TUNTUTULIAK, ALASKA

PRELIMINARY ENGINEERING REPORT

SANITATION & BOARDWALK SYSTEMS

WASHETERIA & WATER TREATMENT PLANT, TUNTUTULIAK, ALASKA

Prepared By:

CE2 Engineers, Inc.

In Cooperation with the
State of Alaska Village Safe Water Program

95% Submittal July 2005

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I. CONCLUSIONS AND RECOMMENDATIONS

A. Overview and Alternative Selected by the Community

The scope of this preliminary engineering report consists of five separate tasks selected by the community toward the goal of a complete and efficiently functioning Water and Sewer Haul System. In order of community priority, the tasks are as follows:

Task Number	Description
1	Upgrade the water treatment plant (WTP) to meet current primary and secondary water quality standards. The WTP upgrade will be funded from Indian Health Service (IHS), Project AN05-N98 in the amount of $762,000.
2	Construct boardwalk improvements in twelve locations where the existing boardwalk has failed. This will provide reliable transportation routes for the water and wastewater haul system
3	Upgrade the existing washeteria public use spaces by expanding the number of laundry units to adequately meet public demand.
4	Provide plumbing facilities (including haul tanks) for fourteen additional houses and upgrade existing houses with functional components as required.
5	Provide alternative haul units and change haul methodologies with the goal of reducing the cost of operating the haul system

The Water and Sewer Haul System project will be considered complete when the water treatment plant has been upgraded to meet water quality standards, the failing sections of the boardwalk rehabilitated, the washeteria has been remodeled, the remaining fourteen (14) homes have been served and the haul system modified to reduce haul operating costs. The Haul System project will serve three (3) schoolteacher residences and seventy-seven (77) residential units as well as one (1) commercial facility and the clinic. The recently completed haul system boardwalk and landfill constructed as part of the overall sanitation improvement serves everyone in the community, including the school.

B. Conceptual Project Layout

Conceptual layouts for the water treatment upgrade and the washeteria laundry expansion are shown in Fig. 3. Locations of the boardwalk improvements are shown in Fig. 4.

C. Project Construction Phases, Including Units and Unit Costs for Each Phase

The project is proposed to be constructed in a single phase consisting of multiple tasks as shown in the individual task cost estimates. The estimated project cost for all the tasks is $2,351,200. USDA Rural Development (RD) and Indian Health Service (IHS) will provide funding. Units and unit costs for each task are shown under the task descriptions.

D. Operation and Maintenance (O & M) Costs

Current Rate Structure	
100-gallon water delivery	$35
300-gallon sewage pump-out	$44
Rate to wash 1 load of laundry	3 – washers @ $4/load, 1- washer @ $2.75/load
Rate to dry laundry	$2 for the 1st load and $1 for subsequent loads
Solid waste service	$15/month/household
Solid waste	Commercial & School $100/month
Residential maintenance rate	$15/hour per laborer

The addition of fourteen new haul customers, water quality improvements creating more consumer use, additional revenue-producing laundry units and improvements to the haul system will reduce the unit cost of providing service. The management and accounting systems are undergoing improvements. All of these will contribute to lower unit costs that will provide sanitation services to the community at an affordable rate.

E. Business Plan Summary

The *DRAFT* Business Plan (Appendix I) describes the current operations pertaining to the sanitation utilities in Tuntutuliak. These include a Small-vehicle Haul Water and Sewer system, four miles of boardwalk, a solid waste collection and landfill operation, and washeteria operations. Though the haul system is only 80% completed the norms and practices existing in the village are extrapolated to a fully completed system for the purposes of developing the financial aspects of this plan. The existing sanitation system is fraught with a multitude of problems that include:

- Under-utilization of the water haul portion of the system due to the fact that many residents use alternative water sources such as roof catchments, self-haul, pond haul, ice melting.
- Severe customer delinquency on all parts of sanitation services ($39,519 in total Aged Receivables); 80% are 90-days +
- The electric utility profits are used to subsidize over 50% of the O&M of the sanitation utility.
- The electric utility is not utilizing the Power Cost Equalization program.
- High personnel turnover in bookkeeping staff results in poor financial reporting
- The system is only 80% completed: 14 more homes need to be served
- The utility does not have "anchor" clients such as the school that pay disproportionate rates
- The estimated annual cost of sanitation services represents about 11% of an annual household income of $26,608; the median household income is $25,500.

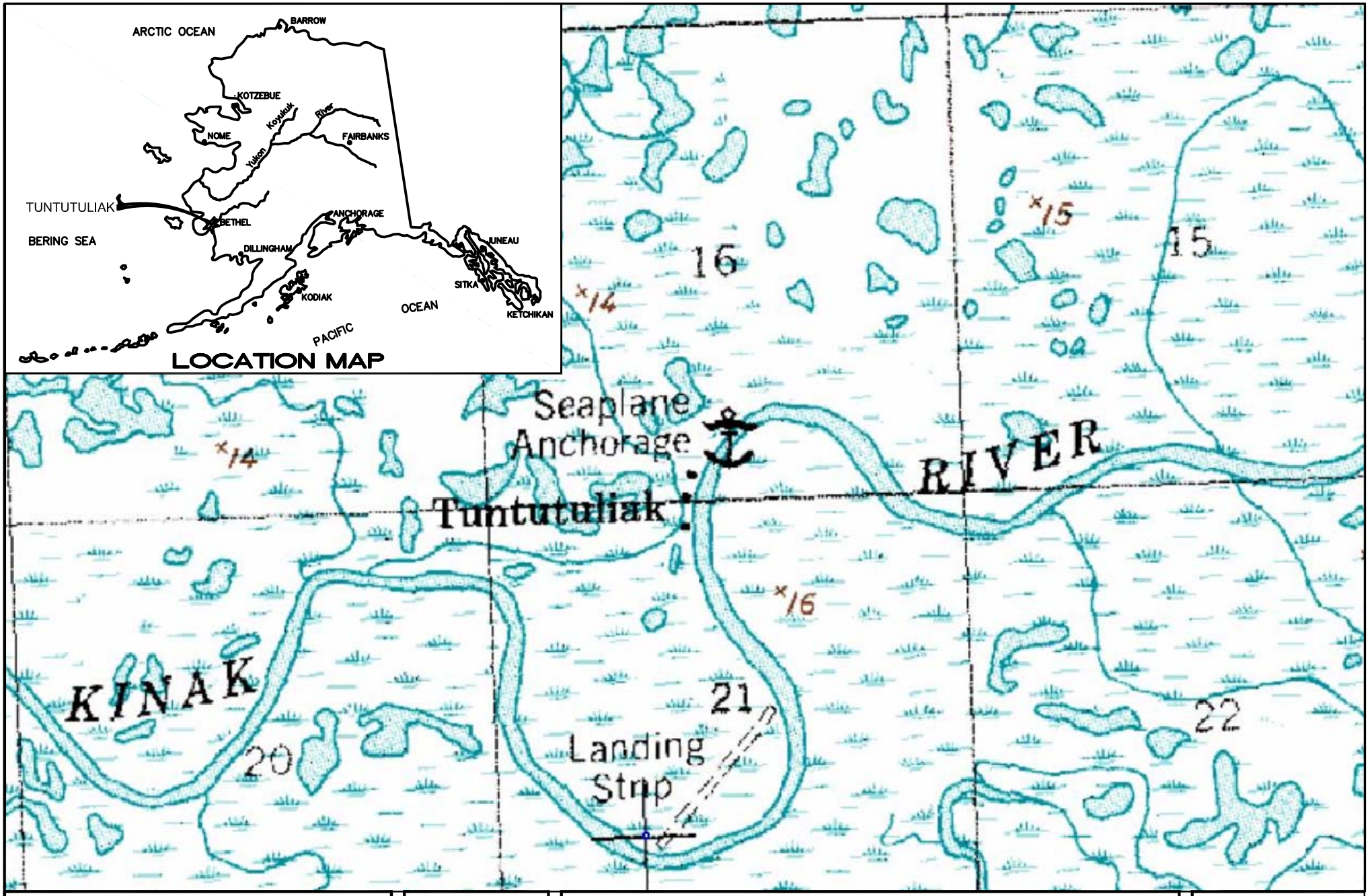
Despite the aforementioned problems, the managing utility, TCSA (Tuntutuliak Community Services Association), uses considerable profits from the electric utility to subsidize a little over 50% of sanitation operations. Because a significant subsidy is integral to the business plan the concept of a small profit seems moot. On the expense side, the plan does include $22,700 in annual repair and replacement (R&R) costs.

II. INTRODUCTION

Tuntutuliak is on the northwest bank of the Qinaq (Kinak) River, approximately 3 miles from its confluence with the Kuskokwim River, about 40 miles from the Bering Sea coast. It is located 40 miles southwest of Bethel and 440 miles west of Anchorage. It lies at approximately 60°20’35” North Latitude and 162°39’47” West Longitude (Section 21, Town 003 North, Range 077 West, Seward Meridian). Tuntutuliak is located in the Bethel Recording District. The area encompasses 119.2 sq. miles of land and 0.2 sq. miles of water. See Fig. 1--Location & Vicinity Map.

The Yup'ik name of the village is Tuntutuliaq, meaning "place of many reindeer". It was originally located four miles to the east and called Qinaq, as noted in 1879 by Edward Nelson who found 175 residents at that time. In 1908, a Moravian missionary visited the village and found 130 people living there. In 1909 a BIA school was built, and the first teacher was well liked in the community. Due to a lack of confidence in the subsequent teachers, the school was closed in 1917 and the building moved to the village of Eek. It is thought that some Qinaq villagers may have moved to Eek so their children could attend school. In 1923 the first Moravian Chapel was built, with lumber and other support from Eek. In the late 1920’s John Johnson opened a trading post and store. The community moved to its present site on higher ground and was renamed Tuntutuliak in 1945. The BIA built a school in 1957. A post office opened in 1960.

Tuntutuliak is a traditional Yup'ik Eskimo village with a fishing and subsistence lifestyle. Salmon and seal are important food sources. Children are taught in Yup'ik until the third grade, and then classes are taught in English. The sale, importation, or possession of alcohol is banned in the village.



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LOCATION & VICINITY MAP
TUNTUTULIAK, ALASKA

FIG. 1

III. PROJECT PLANNING AREA

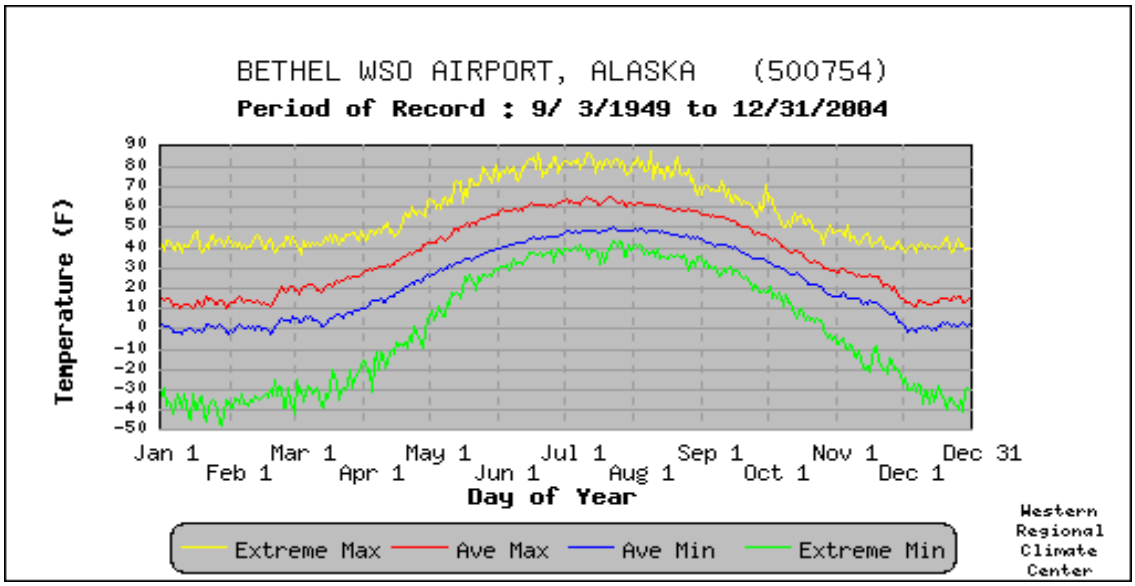
A. Location and Access--Airports and Barge Service

Tuntutuliak relies heavily on air transportation for passengers, mail and cargo service. A State-owned 1,772 foot by 28-foot gravel runway, and a public seaplane base on the Qinaq River are available. FAA information of March 17, 2005 indicate an average 47 aircraft operations per week, consisting of 73% Air Taxi, 20% Transient General Aviation and 6% Local General Aviation. Arctic Circle Air Service, Era Aviation, Grant Aviation and Hageland Aviation provide air services to the community. Barge services deliver goods approximately six times a year. Boats, 4-wheelers and snow machines are used for local travel. Winter trails are marked to Kipnuk (77 mi.) and Kongiganak (29 mi.)

B. Environmental Conditions or Resources Present

1. Climate

Tuntutuliak's summer temperatures average from 42 to 62° Fahrenheit, winter temperatures average -2º to 19° Fahrenheit. Extremes have been recorded from 86º to -46° Fahrenheit. Annual precipitation averages 16 inches, with snowfall of 50 inches. Tuntutuliak lies 40 miles southwest of Bethel; below are mean temperatures as recorded at the Bethel Airport.



2. Geology and Soil Conditions

The regional terrain is flat and poorly drained, with grade changes of less than 15 feet and numerous ponds and small lakes. Vegetation exists primarily of mixed tundra and grass with occasional willow groves along the river banks.

3. Flood, Erosion and Seismic Hazards

Wetlands have not been mapped in or near Tuntutuliak, however it can be assumed that they exist in much of the community. Construction and/or utility improvements will most likely be permitted under a United States (U.S.) Army Corps of Engineers General Permit for sanitation facilities.

According to the U.S. Army Corps of Engineers flood hazard data for Tuntutuliak, the last flood experience in the village was in August of 2000 and caused by tides and wind. The flood of record was in 1990, with an elevation of 89.5 feet, based upon an arbitrary elevation of 100.00 feet for the school's entrance grate. Much of the area is subject to flooding from storm surges that push water up the Qinaq. The community is not eligible for flood insurance**.**

Seismic hazards (damage due to earthquakes) are predicted to be moderate for the region of Alaska where Tuntutuliak is located. The ground shaking produced by an earthquake is very complex (hard, gentle, long, short, jerky or rolling) and not describable with one number. Motions are described by the PEAK VELOCITY (how fast the ground is moving); PEAK ACCELERATION (how quickly the speed of the ground is changing); FREQUENCY (energy is released in waves and these waves vibrate at different frequencies just like sound waves); and DURATION (how long the strong shaking lasts).

From Section 1615 in the 2000 International Building Code, as adopted by the State of Alaska, the following seismic design parameters are applied to construction at Tuntutuliak.

Site Class E This site class relates to the soil profile. This type of soil is classified as a soft soil profile in the upper 100 feet of the site profile.

0.25 G for 0.2 sec spectral response acceleration (Sds) G is the force of gravity (an acceleration of 32 feet/second^2). When there is an earthquake, the forces caused by the shaking can be measured as a percentage of the force of gravity. Spectral acceleration (SA) is what is experienced by a particle on the ground. The design of a building must be able to withstand 25% of G for 0.2 of a second (short period response).

0.15 G for 1.0 sec spectral response acceleration (Sdl) The design of a building must be also able to withstand 15% of G for 1.0 second (long spectral response).

4. Historic Sites

A review of files and maps at the State Historical Preservation Office (SHPO) on February 23, 2005 found three historic sites in or near Tuntutuliak: XBI 025 is the St. Agaphia Russian Orthodox Church and cemetery, located at the corner of Tumyarak and Agayuyarvik Streets; XBI 068, a house pit on the Kinak River 1.5 miles west of the developed community, and XBI 006, the abandoned village of Kinak, located four miles east of the developed community of Tuntutuliak.

None of these sites is likely to be disturbed by the project, however, caution must be taken if the project will be in the vicinity of either the Russian Orthodox or Moravian churches and associated cemeteries. Concurrence from the Alaska State Historic Officer (SHPO) that no historic properties will be affected by this project will be sought before the project begins.

5. Endangered Species and Critical Habitats

The Tuntutuliak study area is not known to contain any endangered species and is not located within any designated critical habitat areas. Concurrence that the project will not affect threatened or endangered species or critical habitat will be sought before the project begins.

C. Economy and Financial Profile

Employment by the school, services, commercial fishing and fish processing provides most of the income. Trapping, basket weaving, skin-sewn products and other Native handicrafts

also provide cash. Subsistence foods comprise approximately 50% of the community's diet, and about one-half of families go to fish camp each summer. Fifty-one residents hold commercial fishing permits for salmon net and herring roe fisheries. Poor fish returns since 1997 have significantly affected the community.

The following Income and Employment data is from the 2000 U.S. Census. Tuntutuliak is located in the Bethel Census Area.

Economy, Income, and Poverty	
Per Capita Income:	$7,918
Median Household Income:	$25,500
Median Family Income:	$26,000
Persons in Poverty:	73
Percent Below Poverty:	23.0%
Employment	
Total Potential Work Force (Age 16+):	177
Total Employment:	99
Civilian Unemployed (And Seeking Work):	17
Percent Unemployed:	14.7%
Adults Not in Labor Force (Not Seeking Work):	61
Percent of All 16+ Not Working (Unemployed + Not Seeking):	44.1%
Private Wage & Salary Workers:	53
Self-Employed Workers (in own not incorporated business):	2
Government Workers (City, Borough, State, Federal):	44

Note: These figures are estimates based on a sample, and are subject to sampling variability. The percent of all households sampled in Tuntutuliak was 47.4%.

D. Potential Growth Areas

Community growth will likely be predominantly residential, however the community is in the conceptual planning stage for a new clinic, assisted by the Alaska Native Tribal Health Consortium and the Denali Commission. The bulk fuel facility and the power system were

recently upgraded with the assistance of the Alaska Energy Authority. A new landfill, sewage lagoon, and a 4-mile sanitation boardwalk were recently completed.

E. Power Generation and Fuel Storage Facilities

Tuntutuliak Community Service Association (TCSA), a non-profit arm of the Village Council, operates the Electric Utility. The diesel generation capacity is 410 kilowatts. The charge per kilowatt/hour is 30.4 cents. There is a Power Cost Equalization (PCE) Subsidy available.

Bulk Fuel tanks are maintained as follows (Total capacity): Lower Kuskokwim Schools (74,400 gals.), Village Council (86,900), and Qinarmiut Corp. (71,700)

F. Public Facilities and Housing

The following Housing data is from the 2000 U.S. Census.

Housing Characteristics	
Total Housing Units:	97
Occupied Housing (Households):	84
Vacant Housing:	13
Vacant Due to Seasonal Use:	0
Owner-Occupied Housing:	49
Median Value Owned Homes:	$35,000
Renter-Occupied Housing:	35
Median Rent Paid:	$430
Total Households:	84
Avg. Household Size:	4.40
Family Households:	74
Avg. Family Household Size:	4.74
Non-Family Households:	10
Pop. Living in Households:	370

G. Public Administration

Tuntutuliak is unincorporated, so there are no city or borough "officials" in this community. The community is governed by a Village Council (BIA-Recognized Traditional Council). Tuntutuliak Community Service Association (TCSA), a non-profit arm of the Village Council, operates the utilities (electric, flush/haul, honeybucket and washeteria).

H. Population

1. Present and Projected Population

The following table shows the historical population for Tuntutuliak.

Census Population History	
1880	257
1890	0
1900	209
1910	0
1920	100
1930	76
1940	0
1950	68
1960	144
1970	158
1980	216
1990	300
2000	370

The average annual growth rate over the past five decades has been 1.8%. The annual growth in the last decade has been 2.3%. The highest growth rate occurred between 1950 and 1960; during that decade the average annual growth rate was 11.2%. The population is 98.9% Alaska Native, 0.8% white, and 0.3% Hispanic. There are a total of 84 households in the community, 74 are family households with an average family size of 4.74 persons. Ten households are classified as non-family households.

Growth is expected to continue at an average annual rate of 2% throughout the 30-year planning period. Recent population projections made in consultation with the Tuntutuliak

Community Services Association and the Alaska Department of Community and Economic Development are summarized in the following table:

Year	Projected Population
2010	444
2020	533
2030	640
2040	768

2. Number of Households to be Served

A Rural Alaska Housing Sanitation Inventory System (RAHSI) survey (submitted 11/22/2002) shows the following households eligible for utility service:

Home Type	Number Homes	Water I.D.L.*	Sewer I.D.L.*	Comments
E1 - Existing Homes	52	4	4	RAHSI Count
E2 - Non-Residential Units	5	1	1	RAHSI Count
E2 - Non-Residential Units	3	4	4	RAHSI Count
E2 - Non-Residential Units	21	4	4	RAHSI Count
H1 - HUD Housing	29	4	4	RAHSI Count
H5 - Other Housing	2	2	4	RAHSI Count
H5 - Other Housing	2	4	4	RAHSI Count

* I.D.L. Represents the initial deficiency level. A ranking of 4 indicates houses without piped water and sewer that are not feasible to serve with a piped system.

The SDS Community Deficiency Profile for Tuntutuliak shows 114 total homes with 107 lacking piped water and sewer. The 2000 U.S. Census reported 97 total housing units, with 13 vacant.

3. Number of People Benefiting from Project

All of the 370 persons (2000 U. S. Census) in Tuntutuliak will benefit from the healthier living environment produced by the improvements evaluated in this report. In addition, all households will benefit financially by the increasing the number of customers served by the utility. Operational costs will not increase significantly and the customer base will increase by up to 14 residences.

IV. FUTURE CAPITAL PROJECTS, COSTS AND SCHEDULES

A. Roads, Airports and Ports

Tuntutuliak is served primarily with boardwalks for local transportation connections. The community received BIA Funds to renovate the community boardwalk system. Kuskokwim Architects and Engineers, Inc. is designing the renovation plan for the community. Phase I construction of a new airport is completed and the funding of phase II ($4,210,526) is pending. Phase II will complete runway construction and build a connector from the new runway to the community.

B. Power Generation and Fuel Storage Facilities

A recently completed Consolidated Bulk Fuel facility provides fuel storage for the Community. Electric powerhouse upgrades were funded in 2000. No additional improvements are anticipated.

C. Community Facilities

Tuntutuliak received a Community Building Restoration - Capital Matching Grant of $16,000 in 1999. At this time no additional community facility improvements are planned.

D. School and Headstart

One hundred three (103) students in grades K through 12 attend the Lewis Angapak Memorial School, operated by the Lower Kuskokwim School District. The school has its own well and sewage lagoon, but needs improvements in water treatment and wastewater disposal. The school is in the process of installing a secondary treatment wastewater system because the school lagoon has failed.

Lewis Angapak Memorial School

E. Health Clinic

The local health clinic is the Kathleen Daniel Memorial Clinic. Tuntutuliak is classified as an isolated village; it is found in EMS Region 7A in the Yukon/Kuskokwim Region.

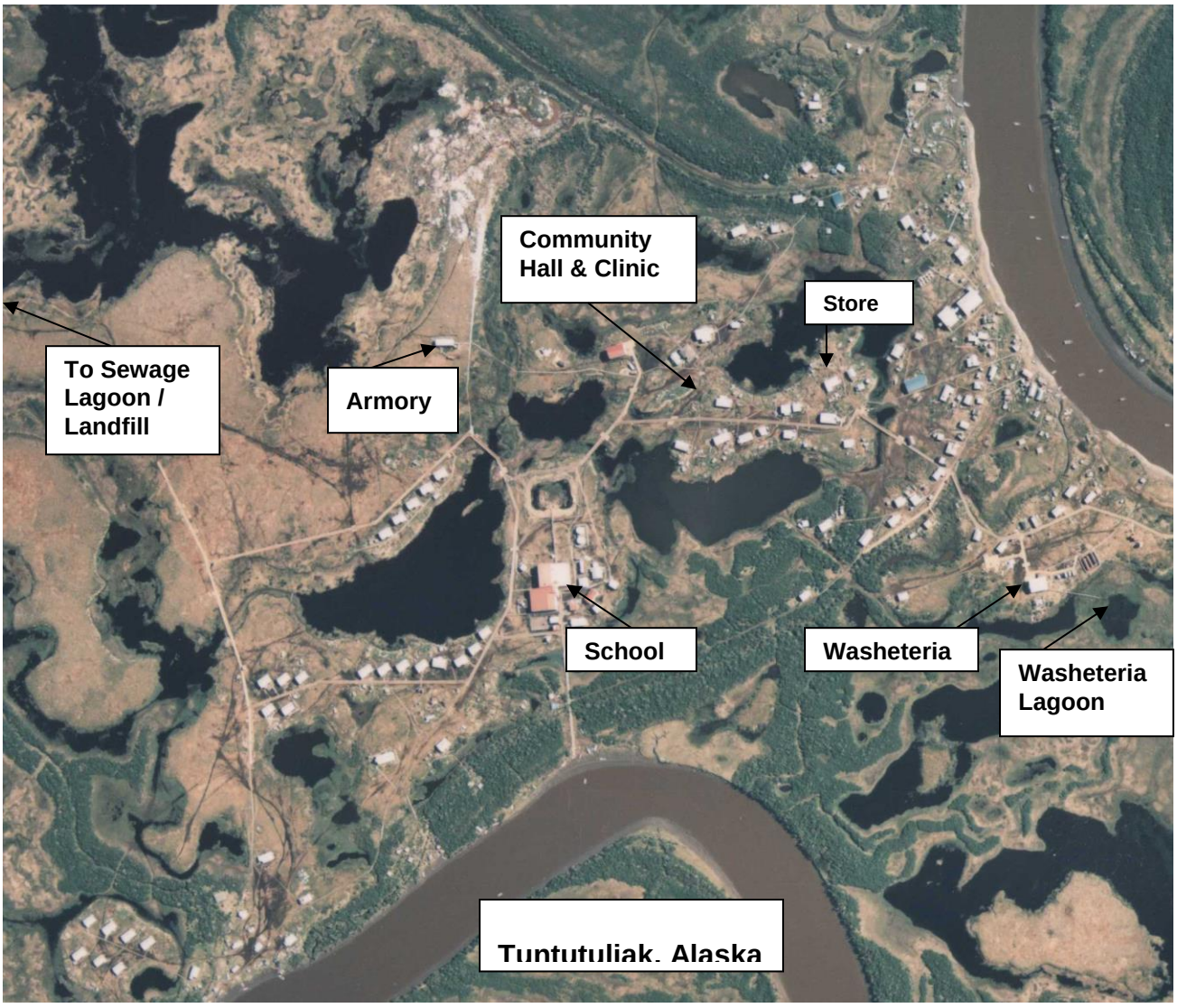
Emergency Services have coastal and air access. A health aide provides emergency service. The community is in the conceptual planning stage for a new clinic, assisted by the Alaska Native Tribal Health Consortium and the Denali Commission.

F. Commercial Facilities

There are no known plans for additional commercial facilities.

V. EXISTING WATER & SEWER FACILITIES AND PLANNING CONDITIONS

A. Project Planning Area Map



B. History of Sanitation Improvements

A Community Water and Sewer Feasibility Study was prepared in 1993 providing an extensive history of community sanitation improvements. Excerpts of this report are provided in Appendix J.

A flush/haul system was completed for 68 homes in 2000, including bathroom plumbing. The utility organization received additional funding in FY 01 to complete installation to

those interested in the flush haul system, but is on hold until the engineering and environmental reports are done. Tuntutuliak Community Services Association (TCSA) operates the electrical services, washeteria, water treatment plant, flush tank haul system, landfill/lagoon site, and garbage collection services.

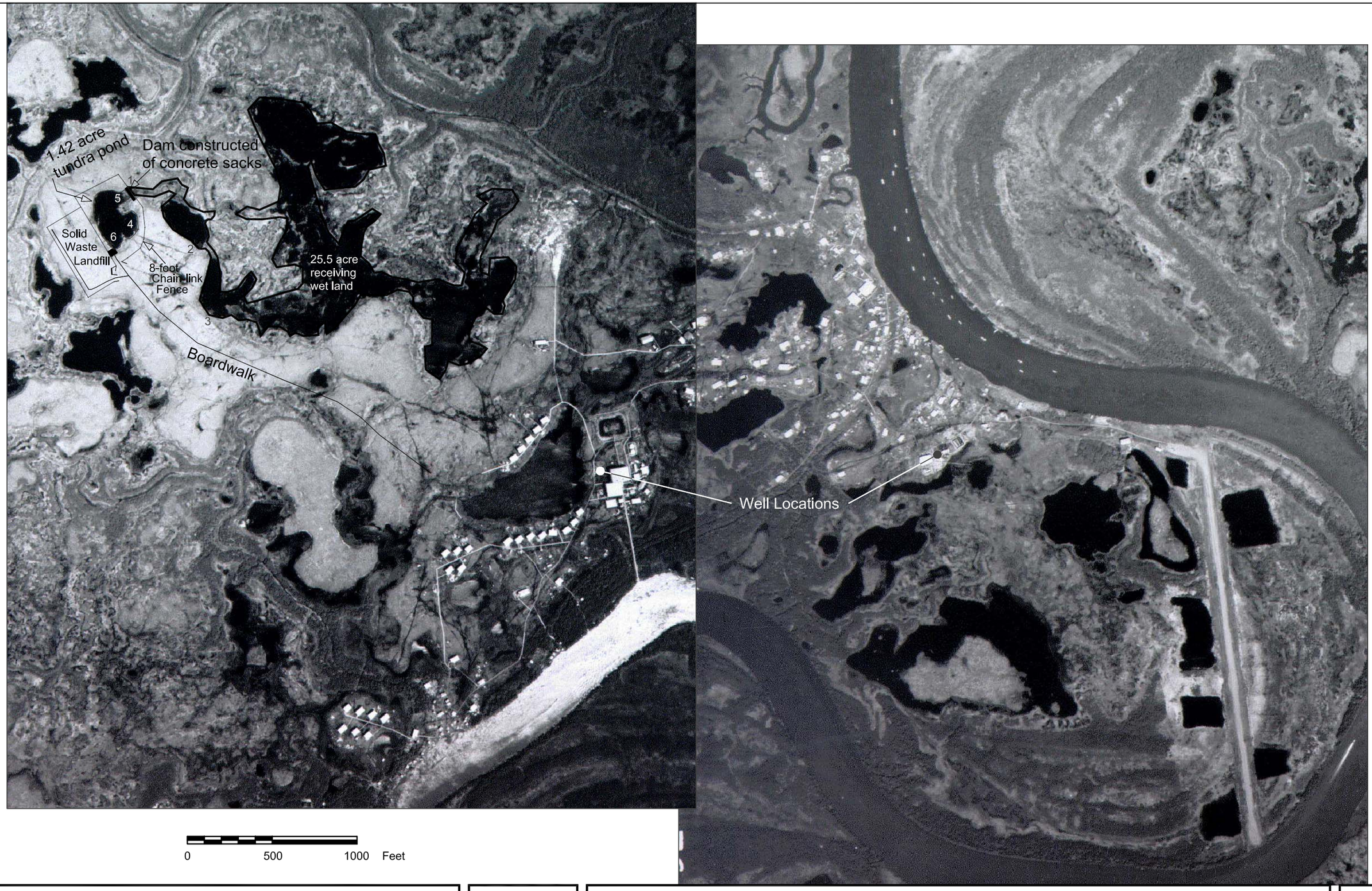
TCSA operates the "small haul" wastewater collection and treatment system for residents of the village. TCSA uses a 300-gallon vacuum trailer to collect domestic wastewater from residential and commercial holding tanks and transport it over boardwalks to a lagoon treatment system located approximately ¾ mile northwest of the community (see Fig. 2). The wastewater system serves approximately 250 residents, who collectively generate approximately 1,000 gallons of wastewater per day. The lagoon treatment works consists of a 1.42 acre "improved" tundra pond followed by a one-acre natural pond that serves as a "second cell".

The primary cell is fenced and has a timber pier to facilitate discharge of wastewater from the tanker through a permanently affixed lagoon inlet pipe. The primary cell has been bermed on the east to channel effluent to an outlet weir, constructed of concrete sacks, that conveys the flow to the second cell.

Construction of pier for discharge point


Winter Discharge from Tanker Haul

The second cell is an unimproved natural tundra pond with a surface area of approximately one acre. The pond is several hundred feet from the nearest boardwalk making causal contact unlikely. Residents do not consider it a hazard. The second pond discharges to a series of connected channels and tundra potholes/lakes. These wetlands cover approximately 25.5 acres and are believed to generally flow toward the east. There is no visible connection between this drainage system and the creeks and ponds within the developed area of the community.



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SCALED AERIAL PHOTO TUNTUTULIAK WASTEWATER LAGOON

TUNTUTULIAK, ALASKA

FIG. 2

G:\CE2 Data Files\Tuntutuliak\2005 Sanitation and Boardwalk\FIG 2.dwg, 5/20/2005 11:31:34 AM, doug

C. Condition of Facilities

A flush/haul system, including household plumbing, is substantially completed in the village. The 14 households remaining to be served currently use honeybuckets and the sewage is disposed in community bunkers. As part of overall sanitation improvements, a landfill, wastewater treatment lagoon (described above), and four miles of sanitation boardwalk were recently completed.

The school has its own well and sewage lagoon, but needs improvements in water treatment and wastewater disposal. The school is in the process of installing a secondary treatment wastewater system because the school lagoon has failed.

D. Financial Status of Operating Facilities

The Tuntutuliak Community Service Association, a non-profit arm of the Village Council, operates the washeteria, solid waste collection and disposal, and the small-vehicle haul water and sewer system. The current rate structure is detailed in the table below.

Current Rate Structure	
100-gallon water delivery	$35
300-gallon sewage pump-out	$44
Rate to wash 1 load of laundry	3 – washers @ $4/load, 1-- washer @ $2.75/load
Rate to dry laundry	$2 for the 1st load and $1 for subsequent loads
Solid waste service	$15/month/household
Solid waste	Commercial & School $100/month
Residential maintenance rate	$15/hour per laborer

The water and sewer portion of the utility operates at a deficit for a number of reasons as outlined in the *draft* business plan (Appendix I). The profits from electrical generation and distribution currently subsidize the water and sewer. The utility is in the process of making operational changes to address the current financial situation.

The following four pages are a summary used by the TCSA to explain to the residents the use of the operation and maintenance fees that are collected when service is provided.

Tuntutuliak Flush Haul System

What am I paying for?

Haul Vehicles

There are 6 haul vehicles. They are used for towing water and sewage trailers, plowing snow, and hauling garbage.

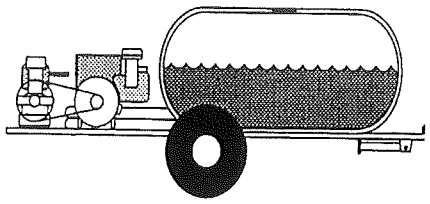
Maintenance cost for each vehicle is $500 a year.

The vehicles are expected to last 4 years. $27,500 needs to be put away in four years to purchase 2-John Deer÷s, a Arctic Cat, and a Honda. Price for these 4 vehicles is $27,500.

A portion of each haul is put into a savings account to pay for both maintenance and replacement.

Haul Trailers

There are 4 trailers. It costs $300 a year to maintain each trailer (tires, grease, fittings, axles).



A trailer will last 4 years if maintained. It costs $1000 to buy a new trailer when they wear out. To purchase 4 new trailers when they wear out, $1000 must be put into a bank account.

A portion of each haul is put into a savings account to pay for both maintenance and replacement.

Operators


OPERATOR

Operators have several jobs.
- ä Haul water and sewage
- ä Maintain haul vehicles and trailers
- ä Remove snow from boardwalks so haul vehicles can pass
- ä Maintain and level boardwalks

The cost of all this labor is included in the cost of a water and sewage haul.

Office Employees

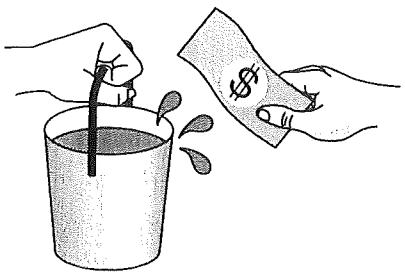

CLERK

The Utility Clerk works 20 hours a week. 65% of her time is spent on the water/sewer haul system. 35% of her time is spent working for garbage haul. 65% of her wages are included in the cost of a water and sewage haul.


MANAGER

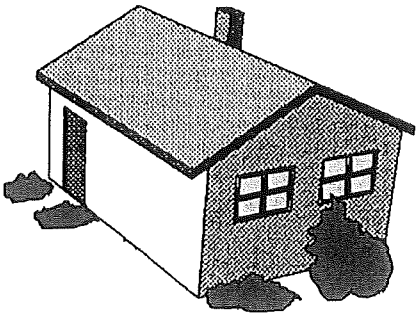
The Utility Manager works 20 hours a week. His time is split between running the electric utility, water/sewer haul system, washeteria, and garbage haul. 21% of his wages are included in the cost of a water and sewage haul.

Cost of Water



The Washeteria spends money to make the water safe to drink. It costs about 15¢ a gallon to make good water. The water/sewer haul must "buy' the water from the washeteria for the water it delivers to customers.

300 gallons of water (at 15¢ a gallon) costs $45. This amount is charged directly to the customer and paid to the washeteria.



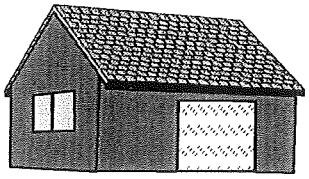
Office Expenses

It costs money to run the utility office. The cost is shared with the electric utility, water/sewer, washeteria, and garbage haul.

Water/Sewer pays 21 % of the cost. These costs include heating fuel, electricity, phone, fax, paper, pens, and other office supplies.

Vehicle Storage Building

Currently the vehicles are kept and maintained in the electric company shop. Part of the cost for heating fuel for this building is included in the cost of the water/sewer.



A new building is being built. The entire cost of heating fuel and electricity will be paid for by water/sewer hauls.

Tuntutuliak Flush Haul System

What does it really cost?

Haul Vehicles	Water Haul	Sewer Haul
Vehicle Parts	$ 1.54	$ 1.54
Vehicle Maintenance (Labor)	$ 2.15	$ 2.15
Vehicle Replacement	$ 3.53	$ 3.53
Haul Trailers		
Trailer Parts	$ 1.07	$ 1.07
Trailer Maintenance (Labor)	$ .58	$ .58
Trailer Replacement	$ .89	$ .89
Operators		
Haul	$ 31.18	$ 15.59
Snow Removal	$ 1.08	$ 1.08
Boardwalk Maintenance	$ .82	$ .82
Office Staff		
Administrator	$ 3.41	$ 3.41
Clerk	$ 6.78	$ 6.78
Cost of Water		
150 Gallons of water	$ 22.50	None
Office Building		
Utilities, supplies	$ 1.41	$ 1.41
Equipment Building		
Heating and Electricity	$ .26	$ .26
Total Cost Per Haul	**$ 77.20**	**$ 39.11**

Cost for 2-water hauls, 1-sewer haul = $193.51

VI. LAND STATUS

A. Land Owners in Proposed Project Area (Federal, State, Regional Land Corporation, Village Land Corporation, City or Tribal, Native Allotments, Homesteads, Other Owners, Existing Easements)

The village corporation is Tuntutuliak Land Limited. The ANCSA 12(a) land entitlement is 115,200 acres. No ANCSA 12(b) land is anticipated to be reallocated to the Village Corporation from the Regional Native Corporation. The local governing body is the Tuntutuliak Traditional Council. The 14(c)(3) transfer is in process, no agreement has been signed and no plat has been prepared.

B. Traditional Use Areas

The tasks enumerated in the report will not encroach on any traditional use areas.

C. Land Conflicts that Could Affect the Project, Platting Status

Site control and easement acquisition related to the boardwalk construction during 1995 through 1997 was not obtained for many sections. This deficiency was shown as a result of a BIA-managed transportation feasibility study. This sanitation project will rehabilitate sections of failed existing boardwalk where it exists now and will not address the rights of way status.

D. Proposed Solutions to Land Conflicts

The tasks enumerated in this report will not create additional land conflicts and do not propose to solve those that do exist.

VII. NEED FOR PROJECT

A. Health and Safety Concerns

The water produced by the water plant in the washeteria is not of a quality acceptable to the majority of the residents. Currently residents obtain the majority of their drinking water by privately transporting it from sources they deem sufficient. Depending on the source, transport and storage containers, there is a high probability that contaminated water is being used by a significant number of the residents.

Fourteen houses have not been provided with flush/haul facilities, increasing the possibility of disease spread through the manual handling of human waste.

B. Environmental Concerns

The current wastewater discharge from the washeteria/water plant is through an above ground arctic pipe to a sewage lagoon that appears to be a natural wetland and not a constructed facility. This wastewater lagoon receives only the discharge from the washeteria/water plant and is not near or connected to the recently constructed lagoon that receives the haul system discharges. The water plant will not meet the primary drinking water standard for arsenic and secondary standards for iron, manganese and color.

C. System Growth Capacity

The proposed upgrades to the water plant and improvements to the haul system include adequate capacity to serve the fourteen homes without current facilities. Additionally, the upgraded system will be able to provide service to the projected growth in the 30-year planning period.

VIII. COMMUNITY CAPACITY

A. Management Status

The Tuntutuliak Community Services Association (TCSA) was created in 1982 as a separate policy-making and managerial organization for the Native Village of Tuntutuliak's utilities. The Traditional Council transferred the washeteria facility to TCSA in 1991. A board of 7 elected individuals meets regularly with the Utility Manager, and the Traditional Council on utility matters. The TCSA Board of Directors has the authority for hiring and firing employees. The Utility Manager is responsible for all other personnel management actions such as performance reviews, training, and directing the workloads for both the Sanitation and Electrical Utilities. The Utility Manager also coordinates the purchase of fuel and equipment to operate all the facilities under his charge.

B. Financial Status

The water and sewer portion of the utility operates at a deficit for a number of reasons as outlined in the business plan. The profits from electrical generation and distribution currently subsidize the water and sewer. The utility is in the process of making operational changes to address the current financial situation.

It is a reasonable certainty that Tuntutuliak will have to replace significant portions of the water and sewer utility in the decades to follow. The community needs to build a capital sinking fund to have the ability to make these replacements when they are needed and to provide matching dollars for future grants. This accumulation of funds would provide a hedge should major funding agencies require matching funds similar to those currently required of larger communities elsewhere in the State of Alaska.

The Equivalent Annual Capital Cost (EACC) for the Feasibility Study Level Business Plan (FSL-BP) represents a sinking fund annuity that would accrue 20% of the capital cost over 30 years, assuming the calculation of Future Value (FV) at 2% inflation and the annual payment (PMT) at 3% investment growth. For Tuntutuliak, 20% of the Present Value (PV) of the Capital (CC) investment is $1,540,000. The FV is $2,789,497 and the annual payment (PMT) is $58,633.

C. System Operation & Maintenance Status

As many as two Solid Waste Operators are employed to collect and transfer household solid waste from each residence and then manage the volume reduction and containment in the village's landfill. As many as three Water and Wastewater Haul Operators are employed on an overlapping 2 weeks on/1 week off schedule to maintain two operators engaged at any given time. These operators are tasked with delivering treated water from the water treatment plant in 300-gallon tanker haul systems and pumping the water through a port in the side of each residence. The second operator is required to ensure the interior tanks do not overflow in the house. The same operators conduct sewage holding tank pump-outs using a different haul tank assembly, however, this operation requires only one operator. All operators are responsible for equipment maintenance and the maintenance of the two haul garages. All of the operators engage in boardwalk maintenance and snow removal activities. The three water and wastewater operators also conduct residential maintenance of sanitation fixtures at cost.

IX. SANITATION FACILITY ALTERNATIVES - TASK 1: WATER TREATMENT PLANT UPGRADE

A. Description

The existing washeteria/water treatment plant was constructed in 1982 and uses a well that was drilled in 1979 to a depth of 201 feet. The 1993 study report analyzed the draw down of the existing well and concluded it could be pumped continuously at 20 gallons per minute (gpm). Therefore, an adequate quantity of water is available. Due to more stringent water quality regulations and the community's dislike of the quality of water produced, upgrades to the water treatment plant are needed. The current wastewater discharge from the washeteria/water plant is through an above ground arctic pipe to a sewage lagoon that appears to be a natural wetland and not a constructed facility. Upgrade of the lagoon is not addressed in this report.

B. Design Criteria

The water source contains the following components that must be removed:

- ✓ Iron: Three fourths (¾) is estimated as soluble iron, and one fourth (¼) is tied up with the organics (color) in the water;
- ✓ Manganese: Mineral dissolved in the water
- ✓ Color: This is very fine material (mostly from plants and other organic sources) that will not settle out without special treatment;
- ✓ Arsenic: This consists mainly of dissolved arsenite in the water.

The present system does not adequately address the removal of the above contaminants. Pilot testing confirms that the following described process will provide an acceptable drinking water source for the community that meets current regulatory standards.

First, the raw water would be preheated to a temperature of 50°F to facilitate oxidation and coagulation. If preoxidants (such as potassium permanganate) are needed, then they would be added to the stream that would flow into the 10,000-gallon settling tank. After the settling tank is filled with raw water, a propeller-type motorized mixer is run at high speed to thoroughly agitate the tank. During rapid mix, coagulant is added immediately upstream of the mixer propeller as a batch. After 10 to 15 minutes of high-speed mixing, the mixer is

run at very low speed for thirty minutes for formation of floc (large particles that settle). The floc then settles for 8 hours. Settled sludge is pumped out of the bottom of the tank to the lagoon. Then the clear liquid remaining is pumped through two parallel multimedia filters to polish the water and remove any remaining pin floc that did not settle out in the tank. Filtered water is chlorinated as it is transferred to the 10,000-gallon potable water tank.

C. Conceptual Layout

A schematic of the proposed water treatment process is shown in Fig. 3.

D. Unique Environmental Impacts

There are no known unique environmental impacts.

E. Land Requirements and Easements

Additional land purchase/easement acquisition will not be required. Upgrades will occur within the existing water treatment plant structure.

F. Construction Constraints

Upgrades to the water treatment plant equipment will need to be closely coordinated so the minimum amount of disruption to service occurs.

G. Impacts to Existing Infrastructure (Roads, Electric Power Generation and Bulk Fuel)

Electrical power usage and fuel usage will increase at the water treatment plant to produce the anticipated increased volume of water.

H. Cost Estimates

1. Construction Cost Estimate

Preliminary Cost Estimate*--Tuntutuliak, Alaska

Water Treatment Plant Upgrade

Item	Activity	Unit	Unit Price	Quantity	Cost
1	Demolition	LS	$35,000	1	$35,000
2	Architectural Preparation--Floor, walls, interior modifications	LS	$155,000	1	$155,000
3	Mechanical--Boilers (1.2MM BTU/Hr) water heaters, ventilation, code compliance	LS	$85,000	1	$85,000
4	Water Process Modifications	LS	$220,000	1	$220,000
5	Electrical Modifications	LS	$75,000	1	$75,000
6	Miscellaneous	LS	$25,000	1	$25,000
				Subtotal	$595,000
				Contingency (10%)	$59,500
				Subtotal	$654,500
				Engineering & Administration (10%)	$65,500
				Construction Administration (12%)	$78,500
	*2005 dollars assuming force account construction / local wages	**Water Treatment Upgrade Total Cost**			**$798,500**

(1) Existing storage tanks to be retained with bladder upgrades
(2) Additional tankage for finished water storage not considered
(3) Upgrade of existing discharge lagoon not considered

2. Annual Operation and Maintenance Costs, Cost per Month per Household Served and Cost per Month for Non-Residential Users

See the *DRAFT* Feasibility Study Level Business Plan in Appendix I for discussion of current costs. Tuntutuliak does not have a large institutional user for the water produced and does not provide services to the local school. Quality of water provided has not been satisfactory for community residents so the cost per unit sold has been high. Producing an acceptable quality product will cause it to be sold to more users there by reducing the unit costs.

3. Life Cycle Costs

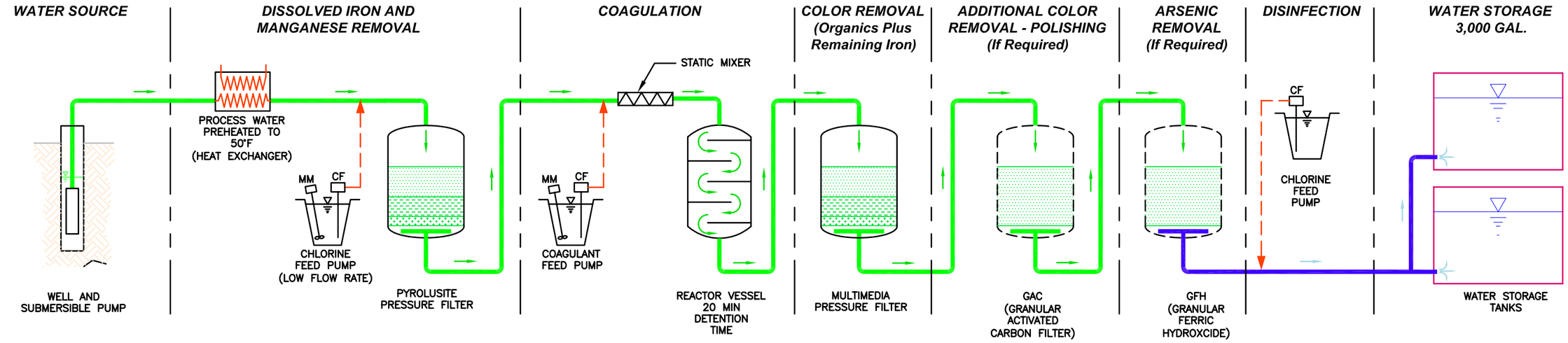
Ultimately, Tuntutuliak system improvements will require major capital replacement. The Equivalent Annual Capital Cost (EACC) for the Feasibility Study Level Business Plan (FSL-BP) represents a sinking fund annuity that would accrue 20% of the capital cost over 30 years, assuming the calculation of Future Value (FV) at 2% inflation and the annual payment (PMT) at 3% investment growth. For Tuntutuliak, 20% of the Present Value (PV) of the Capital (CC) investment is $1,540,000. The FV is $2,789,497 and the annual payment (PMT) is $58,633.

I. Review of Operational Costs for Similar Systems within Region

See the report *Cost Analysis of Selected Flush Haul Water and Wastewater Systems in Rural Alaska* provided in Appendix L.

J. Advantages and Disadvantages

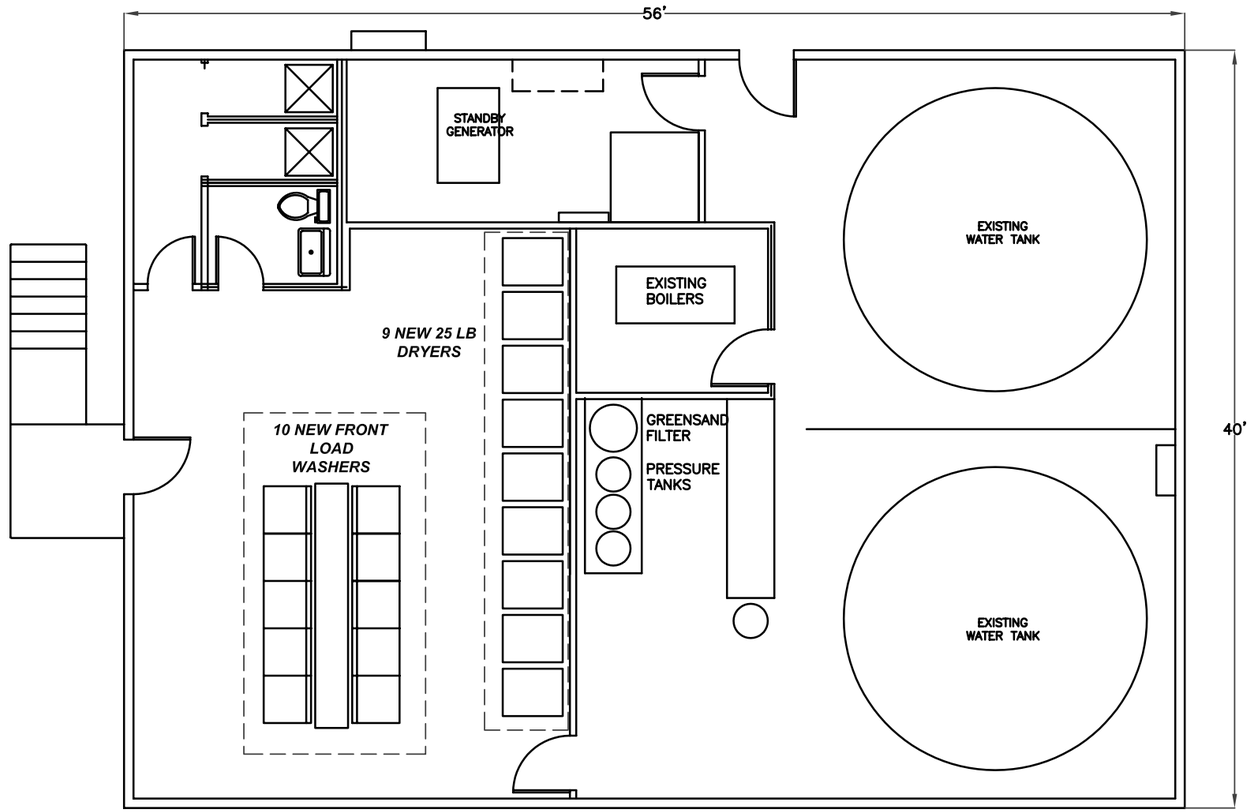
PROPOSED ALTERNATIVE	ADVANTAGES	DISADVANTAGES
Upgrade Water Plant	Water quality will meet regulatory requirements. Water quality will be satisfactory to residents	Capital costs are large.
No Build	Capital expenditures will not occur.	Health and safety concerns will not be addressed. Facilities will continue to deteriorate.



PROPOSED WATER TREATMENT PROCESS

LEGEND

	PROCESS WATER
	POTABLE WATER
	CHEMICAL FEED
GFH	GRANULAR FERRIC HYDROXIDE
GAC	GRANULAR ACTIVATED CARBON FILTER



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UPGRADE WASHETERIA / WATERTREATMENT SCHEMATIC

TUNTUTULIAK, ALASKA

FIG. 3

X. SANITATION FACILITY ALTERNATIVES – TASK 2: BOARDWALK IMPROVEMENTS

A. Description

The boardwalk is an integral part of the Haul System and the Solid Waste utility. This infrastructure was constructed to enable operation of the Haul System. This sanitation project will rehabilitate sections of failed existing boardwalk.

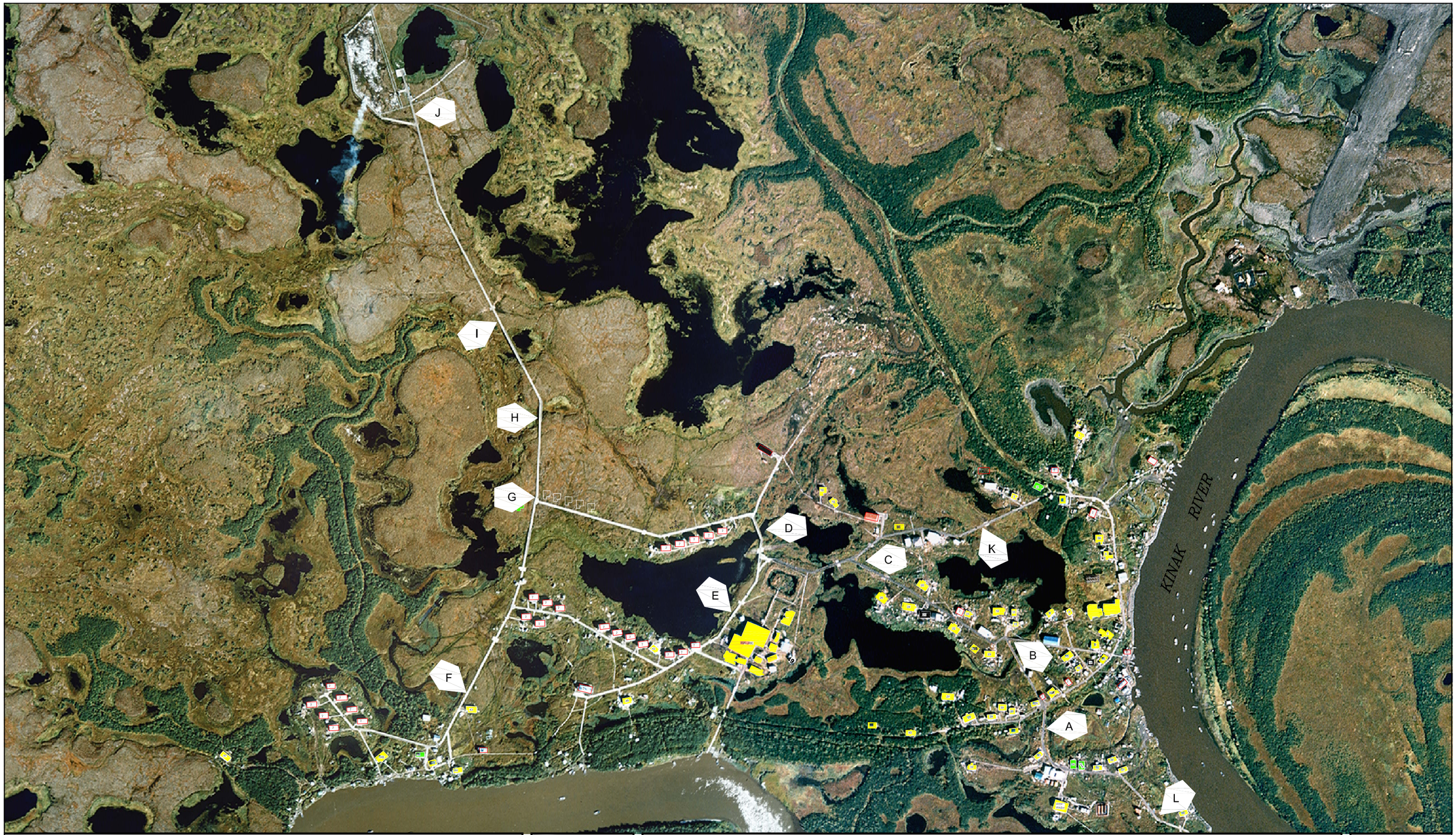
Boardwalks were constructed to connect all structures to the new sewage lagoon, new landfill and to the airport. The boardwalks are routed around wetlands and make several crossings of open water and grass covered lakes. Helical piles and floats are used in wetland crossings and mudsills are used on tundra in between. The community floods nearly every fall due to the convergence of on-shore storms in the Bering Sea and high tides. The Qinaq River is diurnally influenced by the tide. The existing boardwalk was not designed to withstand the effects of the floods. The boardwalk has failed by floating off the pile foundations. The upward movement of grass mats has produced floatation over grass-covered wetlands at one location. At two bridge locations, large floats serving as foundations at the transition from land to water have dislodged the boardwalk. The boardwalk on mudsills has also been dislodged by flowing water in at least two locations. Extreme axial contortion of the boardwalk occurs from seasonal freeze-thaw cycling in the active layer. This is most pronounced when the boardwalk narrowly skirts the edge of wetlands. Here the boardwalk straddles zones of relatively high-and low-displacement active layers in the seasonal frost.

B. Design Criteria

Each of the twelve (12) areas noted in Fig. 4 require reconstruction. Generally the cribbing and float supports will be removed and new helical anchor supports will be used. See Geotechnical Report in Appendix C for full reconstruction recommendations.

C. Conceptual Layout

See Fig. 4 for boardwalk locations proposed to receive foundation repairs.



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PROBLEM AREAS IDENTIFIED ON BOARDWALK

TUNTUTULIAK, ALASKA

FIG. 4

D. Unique Environmental Impacts

There are no known unique environmental impacts.

E. Land Requirements and Easements

Site control and easement acquisition related to the boardwalk construction during 1995 thru 1997 was not obtained for many sections. This deficiency was shown as a result of a BIA-managed transportation feasibility study. Boardwalks will be repaired in their current locations. No new segments will be constructed without completion of rights-of-way and utility easements prior to construction, should the issue arise during the rehabilitation project.

F. Construction Constraints

Boardwalks to be repaired are in continuous use. Construction activities need to be coordinated to provide the minimum disruption to service.

G. Impacts to Existing Infrastructure (Roads, Electric Power Generation and Bulk Fuel)

Except for fuel required for construction vehicles, no increase in fuel usage will occur.

H. Cost Estimates

1. Construction Cost Estimate

Preliminary Cost Estimate*--Tuntutuliak, Alaska

Boardwalk Improvements

Item	Activity	Unit	Unit Price	Quantity	Cost
1	Demolition	EA	$10,000	12	$120,000
2	Materials--Helical anchors, steel beams, repalacement decking and railings	EA	$13,000	12	$156,000
3	Labor to place anchors, beams and replace decking and railings	EA	$14,000	12	$168,000
				Subtotal	$444,000
				Contingency (10%)	$44,400
				Subtotal	$488,400
				Engineering & Administration (10%)	$48,800
				Construction Administration (12%)	$58,600
	*2005 dollars assuming force account construction / local wages			**Boardwalk Improvements Total Cost**	**$595,800**

2. Annual Operation and Maintenance Costs, Cost per Month per Household Served and Cost per Month for Non-Residential Users

Operation and maintenance costs for boardwalk snow removal and miscellaneous repairs are not segregated from the other costs associated with the Water and Sewer Haul System.

3. Life Cycle Costs

Ultimately, Tuntutuliak system improvements will require major capital replacement. The Equivalent Annual Capital Cost (EACC) for the Feasibility Study Level Business Plan (FSL-BP) represents a sinking fund annuity that would accrue 20% of the capital cost over 30 years, assuming the calculation of Future Value (FV) at 2% inflation and the annual payment (PMT) at 3% investment growth. For Tuntutuliak, 20% of the Present Value

(PV) of the Capital (CC) investment is $1,540,000. The FV is $2,789,497 and the annual payment (PMT) is $58,633.

I. Review of Operational Costs for Similar Systems within Region

Boardwalk operation and maintenance costs are not normally segregated, so no cost comparisons were found.

J. Advantages and Disadvantages

PROPOSED ALTERNATIVE	ADVANTAGES	DISADVANTAGES
Repair boardwalk foundations	Provide a usable year round transportation system	High capital costs.
No Build	Capital expenditures will not occur.	Safety concerns will not be addressed. Facilities will continue to deteriorate.

XI. SANITATION FACILITY ALTERNATIVES – TASK 3: UPGRADE OF THE EXISTING WASHETERIA

A. Description

The existing washeteria was constructed in 1982. Typically a washeteria has a design life of 30 years. However, due to the population growth upgrades to the laundry side of the facility are needed. The washeteria consists of a bank of Hoyt Windsor I dryers heated by circulating glycol off the boiler system, light duty coin-operated washers, and separate men's and women's shower/toilet areas. The shower/toilet areas are underutilized and the number of washers and dryers are too few. The TCSA manages the laundry through a reservation system but still cannot satisfy the demand in the village.

B. Design Criteria

The laundry facility upgrade to the washeteria proposes ten (10) new front load washers and nine (9) new 25-pound dryers. To provide adequate space, a portion of the underutilized shower and restroom area will be demolished and the remaining shower and restroom area remodeled for unisex use.

C. Conceptual Layout

The conceptual layout of the Washeteria Upgrade is shown in Fig. 3.

D. Unique Environmental Impacts

There are no known unique environmental impacts.

E. Land Requirements and Easements

Additional land purchase/easement acquisition will not be required. Remodeling/upgrade will occur within the existing washeteria.

F. Construction Constraints

Remodeling of the washeteria will need to be closely coordinated so the minimum amount of disruption to service occurs.

G. Impacts to Existing Infrastructure (Roads, Electric Power Generation and Bulk Fuel)

Installation of additional washers and dryers is intended to increase usage. This will require more electric power and fuel to operate. This will be a minimum impact on overall community usage.

H. Cost Estimates

1. Construction Cost Estimate

Preliminary Cost Estimate*--Tuntutuliak, Alaska

Washeteria Upgrade

Item	Activity	Unit	Unit Price	Quantity	Cost
1	Demolition	LS	$15,000	1	$15,000
2	Architectual Preperation--Floor, walls, interior modifications	LS	$65,000	1	$65,000
3	Accesibility Upgrades--Entrance ramp, door sizes, grab bars, etc.	LS	$30,000	1	$30,000
4	Replace/Expand Laundry Equipment	LS	$60,000	1	$60,000
5	Plumbing Upgrade	LS	$35,000	1	$35,000
6	Electrical Upgrade	LS	$30,000	1	$30,000
				Subtotal	$235,000
				Contingency (10%)	$23,500
				Subtotal	$258,500
				Engineering & Administration (10%)	$25,900
				Construction Administration (12%)	$31,000
	*2005 dollars assuming force account construction / local wages			**Washeteria Upgrade Total Cost**	**$315,400**

(1) Boiler upgrades and hot water heaters included in Water Plant Estimate

2. Annual Operation and Maintenance Costs, Cost per Month per Household Served and Cost per Month for Non-Residential Users

CURRENT RATE STRUCTURE	
Rate to wash 1 load of laundry	3 – washers @ $4/load, 1-- washer @ $2.75/load
Rate to dry laundry	$2 for the 1st load and $1 for subsequent loads

Rates for use of the laundry facility are not proposed to change.

3. Life Cycle Costs

Ultimately, Tuntutuliak system improvements will require major capital replacement. The Equivalent Annual Capital Cost (EACC) for the Feasibility Study Level Business Plan (FSL-BP) represents a sinking fund annuity that would accrue 20% of the capital cost over 30 years, assuming the calculation of Future Value (FV) at 2% inflation and the annual payment (PMT) at 3% investment growth. For Tuntutuliak, 20% of the Present Value (PV) of the Capital (CC) investment is $1,540,000. The FV is $2,789,497 and the annual payment (PMT) is $58,633.

I. Review of Operational Costs for Similar Systems within Region

Cost comparisons for the operation of laundry facilities are not immediately available.

J. Advantages and Disadvantages

PROPOSED ALTERNATIVE	ADVANTAGES	DISADVANTAGES
Expand and replace laundry facilities.	Provide adequate service to community residents.	Additional capital expenditures.
No Build	Capital expenditures will not occur.	Residents do not have access to adequate laundry facilities. Over utilization of laundry equipment will cause early failure of components.

XII. SANITATION FACILITY ALTERNATIVES – TASK 4: MODIFYING EXISTING / ADDING HOUSES TO THE HAUL SYSTEM

A. Description

In 1996, the initial 10 houses were fitted out with demonstration haul services using an external insulated sewage tank. By the end of 1998 there were a total of 32 residential services with external sewage tanks and 7 buildings with a modular panelized bathroom addition. The bathroom additions (referred to in Figure 5 as divorced systems) are flanged to the house and built on a platform that includes the sewage tank. One of the additions burned with a house. In 1999, 20 bathroom additions were constructed using conventional stick-built construction on an insulated fiberglass floor and sewage tank platform. In 1999 and 2000 the pre-1999 constructed systems were upgraded with level controls, a manual vs. electric-operated toilet, and in some cases an electric on-demand hot water heater. The first hot water heaters used were designed for recreational vehicles and not meant for continuous duty and subsequently failed at a high rate. Most of these are no longer in service. In 2002, AVCP homes were built using residential haul systems components designed by CoWater Alaska, Inc. The community clearly has multiple generations and styles of residential haul system services.

B. Design Criteria

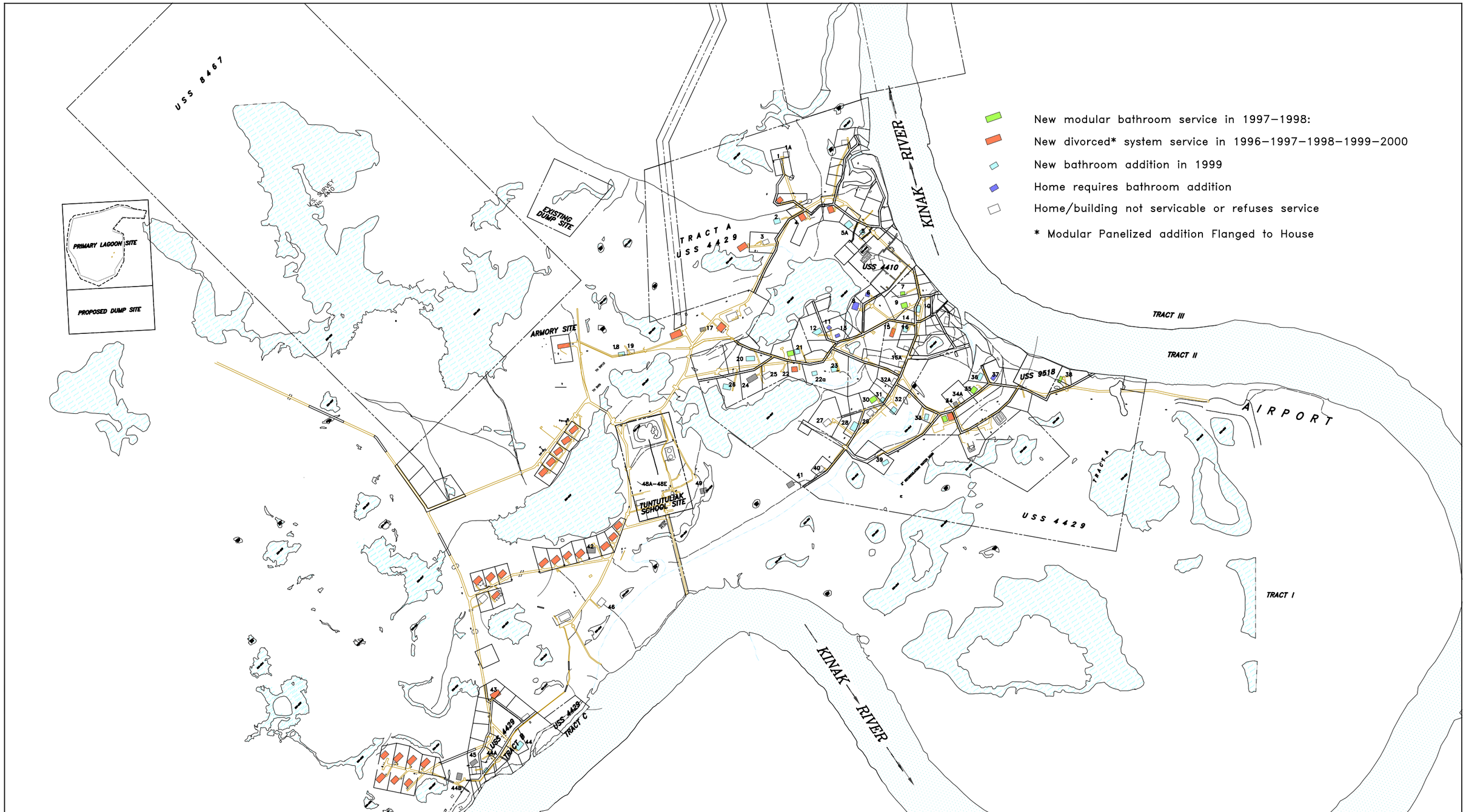
There are fourteen (14) more houses to serve with plumbing and haul services. As current designs (See Figure 6 for Schematic Layout) are used for the houses without service, an inspection of the existing served houses will be made to upgrade water heaters and provide water tank overflow protection as required.

C. Conceptual Layout

See Fig. 5 for the locations of houses desiring residential haul service. Fig. 6 shows a typical plumbing improvement to a house without service. The plumbing fixtures may be placed in the existing house if it is large enough or in a constructed “addition” if adequate space is not available.

D. Unique Environmental Impacts

There are no known unique environmental impacts.



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HOUSES WITH/NEEDING HAUL SERVICE

TUNTUTULIAK, ALASKA

FIG. 5

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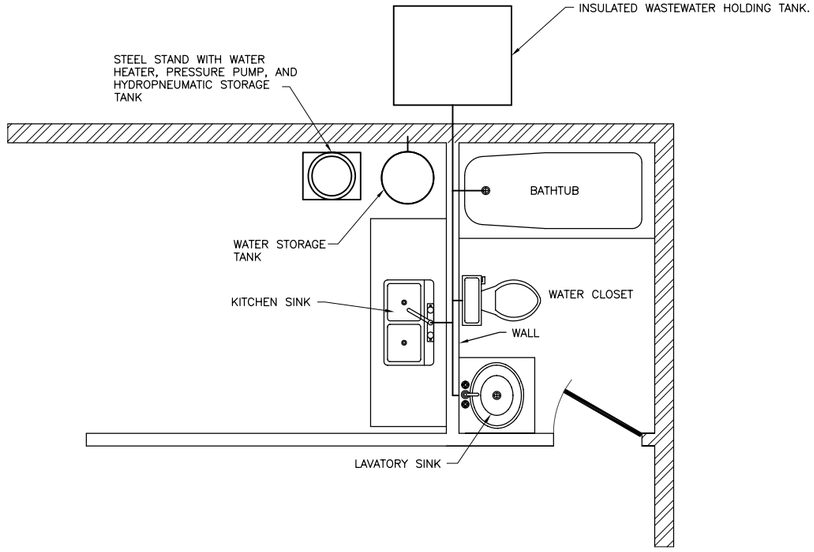
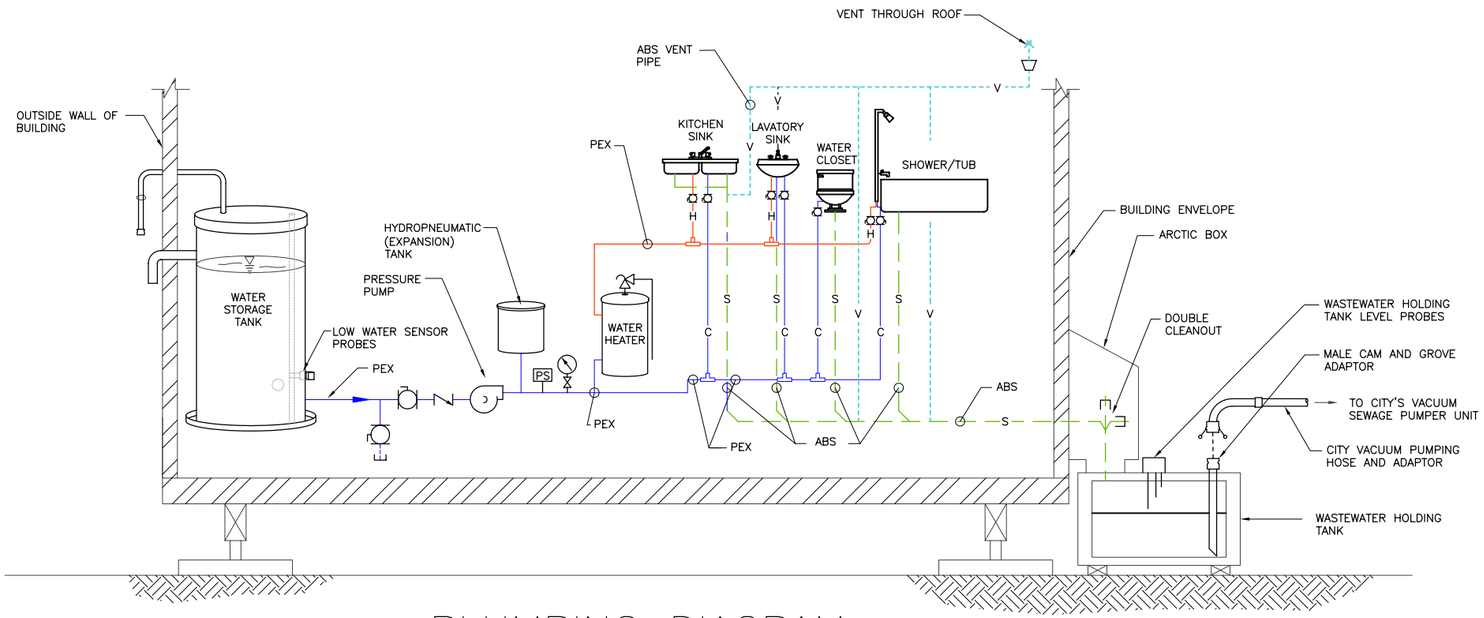


PLUMBING LAYOUT



PLUMBING DIAGRAM

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PLUMBING IMPROVEMENTS LAYOUT AND DIAGRAM

TUNTUTULIAK, ALASKA

FIG. 6

E. Land Requirements and Easements

Homeowner agreements will be required for each of the fourteen homes to be provided with plumbing facilities. Homeowner agreements may need to be updated for those houses will receive upgrades to existing flush/haul components.

F. Construction Constraints

House plumbing upgrades will be to structures currently occupied, requiring close coordination to minimize inconvenience to the occupants.

G. Impacts to Existing Infrastructure (Roads, Electric Power Generation and Bulk Fuel)

Adding plumbing fixtures to the fourteen houses will increase the use of electricity to operate the improvements and potentially additional fuel to heat enlarged spaces.

H. Cost Estimates

1. Construction Cost Estimate

Preliminary Cost Estimate*--Tuntutuliak, Alaska

Haul Tankage and Bathrooms (Additional Houses)

Item	Activity	Unit	Unit Price	Quantity	Cost
1	Install tankage for water and wastewater haul/construct and plumb bathrooms in individual houses	EA	$24,000	14	$336,000
				Subtotal	$336,000
				Contingency (10%)	$33,600
				Subtotal	$369,600
				Engineering & Administration (10%)	$37,000
				Construction Administration (12%)	$44,400
	*2005 dollars assuming force account construction / local wages			**New House Connections Total Cost**	**$451,000**

2. Annual Operation and Maintenance Costs, Cost per Month per Household Served and Cost per Month for Non-Residential Users

Adding new users to the system will spread the operating costs over a larger base without substantially increasing the labor costs. This will produce a lower unit cost that may be passed on to the consumer. Given the apparent under-funding of the operational costs of the haul system (See *DRAFT* Business Plan—Appendix I) potentially no cost reduction will accrue to the consumer.

3. Life Cycle Costs

Ultimately, Tuntutuliak system improvements will require major capital replacement. The Equivalent Annual Capital Cost (EACC) for the Feasibility Study Level Business Plan (FSL-BP) represents a sinking fund annuity that would accrue 20% of the capital cost over 30 years, assuming the calculation of Future Value (FV) at 2% inflation and the annual payment (PMT) at 3% investment growth. For Tuntutuliak, 20% of the Present Value (PV) of the Capital (CC) investment is $1,540,000. The FV is $2,789,497 and the annual payment (PMT) is $58,633.

I. Review of Operational Costs for Similar Systems within Region

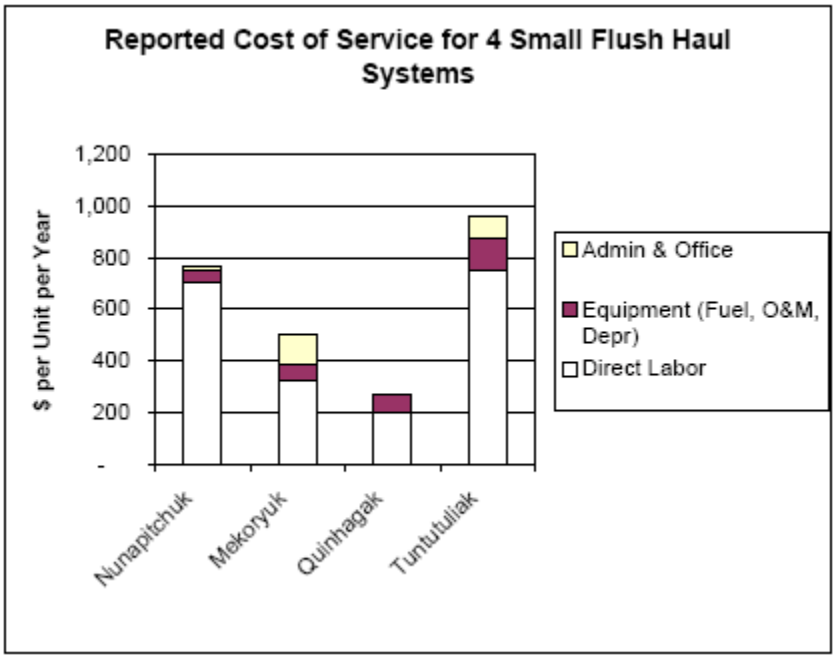
See *Cost Analysis of Selected Flush Haul Water and Wastewater Systems in Rural Alaska* in Appendix L.

J. Advantages and Disadvantages

PROPOSED ALTERNATIVE	ADVANTAGES	DISADVANTAGES
Add 14 additional houses to the haul system.	Improved quality of life. Reduction in health risks.	Capital outlay costs.
No Build	Capital expenditures will not occur.	Health risks continue to be high.

XIII. SANITATION FACILITY ALTERNATIVES – TASK 5: IMPROVEMENTS TO THE EXISTING WATER AND SEWER HAUL SYSTEM

A. Description



The above graph from Appendix L: *Cost Analysis of Selected Flush Haul Water and Wastewater Systems in Rural Alaska*, prepared for the Alaska Native Health Board Operation & Maintenance Demonstration Project by Steve Colt, University of Alaska Anchorage Institute of Social and Economic Research, shows the Tuntutuliak system is the most expensive of the four communities analyzed in the study.

The report notes:

> *"...the Tuntutuliak system is used with almost twice the frequency of the Mekoryuk or Quinhagak systems. There is no obvious reason for this, since the fee per haul is about the same for all systems, and residents can self-haul water from the water plant at no cost in all three communities. The average cost per household is $961, almost twice the amount for Mekoryuk. The main reason for the higher cost is that the Microflush (MF) system (Tuntutuliak) uses two operators per haul, according to the YKHC survey. Other reasons why the estimated cost is higher include the high number of service calls to repair plumbing on the customer's premises and the explicit recognition of routine vehicle maintenance at 8 hours per month of operator time.*

B. Design Criteria

Changes in equipment and methodology should produce a reduction in the cost per haul. Modification to the water holding tanks with overflow protection could reduce the requirement of two operators per haul.

C. Conceptual Layout

Modification to the holding tanks in the houses will be designed to permit the delivery and removal of product by one operator.

D. Unique Environmental Impacts

There are no known unique environmental impacts.

E. Land Requirements and Easements

No additional land purchase/easement acquisition will be required.

F. Construction Constraints

No specific construction constraints are anticipated.

G. Impacts to Existing Infrastructure (Roads, Electric Power Generation and Bulk Fuel)

Use of newer more efficient haul equipment and implementing operating efficiencies may result in a reduction of fuel use.

H. Cost Estimates

1. Construction Cost Estimate

Preliminary Cost Estimate*--Tuntutuliak, Alaska

Water & Wastewater Haul System Improvements

Item	Activity	Unit	Unit Price	Quantity	Cost
1	Provide overflow protection to existing in house water tanks	EA	$2,500	20	$50,000
2	Replace failed hot water heaters*	EA	$1,500	32	$48,000
3	Replace haul vehicle and trailer	EA	$11,000	4	$44,000
				Subtotal	$142,000
				Contingency (10%)	$14,200
				Subtotal	$156,200
				Engineering & Administration (10%)	$15,600
				Construction Administration (12%)	$18,700
	*2005 dollars assuming force account construction / local wages	**Haul System Improvements Total Cost**			**$190,500**

***** The first hot water heaters used were designed for recreational vehicles and not meant for continuous duty and subsequently failed at a high rate. Most of these are no longer in service.

2. Annual Operation and Maintenance Costs, Cost per Month per Household Served and Cost per Month for Non-Residential Users

Modifying the delivery equipment and the holding tanks should permit the reduction in operator time, thus reducing the current unit costs to the residents.

3. Life Cycle Costs

Ultimately, Tuntutuliak system improvements will require major capital replacement. The Equivalent Annual Capital Cost (EACC) for the Feasibility Study Level Business Plan (FSL-BP) represents a sinking fund annuity that would accrue 20% of the capital cost over 30 years, assuming the calculation of Future Value (FV) at 2% inflation and the annual payment (PMT) at 3% investment growth. For Tuntutuliak, 20% of the Present Value

(PV) of the Capital (CC) investment is $1,540,000. The FV is $2,789,497 and the annual payment (PMT) is $58,633.

I. Review of Operational Costs for Similar Systems within Region

Comparison of Four Small Vehicle Systems:

Cost Analysis of Selected Flush Haul Water and Wastewater Systems in Rural Alaska (Appendix L) provides a cost comparison including Tuntutuliak. The following is an excerpt from the summary:

> *The operating cost of flush haul service (over and above the cost of providing water at the treatment plant) varies from less than $300 per unit per year (Quinhagak) to almost $1,000 per unit per year (Tuntutuliak). When cost is measured in terms of gallons of water delivered, it ranges from 13 cents per gallon in Quinhagak to 61 cents per gallon in Mekoryuk. Tuntutuliak residents pay about 43 cents per gallon. Thus, Tuntutuliak residents pay more total dollars per year partly because they have significantly more water delivered.*

J. Advantages and Disadvantages

PROPOSED ALTERNATIVE	ADVANTAGES	DISADVANTAGES
Modify holding tanks and haul equipment	Reduced operator time, hence, reduction in charges to the customer.	Capital outlay costs.
No Build	Capital expenditures will not occur. Monies will be saved.	High costs cause customers to avoid the system. This contributes to potential health problems.

XIV. PUBLIC PARTICIPATION IN THE PLANNING PROCESS

A. Methods Used to Gain Community Input and Direction

Meetings have been held with the TCSA board and extensive discussion has been conducted with the TCSA manager and staff. The Village Safe Water Engineer has maintained close contact with the community over a long period of time and has documented the concerns of the residents of Tuntutuliak.

B. Identification of Community Goals and Objectives

Tuntutuliak residents are receptive to improvements to their water and wastewater systems. (See Community Survey Results in Appendix E.) The ultimate choice would be a fully piped water and sewer system. However, the high operating costs of such a system cannot be afforded by many of the residents. The residents also realize that the low operating cost, self-haul honey bucket system of waste removal is unsanitary and a high health risk. The residents concur that the best balance between an acceptable disposal system and high operating costs is a Water and Sewer Haul System**.** The Water and Sewer Haul System project will be considered complete when the water treatment plant has been upgraded to meet water quality standards, the failing sections of the boardwalk rehabilitated, the washeteria has been remodeled and the remaining fourteen (14) homes have been served.

XV. COMMUNITY BUSINESS PLAN FOR SELECTED ALTERNATIVE

The *DRAFT* Feasibility Study Level Business Plan for the selected alternative has been prepared as a stand-alone document and is included as Appendix I.

XVI. CONCLUSIONS AND RECOMMENDED ALTERNATIVE

A. Description of Recommended Alternative

The selected tasks in their order of priority are as follows:

- Upgrade the water treatment plant to meet current primary and secondary water quality standards.
- Construct boardwalk improvements in twelve locations where the existing boardwalk has failed to provide a reliable transportation system within the community.
- Upgrade the existing washeteria public use spaces by expanding the number of laundry units to adequately meet public demand.
- Provide plumbing facilities (including haul tanks) for fourteen additional houses and upgrade existing houses with functional components as required.
- Alternative haul units and haul methodologies with the goal of reducing the cost of operating the haul system.

B. Capital Cost Estimate

Preliminary Cost Estimate*--Tuntutuliak, Alaska

SUMMARY

Item	Activity	Unit	Unit Price	Quantity	Cost
1	Water Treatment Plant Upgrade	EACH	$798,490	1	$798,500
2	Washeteria Upgrade	EACH	$315,370	1	$315,400
3	Boardwalk Improvements	EACH	$595,848	1	$595,800
4	Haul Tankage and Bathrooms (Additional Houses)	EACH	$450,912	1	$451,000
5	Water & Wastewater Haul System Improvements	EACH	$190,564	1	$190,500
	*2005 dollars assuming force account construction / local wages		**Project Total Cost**		**$2,351,200**

C. Estimated Annual Revenues and Revenue Sources

Table 4. Revenue Estimates by Source

Revenue Source	Rate	Estimated Annual Units	Collection Rate	Total
Residential User Fees				
Water Delivery (per haul)	$ 35	305	95%	$ 10,141
Sewage Pump & Haul (per haul)	$ 44	550	95%	$ 22,990
Solid Waste (per month)	$ 15	1200	60%	$ 10,800
Small Commercial Users				
Water Delivery (per haul)	$ 35	12	100%	$ 420
Sewage Pump & Haul (per haul)	$ 44	8	100%	$ 352
Solid Waste (per month)	$ 100	12	100%	$ 1,200
Large Commercial Users				
Teacher Housing & School User Fees				
Water Delivery (per haul)	$ 35	63	100%	$ 2,205
Sewage Pump & Haul (per haul)	$ 44	78	100%	$ 3,432
Solid Waste (per month)	$ 15	27	100%	$ 405
School Solid Waste	$ 100	9	100%	$ 900
Washeteria Revenue				$ 45,000
			Sub-total	$ 97,845
Local Capital Contribution				$ 101,801

Note: From *DRAFT* Business Plan—See Appendix I

D. Annual Operation and Maintenance Costs

Table 5. Estimate of Sanitiation Utility Expenses

EXPENSE CATEGORY	ANNUAL ESTIMATE
Administration	$ 11,700
Labor	$ 92,000
Miscellaneous Materials	$ 1,600
Electricity (non-PCE rate $0.46/kWh)	$ 9,946
Heating & Equipment Fuel	$ 54,100
Water Treatment	$ 4,600
Sewage Treatment	$ 1,000
Insurance	$ 2,000
Sub-total: O&M Expenses	$ 176,946

Note: From *DRAFT* Business Plan—See Appendix I

E. Capital Cost per Home Served

When the 14 additional houses are served, 77 total units will be served by the haul system.

ITEM	ACTIVITY	ESTIMATED COST	HOMES SERVED	COST PER HOME SERVED
1	Water Treatment Plant Upgrade	$798,490	77	$10,370
2	Washeteria Upgrade	$315,370	77	$4,096
3	Boardwalk Improvements	$595,848	77	$7,738
4	Haul Tankage and Bathrooms (Additional Houses)	$450,912	14	$32,208
5	Water & Wastewater Haul System Improvements	$190,564	77	$2,475