "Size Matters: Getting Bigger Without Consolidation." *Management Quarterly* V. 40, No. 1: pp. 33-44.

Bouwens, William. 1987. Public Health Service Trip Report, Newtok, March 10-11.

Briscoe, John. 1993. "When the Cup is Half Full, Improving Water and Sanitation Services in the Developing World." *Environment* V. 35, No. 4: pp. 6-25.

Brookes, Terry. October 25, 2000. Professional Engineer, Greater Northwest Territories, Canadian Municipal and Community Affairs. Phone conversation regarding water and sewer services in the Greater Northwest Territories.

Brooks, Linda. 1995. *Legislative History of the Power Cost Equalization Program*. Legislative Research Agency, Research Request 95.159.

Brown, William S. and Clive S. Thomas. "Diversifying the Alaskan Economy: Political, Social, and Economic Constraints." *Journal of Economic Issues*. June 1996. Volume 30, No. 2: pp. 599-608.

Bureau of Indian Affairs and Tlingit Haida Native Council. 1999. *Bureau of Indian Affairs' and Tlingit Haida Native Council's Cooperative Long-term Solid Waste Management and Facility Improvement Project Scope, 1999*.

Campbell, Steven V. 1999. *A Fiscal Case Study of the Water and Sanitation Systems in Nulato and Tanana*. Prepared for the Institute of Social and Economic Research, University of Alaska Anchorage and the Alaska Native Health Board.

Canadian Press. 7/31/2000. "Municipalities Will Fund Required Upgrades to Water Treatment Facilities: Harris."

Canadian Press. 6/20/2000. "More Money Needed to Upgrade Sewers, Roads: Municipalities."

Canadian Press. 6/12/2000. "Billions Needed on National Sewer, Water Infrastructure Upgrade."

Canadian Press. 6/05/2000. "Municipalities Must Re-evaluate Infrastructure Priorities: Harris."

Cariaga, Vance. 1998. "Electric Deregulation Battle to Heat Up In '98." *Business Journal Serving Charlotte & the Metropolitan Area* V. 12, No. 39: p. 16.

Casada, Manny. November 2, 2000. Desert Air Water Association, New Mexico. Phone conversations regarding the Desert Air Water Association and water and sewer services in the Colonias.

CH2M Hill 1999. *Report to: The Alaska Public Utilities Commission and the Alaska State Legislature: Study of Electric Utility Restructuring in Alaska, Final Report*, prepared by Karl R. Rabago, CH2M Hill, Tom Feiler, Ecoenergy International Corporation, Floyd Damron, CH2M Hill and Deanna Gamble, CH2M Hill. Anchorage, Alaska, June 30, 1999.

CH2M Hill. 1994. *NANA Regional Utility Feasibility Study*. Prepared for NANA and Village Safe Water Construction Grants Program.

Cheff, Christine M. 1992. *Alaska Public Utility Commission Regulation of Solid Waste Collection and Disposal*. Legislative Research Agency, Research Request 92.213.

Cheff, Christine. *Public Assistance Matters*. Legislative Research Agency, Research Request 92.188.

Chester, Tom. 1991. *Economic Feasibility of Interties and Other Railbelt Projects*. Legislative Research Agency, Research Request 91.176.

Chester, Tom. 1990. *Benefit-Cost Comparison of Eight Railbelt Energy Projects*. Legislative Research Agency, Research Request 91.025.

City of Galena and the Louden Tribe. 1998. *Memorandum of Understanding creating the Galena Waste Management Steering Committee*. April 1998.

Colt, Steve and Mark Foster. 1996. *Yukon-Kuskokwim Region Sanitation Utility Management Options Type 1 Market Feasibility Study*. Institute of Social and Economic Research, University of Alaska Anchorage.

Colt, Steve. 1994. *Operations and Maintenance Issues in Rural Alaska Sanitation, Final Report*. Institute of Social and Economic Research, University of Alaska Anchorage, Anchorage, Alaska.

Colt, Steve, and Lexi Hill, 2000. *Existing and Potential Local Contributions to Village Safe Water Projects*. ISER, Prepared for Village Safe Water Program.

Colt, Steve. 2000. *Flush Haul Cost Analysis*. Prepared for Alaska Native Health Board. Reprinted in: Haley, Sharman, et al., 2000. *Financing Water and Sewer Operations and Maintenance in Rural Alaska*. Available at www.iser.uaa.alaska.edu

Cook, William B. 1999. *Public Works Performance Management: Creating Accountability and Increasing Performance*. American Public Works Association.

Coopers & Lybrand. No date. *Best Practices of Improvement Driven Organizations: How Today's High Performers Produce Results*. Arlington, VA: Coopers & Lybrand.

Copeland, Claudia. 1994. *Rural Water Supply and Sewer Systems: Background Information*. Washington D.C.: Congressional Research Service Report for Congress. Made available by the Committee for the National Institute for the Environment.

Davidson, Deborah L. 1993. *State General Fund Commitment to Energy-Related Utilities*. Legislative Research Agency, Research Request 94.012.

Davis, Elaine R. 1997. *Paying for Power: Taxpayer-Subsidized Electricity in Washington State*. Washington Institute for Policy Studies publication. Web site: http://www.wips.org/Studies/power.htm

Dayal, Rekha and Peter Lochery. 1994. *Application of Key Sector Principles: Issues and Realities*. Paper presented at the 20th Water, Engineering and Development Center Conference, Colombo, Sri Lanka.

De Fatima Dimas Carteado, Maria and Richard Franceys. 1994. *Institutional Development, Brazil*. Paper presented at the 20th Water, Engineering and Development Center Conference, Colombo, Sri Lanka.

Department of Energy, Office of Fossil Energy. No date. *An Energy Overview of Brazil*. International, fossil energy related global activity, DOE web site: http://www.fe.doe.gov/international/brazover.html

Dillingham, Terese. 1999. "Playing Reindeer Games: Native Alaskans and the Federal Trust Doctrine." *Boston College Environmental Affairs Law Review*. Spring 1999, Volume 26, No. 3: pp. 649-685.

Division of Subsistence, Alaska Department of Fish and Game. 1998. "Subsistence in Alaska: 1998 Update."

Division of Subsistence, Alaska Department of Fish and Game. 1990. *Subsistence in Alaska: A Summary*. Anchorage, Alaska.

Dolan, A.H., R. Kreutzwiser and R. DeLoe. 2000. "Rural Water Use and Conservation in Southwestern Ontario." *Journal of Soil & Water Conservation,* 2nd Quarter, V. 55, No. 2: pp. 161-171.

Dougherty, Cynthia C. 1999. *Rural Water Projects*. Federal Document Clearing House Congressional Testimony.

Downs, Timothy J., Enrique Cifuentes-Garcia and Irwin Mel Suffet. 1999. "Risk Screening for Exposure to Groundwater Pollution in a Wastewater Irrigation District of the Mexico City Region." *Environmental Health Perspectives,* V. 107, No. 7: pp. 553-562.

Dryden & LaRue, Inc. 1996. *Bethel-Nyac Intertie Cost Estimate*. Prepared for L.C.M.F., Inc.

Dunn, Seth. July 2000. *Micropower: The Next Electrical Era*. World watch Paper 151. Jane A. Peterson, Editor.

Economist Newspaper Limited. *The Dawn of Micropower*. Internet publication. No author, no date.

Economist Newspaper Limited. *The Electric Revolution*. Internet publication. No author, no date.

*The Economist*. "The Electrification of Everywhere Else." V. 331, No. 7868: pp. 6-9.

*Electric Light & Power*. "Co-ops to Investigate Joint Efficiency." V. 75, No. 9: p. 24.

Emmanuel, V.J. 1994. *Water and Economic Development*. Paper presented at the 20th Water, Engineering and Development Center Conference, Colombo, Sri Lanka.

Emerman, Dick. 1993. Memorandum from Dick Emerman of the Alaska Energy Authority to Bruce Tiedeman, regarding the Review of Calista Regional Utility Draft Report.

Energy Information Administration, Department of Energy. *International Energy Outlook*. Report #: DOE/EIA-0484(98), web site: http://www.eia.doe.gov/oiaf/ieo98/home.html

Eng, Steven and James K. Lake. 1997. "Bringing Low-Flow to Eskimos." *Civil Engineering,* V 67, No. 11: pp. 56-57.

Engelman, Paul. 1992. *Review of the Estimated and Actual Costs, Benefits and Economic Return of the Anchorage-Fairbanks Intertie*. Legislative Research Agency, Research Request 92.095.

English, Glenn. 1997. "National Rural Electric Cooperative Association (NRECA)." *Congressional Digest,* V. 76, No. 6-7: pp. 211-217.

Environmental Protection Agency. March 1998. *Colonias Facts*. Environmental Protection Agency web site: http://www.epa.gov/owm/clnfcts.pdf

Environmental Protection Agency. 1997. "Partnerships in Solid Waste Management." EPA 530-F-97-050, December 1997.

Estache, Antonio and Martin A. Rossi. "Comparing the Performance of Public and Private Water Companies in the Asia and Pacific Region." Washington D.C.: Policy Research Working Paper 2152, The World Bank/World Bank Institute/Governance, Regulation and Finance. 1999.

F.P.E. Roen Engineers. 1996. "Transmission Intertie Feasibility Design and Cost Estimate Bethel-Nyac." Prepared for the State of Alaska, Department of Community and Regional Affairs, Division of Energy.

Fay, Ginny. 1989. "Railbelt Energy Capital Project and Power Cost Equalization Appropriations." Legislative Research Agency, Research Request 90.113.

Fay, Ginny. 1989. "State Funding for the Power Cost Equalization and Four –Dam Pool Projects and an Overview of Proposed Railbelt Electrical Intertie Proposals." Legislative Research Agency, Research Request 90.142.

Federal Reserve Bank of Dallas, Community and Regional Affairs. No date. "Colonias FAQ's (Frequently Asked Questions)." Office of the Secretary of State (Texas) web site: http://www.sos.state.tx.us/colonias/faq.html

Federal Reserve Bank of Dallas, Community Affairs Office. No date. "Texas Colonias: A Thumbnail Sketch of the Conditions, Issues, Challenges and Opportunities." Federal Reserve Bank of Dallas publications, web site: http://www.dallasfed.org/htm/pubs/pdfs/ca/colonias.pdf.

Fisher, John and Pat McCree. "A brief commentary by a Rural Utilities Business Advisor and a Rural Maintenance Worker on 'A Fiscal Case Study of the Water and Sanitation Systems in Nulato and Tanana' by Steve Campbell." Chapter 5 in Financing Water and Sewer Operations and Maintenance in Rural Alaska. Institute of Social and Economic Research, University of Alaska, Anchorage, 2000.

Gerger, Asa and Monica Gullberg. 1995. "Locally Managed Electricity Systems in Developing Countries." Stockholm Environmental Institute, Renewable Energy for Development, August 1995, V. 8, No. 2: 3 pages. Web site publication: http://www.sei.se/red/red9508.html

Gladziszewski, Maria. 1999. "Use of the PCE Program by School Districts." Legislative Research Services, Legislative Research Report 99.086.

Gladziszewski, Maria. 1994. "Alternative Sewage Treatment Systems for Rural Alaska." Legislative Research Agency, Research Request 94.090.

Goldsmith, Scott. 1998. "The Economic Significance of the Power Cost Equalization Program." Institute of Social and Economic Research, University of Alaska Anchorage.

Goldsmith, Scott. 1993. "When Competition on Telecommunications Fail the Public Interest." Prepared for the Alaska Public Utilities Commission. Institute of Social and Economic Research, University of Alaska, Anchorage.

Governor's Blue Ribbon Committee, Power Cost Equalization: Report and Recommendations of the Governor's Blue Ribbon Committee, February 1, 1999.

Governor's Council on Rural Sanitation. 1999. Rural Sanitation 2005 Action Plan: a Strategy to Make Safe Water and Hygienic Sewage Service a Reality for All Alaskans: Developed and Adopted by the Governor's Council on Rural Sanitation, Juneau, Alaska Department of Environmental Conservation, February 17, 1999.

Grand Rapids Business Journal. "Deregulation: Group Shows How to be Proactive." V. 17, No. 42: p. 4.

Gray, Glenn. 1991. "Community Development Quotas for Fisheries." Legislative Research Agency, Research Request 91.185.

Hale, Harold and Sid Sperry. 1998. "'Leveling the Playing Field' with 'Postage Stamp' Electricity." Management Quarterly V. 39, No. 2: pp. 13-17.

Haley, Sharman, et al., 2000. *Financing Water and Sewer Operations and Maintenance in Rural Alaska*. Available at www.iser.uaa.alaska.edu

Hall, Bridget. 2000. "County Looks at Plan to Control Private Utilities." St. Petersburg Times, May 17, 2000.

Harris, Marwood. 1994. "Update History of Municipal Assistance and Revenue Sharing." Legislative Research Agency, Research Request 94.169.

Harrison, Gordon. 1995. "AML Proposal to Modify Revenue Sharing and Municipal Assistance Programs." Legislative Research Agency, Research Request 95.044.

Harrison, Gordon. 1995. "Municipal Land Entitlements and the Problem of the 'Have Not' Cities." Legislative Research Agency, Research Request 95.181.

Harrison, Gordon. 1995. "Unique State Programs in Alaska." Legislative Research Agency, Research Request 95.208.

Harrison, Gordon. 1993. "Transfer of Powers from the Alaska Energy Authority." Legislative Research Agency, Research Request 94.032.

Harrison, Gordon S. 1992. "Public Utility Commission 'User Fees' in Other States." Legislative Research Agency, Research Request 92.256.

Harrison, Gordon. 1990. "Regulation of Refuse Collection and Disposal in Alaska." Legislative Research Agency, Research Request 90.190.

Heubner, Bill. October 5, 2000. Civil Engineer, National Park Service, Alaska Support Office. Phone conversation regarding water and sewer services in National Parks.

Hill, Alexandra. 1992. Memorandum regarding Lime Village to Alaska Energy Authority from the Institute of Social and Economic Research, University of Alaska, Anchorage.

Hodson, Loyd M. 1997. Village Phoenix: The Struggle to Recreate Alaska Village Electric Cooperative, Inc. Alaska Village Electric Cooperative, Anchorage, Alaska.

Hoffman, Carl. 1998. "A Tale of Two Water Systems." Appalachia Magazine January-April Issue. Appalachia Regional Commission web site: http://www.arc.gov/infopubs/appalach/janapr98/ataleof.htm

Hosler, Karen, George Menard, Alexandra Hill, and George Hagerman. 1995. "Conceptual Design and Economic Evaluation of 'Nano-Grid' Power Generation and Distribution

Systems for Lime Village, Alaska." Final Report prepared for Gary Cox, Division of Energy, Alaska Department of Community and Regional Affairs.

Hudson, Tim. October 6, 2000. Chief of Maintenance, Yellowstone National Park. Phone conversation regarding water and sewer services in National Parks.

Hukka, Jarmo J. and Tapio Katko. 1997. "Towards Viable Drinking Water." Natural Resources Forum V. 21, No. 3: pp. 161-167.

Hund, Andrew. 1998. "Perspectives on the Alaskan Rural Sanitation Struggle." Humboldt State University.

Indian and Northern Affairs Canada. 1998. "Water and Sewer Services Reach First Nation Homes in Ontario's Northwest." News Release, August 14, 1998. Web site: http://www.inac.gc.ca/nr/prs/m-a1998/1-9878.html

Indian Health Service. 1998. "Report: Open Dumps on Indian Lands, August 1999."

Institute for Tribal Environmental Professionals. 1999. "Introduction to Tribal Solid Waste Management." Northern Arizona University, Flagstaff, Arizona. February 1999.

International Institute for Learning. *Breakthrough Results with Benchmarking*. Pamphlet for the Breakthrough Results with Benchmarking Conference, New York, N.Y., June 27, 1995.

International Water and Sanitation Centre, Netherlands and Network for Water and Sanitation International, Kenya. 1998. "Management Options for Small-Scale Water Supply Systems in Africa." Report on a workshop held in Kakamega, Kenya, 7-10 December.

Irwin, Colin. "Lords of the Arctic: Wards of the State."

Isaacs, F.W. Colin. 1998. "Advancements in Municipal Waste Management Policy & Programs: Canadian Experience." Paper presented at the Organization of American States Inter-American Program for Environmental Technology Cooperation in the Key Industry Sectors Roundtable On Urban Solid Waste Management in Salvador, Brazil, 27-28 September 1998.

Isserman, Andrew and Terance Rephann. 1995. "The Economic Effects of the Appalachian Regional Commission." Journal of American Planning Association Summer 1995, V. 61, No. 3: pp. 345-364.

Jacobs, Ellis. No date. "Public Utility Commissions and Sustainable Funding for Community Technology." The Community Technology Centers' Network (CTCNet), CTCNet Member Services, web site: http://www.ctcnet.org/puco1.html

Jensvold, Betsy. 1994. "Western Alaska Fisheries Employment." Legislative Research Agency, Research Request 94.065.

Johnston, Elwood. October 31, 2000. Senior Administrative Officer, Department of Community Government and Transportation, Cambridge Bay, Nunavut, Canada. Phone conversation regarding water and sewer services in Nunavut.

Johnson, Mark L. 1989. "Recommendations for Improvements and Alternatives to the Honey Bucket Haul System for Alaska Villages." Thesis, University of Alaska Anchorage. University Microfilms International.

Johnston, Robert C. 1997. "Utility Breakups May Mean Savings for Schools." Education Week V.16, No. 35: pp. 12-13.

Juhola, P., J.J. Hukka and T.S. Katko. 1999. "Water and sewage utilities as community service producers in Finland—development trends and needs." European Water Management V. 2, No. 2: pp. 46-54.

Juuti, Petri S., Tapio S. Katko and Jarmo J. Hukka. 1999. "Private ownership of waterworks? A lesson learned from the past." Draft only, unpublished.

Kalbermatten, J.M., D.S. Julius, C.G. Gunnerson, and D.D. Mara. "Appropriate Sanitation Alternatives: Planning and Design Manual (Washington D.C.: World Bank, 1982).

Karg, Pamela J. "Fingers and Needles." Rural Cooperatives. Mar/Apr 2000. Volume 67, No. 2: pp. 7-10.

Katko, Tapio S. February 21, 2001. E-mail correspondence regarding the current status of water and sewer services in rural northern Finland.

Katko, Tapio S. 2000. "Long-Term Development of Water and Sewage Services in Finland." Public Works Management & Policy V. 4, No. 4: pp. 305-318.

Katko, Tapio S. 1994. "The need for champions in water supply." Waterlines V. 12, No. 3: pp. 19-22.

Katko, Tapio S. 1993. "Rural water supplies: what ways and means?" World Health Forum V. 14: pp. 425-428.

Katko, Tapio S. 1992a. "The Development of Water Supply Associations in Finland and Its Significance for Developing Countries." Washington D.C.: The International Bank for Reconstruction and Development/The World Bank.

Katko, T. S. 1992b. "Limited applicability of economies of scale to water supplies." Aqua V. 41, No. 5: pp. 283-89.

Katko, T. S. 1992c. "Cost Recovery in Water Services." Water Science Technology V. 26, No. 9-11: pp. 2621-2624.

Katko, Tapio. 1989. "The Role of Cost Recovery in Water Supply in Developing Countries." Tampere University of Technology, Institute of Water and Environmental Engineering.

Katko, Tapio S., Petri Juhola and Saila Kallioinen. 1998. "Declining Water Consumption in Communities: Sign of Efficiency and a Future Challenge." Vatten V. 54: pp. 277-82.

Kaua'i Island Utility Co-op web site. "KIUC Facts." Internet publication. No author, no date.

Keehley, Patricia; Medlin, Steve; MacBride, Sue; Longmire, Laura, Benchmarking for Best Practices in the Public Sector: Achieving Performance Breakthroughs in Federal, State, and Local Agencies, Jossey-Bass Publishers, 1996.

Kipnuk Traditional Council. 1998. *Resolution 98-01*.

Kofinas, Gary. "Subsistence Hunting in a Global Economy, Contributions of Northern Wildlife Co-Management to Community Economic Development."

Kufhal, Pam. 2000. "Electric Utilities in the Crossroad of Change." Transmission & Distribution World V. 52, No. 1: pp. 52-55.

Kulo, Ilari and Erkki Santala. "Water Services in Finland." Helsinki, Finland: Finnish Environment Institute and Finnish Water and Waste Water Works Association, 1998.

Legislative Digest. "Deal for Four-Dam Pool to be Sold, Power Cost Equalization Endowment Formed—But Will it Pass?" V. 15. (April 14, 2000). p. 3.

Legislative Digest. "Energy Solutions Are Also Political." V. 13. (March 31, 2000), insert-d.

Legislative Digest. "HB-169: Electric Co-op Expansion Activity." V. 15. (April 14, 2000): p. 3.

Legislative Digest. "Lawmakers Want Energy Study Speeded Up." V. 13. (March 31, 2000), insert-c.

Legislative Digest. "Power Cost Equalization Endowment, Sale of Four State Dams Approved." V. 17, (May 5, 2000): p. 3.

Legislative Digest. "Senate Reviewing Power Cost Equalization—Four Dam Pool Package." V. 16, (April 16, 2000): p. 3.

Lewis, Carol E., Hans Geier, Ed Arobio, Christina A. Young and Joshua A. Greenberg. "Co-ops On the Last Frontier." Rural Cooperatives. Nov/Dec 1996, Volume 63, Number 6: pp. 13-17.

Lindauer, Susan. 1992. "Rural Sewers Worst in Nation." Alaska Magazine V. 58, No. 8: p 9.

Looker, Norman. 1998. "Municipal Wastewater Management in Latin America and the Caribbean, a Discussion Paper on Trends, Challenges and the Market." Paper presented at the Organization of American States Inter-American Program for Environmental Technology Cooperation in the Key Industry Sectors Roundtable On Municipal Water in Vancouver, Canada, March 15-17 1998.

Lyon, Carl F. and Robyn Huffman. 1997. "Stranded Cost Recovery and Cooperative Electric Utilities." Management Quarterly, Fall 1997, V. 38, No. 3: pp. 40-49.

Manikutty, S. 1998. "Community Participation: Lessons from Experiences in Five Water and Sanitation Projects in India." Development Policy Review V. 16, No. 4: pp. 373-404.

Manikutty, S. 1997. "Community Participation: So What? Evidence from a Comparative Study of Two Rural Water Supply and Sanitation Projects in India." Development Policy Review V.15: pp. 115-140.

Mann, Beecher. 1989. "Cost Impact of Safe Drinking Water Act Compliance for Commission-Regulated Water Utilities." National Regulatory Research Institute. NRRI 89-06.

Mann, Dreese, Tucker. 1986. "Commission Regulation of Small Water Utilities Mergers and Acquisitions." National Regulatory Research Institute. NRRI 86-10.

Mann. 1999. "Financing Mechanisms for Capital Improvements for Regulated Water Utilities." National Regulatory Research Institute. NRRI 99-16.

Mann. 1997. "Assessing the Applicability of Selective Financial Incentive Regulation Methods for Water Utility Regulation." National Regulatory Research Institute. NRRI 97-09.

Marino, Lynn. 1997. "Alaskan Water and Sewer Systems: Confusions and Challenges in the Rural Arctic." Nepal Journal of Water Resources Development V. 6, No. 2: pp. 45-52.

Marks, Anita. 1995. "Metro to Share Water Planning Role with Local Districts." Business Journal Serving Greater Portland V. 12, No. 22: p. 6.

Middleton, Saundra. 1999. "The Flush of the Future." Alaska Business Monthly V. 15, No. 6: pp. 20-24.

Miles, Derek. Developing Private Sector Capacity. Paper presented at the 20th Water, Engineering and Development Center Conference, Colombo, Sri Lanka 1994.

Missen, Cliff. Appropriate Technology Strategies for Rural Water Development After the Decade. Presented at the 16th Annual Third World Conference, St. Louis, Missouri, U.S.A. and the Water and Wastewater Conference, Barcelona, Spain 1990.

Modern Power Systems. May 1996. "Electricity Supply and Consumption Statistics in Finland." Supplement Scandinavia, V. 16, No. 5: p. 15.

Modern Power Systems. April 1995. "Automation System Offers Reduced Maintenance Overheads to Recs." V. 15, No. 4: p. 97.

Mulick, Chris. 1999. "Cheap Northwest Power Rates May not Last Long." Tri-City Herald, October 4-7. Web site: http://www.tri-cityherald.com/power/story10.html

Mulick, Chris. 1999. "Deregulation could bring changes for rural customers." Tri-City Herald, October 4-7. Web site: http://www.tri-cityherald.com/power/story9.html

Mulick, Chris. 1999. "Private Utilities Wave of the Future." Tri-City Herald, October 4-7. Web site: http://www.tri-cityherald.com/power/story2.html

Murray, D.W. "Self-Sufficiency and the Creation of Dependency: The Case of Chief Isaac, Inc." American Indian Quarterly. Spring 92. Volume 16, No. 2: pp. 169-188.

Mykkanen, Timo. 1996. "Finland: Looking to a Common Nordic Electricity Exchange." Modern Power Systems, Supplement Scandinavia V. 16, No. 5: pp. 25-27.

National Institute of Standards and Technology. *Malcolm Baldrige National Quality Award 1995 Award Criteria*. Gaithersburg, Md.: U.S. Department of Commerce, National Institute of Standards and Technology, 1995.

National Rural Electric Cooperative and the National Rural Utilities Cooperative Finance Corporation. February 1995. Community Involvement, Opportunities in Water-Wastewater Services. The Final Report of the NRECA/CFC Joint Member Task Force on Rural Water and Wastewater Infrastructure.

National Rural Electric Cooperative Association. "America's Cooperative Electric Utilities: The Nation's Consumer Owned Electric Utility Network." National Rural Electric Cooperative Association website (http://www.nreca.org).

National Rural Electric Cooperative Association. "Electric Energy Consumer Bill of Rights." Approved at the NRECA's 57th Annual Meeting, March 1999. National Rural Electric Cooperative Association website (http://www.nreca.org).

National Rural Electric Cooperative Association. "The Electric Cooperative Market." National Rural Electric Cooperative Association website (http://www.nreca.org).

National Rural Electric Cooperative Association. "Why Cooperatives Are Special." National Rural Electric Cooperative Association website (http://www.nreca.org).

Neal, John W. 1994. "Water/Wastewater: Crucial Infrastructure for Rural Economic Development." Management Quarterly V. 35, No. 3: pp. 44-47.

New Hampshire Business Review. "Electricity Deregulation Sets the Stage for Power-Buying Co-ops, Says Institute." V. 19, No. 11: pp. 11-14.

New Mexico Administrative Code. "Colonias Wastewater Grant Policies—20NMAC 7.9." New Mexico Administrative Code Title 20, Chapter 7, Part 9.

Nicolai, Mathew. 6/22/1999. "Efforts to Promote Alternative Electricity Generation." FDCH Congressional Testimony to the Senate Energy and Natural Resources Water and Power Committee.

Nwankpa, Emeka. No date. "Government Signs Pact with Indian Firm on Electricity." Nigeria Today (newspaper) web site: http://www.nigeriatoday.com/govt_signs_pact_with_indian_firm.htm

O'Brien, John. 1995. "Joint Utility Purchasing: A Case Study Lane Electric Cooperative." Management Quarterly V. 36, No. 1: pp. 21-23.

Parascandola, John. 1997. "Privies and the Public Health Service." Public Health Reports V. 112, No. 2: pp. 168-169.

Patterson, James L. Correspondence between Tapio Katko, James Patterson and John Kabermatten between February and April of 1989.

Pickford, John. Affordable Sanitation for Low-Income Communities. Paper presented at the 20th Water, Engineering and Development Center Conference, Colombo, Sri Lanka 1994.

Pinidiya, H. and K.M. Minnatullah. Urban Sanitation Issues in Sri Lanka. Paper presented at the 20th Water, Engineering and Development Center Conference, Colombo, Sri Lanka 1994.

Planning. "What Other Utilities Are Doing." V. 63, No. 12: p. 20.

Pochylko, D., Powley, R. and Brandt, G. 1999. "Rural Pipelines - Addressing the Needs of the Prairies." Proceedings, Canadian Society for Civil Engineers, Regina, Saskatchewan, June 2-5, 1999.

Powers, Mike. 1994. "Rural Development in Africa: In for the Long Haul." Human Ecology Forum V. 22, No. 3: pp. 20-24.

Puchtler, Bertold, Barry Reid and Conrad Christianson. 1976. Water-Related Utilities for Small Communities in Rural Alaska. National Technical Information Service, Springfield, Virginia.

Puchtler, Bertold. 1973. "Social and Economic Implications of the Alaska Village Demonstration Projects." Working Paper No. 20. Associate Laboratory of National Environmental Research Laboratory, Office of Research and Development, Corvallis, Oregon.

Ramo, J.J., J.J. Hukka and Tapio Katko. 1997. "Economic performance of water supply organizations: the implications for institutional framework and development cooperation." Aqua V. 46, No. 2: pp. 106-116.

Ribeiro Pena Neto, Jose. No date. "Overview of the Brazilian Electricity Sector." Energy On Line by LCG Consultants, web site: http://www.energyonline.com/Restructuring/models/brazil1.html

Sapa, Chad. Vice-President of Corporate Services, Cass County Electric Cooperative. "It Keeps the Lights On." A Message from the President of the Cass County Electric Cooperative. Internet publication. No date.

Sarcone, Joe. March 2, 2001. Personal interview regarding solid waste management in rural Alaska.

Sarcone, Joe. 1999. Letter correspondence from Joe Sarcone, Rural Sanitation Coordinator, Environmental Protection Agency, Alaska Operations Office, to Kathleen Kilbane, Applied Research Group , The Solid Waste Association of North America, regarding the Native American Initiative Advisory Group; January 8, 1999.

Sarcone, Joe. 1998. Letter correspondence from Joe Sarcone, Rural Sanitation Coordinator, Environmental Protection Agency, Alaska Operations Office, to Liza Daley, Tribal Environmental Resource Center, Institute for Tribal Professionals Northern Arizona University, regarding the opportunity to comment on the Introduction to Tribal Solid Waste Management course, November 20, 1998.

Scavera, Paula. 1995. "Participation in Public Assistance by Community with 1993 Estimated Population." Legislative Research Agency, Research Request 95.170.

Schill, Karen. 1999. "North Carolina Electricity Cooperatives Diversify in Order to Compete." The News & Observer (Raleigh North Carolina), 10/05/1999.

Scholten, Dutch. October 5, 2000. Facility Manager Specialist, Denali National Park. Phone conversation regarding water and sewer services in National Parks.

Seal Jr., John A. 1995. "Improving the Quality of Rural Living Through Water and Wastewater Services." Management Quarterly V. 36, No. 3: pp. 20-23.

Self Help Virginia Program. No date. Information packet adapted from materials developed by The Rensselaerville Institute as part of their Small Towns Environment Program.

Sillars, Les. 1994. "The Drive to Privatize Calgary." Alberta Report V. 21, No. 21: pp. 16-17.

Snow, Linda. 1992. "The Economic Impact of Proposed FY 93 Operating Budget Cuts on Rural Alaska." Legislative Research Agency, Research Request 92.210.

Snow, Linda. 1991. "Alaska Statistics on Comparative Wealth." Legislative Research Agency, Research Request 91.290.

Snow, Linda J. 1991. "Disposal of Household Hazardous Waste in Rural Alaska." Legislative Research Agency, Research Request 91.277.

Snow, Linda. 1991. "Economic Impact of Reduced Power Cost Equalization Subsidies and Increased Airport Fees on Rural Households." Legislative Research Agency, Research Request 92.027.

Snow, Linda. 1991. "Rural Unemployment Statistics." Legislative Research Agency, Research Request 91.294.

Snow, Linda. 1991. "State Budget, Municipal Assistance and State and Local Government Employment, FY 86-FY 91." Legislative Research Agency, Research Request 91.252.

Snow, Linda. 1990. "Economic Impact of Poor Fish Runs in the Yukon River." Legislative Research Agency, Research Request 91.029.

Snow, Linda. 1990. "Rural Fishing 'Permit Drain' : Causes and Economic Consequences." Legislative Research, Research Request 90.344.

Spencer, Jim. October 31, 2000. Public Service Administration Administrator, Tazwell County, Virginia. Phone conversation regarding water and sewer services in Appalachia.

Stocks, Terri and Lisa Rozmyn. 1996. "Solid Solutions in Rural Alaska, Working Together to Reduce Waste in Our Communities."

Teitzel, Mark E. 2000. Memo from Mark E. Teitzel, Vice-President and Manager, Engineering. "AVEC vs. NWTPC Comparison."

Texas Low Income Housing Information Service (TxLIHIS). No Date. "Our Work in Colonias." TxLIHIS Examples of our work web site: http://www.texashousing.org/txlihis/txlihis/coloniawk.html.

Texas Natural Resource Conservation Commission. Winter 1999. "Colonias: Serving the Unserved." Texas Natural Resource Conservation Commission web site: http://www.tnrcc.state.tx.us/admin/topdoc/pd/020/99-01/colonias.html.

The Cadmus Group, Inc. July 1999. National Characteristics of Drinking Water Systems Serving Populations Under 10,000. Prepared for Peter Shanaghan, United States Environmental Protection Agency, Designated Federal Official, Small Systems Implementation Working Group.

Theobold, Molly. October 6, 2000. Director of Appalachian Regional Commission, Goal 2, Physical Infrastructure. Phone conversation regarding water and sewer services in Appalachia.

Torrez, Martha. October 27, 2000. USDA Rural Utility Service, New Mexico Field Office. Phone conversation regarding Rural Utility Service funding of water and sewer projects in the Colonias.

Tribal Solid Waste Interagency Workgroup, EPA, BIA and IHS. 1999. "Tribal Open Dump Cleanup Project Request For Proposals, 1999."

U.S. Army Corps of Engineers, Cold Regions Center of Expertise. 1999. Alaska Environmental Infrastructure: Special Investigation, prepared for the Northwest Arctic Borough, Anchorage, U.S. Army Corps of Engineers, Alaska District, May 1999. (2 volumes -- Volume 1 - Main Report; Volume 2 - Appendixes).

U.S. Army Corps of Engineers, Cold Regions Center of Expertise. 1998. Report to Congress on Advisability and Capability of the Army Corps of Engineers to Implement Sanitation Projects for Rural and Native Villages in Alaska, Anchorage, U.S. Army Corps of Engineers, Alaska District, March 1998.

U.S. Congress, Office of Technology Assessment, An Alaskan Challenge: Native Village Sanitation, Washington, D.C., U.S. Government Printing Office, May 1994.

U.S. Department of Agriculture, A Water and Sanitation Needs Survey of Rural Alaskan Native Villages, unpublished, undated.

United States Environmental Protection Agency. March 1998. "Colonias Facts." http://www.epa.gov/owm/clnfcts.pdf.

United State Environmental Protection Agency, Office of Water, Office of Ground Water and Drinking Water, Implementation and Assistance Division. January 1997. Drinking Water Infrastructure Needs Survey, First Report to Congress. National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

United States Environmental Protection Agency, Water Division, Federal Field Work Group Report on Rural Alaska Sanitation, Seattle, WA., Environmental Protection Agency, August 1995.

University of Alaska Anchorage, Institute of Social and Economic Research, Evaluation of the Alaska Native Health Board Sanitation Facility Operation and Maintenance Program: Final Report on Phase Two Projects, prepared by Sharman Haley for the Alaska Native Health Board and the U.S. Environmental Protection Agency, Office of Wastewater Management, Anchorage, February 15, 2000. (2 volumes).

University of Alaska Anchorage, Institute of Social and Economic Research, Evaluation of the Alaska Native Health Board Sanitation Facility Operation and Maintenance Program: Final Report on Phase I Projects, prepared by Sharman Haley and Rosyland Frazier for the Alaska Native Health Board and the U.S. Environmental Protection Agency, Office of Wastewater Management, Anchorage, April 1999.

University of Alaska Anchorage, Institute of Social and Economic Research, Evaluation of the Alaska Native Health Board Sanitation Facility Operation and Maintenance Program: First Year Report on Phase Two Projects, prepared by Sharman Haley for the Alaska Native Health Board and the U.S. Environmental Protection Agency, Office of Wastewater Management, Anchorage, August 1998. (2 volumes).

Virginia Center on Rural Development. 2000. Self Help Program Fact Sheet.

Virginia Center on Rural Development and The Rensselaerville Institute. Self Help Virginia Program information packet adapted from materials developed as part of the Rensselaerville Institute Small Towns Environment Program.

Wallace, Jimmy. October 6, 2000. Community Representative, Virginia Department of Housing and Community Development. Phone conversation regarding water and sewer services in Appalachia.

Washington Institute Foundation. 1997. "Responses to Comments from Washington Public Utility District Association--Paying for Power: Setting the Record Straight." Washington Institute for Policy Studies publication. Web site: http://www.wips.org/Studies/pudpower.htm

Water & Environment International. March 2000. "Full Privatization to go ahead in India." V. 9, No. 66: p3.

Water World. 1999. "EPA Water Official Focuses on Small System Needs." V. 15, No. 8: pp. 9-19.

Weeks, Maureen. 1996. "Power Cost Equalization Program Utility Improvement Grants." Legislative Research Agency, Research Request 96.038.

Weeks, Maureen. 1989. "Solid Waste Management and Recycling in Alaska." Legislative Research Agency, Research Request 90.050.

Wegelin-Schuringa, Madeleen. Community Management Models for Small Scale Water Supply Systems. Paper for Discussion in Workshop on Public-Private Partnerships in Service Provision for Community Managed Water Supply Schemes, Kakamega, Kenya, 7-10 December 1998.

Widmere, Adrian. October 30, 2000. Professional Engineer, Molzen-Corbin and Associates. Phone conversation regarding water and sewer services in the Colonias.

Wilhelm. 1999. " Water Capacity Development and Planning: A Benchmarking Guide for Regulatory Commissions." National Regulatory Research Institute. NRRI 99-10.

Wirick, Borrows, Goldberg. 1997. "Evaluating Water Utility Financial Capacity with Ratio Analysis and Discounted Cash Flows." National Regulatory Research Institute. NRRI 97-18.

Wolfe, Robert J. and Robert J. Walker. 1987. "Subsistence Economies in Alaska: Productivity, Geography, and Development Impacts." Arctic Anthropology. Volume 24, No. 2: pp. 56-81.

Woolard, Craig R. and White, Daniel M., eds., Fourth Annual Research and Development Conference on Rural Sanitation, April 27, 1999, Juneau, Alaska: Proceedings, Alaska Water and Wastewater Management Association, 1999. (Includes papers by Nina Miller and Joe Sarcone and by Sharman Haley on the Alaska Native Health Board Operation and Maintenance Demonstration Project).

World Bank Water Demand Research Team, "The Demand for Water in Rural Areas: Determinants and Policy Implications," World Bank Research Observer 8, No. 1 (1993).

World Bank, The World Development Report 1992: Development and the Environment (Washington, D.C.: World Bank, 1992).

Wray, Lyle D. and Hauser, Jody A., "Best Practices Reviews for Local Government: Identifying and Sharing Better Ideas on Public Services," *Public Management*, January, 1996.

Wright, Jack. 1995. "Midnight Subdividing Creates Unsanitary Messes." High Country News May 01, 1995, V. 27, No. 8. Web publication: http://www.hcn.org/servlets/hcn.Issue?issue_id=34

Yeager, T. 1992. Rural Water/Wastewater Study. Volumes 1-2. Prepared for Rural Electric Research, the National Rural Electric Cooperative Association, the Electric Power Research Institute and the American Water Works Association.

Young, Patricia. 1999. "State Expenditures by Fund Source—FY 1996." Legislative Research Agency, Research Request 99.063.