

Attachment F.4 Benefit Cost Analysis Teller, Alaska

I. Introduction & Overview

The community of Teller, Alaska is located on a spit between Port Clarence and Grantley Harbor, 72 miles northwest of Nome, on the Seward Peninsula. Teller is connected to Nome by a 72 mile highway that is maintained by the ADOT. Teller has a population of 256 and is a predominantly Inupiat Eskimo community. Residents depend primarily on a subsistence lifestyle supplemented with a limited cash economy. There are two Federally Recognized tribes in Teller, the Native Village of Teller and the Native Village of Mary's Igloo.

In 2013 during a severe fall storm caused \$6,788,357 worth of damage in Teller, resulting in presidentially declared disasters (DR-4150-AK and DR-4160-AK).

II. BCA Summary

A summary of Benefits and costs for all projects is provided below. Additional information on individual projects can be found in Section III Project BCA Narratives. Projects 2 and 3 have a combined BCR as many of the calculated benefits are only applicable if both projects are constructed.

Aggregate Benefit Cost Ratios (BCR's) for Proposed Projects			
Project Description	Quantitative Benefits	Estimated Costs	BCR
1. Wind Energy Project	\$2,018,000	\$4,359,500	0.46
2. Innovative Seawall Project	\$81,514,000	\$8,717,000	9.35
3. Road Elevation for Flood Prevention			
4. Debris Removal	-0-	\$90,000	-0-
5. Water and Sewer Improvements	\$22,726,000	\$18,125,000	1.25
6. Elder Food Pantry	-0-	\$202,700	-0-
7. Community Garden	\$42,000	\$63,000	0.67
8. Community Development Building	\$1,755,500	\$3,865,500	0.45
9. Vocational Training	-0-	\$200,000	-0-
10. Recovery & Resiliency Study	-0-	\$250,000	-0-
Totals:	\$108,055,500	\$35,872,700	3.01

Direct Activity Delivery Cost (20%)		
Training, travel, grant management, project management, technical assistance, kick-off meetings and other supporting activity implementation	\$7,174,540	
Total with Direct Activity Delivery Cost	\$43,047,240	

III. Project BCA Narratives

BCA narratives for individual projects are provided below. Proposed projects focus on infrastructure, housing, and food and economic security.

Analysis calculations applicable to more than one project are summarized under the Analysis Process Applicable to Multiple Projects heading and includes such items as determining the return interval for future disaster events, population, and other similar items. Cited references are provided in the attached Appendices.

Analysis Process Applicable to Multiple Projects

Flood Elevation

The flood elevation in Teller was determined from several different sources. The basis for surface elevations in Teller is Community Mapping from the Alaska Department of Commerce, Community, and Economic Development. Steps for determining flood elevations are as follows:

Step 1: From *Storm-Surge Flooding on the Yukon-Kuskokwim Delta, Alaska* (September 2014)

- 1974 flood event equated to a water level measurement of 3.5 meters (11.48 feet) at the Tutakoke River gauge
- 2011 flood event equated to a water level measurement of 3.3 meters (10.82 feet) at the Tutakoke River gauge and a Nome tide gauge height of 2.7 meters (8.86 feet) above mean sea level

Step 2: From Army Corp of Engineers Flood Hazard Data City of Teller

- 1974 flood reached a depth of 29-inches above existing ground at the Post Office (2-inches above FF)
- Existing grade at the Post Office measured to be 11.21 which equates to a flood elevation of 13.63 feet

Step 3: Correlate Flood Data

- Flood Elevation of 13.63 feet correlates to a mean sea level measurement at Nome Tide gauge of 8.86 feet.
- Minimum existing grade at community is approximately 10-feet (Teller Power Plant)
- Maximum tide elevation where flooding will be observed = 8.86 feet minus 3.63 feet = 5.05 feet

Determining Flooding Return Interval

Maximum monthly tide elevation data for the Nome Tide Gauge was obtained from the National Oceanic and Atmospheric Administration (NOAA) for approximately 15 years (Jan 2000 to Aug 2015). Tidal maximums were compared to the Teller Flood Elevation determined previously. Results of the analysis are provided below:

- Flood 0 to 1 feet in depth: 11 events
- Flood 1 to 2 feet in depth: 5 events
- Flood 2 to 3 feet in depth: 3 events
- Flood more than 3 feet in depth: 3 events

Due to the effects of climate change it is expected that a similar or greater recurrence interval for similar flood events will occur in future years. For benefit analysis purposes it is assumed that the return interval of future flood events will be similar to those seen in the past 15 years.

Community Population

Community Population for Teller is 229 residents based on information from the 2010 US Census.

Project Useful Life

Project useful life was determined for each project based on guidance in Appendix D – Project Useful Life Summary provided in the FEMA BCA Reference Guide (June 2009)

BCA Narrative

Project 1: Wind Energy Project

Process for Preparing the BCA

The Benefit Cost Analysis (BCA) for the Wind Energy Project was prepared as follows:

Costs

Capital cost data was provided by Alaska Village Electric Cooperative (AVEC) in September 2015 to construct two Northwind 100-C Wind Turbines including tower, foundation, connection to the proposed power plant, and a connection to the water treatment plant.

Operations and Maintenance (O&M) costs were determined from the Saint Mary’s, Alaska Wind Power Conceptual Design Analysis prepared by V3 Engineering, LLC (September 2012). A cost of \$0.0469 per kWh was used for O&M costs (Dropbox: T-2).

Benefits

Quantified benefits include cost savings related to reduction in the use of fuel and the reduction in carbon emissions resulting from burning less diesel fuel. All calculations and references are provided in Appendix F.4.1. Benefits were calculated as follows:

Fuel savings is based on published data in the Alaska Village Electric Cooperative, Inc. (AVEC) "Teller Bulk Fuel and Rural Power System Upgrades" (2006) which estimated that 22,000 gallons of fuel would be saved by constructing two wind turbines. The cost of fuel is based on published data at <https://akenergygateway.alaska.edu/community-data-summary/1410730/> (June 2013) which provides a fuel cost of \$3.95 for Power Sector users.

Savings from carbon emissions is based on information provided in the FEMA Final Sustainability Methodology report which outlines methods to calculate benefit values for carbon emissions from vehicles (Appendix F. Reference). A similar process was utilized for carbon emissions from diesel generators. A value of 0.01018 metric tons of carbon per gallon of diesel fuel was provided in the report. A value for the Social Cost of Carbon of \$36.00 per metric ton and multiplied by 22,000 gallons of fuel saved per year.

Discount Factor

A discount factor of 7% was applied to all annual costs and benefits to calculate present dollar values of future costs and benefits.

Full Proposal Cost	Estimated Cost	Other Funding
A construction cost estimate is provided in Appendix F.4.1.	\$4,359,500	

Description of Current Situation and Problem to be Solved

The current cost of power in Rural Alaska is always expensive, but the cost in Teller is disproportionately elevated due to the age of their current power plant. This power plant was slated to be taken offline and decommissioned, but the storm event that resulted in the presidentially declared disaster disrupted those plans because the newly constructed tie-line between Brevig Mission and Teller was severed. The State of Alaska has a program to equalize the cost of power between Rural and Urban Alaska, call the Power Cost Equalization Program (PCE), but even with this program being implemented in Teller the cost of electricity is extremely elevated in Teller (.65 KWH) compared to one of our Urban areas,

Anchorage (.13 KWH). The PCE Program is a formula based program and is already providing the maximum benefit allowable for Teller, but this is not enough to make the cost of power affordable for critical infrastructure and municipal and tribal government services.

The community of Teller is dependent on diesel generators to provide their power needs. Diversifying the methods from which electricity can be generated will help the community be less dependent on importing and storing fuel. Importing fuel via barge service can be difficult to impossible during adverse weather events and storage tanks can become damaged during disasters. A wind-energy project will decrease utility costs and provide wind-heat production. The current cost of fuel is \$6.15 a gallon for gasoline and \$3.95 for diesel (PCE Rate). Electrical costs are \$0.65 per KWH.

Description of Proposed Project or Program

This project proposes to construct two 100 kW wind turbines and a connection to the proposed AVEC power plant. The connection will follow the Nome-Teller highway from the wind turbines to Teller.

An analysis of the potential use of wind energy in Teller was completed in 2004 and found that the proposed project could generate approximately 222,000 kWh of electricity per year (Dropbox: T-3).

The Project Useful Life for the Wind Farm is 50 years.

Wind Energy was determined to be the best fit for Teller in the Bering Straits Regional Energy Plan. (Dropbox: T-6)

Description Risk to the Community if the Proposal is Not Implemented

The community is currently dependent on diesel generators to provide power. AVEC is currently in the process of constructing a new power plant and fuel storage facility that will be above the historical flood elevation. The City's fuel tank farm is on the shores of Grantley Harbor and, although surrounded by a dike, is vulnerable to damage from disaster events. Diesel fuel may not be able to be delivered during disaster events and the community could be at risk to prolonged periods without power if fuel tanks are damaged and /or reserves are depleted.

The current high cost of electricity will remain and will likely increase as fuel prices increase over time. Wind generation lowers the cost to generate power and costs are expected to remain relatively steady throughout the life of the project which will help mitigate the high cost of fuel.

List of Benefits and Costs

A list of project benefits and costs and associated computations is provided in Appendix F.4.1. Project benefits include:

- The community will be less dependent on fuel to provide power to the community. The community will receive a social benefit by improved peace of mind from having redundant sources of electricity.
- The cost to generate power will be reduced with wind turbines and therefore the cost of electricity to the residents of Teller is expected to decrease. The amount of the decrease is unknown at this time and was not quantified.
- Excess heat generated from the wind turbines can be utilized to heat community buildings and structures, further reducing energy costs to the community.

A copy of the BCA is provided in Appendix F.4.1.

Economic Revitalization:

Through the decreased costs of utilities, residents and the local governments will have the ability to refocus their economic resources to meeting their unmet needs. There are many worthy projects and needed Operations and Maintenance needs that go unfunded each year due to the large percentage of their budget that is allocated for utilities. The City of Teller generates \$135,500.00 in revenue annually and expends \$18,225.00 on utility costs (Dropbox: T-5). The City of Teller is fortunate that they share a building with the school district maintenance rooms, so they are able to capitalize on the waste heat generated by the waste to heat used oil burner decreasing their utility costs. The tribal government buildings, school, medical center, and bingo hall do not share a building with another entity. Providing reasonably priced utility rates for the community of Teller will allow these critical services to refocus much of their budgets towards their current missions allowing Teller's local economy and level of services to be revitalized.

Social Value:

Decreasing the cost of electricity in Teller will provide psychological relief for its community members. Currently community members conserve power at every opportunity because of the extreme cost of electricity. While this may seem like a model lifestyle on paper, the reality is a home that is dimly lit due to conservation of lighting and concentrated cooking events to prevent the prolonged use of appliances. Providing freedom from extreme conservation will provide psychological relief for the residents in Teller.

Descriptions of Risks to Ongoing Benefits

Wind is a variable and generally unpredictable source for power generation. Climate change and seasonal variations may change wind patterns and make wind generation a more or less reliable source of power for the community.

Assessment of Challenges Faced with Implementing the Proposal

Wind turbines have been installed in many remote communities throughout Alaska and no unusual challenges are anticipated for construction.

Metrics

The following metrics will be used to determine the impacts of the Wind Energy Project:

Resiliency: A redundant power supply will make the community more resilient. Measuring the number of times the community utilizes the wind energy project.

Environmental Value: Reduced fossil fuel consumption.

Economic Revitalization: The State of Alaska proposes to track the decreased cost of utilities for the City of Teller and the 2 Tribal Governments in Teller, the Native Village of Teller and the Native Village of Mary's Igloo. There will be a short period of time between the construction of the power plant and the implementation of the wind turbines, and this will allow quantitative comparison between the current cost of electricity, the cost with a new power plant and then the cost with alternative energy and wind heat production offsetting heating fuel costs. These metrics will allow a true comparison of the cost differences in Teller between an old power plant, a new power plant, and a new power plant with an alternative energy component. This information will be used as a model for other communities in the Bering Straits Region as they move forward with their regional energy plan (Dropbox: T-6).

Social Value: Qualitative data will be collected through surveys. The State of Alaska proposes to survey the community and compile information on how having decreased utility costs has improved their quality of life and psychological health. We will share this information with the Bering Straits Health

Corporation, Behavioral Health Department.

BCA Narrative

Project 2: Innovative Seawall Improvements

Process for Preparing the BCA

The Benefit Cost Analysis (BCA) for the Innovative Seawall Improvements was completed in conjunction with Project 3: Road Elevation for Flood Projects as many of the benefits are related to avoided damaged from future flood events and will only be realized if both projects are constructed. The BCA was prepared as follows:

Costs

Project costs were determined by estimating unit costs for various project components and multiplying the unit prices by the total quantity of each component. Unit prices were developed from published cost information in *RS Means Heavy Construction Cost Data* multiplied by the RS Means City Cost Index (1.183) and the Alaska Department of Education Geographic Area Cost Factor for Teller (1.812). A detailed cost estimate is provided in Appendix F.4.2&3. Quantities were developed based on AutoCAD measurements and conceptual cross sections of the proposed improvements.

Operations and Maintenance Costs were not calculated for the Innovative Seawall Project as Teller already maintains the existing failing seawall and the proposed project is not anticipated to increase the required effort.

Benefits

Calculated benefits were based on the proposed improvements (Seawall and Elevated Roadway) preventing future floods from affecting the community. All calculations and references are provided in Appendix F.4.2&3 and Appendix F. Reference. Benefits include:

1. Reduction in expected property damage due to future/repeat disasters.
 - Future flood events at specific depths (0-1 ft, 1-2 ft, 2-3 ft, and 3-4 ft) were estimated based on previous flood events.
 - Building elevations, types (residential, commercial, public), and areas (sq. ft) were determined for all structures in the flood zone based on AutoCAD drawings from the Department of Community and Economic Development.
 - Average building values were determined based on data from the 2000 US Census. Prices were inflated to 2015 values based on the online inflation calculator provided by the US Bureau of Labor Statistics. Average square foot area of residential homes was calculated. The average home value of \$93,070 was divided by the average home area of 1,153.3 square feet to determine an average home value of \$80.70 per square foot.
 - The average home value was multiplied by the area of each structure in the flood plane to determine an individual cost for each structure.
 - Based on the elevation of each structure, a determination of whether or not each structure would be affected by a flood event of a specific depth was made (i.e. a structure with building elevation of 11.5 feet would not be affected by a flood that was 0-1 feet in depth but would be effected during deeper floods.
 - Structure damage costs were determined based on the US Army Corp of Engineers Catalog of Residential Depth-Damage Functions (May 1992). Damage percentages were based on

- Table A-1 (One Story, No Basement – Structural) utilizing the Pacific Ocean Division category. A total damage value for structures for each flood event (0-1 foot flood, 1-2 foot flood, 2-3 foot flood, and 3-4 foot flood) was determined.
- The total damages were applied to future anticipated flood events over a 30 year design life of the project with a discount factor of 7% applied to future benefits.
2. Reduction in Expected Damage to Property Contents Due to Future/Repeat Disasters
 1. Reduction in content damage was calculated similarly to the Reduction in structure damage with the following exceptions.
 2. Value of structure contents was estimated to be 50% of structure value based on guidance provided on Page 4 of the Army Corp of Engineers Catalog of Residential Depth-Damage Functions (May 1992).
 - Damage percentages were based on Table A-14 (One Story, No Basement – Contents) utilizing the Pacific Ocean Division category. A total damage value for structure contents for each flood event (0-1 foot flood, 1-2 foot flood, 2-3 foot flood, and 3-4 foot flood) was determined.
 - The total damages were applied to future anticipated flood events over a 30 year design life of the project with a discount factor of 7% applied to future benefits.
3. Reduction in Expected Displacement Costs due to Future/Repeat Disasters
 - Displacement Cost = (Disruption Cost x Sq. Ft) + (Rental Cost x Sq. Ft x Displacement Time in Months) as described in the FEMA Benefit-Cost Analysis Re-engineering (BCAR) publication.
 - Rental costs per month based on Table 2 provided in BCAR. Residential Rental Costs based on Multi-Family Dwelling: Duplex = \$0.65 per square foot. Commercial Rental Costs Based on Retail Trade = \$1.25 per square foot Public Rental Cost based on Medical Office/Clinic = \$1.46 per square foot.
 - Disruption Cost (\$/square foot) is provided in Table 2 of BCAR. Residential Disruption Costs based on Multi-Family Dwelling: Duplex = \$0.88 per square foot. Commercial Disruption Costs Based on Retail Trade = \$1.16 per square foot. Public Disruption Cost based on Medical Office/Clinic = \$1.45 per square foot
 - Recovery Time by Occupancy Type and Flood Depth is provided in Table 3 of BCAR. Assume a 9 month Recovery Time (minimum per Table 3 in BCAR for 0-4' Flood).
 - Area of damage for each category of structure (residential, commercial, and public) were determined from previous calculations for structure damage based on depths of future anticipated flood events. Rental and displacements costs were determined based on damage areas multiplied by the Rental and Displacement costs listed above.
 - The total displacement costs were applied to future anticipated flood events over a 30 year design life of the project with a discount factor of 7% applied to future benefits.
 4. Reduction in Expected Solid Waste Removal Costs due to Future/Repeat Disasters
 - Tipping fees for debris removal determined from Table 2 of FEMA Final Sustainability Benefits Methodology Report (FSBMR). A value of \$37.74 was specified for use in Alaska.
 - Amount of debris generated during a flood event determined from Table 3 of FSBMR. Total

- quantity of debris generated per residential structure is 6.875 tons based on a residence without a basement.
- Number of affected residents was determined based on previous calculations for structure damages. The debris quantity was multiplied by the number of affected residential properties for each flood event (0-1 foot flood, 1-2 foot flood, 2-3 foot flood, and 3-4 foot flood) and a total debris removal cost was calculated.
 - The total debris removal costs were applied to future anticipated flood events over a 30 year design life of the project with a discount factor of 7% applied to future benefits.
5. Reduction in Cost of Treatment of Psychological Issues from Future/Repeat Disasters
- Total cost for mental health treatment for severe and mild/moderate illnesses with effect of prevalence and course determined from Table 6 in FSBMR. Cost of \$2,443.10 per person in population, per traumatic event was provided.
 - Calculation assumes that traumatic event will only occur if the flood depth exceeds 2-feet.
 - Cost of \$559,469.90 in psychological treatment ($\$2,443.10 \times$ Teller population of 229) was calculated for each traumatic event.
 - The total psychological treatment costs were applied to future anticipated flood events over a 30 year design life of the project with a discount factor of 7% applied to future benefits.
6. Reduction in Cost of Lost Productive Hours due to Psychological Issues from Future/Repeat Disasters.
- Total cost for productivity loss due to severe mental illness determined from Table 7 in FSBMR. Cost of \$8,736 per productive person in household, per traumatic event was provided.
 - 2010 US Census data lists 72 householders and 14 spouses living in community for a total of 86 productive persons.
 - Calculation assumes that traumatic event will only occur if the flood depth exceeds 2-feet.
 - Cost of \$751,296 in lost productivity ($\$8,736 \times$ 84 productive persons) was calculated for each traumatic event.
 - The total lost productivity costs were applied to future anticipated flood events over a 30 year design life of the project with a discount factor of 7% applied to future benefits.
7. Reduction in Cost of Loss of Function of Emergency Medical Service (clinic) from Future/Repeat Disasters
- Calculation base on outline provide on Pages 17 and 18 of BCAR.
 - EMS assumed to be interrupted for 3 days per event when flood depth exceeds 1 foot. Nearest EMS available for response is in Nome, Alaska which is 72 road miles away.
 - Total cost of loss of EMS calculated to be \$6,462.95 per flood event.
 - The total costs for loss of EMS were applied to future anticipated flood events over a 30 year design life of the project with a discount factor of 7% applied to future benefits.
8. Reduction in Cost of Loss of Business from Future/Repeat Disasters
- Total sales tax revenues for City of Teller for 2015 determined from City of Teller Budgeted

Operating Revenues. Total sales tax collected was \$37,647. Sales tax rate is 3%.

- Daily business revenue of \$3,438.08 calculated from annual sales tax revenue. Businesses assumed to be interrupted for 3 days per event when flood depth exceeds 1 foot.
- Total cost of loss of business calculated to be \$10,315.25 per event.
- The total costs for loss of business were applied to future anticipated flood events over a 30 year design life of the project with a discount factor of 7% applied to future benefits

9. Reduction in potential for wastewater contamination due to flooded lagoon

- Flood waters have overtopped the berms on the existing sewage lagoon during past events. This causes wastewater to be spread into the community, increasing the risk for illness and disease after disasters. The benefit cannot be easily quantified due to lack of information on illnesses caused by from previous events.

Full Proposal Cost	Estimated Cost	Other Funding
A construction cost estimate is provided in Appendix F.4.2&3.	\$4,919,000	

Description of Current Situation and Problem to be Solved

An existing seawall in Teller has protected the community since circa 1980 and has reached the end of its useful life. The existing seawall is situated along the spit on the west side of the city, which separates Port Clarence to the west and Grantley Harbor to the east. The seawall was intended to protect the city from high waves which occur during storm surge events associated with fall storms and consists of a variety of materials including a wood retaining wall, sheet piling, riprap and gabion baskets and has failed in several locations (Dropbox: T-7). Storm surges now flood into the village unimpeded and threaten the school, sewage lagoon, homes, and businesses (Dropbox: T-8). The seawall was evaluated by FEMA, and a project worksheet was completed in 2011, but before repairs could be conducted, the seawall sustained additional damage during the subsequent storm events. FEMA ruled that the seawall repairs were ineligible because they were unable to distinguish between the damages of the two natural disasters.

Description of Proposed Project or Program

This project proposes to construct a resilient seawall to replace the existing seawall and protect Teller’s critical infrastructure and mitigate the threat of erosion and flooding to the public health and to the environment. The proposed seawall improvements include removal of the existing seawall components and replacing with a new sheet pile wall, rip rap and a gravel berm set back from the active beach zone. The new sheet pile wall would extend approximately 1,000 feet from the bluff near the cemetery to the north along the beach. The top of the sheet pile wall would be constructed to elevation 14, the historic flood level for Teller. Large riprap would be placed on the ocean side of the wall to de-energize wave action before it reaches the sheet pile wall. Additionally, a gravel berm would be constructed above the sheet pile wall for additional storm surge protection.

Description Risk to the Community if the Proposal is Not Implemented

If a new seawall is not constructed, future flood events will continue to enter into the community causing damage to property and structure, psychological harm, lost productivity and loss business.

Although the existing seawall is failing, it still provides some protection to the existing school sewage lagoon. If the existing seawall fails, the sewage lagoon is at serious risk to also fail and discharge its

contents on to the beach and into the ocean. The community will also lose the use sanitation facilities at the school and washeteria.

List of Benefits and Costs

A list of project benefits and costs and associated computations is provided in Appendix F.4.2&3.

Descriptions of Risks to Ongoing Benefits

The elevation of the seawall is based on flood of record elevation. Climate change may affect flood levels and increase the flood of record elevation. This could be mitigated by additional research during design to determine if the appropriate seawall elevation matches what is currently proposed.

Assessment of Challenges Faced with Implementing the Proposal

Equipment and materials necessary to construct the seawall are available in Nome, Alaska and can easily be driven or barged to Teller. Construction will need to avoid existing infrastructure along the beach which may require some construction at low tides or from an anchored barge. Neither option is considered to be a significant challenge to construction.

Metrics

The following metrics will be used to determine the impacts of the Seawall and Roadway Project:

Resiliency Value: Minimizing the amount of emergency efforts needed to address erosion.

Economic Revitalization: The State of Alaska will track the impact of future flood events and the resulting damage. The State of Alaska will also track the availability of critical services before, during, and after a storm event to determine that the seawall and road elevation project addressed the current deficiencies. These two benefits will allow businesses to reopen faster after a storm event and will result in economic resiliency in the face of future natural disasters.

Social Value: The State of Alaska will qualitatively track the psychological relief that the community members experience knowing that they are better protected before, during and after a storm event. We will also ask questions to local businesses and critical services about how quickly they were able to resume normal operations after the project compared to previous storm events.

Environmental Value: The State of Alaska will track how many feet of shoreline were saved by constructing the seawall and elevating the roads. Erosion in Teller is slow but persistent and that can be tracked easily by taking measurements. The State of Alaska Solid Waste Program just completed a 3-year Coastal Erosion study called the Waste Erosion Assessment and Review project and collected shoreline erosion information for Teller. This State of Alaska can use this data as a baseline for how much erosion and environmental degradation is prevented in the future by constructing the seawall and elevating the roads in Teller.

BCA Narrative

Project 3: Road Elevation for Flood Prevention

Process for Preparing the BCA

The Benefit Cost Analysis (BCA) for the Road Elevation for Flood Prevention was completed in conjunction with Project 2: Innovative Seawall Improvements as many of the benefits are related to avoided damaged from future flood events and will only be realized if both projects are constructed. The BCA was prepared as follows.

Costs

Project costs were determined by estimating unit costs for various project components and multiplying the unit prices by the total quantity of each component. Unit prices were developed from published cost information in *RS Means Heavy Construction Cost Data* multiplied by the RS Means City Cost Index (1.183) and the Alaska Department of Education Geographic Area Cost Factor for Teller (1.812). A detailed cost estimate is provided in Appendix F.4.2&3. Quantities were developed based on AutoCAD measurements and conceptual cross sections of the proposed improvements.

Operations and Maintenance Costs were not calculated for the Road Elevation for Flood Prevention project as Teller already maintains the existing roadway and the proposed project is not anticipated to increase the required effort.

Benefits

Benefit calculations for the Road Elevation for Flood Prevention project are described under Project 2: Innovative Seawall Improvements and not repeated here.

Discount Factor

A discount factor of 7% was applied to all annual costs and benefits to calculate present dollar values of future costs and benefits.

Full Proposal Cost	Estimated Cost	Other Funding
A construction cost estimate is provided in Appendix F.4.2&3.	\$3,798,000	

Description of Current Situation and Problem to be Solved

The primary road in Teller, Front Avenue, extends along Grantley Harbor on the east side of the city from the spit to where it connects with Bob Blodgett Highway. Approximately 1.5 miles of Front Avenue sit below the historic flood level (elevation 14) and is under water during flood events. As such, there is no evacuation route for residents to move to higher ground when flood waters enter the community. Access to the community medical center is also cut-off for 50% of the residents in Teller when this road is under water during a flood event.

Description of Proposed Project or Program

In order to provide a safe evacuation route for the residents of Teller and prevent flood waters from entering the community, Front Avenue will be raised to a finished surface elevation of 14. The existing roadway is approximately 20-feet wide and the proposed road would match that width. Embankment slopes are assumed to be a minimum of 2 feet horizontal to 1 foot vertical. Several areas along the roadway embankment will require erosion protection measures (i.e. rip rap revetment) to protect from

wave action. Culverts under the roadway will be installed with backflow prevention devices to prevent seawater from flowing into the community.

This road elevation project will also allow all residents to access medical care before, during and after a storm event if needed. Without access to the local medical center, 50% of the population would be forced to drive to Nome (68 miles) during adverse conditions to receive medical care. Airplane and medivac services are very restricted in Alaska during storm events. Air traffic to Rural Alaska is limited to bush planes, which are small planes that can carry 4-12 passengers depending on how much cargo they are also carrying. These planes are unable to fly in fog or inclement weather, so are not a reliable means to access medical care during a storm event. If a situation is dire enough, a military helicopter is dispatched to provide evacuation medical transportation, but that generally takes multiple hours and an often a non-existent phone/internet connection to request aid. Providing reliable and resilient access to the local medical center is the resilient choice to address this challenge.

Psychological stress can also be avoided by ensuring that families are not separated during and after a natural disaster.

Description Risk to the Community if the Proposal is Not Implemented

If the roadway is not elevated, future flood events will continue to enter into the community causing damage to property and structure, psychological harm, lost productivity and loss business. Residents may also be stranded in flooded areas with no access to higher ground.

Other risks include loss of life or lifelong medical complications that could have been avoided if access to lifesaving medical care was accessible.

List of Benefits and Costs

A list of project benefits and costs and associated computations is provided in Appendix F.4.2&3

Descriptions of Risks to Ongoing Benefits

The elevation of the proposed roadway is based on flood of record elevation. Climate change may affect flood levels and increase the flood of record elevation. This could be mitigated by additional research during design to determine if the appropriate roadway elevation matches what is currently proposed.

Assessment of Challenges Faced with Implementing the Proposal

Equipment and materials necessary to construct the roadway and embankment are available in Nome, Alaska and can easily be driven or barged to Teller. No significant challenges are anticipated with regard to construction of the roadway improvements.

Metrics

The following metrics will be used to determine the impacts of the Road Elevation Project:

Resiliency Value: Tracking the number of times the road is closed from a storm event.

Economic Revitalization: The State of Alaska will track the impact of future flood events and the resulting damage. The State of Alaska will also track the availability of critical services before, during, and after a storm event to determine that the seawall and road elevation project addressed the current deficiencies. These two benefits will allow businesses to reopen faster after a storm event and will result in economic resiliency in the face of future natural disasters.

Social Value: The State of Alaska will qualitatively track the psychological relief that the community

members experience knowing that they are better protected before, during and after a storm event. We will also survey the community and ask about how being able to access medical care and their family members during and after a storm event affected them.

We will also ask questions to local businesses and critical services about how quickly they were able to resume normal operations after the project compared to previous storm events.

Environmental Value: The State of Alaska will track how many feet of shoreline were saved by constructing the seawall and elevating the roads. Erosion in Teller is slow but persistent and that can be tracked easily by taking measurements. The State of Alaska Solid Waste Program just completed a 3-year Coastal Erosion study called the Waste Erosion Assessment and Review project and collected shoreline erosion information for Teller. This State of Alaska can use this data as a baseline for how much erosion and environmental degradation is prevented in the future by constructing the seawall and elevating the roads in Teller.

BCA Narrative		
Project 4: Debris Removal		
Process for Preparing the BCA		
<p>The Benefit Cost Analysis (BCA) for Debris Removal is based on qualitative benefits as determined in conversations with community representatives.</p>		
Full Proposal Cost	Estimated Cost	Other Funding
A construction cost estimate is provided in Appendix F.4.4.	\$90,000	\$0
Description of Current Situation and Problem to be Solved		
<p>Existing abandoned debris, buildings, fuel tanks, 55-gallon drums, and equipment pose physical and environmental hazards to the community of Teller. Previous flood events have caused materials to be moved around the community, including a fuel tank being washed away from Teller to the nearby community of Brevig Mission. Cleanup of debris after it has been disbursed is difficult and costly. Removal of the debris while it is still consolidated is more efficient and minimizes risks to the community and environment.</p> <p>Prevention of chemicals, fuels, and debris from mixing together and being widely distributed within homes, the community, and partially washed out to the nearby harbor and sea is less expensive than trying to clean it up after a storm event. Unfortunately most funding sources available for debris removal are reactionary, not preventative, and so many communities in Alaska are unable to take the preventative steps needed to allow them to recover more quickly after a storm event. Instead because of a lack of financial resources, many Rural communities, including Teller are forced to endure expensive and sometimes near impossible clean-up situations after a natural disaster. Alaska is the only State in the United States that has an exemption for Federal waste regulations, allowing Alaska to have a Class III Landfill designation for Rural Alaska. These landfills are not designed to accept hazardous waste and cannot accept most debris after a natural disaster if chemicals are allowed to impregnate the debris. Preventing the mixing of compounds and wide distribution of debris allows a community to ship out these materials for proper disposal and recycling at a significantly reduced rate, if they have the funding to do so.</p>		
Description of Proposed Project or Program		
<p>Remove existing hazardous material and scrap metal and transport out of Teller for proper disposal and/or recycling. Debris could pose an environmental and/or public safety hazard in the aftermath of another natural disaster.</p>		
Description Risk to the Community if the Proposal is Not Implemented		
<p>The existing debris includes fuel tanks, bulky and sharp scrap metal, batteries, 6 uncategorized 55 gallon drums and fluorescent lights that could be harmful to the community and environment if damaged or moved during a flood event. Existing derelict buildings are dangerous to those working around them and children playing in the community. The community lacks the financial means to remove the debris and/or secure them from being further damaged and/or disbursed throughout the community during a future flood event.</p> <p>The community has taken steps to secure all of these materials except the metal debris in warm secured storage to prevent exposure to the elements and releases into the environment. The only warm storage</p>		

building in Teller is where these materials are stored but it is in an area that is impacted by flood waters. They have taken all of the correct steps in managing this material with their local resources, but they lack the financial resources to take the last step, which is shipping it out of the community for proper disposal and/or recycling.

The community enjoys a relatively pristine environment on which they depend on for their primarily subsistence lifestyle. Fishing, berry picking, and similar subsistence activities provide a significant portion of the native diet and could be threatened if contaminated by disbursement of debris during a future flood event.

List of Benefits and Costs

Due to the difficulty in quantifying cleanup efforts for debris (other than for residential/commercial structures) a BCR was not calculated for this project. Qualitative project benefits for this project include:

- Avoided future environmental harm from debris being washed away during future flood events.
- Reduced cost of cleaning up debris after future flood events, including the potential of collecting debris that has been washed out to sea (fuel tanks etc...)
- Reduced risk to community of damaged and derelict buildings collapsing and harming individuals in the community.

A copy of the BCA is provided in Appendix F.4.4.

Descriptions of Risks to Ongoing Benefits

Debris removal can be dangerous work and the risk of harm is ever-present. Additionally removal and transport of hazardous materials could damage the environment if not handled properly. Adequate training to ensure that workers act in a safe and environmentally conscientious manner is critical to avoiding such risks.

Assessment of Challenges Faced with Implementing the Proposal

A similar debris removal effort was recently undertaken in the nearby community of Brevig Mission which proves the project is viable in Teller. Workmen tasked with debris removal will be trained in safe practices and handling of hazardous materials. No significant challenges with implementing the proposed project are anticipated.

Metrics

The following metrics will be used to determine the impacts of the Debris Removal Project:

Resiliency Value: Reduced incidents of injury from improperly stored debris awaiting removal.

Environmental Value: It is standard practice to track debris removal projects by tracking and recording the number of pounds removed throughout the project. The State of Alaska proposes to utilize this method, but to also track all hazardous materials taken out separately regardless of total weight.

Social Value: The State of Alaska will survey the community and ask them how they feel about their community after the project is complete. It can be psychologically depressing to live in an environment that includes derelict buildings that are falling apart and not have a mechanism in place to remove this blight on the community. The State of Alaska will determine the increase in community pride and psychological health after the project.

Economic Value:

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The State of Alaska will calculate the amount of debris that was removed and provide an estimate of how much that prolonged the lifespan of their current landfill. This project will also provide jobs and training opportunities for Low and Moderate Income individuals in Teller.

BCA Narrative

Project 5: Water and Sewer Improvements

Process for Preparing the BCA

The Benefit Cost Analysis (BCA) for the Water and Sewer Improvements project was prepared as follows:

Costs

Capital cost data was provided in the Teller Sanitation Facilities Master Plan prepared by CE2 Engineers, Inc. Cost data was inflated using a 3% inflation rate to estimate 2015 costs.

Operations and Maintenance (O&M) costs were determined from the Teller Sanitation Facilities Master Plan prepared by CE2 Engineers, Inc. Cost data was inflated using a 3% inflation rate to estimate 2015 costs (Dropbox: T-4).

Benefits

Quantified benefits include revenues from providing sanitary services and a reduction in the cost of loss of water service that affects the community on an annual basis. All calculations and references are provided in Appendix F.4.5 and Appendix F. Reference. Benefits were calculated as follows:

1. City revenue from providing sanitary services (honey bucket haul, watering point, and washeteria facilities) was determined from the Teller Sanitation Facilities Master Plan prepared by CE2 Engineers, Inc (Dec 2013). Cost data was inflated using a 3% inflation rate to estimate 2015 costs.
2. Reduction in Cost of Loss of Water Service
 - Community uses a surface water source in Coyote Creek. Water is transported to the water treatment plant through an uninsulated HDPE pipe which cannot be easily drained. The pipeline freezes in the winter making it possible to treat water only during summer months. The benefit calculations assume that pumping can occur from May 20 to September 25 which correlates with the typical dates that the temperature remains above freezing throughout the night. Discussions with water system engineers indicate that the supply pipeline is frozen until mid-June and that Coyote Creek is too low to provide sufficient water until the rainy season begins in August.
 - Water is primarily treated during August and September and stored in a 1,000,000 gallon water storage tank for use during the winter. This volume is not sufficient to last the entire winter assuming average demand conditions (10 gallons per capita per day residential and 25 gallons per person per day for the school which is piped). On average, the community will be without a potable water source for 54 days per year.
 - The economic impact of loss of water service is provided as a standard value on Page 40 of the FEMA Benefit-Cost Analysis Re-engineering (BCAR) and is listed as \$103 per capita per day (2010 dollars). With a population of 229 in Teller, this equates to a total cost of \$23,587 per day of economic impact. An online inflation calculator from the Bureau of Labor and Statistics was used to convert the cost to 2015 dollars for a total daily impact of \$25,778.51.
 - The daily cost was multiplied by the average number of days that the community is without a potable water source (54 days) for a total annual cost of loss of water service equal to

\$1,447,728.99.

- The total costs for loss of water service were applied to future anticipated flood events over a 30 year design life of the project with a discount factor of 7% applied to future benefits.

3. Additional qualitative benefits as determined in conversations with community representatives.

Discount Factor

A discount factor of 7% was applied to all annual costs and benefits to calculate present dollar values of future costs and benefits.

Full Proposal Cost	Estimated Cost	Other Funding
A construction cost estimate is provided in Appendix F.4.5.	\$18,125,000	

Description of Current Situation and Problem to be Solved

Honey Bucket Lagoon

The City of Teller provides a haul service for residential honey buckets (lined 5-gallon bucket for human waste) to a honey bucket lagoon located at the City Landfill. The existing honey bucket lagoon is seriously over capacity and needs to be replaced for continued sanitation operations.

Water Treatment Plan & Washeteria

The existing water treatment plant is operated by the local school. Residents with ATV's and/or snow machines primarily self-haul drinking water from the water treatment plant to their homes. The existing washeteria has two inoperable toilets and a single washer and dryer. The existing water storage tank does not have capacity to sustain average water demands over the winter months when water cannot be processed at the water treatment plant.

Description of Proposed Project or Program

The proposed project will construct a new honey bucket lagoon for disposal of human waste and will construct a new water treatment plant, with water storage tank and washeteria for use by the community. The improvements were identified in the Teller Sanitation Master Plan and selected by the community from several alternatives (Dropbox: T-4).

New Honey Bucket Lagoon

This project will entail closing and covering the existing honey bucket lagoon, construction of a new honey bucket lagoon with more convenient and sanitary means for dumping, and purchase of new honey bucket collection and haul vehicles.

New Water Treatment Plant & Washeteria

This project will upgrade the seasonal water intake structure in Coyote Creek; construct a new water treatment plant and washeteria at Newsite (out of flood zone), construct a new 1,000,000 gallon water storage tank, and install new water piping. The existing water treatment plant will be maintained to supply treated water to the school and other piped users.

The Community Leaders recognized their financial limitations with regards to Operation and Maintenance Costs and decided to not pursue a piped water and sewer system. They are able to operate and maintain the current solid waste and honey bucket system, and have proven capacity in managing a haul system. They passed a resolution stating their preference for a haul system over piped

water and sewer system.
Description Risk to the Community if the Proposal is Not Implemented
Communities without access to clean drinking water and basic sanitation needs experience elevated levels of respiratory infection and rashes which can lead to increased medical care costs and more sick days.
List of Benefits and Costs
<p>A list of project benefits and costs and associated computations is provided in Appendix F.4.5. Project benefits not included in the BCA include:</p> <ul style="list-style-type: none"> • Honey bucket spills provide unsanitary conditions for operators to work in. Vehicles used to haul honey buckets to lagoon track contamination back through the community. Improved disposal methods will help reduce unsanitary conditions. The benefit cannot be easily quantified due to lack of information on illnesses caused by from wastewater spills. • Revenue will be generated from residential and commercial user fees, school user fees, and washeteria user fees. • Revenue will be generated from residential, commercial, and school user fees and washeteria users. • Community fills 1,000,000 gallon water storage tank in fall to last throughout the winter. Drinking water cannot be produced in winter due to the supply piping being above ground and uninsulated. With current water storage, average winter conditions, and average water demands, the community will have no water for approximately 54 days before spring weather conditions allow water production again.
Descriptions of Risks to Ongoing Benefits
<p>The proposed water and sewer improvements do not provide the level of sanitation that would be provided with piped water and sewer. A piped water and sewer system, although preferable, is considered unreasonable due to the extraordinarily high capital cost. The higher than average risk of sickness and disease in the community as a result of relatively poor sanitation infrastructure, in comparison to a piped community, will remain present after the project is constructed.</p> <p>Improvements proposed with this project will mitigate the risks by ensuring they can also be utilized in a piped water and sewer system should funding become available in the future.</p>
Assessment of Challenges Faced with Implementing the Proposal
Equipment and materials necessary to construct the proposed water and sewer improvements are available in Anchorage and Nome, Alaska and can easily be transported to Teller. No significant challenges are anticipated with regard to construction of the proposed improvements.
Metrics
<p>The following metrics will be used to determine the impacts of the Teller Water and Sewer Improvement Project:</p> <p>Resiliency Value: The improved water and sewer system is not expected to be impacted by flooding or erosion. Tracking these incidents (or lack thereof).</p> <p>Economic Revitalization: That State of Alaska in conjunction with the City of Teller will compare the number of sick days in previous years to the number of sick days taken by City staff after the water and</p>

sewer is completed. The State of Alaska will coordinate with the local medical center to track the rates of respiratory infections before and after the water and sewer project is completed.

This project will also create sustainable jobs in Teller. A Water Plant Operator, Janitor, Maintenance Coordinator, and other jobs will be required with the completion of this project. These jobs will be sustainable through the collection of user fees and commercial rates for water and sewer services.

Social Value: The State of Alaska will survey the community and determine the psychological perception of having water and sewer available. This year the flu spread throughout the community and heavily impacted the education system and all critical services provided in Teller due to the long duration (6-8 weeks) that it took for the illness to run its course through the community. The State of Alaska will ask the community if they feel having water and sewer prevented the continued spread of illness after the project by increasing personal hygiene, including but not limited to, the ability to wash their hands and the ability to clean their homes during an outbreak of the flu or other illnesses.

Environmental Value: Locating these facilities outside the flooding area will result in fewer environmental impacts associated with storm events.

BCA Narrative		
Project 6: Elder Food Pantry		
Process for Preparing the BCA		
The Benefit Cost Analysis (BCA) for the Elder Food Pantry is based on qualitative benefits as determined in conversations with community representatives.		
Full Proposal Cost	Estimated Cost	Other Funding
A construction cost estimate is provided in Appendix F.4.6.	\$202,700	
Description of Current Situation and Problem to be Solved		
Traditional foods make up the majority of the diet in Teller, but the community lacks the storage space available and the canning, refrigeration, and freezers necessary to store excess traditional foods when they are available. Access to proper nutrition is essential for the vulnerable elderly population. Many elders have limited mobility, and their ability to hunt, fish and gather their own foods has significantly decreased. The community in Teller would like to have the ability to store and share subsistence foods with others in the community throughout the year.		
Description of Proposed Project or Program		
<p>The food pantry will be located in an office space at the Teller Traditional Council (TTC) Office Building. The TTC has a chest freezer and will use grant funds to purchase an energy efficient refrigerator and shelves to properly store food items. The pantry will be stocked with traditional food items: reindeer meat, moose meat, caribou meat, salmon, migratory bird meat, sea gull eggs, seal meat, seal oil, and berries. Traditional foods will be purchased or donated locally. For example, a local reindeer herd may be harvested for \$300/animal. Black meat (seal) and seal oil can be purchased locally for \$400/5 gallon bucket. Donations of traditional foods will be accepted and will be stocked in the pantry.</p> <p>To supplement the traditional foods, contemporary healthy food items will be purchased from local stores and stocked in the pantry. Contemporary food items will include whole grains, dairy, and fruits and vegetables. The Food Pantry Assistant along with the Tribal Coordinator will do grocery shopping for these items. The Food Pantry Assistant and community and youth volunteers will assist with food processing, gathering donations, and keeping food pantry stocked, organized, and properly maintained. Twice a month the Food Pantry Assistant and community and youth volunteers will put together a brown box weighing approximately 15 pounds for each of the 15 village Elders that will contain a balanced Alaska Native diet consisting of a mixture of traditional and contemporary foods. Brown Boxes will be available for pick up and may also be delivered by Food Pantry Assistant in TTC's van.</p> <p>The project will provide Elders the opportunity to gather healthy foods by providing van excursions to local berry and green picking subsistence locations during the summer and fall months (2014). Excursions will be once a week during the summer and fall months.</p>		
Description Risk to the Community if the Proposal is Not Implemented		
Alaska Native Elders living in rural Alaska have reported high rates of food insecurity. Elders living in rural Alaska depend upon extended kin food sharing networks for their portion of subsistence harvested foods. There is concern among village Elders that youth are changing and may not understand the importance of traditional food systems. Also, some Elders have reported first-hand accounts of periods of hunger and starvation during their lifetime (University of Alaska 2001).		

List of Benefits and Costs

A BCR was not calculated for this project. Project benefits for this project include:

- Consuming traditional foods contributes to positive health of Alaska Native people in many ways, including nutritionally, culturally and spiritually. The goal of the Teller Elder Food Cache is to increase the overall health of village Elders and increase community knowledge about the importance of traditional food systems.
- The subsistence excursions will increase the overall physical and mental health of community Elders by providing them the opportunity to be active, socialize, and to share intergenerational knowledge with their community. The weekly subsistence excursions will eliminate food insecurity by increasing access to healthy foods in areas that would not be readily available due to lack of transportation.
- The project will help eliminate food insecurity by raising community awareness about the importance of traditional food in Alaska Native diets and the importance of food sharing networks.
- The project will reduce the amount of income residents will have to pay for food imported from outside of the community.

A copy of the BCA is provided in Appendix F.4.6.

Descriptions of Risks to Ongoing Benefits

The availability of subsistence food varies seasonally and is generally unpredictable. Changes to the environment due to changes in the climate will affect the availability of these resources in the future. There may be times in the future when subsistence food is not available to fill the food pantry.

Assessment of Challenges Faced with Implementing the Proposal

The project will depend on volunteer efforts in the community to succeed. The community is committed to the project and volunteers are expected to be readily available. During seasons where subsistence foods are scarce, the food pantry will need to purchase more foods to provide sustenance to elders. These challenges are considered routine and are not expected to prevent the project from achieving its goals.

Metrics

The following metrics will be used to determine the impacts of the Elder Food Pantry Project:

Resiliency Value: Reduction of food shortages. Improved health.

Environmental Value: Improved resource management, improved subsistence activities.

Economic Revitalization: Reduced import of processed foods. More money in the community.

Social Value: Improved living environment and health, improved social cohesiveness. The success can be measured by how many pounds of food are provided and consumed.

BCA Narrative

Project 7: Community Garden

Process for Preparing the BCA

The Benefit Cost Analysis (BCA) for the Community Garden Project was prepared as follows:

Costs

Cost based on engineer's estimate from LeMay Engineering & Consulting, Inc. for a similar community garden in Galena, Alaska. Cost estimate provided in Appendix F.4.7 to develop a community garden.

Operations and Maintenance (O&M) are not expected with a volunteer garden and donated materials.

Benefits

Quantified benefits include the market value of the potatoes grown in the community garden. All calculations and references are provided in Appendix F.4.7. Benefits were calculated as follows:

1. The market value of the food grown in the community garden was determined from the size of the garden, the average per acre yield of potatoes in Alaska, the average wholesale value of potatoes grown in Alaska and the cost of shipping potatoes to Galena from Anchorage.

Additional qualitative benefits were determined in conversations with community representatives.

Discount Factor

A discount factor of 7% was applied to all annual costs and benefits to calculate present dollar values of future costs and benefits.

Full Proposal Cost	Estimated Cost	Other Funding
A construction cost estimate is provided in Appendix F.4.7.	\$63,000	

Description of Current Situation and Problem to be Solved

Rural Alaskan food prices are considerably higher than the national average and highly dependent on the cost of fuel for shipping. Fresh vegetables are especially rare and expensive. Developing local agriculture makes the community much more resilient to changes in shipping costs and less dependent on outside food in general. Teller residents have access to programs that will supply free seeds for growing local crops, but they lack the soil that would be required to be successful with local gardening.

Description of Proposed Project or Program

This project would provide fencing, soil, farm implements, watering hoses, a water tank and garden beds to construct a 100'x100' community garden. The proposed project will increase the availability of nutritious non-processed food to the residents of Teller.

Description Risk to the Community if the Proposal is Not Implemented

Lack of access to fresh vegetables is a health concern in rural Alaska.

List of Benefits and Costs

A list of project benefits and costs and associated computations is provided in Appendix F.4.7. Project benefits include:

1. Reduction in dependence on outside sources of food during a disaster.
2. Bringing community together.
3. Value of the food grown in the community garden

Descriptions of Risks to Ongoing Benefits

Production in gardens varies seasonally and is generally unpredictable. Changes to the environment due to changes in the climate will affect the productivity in the future. There may be times in the future when the garden does not provide an adequate food source.

Assessment of Challenges Faced with Implementing the Proposal

There are no unique challenges to building a community garden. Other rural Alaskan communities have had community gardens for many years.

Metrics

The following metrics will be used to determine the impacts of the Community Garden:

Resiliency Value: Improved sources and quantities of food. Reduced reliance on imported food that may not be flown in due to weather.

Environmental Value: Reduced energy use, fossil fuels.

Economic Revitalization: Decrease in processed food consumption, decreased grocery bills. Increase in pounds grown and harvested.

Social Value: Improved social cohesion, education for younger generations.

BCA Narrative

Project 8: Community Development Building

Process for Preparing the BCA

The Benefit Cost Analysis (BCA) for the Community Development Building was prepared as follows:

Costs

Cost based on engineer's estimate prepared by Tonsina based on Final Design Drawings in May 2014. Cost estimate provided in Appendix F.4.8 .

O&M costs are based on Scope of Work document provided by State of Alaska. O&M costs include cleaning, insurance, maintenance, supplies, heating fuel, electricity, other utilities, and meeting expenses. A copy of the Scope of Work document is provided in Appendix F.4.8.

Benefits

Quantified benefits are based on revenue sources identified in the Scope of Work document provided by State of Alaska. Revenue sources include office leases and Tribal Budget income. A copy of the Scope of Work document is provided in Appendix F.4.8.

Additional qualitative benefits were determined in conversations with community representatives.

Discount Factor

A discount factor of 7% was applied to all annual costs and benefits to calculate present dollar values of future costs and benefits.

Full Proposal Cost	Estimated Cost	Other Funding
A construction cost estimate is provided in Appendix F.4.8.	\$3,865,500	\$310,000

Description of Current Situation and Problem to be Solved

Existing facilities for community events are unsafe, unhealthy, small, old and dilapidated, and/or non-existent. Mary's Igloo Traditional Council Office Building was destroyed in a fire.

Description of Proposed Project or Program

The proposed project will construct a new 3,275 square foot Community Development Center in Teller. The building will showcase regional culture and will include government office space, library, commercial kitchen, large meeting room (Native dancing), workshop and small business operation space, cultural museum and gift shop (for regional arts and crafts). Design of the building is complete and awaiting funding for construction. The new building is a priority on the Local Economic Development Plan (Dropbox: T-5).

Description Risk to the Community if the Proposal is Not Implemented

If the project is not constructed the community will continue to lack space for community and native cultural events. Lack of space to hold such events effects the ability of native communities of Mary's Igloo and Teller to maintain their culture.

List of Benefits and Costs

A BCR was not calculated for this project. Project benefits for this project include:

- Community centers create jobs and give people a chance to volunteer in their communities.
- Community centers help prevent social problems and reduce health problems and medical

costs.

- Members of community centers enjoy many benefits such as exercise, relaxation, and entertainment. Members of community centers frequently gather to watch organized activities. Community centers may offer exposure to the arts that residents and visitors might not otherwise receive. Community centers provide space to socialize, as members meet new people, build community awareness and team spirit, and participate in group activities.
- Community centers provide a safe place for children and teens to go after school if a parent is working.
- This Community Center will allow the preservation of culture by allowing scheduled interactions between elders and youth.
- This Community Center will also allow the preservation of culture by allowing master craftsmen, carvers, and skin sewers a space to teach youth their skills. This facility also includes a gift shop for selling these works of art and will increase the income received by local craftsmen.

A copy of the BCA is provided in Appendix F.4.8.

Descriptions of Risks to Ongoing Benefits

No risks to ongoing benefits are anticipated as a result of this project.

Assessment of Challenges Faced with Implementing the Proposal

Equipment and materials necessary to construct the proposed Community Development Center are available in Anchorage and Nome, Alaska and can easily be transported to Teller. No significant challenges are anticipated with regard to construction of the proposed improvements.

Metrics

The following metrics will be used to determine the impacts of the Community Development Center:

Resiliency Value: Improved infrastructure, possible shelter space, training opportunities.

Economic Revitalization: The State of Alaska will coordinate with the Federally Recognized Tribe the Native Village of Mary's Igloo and will track the number of art pieces sold through the new gift shop. The State of Alaska will also track the decrease in energy costs by consolidating services into one building versus having multiple buildings.

Environmental Value: Construction to implement newer energy efficient fixtures. Reduced energy consumption compared to similar sized facilities.

Social Revitalization: The State of Alaska will survey the youth to determine if they feel more connected with their culture after having been given the opportunity to mentor with a skilled craftsmen in Teller.

BCA Narrative		
Project 9: Vocational Training		
Process for Preparing the BCA		
The Benefit Cost Analysis (BCA) for Vocational Training is based on qualitative benefits as determined in conversations with community representatives.		
Full Proposal Cost	Estimated Cost	Other Funding
The estimated cost for this project is based on conversations with Zender Environmental who has provided similar vocational training to other communities in the past.	\$200,000	
Description of Current Situation and Problem to be Solved		
Lack of vocational training opportunities limits the economic viability of the community. Projects to improve the community must hire outside help when locally available tradespeople are not available. Approximately 44% of the residents in Teller live at or below the poverty line and the community wishes to improve the income levels by being able to offer experienced local labor for projects in Teller.		
Description of Proposed Project or Program		
The proposed project will provide training necessary to work on NDRC-HUD funded projects in addition to other capital improvement projects that may be available in the coming years. Providing this training will provide economic revitalization and stability, because it will allow trained individuals from Teller to compete regionally for skilled employment. This training will also provide the community with the skills they need to operate and maintain current and new infrastructure projects in Teller, including NDRC-HUD projects.		
Description Risk to the Community if the Proposal is Not Implemented		
Approximately 44% of the population of Teller lives at or below the poverty line. If the proposal is not implemented the number of people living in poverty would not be expected to change.		
List of Benefits and Costs		
<p>A BCR was not calculated for this project. Project benefits for this project include:</p> <ul style="list-style-type: none"> • Improved job skills • Increased number of jobs that community members are qualified for. • Improved economic standing of residents • Improved health due to increased income and ability to purchase nutritious food • Improved psychological state due to increased income of residents <p>A copy of the BCA is provided in Appendix F.4.9.</p>		
Descriptions of Risks to Ongoing Benefits		
The benefits stated above will only be realized if future capital projects are constructed in Teller and residents are available and willing to work on those projects. Because this project was initiated by the community it is expected to be highly attractive to local residents. One trained, workers may also be able to find skilled labor positions in nearby communities.		

Assessment of Challenges Faced with Implementing the Proposal

Vocational training is offered routinely throughout Alaska and no inordinately difficult challenges are anticipated for the proposed project that would affect its success.

Metrics

The following metrics will be used to determine the impacts of the Vocational Training Project:

Resiliency Value: Increased number of residents with the skill sets needed to rebuild after a disaster.

Environmental Value: Reduction in mishandled waste associated with new skill sets.

Economic Revitalization: Increased number of jobs for newly- skilled residents in the region.

Social Value: Improved social cohesiveness, education of younger generations in the trades.

BCA Narrative		
Project 10: Recovery and Resiliency Study for Critical Infrastructure		
Process for Preparing the BCA		
The Benefit Cost Analysis (BCA) for Recovery and Resiliency Study for Critical Infrastructure is based on qualitative benefits as determined in conversations with community representatives.		
Full Proposal Cost	Estimated Cost	Other Funding
The cost is estimated based on experience with other studies of similar size and scope in rural Alaska.	\$250,000	
Description of Current Situation and Problem to be Solved		
A substantial portion of the existing community is located along the coastline and below the historical flood elevation (Townsite). A new subdivision (Newsite) was developed east of Townsite and is on higher ground where it is less vulnerable to damages from disasters and climate change. A study was undertaken to evaluate whether it is suitable for a new washeteria with promising results. An additional study is necessary to determine what additional infrastructure at Newsite is required to support an eventual move there by community members.		
Description of Proposed Project or Program		
The proposed project will provide an adaptation plan for the community of Teller. The study will gather information from the community and review conditions at Newsite to determine the feasibility of additional development. It is anticipated that several community meetings will be necessary to determine how development should proceed. Geotechnical investigations of promising sites is anticipated to further determine what kind of infrastructure can be supported (i.e. building foundations, above grade or buried piped water and sewer, roadway foundations, etc..)		
Description Risk to the Community if the Proposal is Not Implemented		
A large portion of the existing community, where existing infrastructure is located, sits below the historical flood elevation. Opportunities for new development above the historical flood elevation are limited by the availability of roads, utilities, and other infrastructure. Without a plan for development, new facilities will have no choice but to be constructed within the flood zone placing them at risk during future disaster events.		
List of Benefits and Costs		
A BCR was not calculated for this project. Project benefits for this project include: <ul style="list-style-type: none"> • Increased resiliency to future disasters by planning for development outside of the flood zone • Decreased future damages to new infrastructure in Townsite due to opportunities to locate them instead at Newsite. A copy of the BCA is provided in Appendix F.4.10.		
Descriptions of Risks to Ongoing Benefits		
Relocation to Newsite will need to be voluntary for residents. There is no guarantee that, even with a plan, people will choose to develop at Newsite instead of Townsite. In addition, the study could find		

that development at Newsite is unreasonable or unaffordable for various reasons.

Assessment of Challenges Faced with Implementing the Proposal

There are no significant challenges anticipated with implementing this proposal. Community meetings will be crucial to determining future development goals and maximizing attendance at these meetings will be invaluable. Equipment necessary for investigations are available in Anchorage and Nome, Alaska and can easily be transported to Teller.

Metrics

The following metrics will be used to determine the impacts of the Recovery & Resiliency Study for Critical Infrastructure:

Resiliency Value: Improved layout of critical facilities to lead to quicker recovery during an event.

Environmental Value: Improved layout of critical facilities to lead to reduced environmental impacts.

Economic Revitalization: Reduced future damages resulting in cost savings.

Social Value: Improved social cohesiveness, improved community engagement through the process.

IV. Appendices

Benefit-Cost Analyses for each project are provided in Appendices F.4.1 through F.4.10. Please also see the **Attachment F. Reference** for general reference information that is applicable to multiple projects.