Kenai Bluffs Bank Stabilization
Appendix C
Economics

Kenai, Alaska

June 2017

U.S. Army Corps of Engineers

Alaska District

CONTENTS

I. Introduction....1
A. Document Layout Detailed....3
II. Overview of community and region....4
A. Location and setting....4
B. Climate....5
C. History....5
D. Demographics....6
1. Population....6
2. School Enrollment....9
3. Employment and Income....9
E. Infrastructure....14
1. Roads....14
2. Marine Facilities....14
3. Airport....14
4. Utilities and Services....15
F. Government....15
1. Kenai Peninsula Borough....15
2. City of Kenai....15
3. Kenaitze Indian Tribe....16
4. Cook Inlet Region, Inc. (CIRI)....16
5. Kenai Natives Association, Incorporated....16
III. Methodology....17
A. Evaluation Framework....18
B. Data Collection Techniques....18
C. Model Development....18
IV. Existing Conditions....19
A. Losses to Date....19
B. Land Use....22

C. Land 22
D. Structures and Non-Structural Improvements 23
E. Residency 23
F. Public Infrastructure 24
G. Recreation 24
H. Cultural and Historic Resources 25
V. Future Without-Project Conditions 26
A. Damages Methodology 26
B. Land Damages 27
C. Structure and Non-Structural Improvement Damages 28
D. Public Infrastructure Damages 29
E. Recreation Value 30
1. Unit Day Value (UDV) 31
2. Capacity Analysis 32
F. Cultural and Historic Resources 33
G. Summary of Future Without-Project Conditions 34
VI. Alternatives Considered 35
A. Alternatives 35
1. Alternative 1: No Action Plan 35
2. Alternative 2: River Mouth Relocation 35
3. Alternative 3: Revetting and Vegetating the Bluff Face - Buried Toe 36
4. Alternative 4: Revetting and Vegetating the Bluff Face - Weighted Toe 37
5. Alternative 5: Protective Berm at the Bluff Toe 37
6. Alternative 6: Relocation 38
B. Total Project Costs 38
VII. Future With-Project Conditions 40
A. Assumptions 41
B. Land Damages 41
C. Structure Damages 42
D. Public Infrastructure 43
E. Recreation Value 45
F. Cultural and Historic Resources 46

G. Summary of Future With-Project Conditions 47
VIII. Annual Benefits 49
A. Benefits by Category 49
1. Land 49
2. Structures 49
3. Public Infrastructure 50
4. Recreation 50
B. Benefits by Alternative 50
IX. Summary of Benefits and Costs 53
X. Sensitivity Analysis 55
A. Erosion Rate 55
B. Value of Land, Structures, Non-Structural Improvements, and Infrastructure 55
XI. Environmental Quality 56
XII. Other Social Effects 58
A. Cost Effectiveness/Incremental Cost Analysis (CE/ICA) 58
1. Summary of Alternative 5 62
2. Risk and uncertainty in Other Social Effects: 62
B. Three Types of Significance for Other Social Effects: 63
1. Institutional Significance 63
2. Public Significance 63
3. Technical Significance 63
C. Stabilized Bluff Parcels Related to Significance 64
D. Specific Cultural Resource Concerns 64
1. Technical Significance Brief 64
2. Estimated Cost of Lost Cultural Resources 65
E. Specific Health and Safety Concerns 66
XIII. Regional Economic Development 67
XIV. Four Accounts Summary 69
XV. Ability to Pay 71

FIGURES

Figure 1. Kenai Bluff, Kenai, Alaska..... 4
Figure 2. Kenai Surrounding Area, Kenai, AK..... 5
Figure 3. Kenai Population, 2005-2014..... 7
Figure 4. Kenai Peninsula Borough Population, 2005-2014..... 7
Figure 5. Kenai, Percent of Population by age group, 2000 and 2010 comparison..... 8
Figure 6. Kenai Employment by Industry, 2014..... 10
Figure 7. Personal Use Dipnetting Fishery..... 13
Figure 8. Erosion Processes..... 19
Figure 9. Overview of unidentified structures lost to erosion within project area..... 20
Figure 10. Remnants of unidentified structure number 4..... 21
Figure 11. Eroding prehistoric Dena'ina house depression, 2010..... 21
Figure 12. Pacific Star Seafoods and Eastern Terminus of the Bluff..... 22
Figure 13. Approximate Kenai utility locations and Existing Bank Line..... 24
Figure 14. Toe of Bluff..... 60
Figure 15. Dipnetting Areas..... 60
Figure 16. Cost Effectiveness for Stabilized Bluff Parcels..... 62

TABLES

Table 1. Summary of Benefits and Costs, by Alternative....2
Table 2. Population Projections for the Kenai Peninsula Borough, 2017-2042....9
Table 3. Kenai School Enrollment, Fiscal Year 2015....9
Table 4. Kenai Worker Characteristics, 2014....11
Table 5. Land Value Comparisons....27
Table 6. Future Without-Project Land Damages....28
Table 7. Future Without-Project Structure and Non-Structural Improvement Damages....29
Table 8. Future Without-Project Infrastructure Damages....30
Table 9. Future Without-Project Recreation Value....33
Table 10. Summary of Future Without-Project Conditions....34
Table 11. Total Project Costs, by Alternative....39
Table 12. Summary of Future With-Project Conditions....40
Table 13. Future With-Project Land Damages....41
Table 14. Future With-Project Structure Damages....42
Table 15. Future With-Project Public Infrastructure Damages....44
Table 16. Future With-Project Recreation Value....45
Table 17. Points and Unit Day Values for Kenai, Future Without- and Future With-Project Conditions....45
Table 18. Future With-Project Recreation Value....46
Table 19. Summary of Future With-Project Conditions....48
Table 20. Land Damages, Average Annual Values....49
Table 21. Structure Damages, Average Annual Values....49
Table 22. Public Infrastructure Damages, Average Annual Values....50
Table 23. Recreation Benefits, Average Annual Values....50
Table 24. Alternative 1 No Action, Benefits Summary....51
Table 25. Alternative 2 River Mouth Relocation, Benefits Summary....51
Table 26. Alternative 3 Revetting and Vegetating the Bluff Face – Buried Toe, Benefits Summary....51
Table 27. Alternative 4 Revetting and Vegetating the Bluff Face – Weighted Toe, Benefits Summary....52

Table 28. Alternative 5 Protective Berm at the Bluff Toe, Benefits Summary 52
Table 29. Alternative 6 Structure Relocation, Benefits Summary 52
Table 30. Summary of Benefits by Alternative 53
Table 31. Summary of Costs by Alternative 53
Table 32. Summary of Benefits and Costs, by Alternative 54
Table 33. Estimated Budget for salvage archaeological operations at one site on the Kenai River Bluff 65
Table 34. Economic Impact Regions 67
Table 35. Input Assumptions (Spending and LPCs) 67
Table 36. Overall Summary of Economic Impacts 68
Table 37. Four Accounts Evaluation Summary 70

I. INTRODUCTION

Coastal erosion at the mouth of the Kenai River results in over-steepening, collapse, and inland retreat of the Kenai Bluff. This ongoing condition negatively impacts and continues to threaten commercial, municipal, and private property (land, structures, and infrastructure), as well as cultural and historical resources in Kenai, AK.

There are approximately 59 parcels within the study area, with 13 commercial or public structures, 21 residential structures, and 23 other improvements that are expected to be lost or condemned due to erosion over the period of analysis. There are five historic properties and two archaeological sites, one of which is known to contain a late nineteenth-century cemetery that is at risk of eroding into the Kenai River. While the need to prevent expected damages is immediate, this study looks at the best way to accomplish that goal over a 50 year period of analysis.

The economics portion of this Section 116 Feasibility Study is conducted by the Alaska District with coordination from the Coastal Storm Risk Management Planning Center of Expertise (CSRM-PCX).

Section 116 of the Energy and Water Development and Related Agencies Appropriations Act of 2010 states:

> *"The Secretary of the Army is authorized to carry out structural and non-structural projects for storm damage prevention and reduction, coastal erosion, and ice and glacial damage in Alaska, including relocation of affected communities and construction of replacement facilities: Provided, that the non-Federal share of any project carried out pursuant to this section shall be no more than 35 percent of the total cost of the project and shall be subject to the ability of the non-Federal interest to pay, as determined in accordance with 33 U.S.C. 2213(m)."*

The non-Federal partner for this study is the City of Kenai, Alaska (City). The Feasibility Cost Sharing Agreement (FCSA), Certification Regarding Lobbying, and Certification of Authority were signed in May 2015 by Rick Koch (former City Manager), and Scott Bloom (City Attorney).

This economics appendix first describes the National Economic Development (NED) analysis which considered the costs and benefits of six alternatives that protect against expected loss to varying degrees. These six alternatives are summarized in Table 1. The plan with the highest NED benefits is highlighted in yellow.

Table 1. Summary of Benefits and Costs, by Alternative

Alternative Number	Present Value Benefits	Average Annual Benefits	Present Value Economic (NED) Costs	Average Annual Costs	Benefit to Cost Ratio	Net Annual NED Benefits	Rank by Net NED Benefits
1 No Action	$0	$0	$0	$0	N/A	$0	1
2	$22,300,000	$846,000	$591,983,000	$22,465,000	0.04	-$21,619,000	6
3	$23,108,000	$877,000	$54,469,000	$2,067,000	0.42	-$1,190,000	4
4	$23,108,000	$877,000	$58,132,000	$2,206,000	0.40	-$1,329,000	5
5	$22,300,000	$846,000	$34,488,000	$1,309,000	0.65	-$463,000	2
6	$9,520,000	$361,000	$40,434,000	$1,534,000	0.24	-$1,173,000	3

Since there is no NED plan, a Cost Effectiveness/Incremental Cost Analysis (CE/CIA) was performed in accordance with Section 116 implementation guidance[1], which states that:

> *"Each decision document will present the National Economic Development (NED) analysis for all viable alternative and identify the NED Plan when alternatives exist with net positive NED benefits. If there is no NED Plan and/or the selection of a plan other than the NED Plan is based in part or whole on non-monetary units (Environmental Quality and/or Other Social Effects), then the selection will be supported by a cost effectiveness/incremental cost analysis consistent with established evaluation procedures* (see ER 1105-2-100, Appendix E)*."*

While a number of CE/ICA metrics were evaluated and the CE/ICA does inform plan selection, none of the metrics provided enough granularity to choose a plan. The metrics considered did not fully encapsulate damages prevented nor sufficiently differentiate among the types of damages avoided. Based on additional guidance from the U.S. Army Corps of Engineers (USACE) Headquarters, least cost among plans with similar benefits was selected as the most well-reasoned selection criteria.

Least cost method is used when alternatives have similar benefits; then, the selection of the least cost plan among alternatives with similar benefits becomes the most effective. As shown in Table 1, alternatives 2, 3, 4, and 5 all have present value benefits in the $22 to $23 million range, whereas Alternative 6 has benefits of approximately $9.5 million. Of plans with similar benefits, Alternative 5 is the least cost, costing approximately $20 million less than any other alternative.

Based on the analysis of the four accounts presented in this appendix and an evaluation of least cost among alternatives with similar benefits, the Tentatively Selected Plan for the Kenai River Bluff Erosion Feasibility Study is Alternative 5.

[1] Memorandum for Commander, Pacific Ocean Division, 10 May 2012. "Implementation of Studies and Projects Under Section 116 of the Energy and Water Development and Related Agencies Appropriation Act, 2010, Public Law 111-85."

The rest of this Economics Appendix "shows the work" that was put into providing a recommended plan.

A. Document Layout Detailed

This document first presents a community profile to provide background information on the study area (Section II). Section III describes the methodology used to evaluate alternatives. Section IV lays out information on existing conditions, including an existing structure/property inventory and valuation as well as the extent of existing erosion conditions. Section V details expected erosion in the future without project condition, including quantifying erosion damages.

Alternatives are presented in Section VI. This section describes alternatives considered, including the costs of construction of each alternative carried forward for analysis. Section VII describes future with project conditions, including how each alternative would address the projected erosion, and quantifies remaining erosion damages. NED benefits are described in section VIII, followed by discussion of the selection of alternatives in section IX, where it is concluded that a NED justified plan does not exist. This is followed by a discussion of the sensitivity analysis that was conducted regarding key input variables in the economic analysis, including the erosion rate and value of parcels and structures within the erosion zone.

The remaining sections detail the Regional Economic Development (RED) account, Environmental Quality (EQ) account, and Other Social Effects (OSE) account, which includes the CE/ICA described in the Section 116 Authority implementation guidance from the USACE Headquarters. The appendix concludes with a summary of the four accounts in Section XIV.

Also attached to this Economics Appendix are the complete Regional Economic Development Addendum, which presents the Regional Economic Modeling System (RECONS) results for each alternative considered, and a Recreation Addendum that details the recreation analysis performed.

II. OVERVIEW OF COMMUNITY AND REGION

This section provides general background information pertaining to the socioeconomic composition of the study area. This information enables planners and report reviewers to understand the community, infrastructure, the level of economic activity generated, and the potential of the area to support the project under consideration. This section is an overview, whereas Section IV focuses on the bluff area in more detail including the types of businesses, residential structures, and attributes of properties that will be lost without federal action.

A. Location and setting

Kenai is located on the western coast of the Kenai Peninsula, fronting Cook Inlet. It is approximately 65 air miles and 155 highway miles southwest of Anchorage. It's a Home Rule City with a similar socioeconomic makeup to Anchorage in a few ways: it's demographically diverse and characterized by oil industry, commercial fishing, and tourism jobs. Kenai lies at approximately 60.55 degrees North latitude and -151.25 degrees West longitude. The project area is shown in Figure 1.

Kenai, Soldotna, Nikiski, and parts of Kalifornsky Beach road form a region of activity where individuals may live in Kenai and work in Nikiski, etc. Residents may also seek services and retail opportunities from nearby communities (Figure 2).

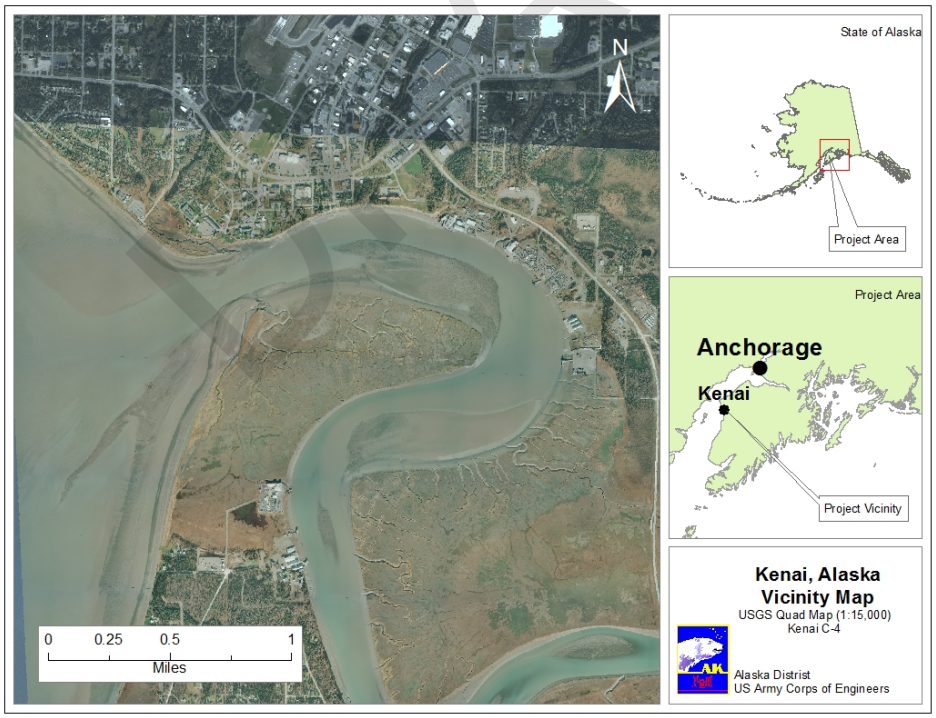

Figure 1. Kenai Bluff, Kenai, Alaska.

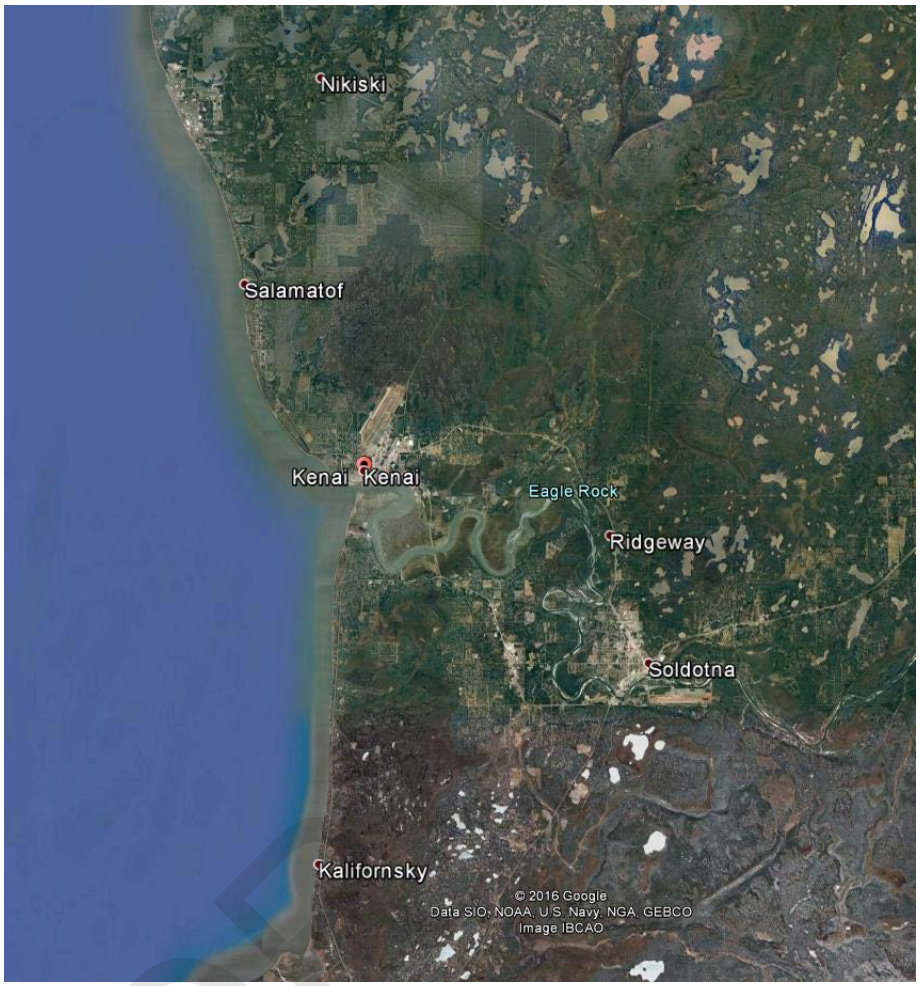

Figure 2. Kenai Surrounding Area, Kenai, AK

B. Climate

Kenai lies within the gulf coast transitional climate zone which is semi-arid and generally characterized by long, cold winters and mild summers. Typical temperature ranges are -26 degrees Fahrenheit to +76 degrees Fahrenheit with 28 inches of precipitation. To some extent the climate supports the economic activities of the region, like fishing and tourism.

C. History

Kenai and the surrounding area has been used extensively by Dena'ina Athabascan people in general and the Kahtnuht'ana Dena'ina people of the Kenaitze tribe in particular for

generations. The Dena'ina name for the Kenai River mouth is "Kahtnu Kaq'".[2] A brief post-contact timeline follows:

1741 – Russian fur traders arrive at the mouth of the Kenai River at the Athabascan village of "Shk'ituk't" which has a population of about 1,000.

1791 – The Russians construct the second permanent Russian settlement in Alaska at Fort St. Nicholas, a fortified fur and fish trading post near Kenai.

1849 – The Holy Assumption Russian Orthodox Church is established by Egumen Nicholai.

1869 – The U.S. Military constructs Fort Kenay, a post for Dena'ina people in the area. It is abandoned in 1870 when the U.S. purchases Alaska from Russia.

1899 – The first U.S. Post Office for Kenai is constructed.

1940 – Homesteading enables the area to develop.

1951 – A dirt road connects the community to Anchorage.

1957 – Oil is discovered at Swanson River, 20 miles northeast of Kenai. It is the first major oil discovery in Alaska.

1960 – The City of Kenai is incorporated.

1965 – The discovery of oil in Cook Inlet rings in a period of accelerated growth.

D. Demographics

The following demographic information provides relevant characteristics to the local economy: population, age distribution, race and ethnicity, local school enrollment, employment, household and per capita income, and poverty status.

1. Population

According to the 2010 US Census, the City of Kenai is home to 7,100 people. In 2014, the State of Alaska Department of Labor and Workforce Development (ADOL&WD) estimated Kenai's population to be 7,167. The maximum population since 2005 was 7,239 people in 2013, while the minimum was 6,815 in 2005. The historic populations of Kenai and the Kenai Peninsula Borough are shown in Figure 3 and Figure 4 below. Please note that the Borough's population is nearing 60,000 and that the peninsula gets between 400,000 and 500,000 visitors a year, most in the summer months.[3]

[2] "Kenaitze Youth Speak", Trefon, Reams, and Boraas, 2014

[3] http://peninsulaclarion.com/news/2014-02-16/tourism-industry-expects-record-season

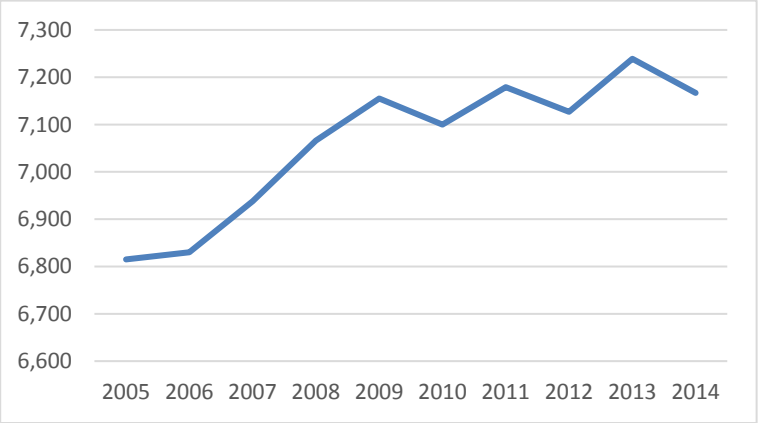

Figure 3. Kenai Population, 2005-2014

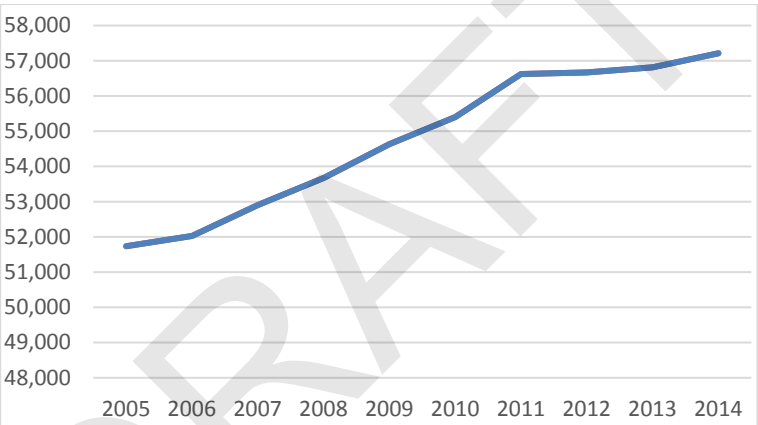

Figure 4. Kenai Peninsula Borough Population, 2005-2014

According to the 2010 US Census, the population of Kenai consists of 8.9 percent Alaska Native and American Indian. This is compared to 7.9 percent for Anchorage, and 16.0 percent for the State of Alaska.[4] The majority of the population in Kenai is listed as white, at 79.9 percent. The gender breakdown of Kenai's population is approximately 50.4 percent male and 49.6 percent female compared to 52 percent male and 48 percent female in the State of Alaska. The median age of Kenai residents is 34.7 years, slightly above the 2010 median age of 33.8 years for the State of Alaska.

Figure 5 shows a comparison of Kenai's population by age groups as reported by the 2000 and 2010 Censuses. These data show the population of Kenai has aged between 2000 and

[4] The 2010 US Census is the most recent data available for employment and income levels. The figures are estimates based on a sample, and are subject to sampling variability.

2010. According to Census data, 71.8 percent of Kenai's population was under 45 years of age in 2000 compared to only 63.2 percent of the population in 2010.[5]

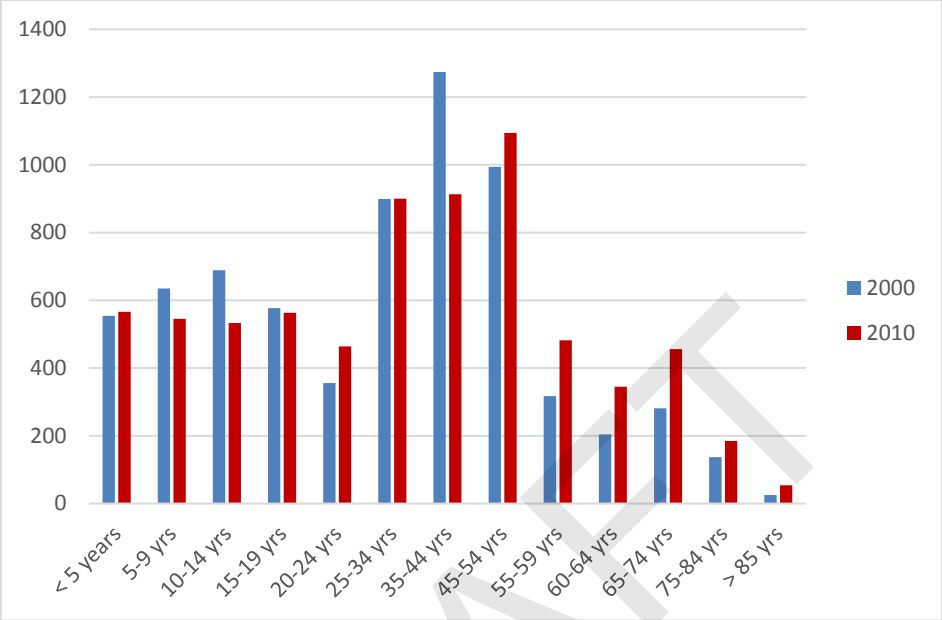

Figure 5. Kenai, Percent of Population by age group, 2000 and 2010 comparison

Source: US Census, 2000 and 2010

The State of Alaska Department of Labor and Workforce Development (ADOL&WD) projects the Kenai Peninsula Borough as a whole to gain approximately 9,000 residents over the next 30 years. The degree to which this increase occurs specifically in the greater Kenai area is dependent upon a number of factors. The city's relative proximity to Anchorage, access to marine recreation, and rural lifestyle, while maintaining common services and conveniences makes it an attractive location. However, a significantly large increase in development and population is not expected. Because of this relatively stable environment, the prevailing economic and political conditions are not expected to change significantly over the period of analysis.

Population projections for the Kenai Peninsula Borough are shown in Table 2.

[5] 2000 and 2010 US Census Data accessed via the State of Alaska Department of Labor and Workforce Development, Research and Analysis Section.

Table 2. Population Projections for the Kenai Peninsula Borough, 2017-2042

Year	Population	Increase
2017	59,225	2,469
2022	61,391	2,166
2027	63,116	1,725
2032	64,321	1,205
2037	65,098	777
2042	65,647	549

Source: State of Alaska Department of Labor and Workforce Development

2. School Enrollment

There are 43 schools in the Kenai Peninsula Borough; all are part of the Kenai Peninsula Borough School District. There are 5 schools in the City of Kenai: Kenai Central High School serving grades 9 through 12; Kenai Middle School, grades 6 through 8; Mountain View Elementary, Pre-K through 5; Kaleidoscope School of Arts & Science, K through 6; and Marathon School, grades 7 through 12. Total enrollment in the 5 schools in Kenai was 1,610 students as of fiscal year 2015. Enrollment figures are summarized in Table 3.

Table 3. Kenai School Enrollment, Fiscal Year 2015

School Name	Grades Taught	# of Students	# of Teachers
Kaleidoscope School of Arts & Science	KG thru 6	253	17
Kenai Central High School	9 thru 12	511	43
Kenai Middle School	6 thru 8	383	25
Marathon School	7 thru 12	10	1
Mt. View Elementary	PK thru 5	453	31
Total		**1,610**	**117**

3. Employment and Income

The Kenai Peninsula Borough's economy is well diversified. The economic foundation includes fishing, seafood processing, tourism, oil and gas, refining, and government. Proximity to and ease of access from Anchorage has encouraged the development of a large

visitor industry.[6] The large number of seasonal and temporary jobs is further discussed below the year round permanent employment makeup of Kenai.

a. Full-time Employment

Employment in the City of Kenai is dominated by the trade, transportation, and utilities industries, educational and health services, and natural resources and mining industries. These industries comprised just over 50 percent of the total employment in Kenai in 2014.[7] Figure 6 shows the composition of Kenai employment by industry. According to ADOL&WD data, the top occupations in Kenai in 2014 were retail salespersons with 156 employees followed by personal care aides (139 employees), cashiers (121 employees), and teachers and other instructors (101 employees). Additionally, Kenai provides labor and services to energy exploration and production facilities in nearby Cook Inlet.

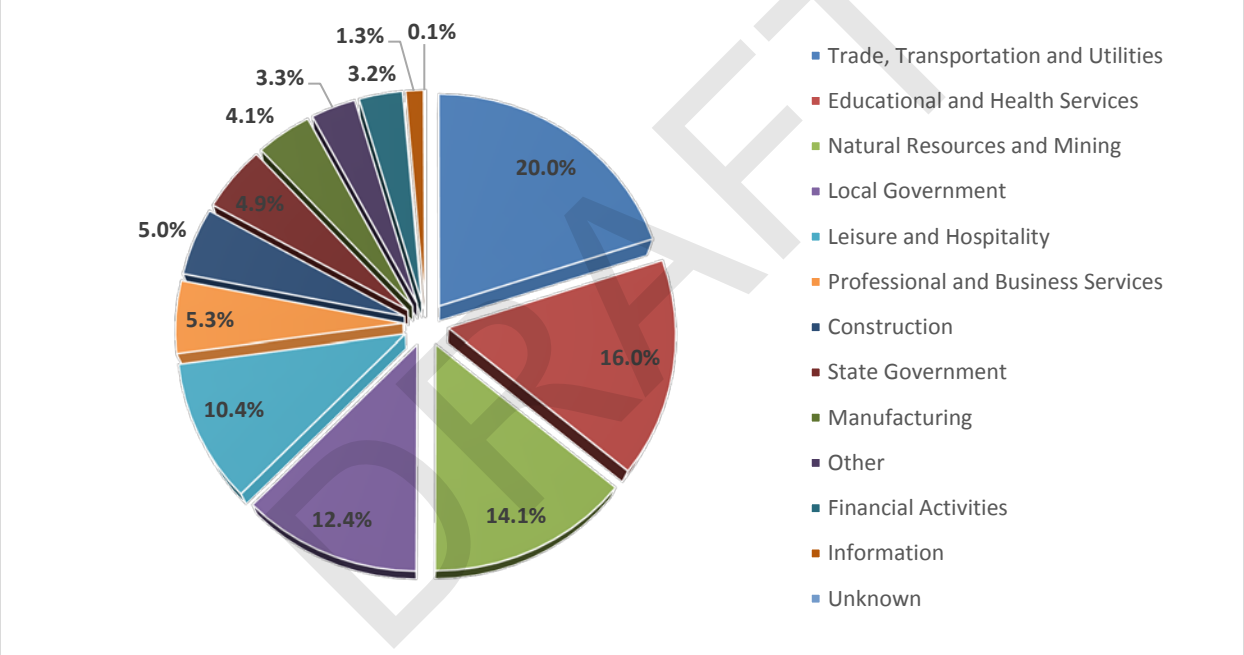

Figure 6. Kenai Employment by Industry, 2014

Source: State of Alaska Department of Labor and Workforce Development, Research and Analysis Section, Alaska Local and Regional Information

[6] http://live.laborstats.alaska.gov/alari/details.cfm?yr=2015&yr=2014&dst=01&dst=03&dst=04&dst=02&dst=06&dst=08&dst=09&dst=11&dst=07&dst=13&r=2&b=12&p=0

[7] State of Alaska Department of Labor and Workforce Development, Research and Analysis Section. Alaska Local and Regional Information, Kenai, 2014.

Data from ADOL&WD show that in 2014, 83 percent of workers in Kenai were employed in the private sector followed by 12 percent in local government and 5 percent in state government.[8] Table 4 summarizes Kenai employment characteristics.

Table 4. Kenai Worker Characteristics, 2014

Worker Characteristics	Value	Percent
Residents age 16 and over	5,412	76%
Residents employed	3,431	63%
Female workers	1,631	48%
Male workers	1,800	52%
Workers age 45 and over	1,307	38%
Workers age 50 and over	997	29%
Total wages	**$149,047,513**	
Sector employed in:		
Private	2,840	83%
Local government	424	12%
State government	167	5%
Peak quarterly employment	3,102	90.4%
Workers employed all 4 quarters	2,497	73

Source: State of Alaska Department of Labor and Workforce Development, Research and Analysis Section, Alaska Local and Regional Information

The 2009 through 2013 5-year data from the American Community Survey (ACS)[9] report that Kenai had a total potential workforce (population over 16 years of age) of 5,608 (margin of error +/- 182) at that time. Of those, 3,915 (MOE +/- 270) were considered in the labor force, with 3,478 (MOE +/- 276) employed and 437 (MOE +/- 131) unemployed.[10]

[8] Ibid.

[9] The 2010 Census differed from past Censuses in that it collected only data related to general population statistics and did not collect income or employment information which had previously been ascertained using the Census "long form". Instead, the Census Bureau now uses the American Community Survey (ACS) to collect more detailed social and economic information from a sample of the American population. The ACS provides detailed and useful data, but it is based on a sample of the population, rather than the decennial census which attempts to count every person. As the ACS is based on a small sample size in an already small population of some communities in Alaska, it can be subject to high sampling variability and large margins of error. This analysis uses the 2009-2013 American Community Survey 5-Year Estimates to report current labor market and other economic conditions in Kenai, but notes significant margins of error as appropriate.

[10] US Census Bureau, American Community Survey, 2009-2013 5-Year Data. Accessed through State of Alaska Department of Labor and Workforce Development, Research and Analysis Section. http://live.laborstats.alaska.gov/cen/acsdetails.cfm

The unemployment level does not account for all of the non-working adults in Kenai. There were also 1,693 residents, 30.2 percent of the potential workforce, who were considered not in the labor force according to the ACS.[11] This means that they were not working and not looking for work. Many factors can play into the decision to search for jobs, including scarce availability, informal searching (through communal connections), and seasonal shifts in job opportunities and subsistence activities. Were these individuals included, the unemployment rate for the community would be 38 percent rather than the 7.8 percent reported by the ACS. It is important to recognize the definitional differences of the potential workforce and the actual labor force for an accurate understanding of local economic conditions.

The ACS reports that Kenai has a total of 504 households (MOE +/- 49) with a median income of $59,643 per year (MOE +/- 10,198). In Kenai, there were 185 persons (MOE +/- 86) in families living below the poverty level. In addition to regular income, the community had 96 of its residents (MOE +/- 28) collecting Social Security Income, 28 (MOE +/- 15) with public assistance income, and 77 (MOE +/- 23) collecting retirement income.[12]

b. Fisheries

Fisheries are a large part of Kenai's economy, as the Kenai River is known for its world class salmon fisheries. The Kenai River flows 82 miles from Kenai Lake to its outlet into Cook Inlet near the community of Kenai. The City of Kenai is uniquely positioned in that four different fisheries take place within the city's boundaries: commercial, sport, personal use, and educational fisheries.[13]

The area has a long commercial fishing history in Alaska. The Kenai fishery was the second large major fishery established in Alaska, shortly after the Bristol Bay fishery which began circa 1901. Currently, there are seven seafood processors in the Kenai Peninsula Borough: three in Kenai, three in Soldotna, and one in Kasilof. The permits for these processors allow 10 million pounds of discharge each and about 2/3 of the fish can be recovered. Therefore, these seven processors could potentially handle 210 million pounds of fish each year. While the actual number is dependent on the managed fishery, Snug Harbor usually employs around 200 seasonal workers, with Pacific Star Seafoods, and North Pacific Seafoods slightly less.

The State of Alaska Division of Community and Regional Affairs (ADCRA) reported that in 2014, 282 separate commercial fishing permits were issued to Kenai residents and fisheries provided over $10 million in earnings.[14] Additionally, the ADCRA reported that 2,215

[11] Ibid.

[12] Ibid.

[13] The Kenai River and its salmon fishery is designated as a "non-subsistence area" by the Alaska Board of Fisheries and Game. A 1992 court case decision made all Alaskans eligible subsistence users. The Board moved to protect particularly valuable fisheries from unrestrained use by designating them "non-subsistence areas" and establishing "personal use fisheries". The Kenai River is one of the five personal use fisheries in upper Cook Inlet.

[14] State of Alaska Division of Community and Regional Affairs (ADCRA) Community Information Database

permits were issued within the Borough in 2014 and fisheries provided $113.4 million in earnings.[15]

Significant economic activity is also associated with sport and personal use fisheries, particularly during the annual dipnet opener, which allows Alaska residents to harvest at least 25 salmon per household. Alaskans harvested 377,532 sockeye salmon in this fishery in 2015 for 34,920 permits issued.[16]

Figure 7. Personal Use Dipnetting Fishery
Courtesy: ADFG

c. Tourism

Tourism activities include the draw of the Kenai River as a fishery. The fishery not only draws local Alaskans for the resident-only dipnet opener, but through charters and a prestigious King salmon run, it draws enthusiasts from around the world, "trying to land the big one." The record fish for the river is a whopping 97 pound king salmon. Kenai River fisheries for king, sockeye, and Coho salmon are the largest freshwater sport fisheries for these species in Alaska.

Other tourism activities include a swarm of recreational vehicles in the summer. They come for the beauty of the Kenai Peninsula and create opportunities for the leisure and hospitality

[15] Ibid.

[16] http://www.adfg.alaska.gov/index.cfm?adfg=PersonalUsebyAreaSouthcentralKenaiSalmon.harvest

industry. Residents may, in addition to their full-time employment, have opportunities to cater to the tourism industry in the summer months.

E. Infrastructure

1. Roads

The City of Kenai is located on the western coast of the Kenai Peninsula. The main road access to Kenai is via the Kenai Spur Highway. The 39-mile-long road begins at the junction with the Sterling Highway near Soldotna, which connects with the Seward Highway to provide road access to Anchorage. Kenai is connected by road to the City of Homer, which is approximately 81 miles south of Kenai and part of the Alaska Marine Highway System.[17]

Another way to access Kenai is via Kalifornsky Beach Road, which is to the south, and Bridge Access Rd., which crosses the Kenai River near the mouth. Snug Harbor Seafoods, one of the predominant processors located at the mouth of the Kenai River, is accessed by Kalifornsky Beach Road. The road provides additional access to recreational and subsistence fisheries, residences, as well as commercial and industrial businesses.

2. Marine Facilities

The City of Kenai owns and operates the City Dock near the mouth of the Kenai River. The facility includes a commercial dock with 3 cranes (not available to the public), diesel and unleaded fuel sales from the commercial dock (available to the public), 4 boat launch ramps, and public restrooms with running water. Parking is available for approximately 238 vehicles with trailers and an additional 45 vehicles without trailers.[18] These facilities are southwest of the proposed project area and are not impacted by erosion along the mouth of the river.

The nearest deep water port to Kenai is in Nikiski, approximately 13 miles north of Kenai via the Kenai Spur Highway.

3. Airport

Kenai Municipal Airport is a city-owned, public use airport located in the City of Kenai. The airport provides scheduled passenger service to Anchorage and serves as a commercial air transportation gateway to the Kenai Peninsula Borough and West Cook Inlet.[19] The airport provides a grooved asphalt runway, gravel strip, and float plane basin.

[17] The Alaska Marine Highway System is operates as a division of Department of Transportation and Public Facilities for the State of Alaska, and is an integral part of the State of Alaska's highway infrastructure. Ferry services is provided from Homer 4 to 6 days per week in summer and 3 days per week in winter. http://www.dot.state.ak.us/amhs

[18] City of Kenai Website. Accessed 4 December 2015. http://www.ci.kenai.ak.us/node/117

[19] City of Kenai Website. Accessed 4 December 2015. http://www.ci.kenai.ak.us/airport

4. Utilities and Services

The municipal facilities and services available in Kenai include: piped water and sewer, police, fire and EMS, health care facilities and services, public libraries, schools, and parks and recreation areas.

The City of Kenai operates the public water system including distribution, wastewater collection and treatment. Trash pickup is available for purchase from several local vendors in Kenai, and the Kenai Peninsula Borough provides a transfer facility with recycling containers. The Central Peninsula Landfill is located in Soldotna approximately 11 miles southeast.

Electricity is provided by the Homer Electric Association through a combination of hydropower, natural gas, and diesel.

Major commercial retailers including Walmart, Home Depot, Safeway grocery, and others can be found in the City. Several large hotels are also found near the city center, accommodating tourism, business, and transient workforces.

F. Government

1. Kenai Peninsula Borough

The City of Kenai lies within the Kenai Peninsula Borough. In Alaska, boroughs are equivalent to county-level governments and are responsible for providing a number of services. The Borough is led by an elected mayor and nine-person Borough Assembly. The borough currently levies a 3 percent sales tax and a 4.50 mill property tax.

2. City of Kenai

The City of Kenai was incorporated in 1960 as a First Class City. It became a Home Rule City through the adoption of a charter in 1963. The City functions under a Council-Manager form of government with day-to-day operations overseen by a City Manager who is appointed by the City Council. There are six council members and a mayor, all of whom are elected.[20]

There are three different classifications of city governments in Alaska: Home Rule, First Class, and Second Class cities. A community must have at least 400 permanent residents to form a Home Rule or First Class city. First and Second Class cities are general law cities: State law defines their powers, duties, and functions. All local governments in Alaska have certain fundamental duties such as conducting elections and holding regular meetings of the governing bodies.[21]

The City of Kenai levies an 8.86 mill property tax and a 6 percent sales tax, 3 percent of the sales tax is a city tax and 3 percent is a borough tax. Based on the City's 2014 population of

[20] City of Kenai website. Accessed 4 December 2015. http://www.ci.kenai.ak.us/government

[21] Local Government in Alaska. Prepared by Local Boundary Commission Staff, Alaska Department of Community and Economic Development. March 2004.

7,167, Kenai's total tax revenue in 2014 was $10,020,046 or $1,398 per capita. Kenai's total 2014 sales tax revenue was $6,623,650 or $924 per capita, and the City's total property tax revenue was $3,396,396 or $474 per capita. A 5 percent bed tax has been suspended indefinitely.

3. Kenaitze Indian Tribe

The Kenaitze Indian Tribe, or Sovereign Nation of the Kenaitze, is a Federally-recognized tribe with 1,600 members. The tribe considers the bluff area at the mouth of the Kenai to be a historical gathering place of significance. In addition to being an important place for hundreds of years, the bluff area is where some early interactions between the tribe and white settlers took place. The tribe elects a seven-person Executive Council with members serving two-year staggered terms. The tribe is active in administering a number of programs including: education, housing, environmental services, elder services, youth programs, language resources, and others. The Nitghuk't'uch'qenashen Tribal Court upholds tribal law.

4. Cook Inlet Region, Inc. (CIRI)

CIRI is one of the 13 regional corporations established by the Alaska Native Claims Settlement Act of 1971 (ANCSA) and holds title to 1.3 million acres of subsurface estate, making it one of Alaska's largest private landowners. These subsurface holdings include lands within the study area along the southern bank of the Kenai River. CIRI is active in many business ventures including: energy, oil and gas development, construction, real estate, tourism, and other services.

5. Kenai Natives Association, Incorporated

Kenai Natives Association, Inc. is the ANCSA village corporation for Kenai. They are land surface owners and engage in business ventures in the area.

III. METHODOLOGY

This section describes the methods used to conduct the economic analysis of bank stabilization to address erosion-related damages along the north bank of the Kenai River near its mouth at Cook Inlet. The analysis described in this report follows implementation guidance for Section 116 authorized projects, which states:

> *"Each decision document will present the National Economic Development (NED) analysis for all viable alternative and identify the NED Plan when alternatives exist with net positive NED benefits. If there is no NED Plan and/or the selection of a plan other than the NED Plan is based in part or whole on non-monetary units (Environmental Quality and/or Other Social Effects), then the selection will be supported by a cost effectiveness/incremental cost analysis consistent with established evaluation procedures."*[22]

This appendix presents the NED analysis and analysis of the Other Social Effects (OSE), Environmental Quality (EQ), and Regional Economic Development (RED) accounts to inform plan selection. Project justification follows this analysis, but also describes its shortcomings. After exhausting the monetary and non-monetary comparisons through the NED analysis and CE/ICA, least cost among plans with similar benefits was selected as the most well-reasoned selection criteria.

For the NED analysis, justification for a proposed action is determined by comparing average annual costs (including project first costs, interest during construction, and operations and maintenance expenses) with an estimate of the average annual benefits derived from the project. Application of an appropriate discount rate and period of analysis make benefits and costs comparable on the equivalent time value of money. For this analysis, the Federal fiscal year 2017 discount rate of 2.875 percent was used, as well as a 50-year project period of analysis. Each alternative has a total construction cost estimate, or project first cost, prepared by Cost Engineering utilizing MCASES. The total economic (NED) cost used in the NED analysis is the sum of project first costs, interest during construction, and operation and maintenance expenses.

The period of analysis begins in the first year in which benefits begin accruing. In this case, that is the first year a project can be started, or 2020. This is also the year to which benefits are discounted back. All benefits are calculated in fiscal year 2017 dollars.

The identification of project benefits under the National Economic Development (NED) criteria is based on increases in the net value of the national output of goods and services, expressed in monetary units. It includes the value of goods and services that are, and are not, marketed. Benefit cost analysis is the technique used to identify the value of the effects of the project. Included are categories of benefits that can be assigned tangible monetary values directly resulting from bank stabilization at the mouth of the Kenai River. Not included are losses of historical and cultural value, and to some extent environmental quality, as these are

[22] Memorandum for Commander, Pacific Ocean Division, 10 May 2012.

not expressed in dollar terms. The loss of historical and cultural value and possible impacts to environmental quality are evaluated under the Other Social Effects and Environmental Quality accounts.

A. Evaluation Framework

USACE planning is conducted by comparing with- and without-project forecasts of future conditions in the study area. To ensure that plan alternatives are economically efficient, it is necessary to impose the condition of economically rational behavior on individuals and firms in both project conditions. The evaluation results in the identification of a theoretical willingness to pay for the project outputs which is used to express NED benefits, regardless of who will actually pay. Several economic analysis methods are used for this study, including CE/ICA and least cost, and are described in subsequent sections.

B. Data Collection Techniques

Data for the economic analysis were gathered through website research and previously published data from sources such as the Kenai Peninsula Borough Assessing Department, the City of Kenai, the State of Alaska Department of Labor and Workforce Development (ADOL&WD), and other sources. Primary input data include tax assessed property and land values maintained by the Kenai Peninsula Borough. The Marshall & Swift Residential and Commercial Estimator Programs were used to estimate depreciated replacement values for structures in the project area.

Data sources are listed in tables throughout the document to credit those agencies responsible. These items are described in more detail as appropriate in the following sections.

C. Model Development

Based on early coordination with the Coastal Storm Risk Management Planning Center of Expertise (CSRM-PCX), it was determined appropriate to develop a project-specific spreadsheet model for the NED analysis. The USACE-certified Beach-FX model is not used in this analysis because the erosion at Kenai Bluff is not event-based or storm-driven, and the study area may lack detailed information necessary for inputs into the Beach-FX model. The spreadsheet model developed by the Alaska District Economics Team went through USACE approval process, including endorsement for one-time use by the HQUSACE model approval panel on 4 October 2016. The CE/ICA was conducted using the Corps-certified Institute of Water Resources Planning Suite model.

IV. EXISTING CONDITIONS

Currently, the bluff fronting the north bank of the Kenai River near its mouth at Cook Inlet is eroding at an average rate of three feet per year. This bluff retreat has already destroyed or forced relocation of multiple structures, associated infrastructure, and historical and culturally significant properties.

Storm surges and wave attack at the toe of the bluff mobilizing fine particles within an exposed layer of clay. This mobilization is exacerbated by other forces. Ground water seepage at the confluence of two soil layers and surface flow over the top of the bluff moves soils from the upper slope to the bottom of the bluff. Tidal action strips away sediment during flood tides and carries it away during ebb tides. High flows on the river also carry away finer particles. Combined, these processes cause over-steepening which leads to collapse of the bluff face and inland retreat of the top of the bluff (Figure 8).

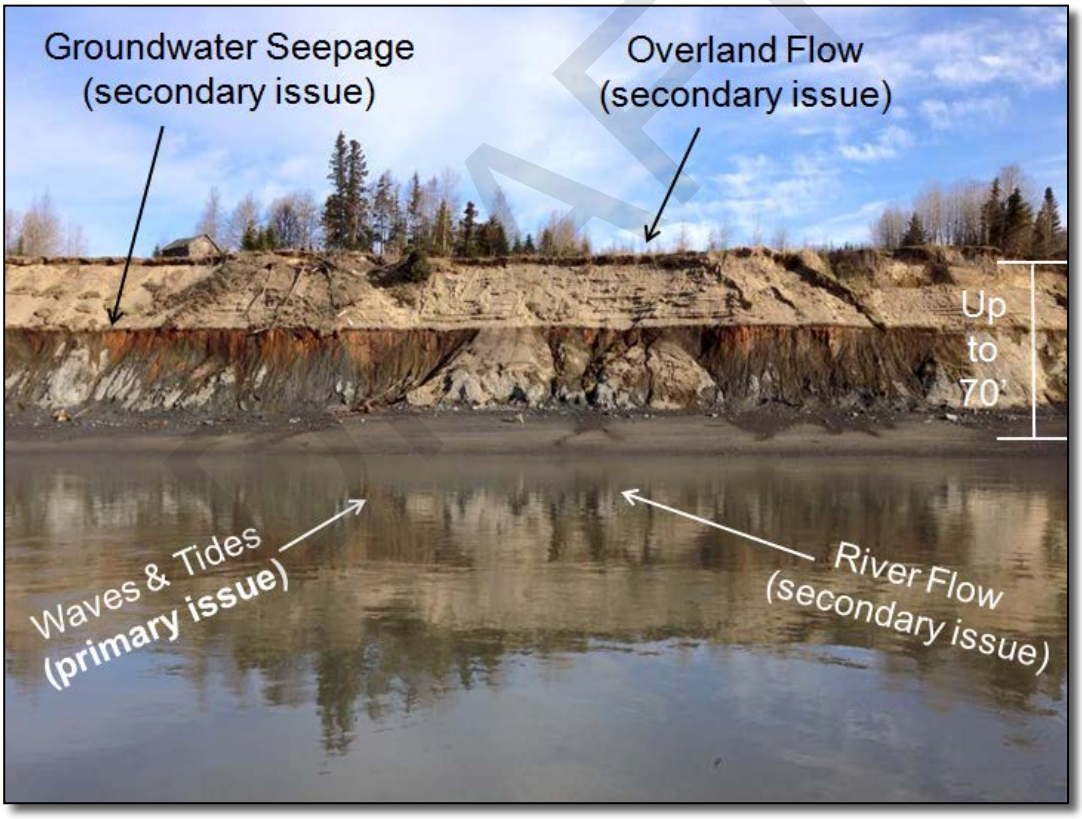

Figure 8. Erosion Processes

A. Losses to Date

For the past 20 years, the City of Kenai has identified the problem of vanishing bluff-top property a priority. Seven parcels have that still have tax assessed land values assigned by the Kenai Peninsula Borough have already been completely lost (four of which are completely

underwater), and at least eighteen additional parcels have suffered land loss. Additionally, nearly all of the threatened parcels have lost value.

One historic property, the Kenai Bible Church, established in 1940, has lost about one third of an acre to erosion. A restaurant inn called the Bunkhouse, established in the 1920's, is now completely gone, along with associated artifacts, except for part of the concrete foundation. In 2003, four historic wooden structures of unknown function were identified along the bluff face by USACE personnel (see Figure 9 and Figure 10).[23] By 2010, two of the structures had been lost;[24] all structures are now gone.

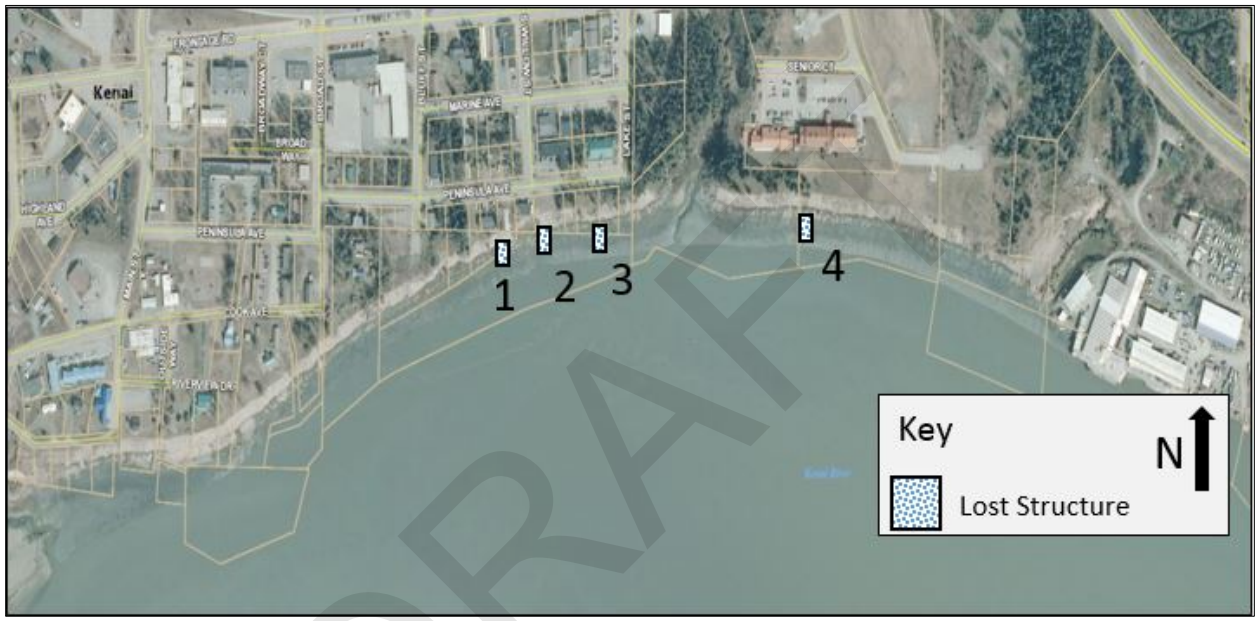

Figure 9. Overview of unidentified structures lost to erosion within project area

[23] Grover, M. 2003. Memorandum for Record. Site Visit to Bank Erosion site at Kenai, Alaska. Manuscript on file, U.S. Army Corps of Engineers, Alaska District, Anchorage, Alaska.

[24] USACE. 2011. "*Kenai River Bluff Limited Economic, Cultural and Historic Property Evaluation*", U.S. Army Corps of Engineers, Alaska District.

Figure 10. Remnants of unidentified structure number 4

An unknown number of prehistoric house depressions have also been lost from both archaeological sites; the 2010 survey photographed a house depression that was half-eroded (Figure 11).[25] Additionally, over the past decade several human remains have eroded out of the bluff face near the archaeological site of Shk'ituk't.[26]

Figure 11. Eroding prehistoric Dena'ina house depression, 2010

[25] Ibid.

[26] Personal communication between POA archaeologist and R. J. Dale, retired forensic anthropologist, State of Alaska, 1 March 2017.

B. Land Use

Land divisions along the bluff are generally low density residential with some commercial and park space. Additional uses include walking, biking, and wildlife viewing. The bluff face itself is too unstable for any current use, but the properties at the top of the bluff include a number of homes, businesses, and facilities expected to be impacted by erosion over the period of analysis. The largest structures within the threatened area are the Kenai Senior Center and Vintage Pointe Independent Senior Housing Facility, both of which are owned and operated by the City of Kenai, and are valued at approximately $7.9 million. A family practice clinic (Central Peninsula Family Practice), a historic local bar (Kenai Joe's), the Kenai Bible Church, and several vacation rental operations are among the establishments fronting the bluff that would be lost to erosion over the period of analysis. Three of the properties within the 50-year erosion area have been determined as historically significant, with a dozen more being eligible for significance. At the far eastern end of the bluff is the Pacific Star Seafoods processing plant, which falls outside the project area (Figure 12).

Figure 12. Pacific Star Seafoods and Eastern Terminus of the Bluff

C. Land

Approximately 5,000 feet of riverbank is actively eroding at an average annual rate of 3 feet per year. It is assumed that when a lot is 50 percent eroded or once road and/or road service to the parcel is cut off due to erosion, the parcel is considered completely damaged and no buyer would be willing to purchase the lot. There are approximately 26 lots fronting the bluff that approach this level of loss, and 59 lots in total that are expected to approach this level of

damage over the 50-year period of analysis. Of these, there are 31 properties with structures and/or other non-structural improvements.

D. Structures and Non-Structural Improvements

There are approximately 59 parcels within the study area, with 13 commercial or public structures, 21 residential structures, and 23 other improvements that are expected to be lost or condemned due to erosion over the period of analysis. According to Kenai Peninsula Borough tax assessment records, these properties include 21 privately-owned residential structures, 7 commercial structures, and 6 city-owned public structures. Some properties do not have structures but have had other improvements such as sheds or patios installed, which would also be affected by erosion and are therefore included in this analysis.

E. Residency

For the 34 structures in the study area, all are assumed to be occupiable or day-time occupiable until lost to erosion and condemned in the future. For the bluff area in general, two census tracts (6 Blocks 1010 and 1003) were compared to the structures in question. These census tracts include areas outside the area expected to be impacted by erosion so the census data does not offer the best estimate of the residents living along the eroding portion of the bluff.[27] However, an estimate of residents living in the erosion area was made based on the size and type of structures in the area (i.e. single family residence, multiple occupancy apartment complexes, etc.).

There are approximately 86 residents living in private homes, apartment complexes, and the Kenai Senior Center that would be forced to relocate if no action is taken to address erosion along the bluff. The Senior Center has the largest occupancy of any of the properties threatened. The Senior Center has 46 residents occupying 38 of 40 units, and there is a waitlist.[28] The Senior Center also serves as a community gathering place, serving approximately 1,700 seniors in the area, with the nearest senior centers being the Nikiski Senior Center, 15 miles from the Kenai center, and the Sterling Senior Center, 21 miles from the Kenai center.[29]

While these figures represent the number or residents living along the bluff, it is important to note that the Senior Center serves a much larger population within the community beyond its 46 residents, and the bluff itself is a popular destination for locals and tourists alike, many of whom recreate in the parks and pathways along the top of the bluff or stay in vacation rentals overlooking Cook Inlet.

[27] The population in the 2 census tracts was 235 compared to approximately 86-100 residents living on the properties within the erosion zone.

[28] Personal communication between POA economist and Chris Clough, GIS Manger for the Kenai Peninsula Borough. 2 February 2017.

[29] USACE 2011. "Kenai River Bluff Economic, Cultural and Historic Property Evaluation." Prepared for the U.S. Army Corps of Engineers by Tetra Tech, Inc.

F. Public Infrastructure

Threatened public infrastructure in the erosion zone includes: parks, walkways, roads, signs, street lights, curbs/gutters, water mains, sewer lines, lift stations, man holes, culverts, storm drains, and various utility lines (gas, electric, and telecom). In 2002, 500 feet of sewer line was moved away from the bank at a cost of $135,000. In addition, the street (Mission Avenue) adjacent to the sewer line was also moved at a cost of $125,000. Figure 13 shows the abandoned section of sewer line that had to be relocated as well as sections of line that are closest to the bank line that will have to be relocated if the erosion problems are not addressed. It is important to note that the bluff has retreated since this photo was taken, so the threat to infrastructure has increased. An inventory of threatened utilities is included in the future without project section.

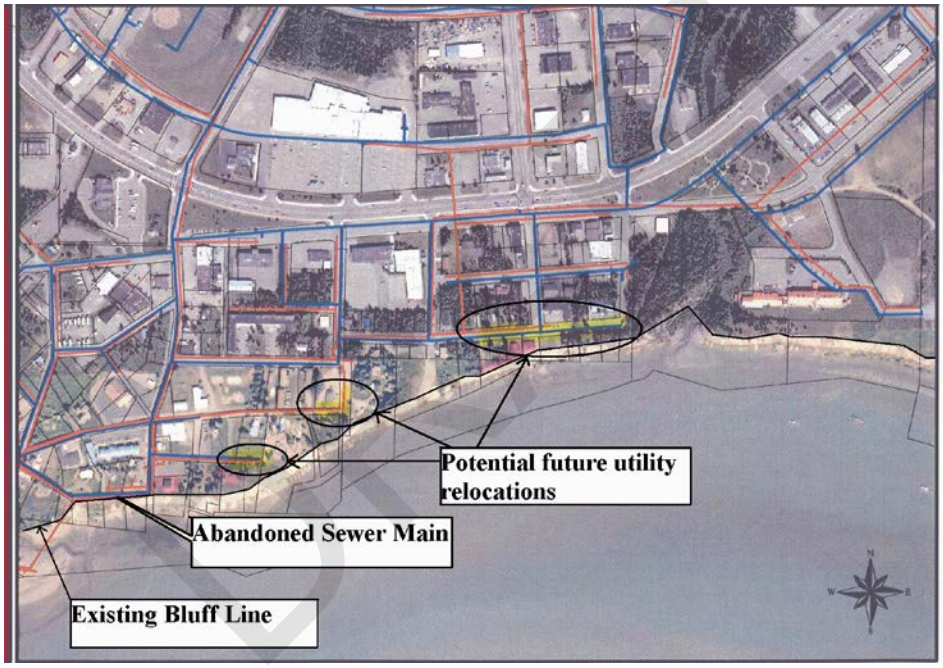

Figure 13. Approximate Kenai utility locations and Existing Bank Line

G. Recreation

The Kenai area is a popular tourist destination for both in-state and out-of-state visitors, as well as local recreation enthusiasts. Trophy King and silver salmon inhabit the Kenai River; dip-net fishing attracts approximately 20,000 visitors per year during the three week dip-net season, often with over 1,000 people concurrently accessing the mouth of the river.[30] While

[30] Poynor, A.E. 2008. "Kenai's Delicate Dunes." *Anchorage Daily News.* 15 July 2008.

the toe of the bluff itself is off limits for fishing and other public access due to safety concerns, the area along the top of the bluff is frequented by such visitors.

Quite a bit of foot traffic into the bluff area comes from the Beluga Lookout RV Park. Area users from the RV Park would usually start at Erik Hanson Scout Park and traverse the bluff area via Mission Ave., as well as the connected streets and natural paths that follow Mission Ave.

Erik Hansen Scout Park at the far west end of the bluff, just above the dunes near the mouth of the river and slightly beyond the 50-year erosion line, is used for viewing the coastline, bird watching, including bald eagles and seagulls that scavenge on fish parts, sitting on several benches, and general lawn games and activities. Picnics and other gatherings also take place here. The park is also adorned with a bronze "scout" statue and several flower beds.

Beyond Erik Hansen Scout Park, the Kenai Bluff area currently offers no formal recreation opportunities. However, as previously noted, tourists and local residents often traverse the bluff for wildlife viewing and outdoor activities such as hiking, biking, or cross-country skiing along the roads and natural paths. These activities have an inherent value to every participant. Mission Ave., Riverview Dr., Cook Dr., Broad St., Peninsula Ave., and Lake St. are all used for traversing the bluff. Moreover, lawn areas at the Senior Center also overlook the bluff. Visitors have been known to travel from the Leif Hanson Memorial Park near the Highway down Spur View Dr. to experience the view, and run dogs in the vicinity of the Senior Center lawn areas.

H. Cultural and Historic Resources

There are five historic properties within the project area identified on the Alaska Heritage Resources Survey, maintained by the State Historic Preservation Office: three historic houses and two archaeological sites. One of these archaeological sites is known to contain a late nineteenth-century cemetery, which is at risk of eroding into the river.

In addition to these resources, there are 13 additional structures of unknown historical relevance within the 50-year erosion zone. It is the opinion of the USACE archaeologist that both of the archaeological sites are eligible for listing on the National Register of Historic Places. Concurrence from the Alaska State Historic Preservation Officer is forthcoming.

V. FUTURE WITHOUT-PROJECT CONDITIONS

This section details the most likely future condition in the absence of Federal investment. Assumptions made for this evaluation include a 50-year period of analysis and the Federal fiscal year 2017 discount rate of 2.875 percent. Damages are reported in current dollars and have been rounded to the nearest thousand, so in some cases columns may not add due to rounding.

This section includes a discussion on expected damages, as well as on other social effects of losing the bluff to erosion, environmental quality effects, and regional economic activity lost.

A. Damages Methodology

The river bank at Kenai Bluff has experienced significant erosion over the last several decades. Based on aerial photography and analysis by Alaska District H&H engineers, an erosion rate of three feet per year is used to bracket the maximum extent of damages under the without-project condition. Currently, the bluff averages a loss of approximately one-third of an acre of land per year to erosion. Erosion may advance faster or slower in some years. On average, however, erosion is expected to move inland by approximately 3 feet annually or 150 feet over the 50-year period of analysis. The result of this erosion would be damages associated with the loss of land, condemned structures, and infrastructure, as well as historic and archaeological losses, risk to public safety, loss of recreational value, and effects to some local businesses.

Expected land loss and the number of condemned structures were identified and assigned a damage value based on Kenai Peninsula Borough tax assessed values for 2015. The Marshall & Swift Residential and Commercial Estimator Programs were used to estimate depreciated replacement values for structures and empty lots in the project area.

The value of land along the bluff has a spatial component and higher values due to the incredible views of the Kenai River and Cook Inlet, and the highly desired location for recreational and/or subsistence fishing. However, properties along the bluff also have about a 70-foot sheer drop due to the bordering erosion activity, which also influences property value.

Valuation of lost land is based on analysis of the average value per acre of comparable parcels within the Kenai Peninsula Borough. A comparison was made of properties on the Kenai Bluff to similar properties in nearby Soldotna, which are on the river but lack the Cook Inlet views. These properties are considered to be "nearshore", as they border the river.

There is a noticeable difference in land value between the properties located on the Kenai Bluff and those not located within danger of erosion. All properties are located in the Kenai Peninsula Borough and therefore have similar tax and employment bases. Noticeable differences are that Kenai Bluff properties have the more exceptional views which would normally indicate higher values.

Findings, however, were that the Kenai Bluff properties had much lower land values, which can be attributed in part to the dramatic erosion activity occurring at the bluff. Because properties subject to erosion tend to be valued at a lower rate than similar riverbank properties

that are not subject to erosion, the average value of comparable land has been used to account for the true value of property were there no active erosion occurring.

The results of the analysis of future without-project erosion damages are presented in the following sections for each damage category.

B. Land Damages

Again, approximately 5,000 feet of riverbank bluff is eroding at an average annual rate of 3 feet per year. It's assumed that once the erosion reaches 50 percent of the total lot size, no buyer would be willing to take the risk of purchasing the lot. There are 59 lots expected to reach this level of loss over the 50-year period of analysis. At current erosion rates, the Kenai Bluff will continue to lose 0.34 acres of land per year, and 17.2 acres over the 50-year period of analysis.[31] Of the 59 parcels, three parcels have eroded to a point where they are entirely or almost entirely located in the water at the toe of the bluff. These parcels still have tax assessed land values assigned by the Kenai Peninsula Borough and are therefore considered in this analysis.

Valuation of lost land within the 50-year erosion zone is based on an analysis of the average value per acre of 41 comparable parcels within the Kenai Borough against the average value per acre of parcels within the erosion zone.[32, 33] The analysis revealed an average value of $113,000 per acre for comparables and an average value of $71,000 per acre for properties within the erosion zone. Assessed values for both the properties in the erosion zone and comparables were adjusted according to the 2014 Alaska Taxable full value determination.[34] Table 5 shows comparisons of land value for properties in the project area versus comparables outside the erosion zone. At the same time, once protected against erosion, land values may become more valuable than comparable properties that lack the Cook Inlet views. However, such increases in land value are not quantified in the NED analysis, resulting in what is considered to be a conservative estimate of existing and future land value.

Table 5. Land Value Comparisons

Land Use	Kenai Bluff	Comparable Land
Average Land Value ($/acre)	$71,000	$113,000

Source: Kenai Peninsula Borough Tax Assessing Department
Note: Actual land value is estimated as the assessed value multiplied by the average percent above the assessed value according to 2014 Alaska Taxable.

[31] 5,000 feet times erosion rate of 3 ft. per year = 15,000 sq. ft. of land or approximately 0.34 acres per year, or 3.44 acres over a ten year period.

[32] Land values are based on nearby upland property per IWR Report 2011-R-09.

[33] Outliers were excluded from this data set. Lot numbers 4705510 and 4705602 were excluded from the land value analysis; both properties are owned by the City of Kenai with one being a large vacant lot of high value and the other being the lot on which the Senior Citizens Center is located.

[34] 2014 Alaska Taxable indicates assessed property values for the City of Kenai reflect 83 percent of the full value.

Using comparable land values, expected future without-project land damages from erosion over the 50-year period of analysis have a total value of approximately $1.9 million, a present value of $1.0 million, and equivalent average annual damage of $39,000. Table 6 summarizes expected land damages from erosion in ten year increments.

Table 6. Future Without-Project Land Damages

Item	Years					Total
	1-10	11-20	21-30	31-40	41-50	
Area (acres)	3.44	3.44	3.44	3.44	3.44	17.2
Total Value	$386,000	$386,000	$386,000	$386,000	$386,000	$1,930,000
Present Value	$331,000	$249,000	$188,000	$141,000	$107,000	$1,016,000
Average Annual Damages						**$39,000**

C. Structure and Non-Structural Improvement Damages

As a result of continued bluff erosion at the expected erosions rate, it is estimated that 31 properties containing structures and/or non-structural improvements in proximity to the bluff would be condemned over the period of analysis. There is some subjectivity on what should be counted as a "structure" (i.e. sheds, lean-tos, carports, etc.), but According to Kenai Peninsula Borough tax assessment records, these 31 properties include a total of 34 structures and 23 other non-structural improvements.[35] Of these structures, 21 are residential structures, 7 are commercial, and 6 are city-owned public structures. All structures are assumed to be occupiable or day-time occupiable. Some properties within the erosion zone have not been fully developed but are not considered vacant land. These properties have improvements including gravel driveways that have been installed, greenhouses, or land development such as fill being placed, etc. Damages to improved properties have been incorporated into the structural damages benefit category.

Condemnation of a structure (or property with a structure) was assumed to occur whenever any of the following conditions occurred:

1) Once any part of a structure intersects with the eroded bluff line
2) Once over 50% of the area of the lot on which the structure is constructed is lost[36]
3) Once utility and/or road service to the parcel is cut off due to erosion.

It was assumed that once condemned, all contents of value would be removed from structures and not damaged by erosion. For occupiable structures, it was assumed that no monetary losses would occur due to safety concerns as structures became condemned. It was also assumed that no future development would occur in the identified erosion zone over the

[35] Note that this differs from Alternative 6, where only occupied structures are counted.

[36] Parcel sizes containing structures within the erosion rate varied from a low of 4,356 square feet (.10 acres) to a high of 660,370 square feet (15.16 acres) with an average size of 41,594 square feet (0.95 acres).

period of analysis.[37] When possible, depreciated replacement values were estimated using the Marshall and Swift Residential and Commercial Estimator Programs. Depreciated replacement values were not available for some types of improvements such as paving and gravel driveways so tax assessed values from the Kenai Peninsula Borough were used in these cases.

Structures and/or property improvements that are condemned also have some additional costs associated with them. Such structures and improvements would need to be demolished and cleaned up, preferably before entering the river where clean-up costs would rise exponentially. In addition, condemned structures or improved properties with utilities will have an induced effect on those utilities. Utilities may need to be moved or removed as lots are lost. Temporary displacement of occupants while they relocate after a property is condemned also has a cost to the displaced.

Future without-project damages to residential, commercial, and public structures over the 50-year period of analysis have a present value of approximately $9.5 million, total value of $14.8 million, and average annual damages of $362,000. The largest structure within the project area is the Kenai Senior Citizen Center, which has a 2015 assessed value (land plus improvements) of approximately $7.9 million. At current erosion rates, the Senior Center is expected to suffer catastrophic damage within the next 20 years. Table 7 summarizes future-without project structure damages.

Table 7. Future Without-Project Structure and Non-Structural Improvement Damages

Type	Total Value	Present Value	Average Annual
Residential	$4,266,000	$2,651,000	$101,000
Commercial	$2,251,000	$1,634,000	$62,000
Public	$8,243,000	$5,235,000	$199,000
Total	**$14,760,000**	**$9,520,000**	**$362,000**

D. Public Infrastructure Damages

Infrastructure damages due to erosion are also expected to occur during the 50-year period of analysis. In addition to the utility hookups mentioned above, threatened infrastructure includes roads, signs, street lights, curbs/gutters, water mains, sewer lines, lift stations, man holes, culverts, storm drains, and various utility lines (gas, electric and telecom). In 2002, 500 feet of sewer line was moved away from the bank at a cost of $135,000. In addition, the street (Mission Avenue) adjacent to the sewer line was also moved at a cost of $125,000.[38]

Relocation of utilities and roads is expected to continue in the absence of a project. It is estimated that at least an additional 1,000 feet of road and utility lines are at risk of erosion. These roads and lines are anywhere from 30 to 100 feet from the bank. At the current pace of

[37] It's acknowledged that some properties may be improved by private owners, and some may lose value; additionally, economic trends could affect property values. It was, however, conservative to assume that little to no future development work occur.

[38] USACE 2006. "*Kenai River Bank Erosion Technical Report, Kenai Alaska*". U.S. Army Corps of Engineers, Alaska District.

erosion, additional streets, sewer lines, and other infrastructure noted above would need to be replaced within approximately 10 to 20 years.

Infrastructure depicted in Table 8 has a present valuation based on existing replacement costs and the expected year of failure due to erosion. As a result of continued bluff erosion at the expected average annual rate of 3 feet per year, estimated infrastructure damages from erosion over the 50-year period of the analysis have a present value of approximately $1.8 million, total value of $2.4 million, and average annual damages of $67,000.[39] Table 8 summarizes expected future without-project infrastructure damages.

Table 8. Future Without-Project Infrastructure Damages

Improvements	Total Value	Present Value	Average Annual
Roads	$444,000	$346,000	$13,100
Water Mains	$271,000	$200,000	$7,600
Fire Hydrants	$18,000	$11,000	$400
Water Valves	$12,000	$9,000	$300
Sewer Mains	$259,000	$192,000	$7,300
Manholes	$42,000	$23,000	$900
Lift Stations	$337,000	$284,000	$10,800
New Sewer Main Required	$64,000	$47,000	$1,800
New Manholes required (3)	$7,000	$5,000	$200
GCI Telecom improvements	$24,000	$18,000	$700
Homer Electric improvements	$421,000	$308,000	$11,700
Enstar Natural Gas Improvements	$301,000	$220,000	$8,300
ACS Telecom Improvements	$60,000	$44,000	$1,700
Curbs and Gutter	$30,000	$23,000	$900
Storm Drains	$18,000	$7,000	$300
Culverts	$4,000	$2,000	$100
Street Lights	$29,000	$20,000	$800
Road Signs	$19,000	$8,000	$300
Total Value	**$2,360,000**	**$1,767,000**	**$67,000**

E. Recreation Value

This section describes the value of recreational activities along Kenai Bluff as they are expected to exist in the absence of a Federal project. This value serves as a baseline for which to evaluate the beneficial increase in future recreation opportunities that would occur under the various future with-project scenarios. An overview of the recreation analysis is presented

[39] USACE 2013. Kenai River Bluff Erosion Section 905(B) (WRDA) Analysis. Costs were updated to FY17 dollars using Civil Works Construction Cost Index System (CWCCIS).

below. A detailed description of the analysis is included in the attached Recreation Addendum.

The bluff offers unparalleled views of the Kenai River and Cook Inlet, and is often traversed by local residents and tourists for wildlife viewing and other outdoor activities such as hiking, biking, dog walking, or cross-country skiing along the roads and natural paths as described in the existing conditions. Additional recreational activities take place in the lawn areas as well as in parks just outside the 50-year erosion area. In the future without-project scenario, these activities would be replaced by lower value activities pushed back to roads and properties further inland from the bluff. The amazing views afforded by the bluff would be impeded, not fully, but to a large extent by remaining structures. Additionally, views may be further depreciated by condemned (but not demolished and picked up structures) as erosion causes properties to be lost.

1. Unit Day Value (UDV)

This analysis uses the unit day value (UDV) method as described in USACE Economic Guidance Memorandum (EGM 17-03) for fiscal year 2017 to estimate the value of recreational use at the project site. The EGM provides guidelines for assigning point values to recreation activities and provides a table showing the range of daily values that correspond to point value scores. Points are awarded based on criteria that address the quality of the recreational area, the number and types of activities enjoyed in an area, and the availability of substitutes nearby. The UDV method then uses this point system to determine day values for recreation.

EGM 17-03 describes that values are higher for specialized recreation. Because the top of the bluff presents an opportunity to view unique regional wildlife including beluga whales, harbor seals, and porpoise, specialized recreation values were used.

The guidance also separates fishing and hunting opportunities from non-fishing and hunting uses. Fishing and hunting fall into the specialized recreation value category, but are dependent on the likelihood of success. Therefore, while the opportunity to pull a world record 97 lb. King salmon out of the Kenai River in the project area does exist, and that experience would be priceless, it isn't expected to occur. At the same time, many fish are pulled out of the river at the toe of the bluff (usually just west of the project area, but also at times, encroaching on the project area).

Non-fishing use has a lower UDV but the area should still be considered a high value recreation area. For instance, the Beluga Lookout RV Park website advertises:

> *"Beluga Lookout Lodge and RV Park offers a unique camping experience overlooking the mouth of the World-Famous Kenai River. We are conveniently situated in Old Town Kenai, with spectacular views of the Kenai River, Cook Inlet, and the volcanoes Mt. Redoubt and Mt. Illiamna… Watch for beluga whales, eagles, seals, moose and caribou. Fly a kite or fish from the beach, rent our unusual fun bikes, tour a historic Russian Orthodox Church and the historical town site of Old Town Kenai. Enjoy a round of golf at the Kenai Golf Course, or watch the Kenai Peninsula Oilers play baseball. Watch the commercial fishing fleet during the fishing season."*

This advertisement captures the recreational opportunities of the bluff area quite well. As a casual comparison, rates for an RV site range from $45 to $89 a day, May through September.

Given the guidelines in EGM 17-03, recreation point values were determined for the existing and foregone opportunity. For both conditions, the assigned point value is 51 (rounded to 50), which converted to the UDV of $23.77 in the specialized case, and a UDV of $8.42 in the general case. These values are multiplied by the area's estimated visitation, as determined through the capacity analysis described below, to estimate the average annual value for recreation.

2. Capacity Analysis

Two groups of people who use the bluff area annually can be considered: (1) high intensity users such as residents, Kenai locals, or users of the commercial businesses along the bluff such as Kenai Joes, the Kenai Bible Church, or the Peninsula Oilers Clubhouse, and (2) transient users such as foot traffic from the Beluga Lookout RV Park, the Erik Hansen park, or Leif Hansen park. Describing these user groups helps to rationalize total annual use, as an actual headcount would be exceedingly difficult given transient foot traffic. For instance, the Kenai Peninsula Tourism and Marketing Council estimates that 730,577 tourists visited the Peninsula in 2015. And much of these tourists want to see the mouth of the Kenai. It is also therefore evident that excess demand for recreation exists along the bluff.[40] However, demand does not equal capacity, and there are only about 40 parking spaces with easy access.

Utilizing guidance published in two IWR documents, a capacity analysis was performed.[41,42] The capacity analysis estimated 127 daily users of the area. When annualized, the average annual use expected at the Kenai site is 46,355 visits. Given the number of bluff residents, the census data for Old Town Kenai, as well as the tourism numbers, this level of use seems rational.

The Unit Day Values for the Specialized Recreation opportunity and the General Recreation opportunity are multiplied by the area's estimated annual visitation, which yields the Average Annual Recreation Value (AARV). The general AARV captures the future without-project value of the recreation opportunity in the absence of a project to address erosion.

From the Recreation Addendum, future without-project recreation value is summarized in Table 9. Over the 50-year period of analysis, the recreation experience at Kenai Bluff has a total value of approximately $19.5 million, a present value of $10.3 million, and an average annual value of $390,000.

[40] Per 3/1/2017 phone call.

[41] IWR Report 86-R-4

[42] IWR Report 74-R-1

Table 9. Future Without-Project Recreation Value

Category	Total Value	Present Value	Average Annual
FWOP Recreation Value	$19,515,000	$10,285,000	$390,309

F. Cultural and Historic Resources

In the absence of a project to address erosion, the only way to protect important cultural resources would involve full salvage recovery operations and Historic American Building Survey (HABS) recordation. Again, there are five historic properties within the project area identified on the Alaska Heritage Resources Survey that are expected to be impacted in the future-without project scenario. These properties includes three historic houses and two archaeological sites, one of which is known to contain a late nineteenth-century cemetery. A moderately-sized salvage archaeology operation could cost up to $938,000 per site.[43] It is important to note that this cost could also increase depending on the full extent of the sites, whether or not human remains are encountered, and soil conditions.

In addition to the five known historic properties, there are 13 additional structures of unknown historical relevance within the 50-year erosion zone. These structures have not been investigated for eligibility for listing on the National Register of Historic Place. The cost of documenting historical structures would include the initial survey, evaluation of eligibility, and HABS Level 1 documentation. An approximate estimate for the cost of these efforts is $80,000 per structure. For 13 structures, this would be about $1 million. However, this cost could potentially decrease, as not all of the structures may be eligible for the National Register of Historic Places, and would therefore only require survey and evaluation, not HABS documentation.

The activities described above regarding cultural and historic resources are not expected to take place in the future-without project scenario. Alaska District archaeologists indicated that there are no known plans for salvage archaeological operations or documentation of historical structures along Kenai Bluff, whether undertaken by the City of Kenai or other entities. Therefore, costs associated with these activities are not considered as future-without project losses. These costs would be incurred in future-with project scenarios for alternatives that would impact these resources. These impacts are discussed in the future-with project and other social effects sections of this appendix.

Please see Section XII on Other Social Effects for detailed discussion and breakdown of costs associated with salvage archaeological operations and documentation of historical structures. These are considered to be cultural mitigation costs and are included as NED costs in the benefit cost analysis.[44]

[43] See Section XII on other social effects for detailed discussion and breakdown of costs associated with salvage archaeological operations.

[44] Memorandum for see distribution. "Corps of Engineers Civil Works Cost Definitions and Applicability." 25 August 2011.

G. Summary of Future Without-Project Conditions

Table 10 summarizes the future without-project condition at Kenai Bluff and forms the basis for comparison for the future with-project alternatives. The present value of the expected damages to structures, land, and public infrastructure, as well as the future without-project recreation Unit Day Value are shown in Table 10. The present value of the future without-project condition costs over the 50-year period of analysis is approximately $22.6 million with an average annual value of t $858,000.

Table 10. Summary of Future Without-Project Conditions

Category:	Present Value	Average Annual
Structure damages	$9,520,000	$362,000
Land damages	$1,016,000	$39,000
Public Infrastructure damages	$1,768,000	$67,000
Damages Subtotal	**$12,304,000**	**$468,000**
Recreation Value	$10,285,000	$390,000
Total	**$22,589,000**	**$858,000**

Note: Potential recreation benefits make up approximately 45 percent of potential benefits in the future without-project condition. Per IWR Report 2011-R-09, no more than 50 percent of the benefits required for justification can be attributed to recreation benefits. Only incidental recreation benefits comprising up to 50 percent of total project benefits are considered in the benefit-cost analysis presented in this report.

While these values represent NED losses, they do not represent the full scale of loss that the erosion will cause if no federal action is taken. For example, and as described further in the Other Social Effects account, historical and archaeological losses are not given a monetary value. Additionally, jobs lost due to commercial businesses losing their property and the value inherent in that property are not accounted for here, but rather are discussed further in the RED account. Habitat losses caused by erosion over time, versus stabilized and protected habitat isn't discussed here, but rather in the environmental quality account. To summarize, the NED losses described in this section are substantial; however, the NED analysis does not tell the whole story of the importance of the bluff area to the Kenai community.

VI. ALTERNATIVES CONSIDERED

The planning charrette held in Kenai 4-5 May 2015 resulted in the development of preliminary alternatives. Six alternatives including the No Action alternative were formulated and are discussed below.

A. Alternatives

The following sections describe each alternative and their associated costs. Costs are at October 2016 price levels. Construction cost estimates include mobilization and demobilization, buyouts and relocations of structures within the project area as necessary, and bank stabilization, which includes the costs of excavation of bluff material, placement of excavated as well as imported soil, installation of rock, and erosion control fabric and vegetation. Costs for Operations, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) are included and described for each alternative. Annual costs are based on the Federal fiscal year 2017 discount rate of 2.875 percent and a 50-year project period of analysis.

1. Alternative 1: No Action Plan

The No Action would not take action to reduce or halt bluff erosion at Kenai. The study objective would not be met and no opportunities would be realized. The bluff would continue to erode. Structures would continue to be lost as the ground beneath them eroded away. These structures include historical structures, the Senior Center and Senior Housing, commercial buildings, and residences. Cultural resources associated with the Dena'ina people in general and the Kenaitze Tribe in particular would be lost. Public utilities and properties would suffer damages as described in the future without project conditions. As above, specialized recreation opportunities for viewing wildlife and traversing the bluff area would be lost or lose value.

2. Alternative 2: River Mouth Relocation

The River Mouth Relocation Alternative would relocate the mouth of the Kenai River approximately 3,500 feet to the south. A new channel would be dredged and the material stockpiled during excavation. Once the excavation was complete, the existing channel would be filled along the active erosion area to create emergent wetlands. Jetties would be constructed to protect the new mouth of the river from cross currents and sedimentation. Erosion of the bluff would be greatly reduced due to the elimination of waves, river currents, and tidal action from the bluff area. However, minor erosion would continue to occur due to groundwater seepage and overland flow. To protect structures, some buyouts, relocations, and/or replacements would be required within the new threatened area, though they would be less than the number required under the Non-Structural Alternative, Alternative Six. The number of buyouts, relocations, and/or replacements would be similar to what would occur under Alternative 5.

A harbor would be created by this action, capturing opportunities to improve navigation. However, since this study does not have the authority to construct navigation features that are eligible for cost-sharing, the channel and harbor would remain non-Federal. Navigation benefits claimed from creation of this harbor would be secondary to construction of coastal storm risk management measures. Because of the high cost of this alternative, benefits from a harbor were not studied in-depth.

The estimated NED cost including interest during construction, real estate costs, Project Engineering and Design (PED), construction supervision and administration, cultural and archaeological site evaluations, and contingency is approximately $450 million, or $17.1 million annually over the period of analysis.

Maintenance dredging would be required with this alternative on an annual basis. It is also assumed that a portion of armor stone would need to be replaced to maintain the jetties. While it is not anticipated that there will be a significant loss of stone from the structure over the life of the project, it is estimated that approximately 28,160 cubic yards of armor stone will need to be replaced every 20 years.

The total economic (NED) cost including interest during construction and maintenance has a present value of approximately $592 million or $22.5 million annually over the period of analysis.

3. Alternative 3: Revetting and Vegetating the Bluff Face - Buried Toe

The upper slope would be graded back and vegetated in order to promote stability. The armoring would extend from a buried toe six feet below the current river bank to a height of +32.5 feet mean low water (MLLW). Filter fabric, material, and geotextile would be used to ensure proper filtering of groundwater seepage and stabilization until areas can be permanently stabilized by vegetation or engineered slope controls.

This alternative would require the relocation or buyout of structures and infrastructure at the top of the bluff in order to facilitate a cut back to a stable slope angle of two to one. A temporary easement at the top of the bluff would be needed for construction of the revetment. Costs associated with this easement are included as NED costs. The estimated NED cost including interest during construction, real estate costs, PED, construction supervision and administration, cultural and archaeological site evaluations, and contingency is approximately $52.9 million, or $2.0 million annually. It is not anticipated that there will be a significant loss of stone from the structure over the life of the project. It is estimated that approximately 1,350 cubic yards of armor stone will need to be replaced every 20 years.

The total economic (NED) cost including interest during construction and maintenance has a present value of approximately $54.5 million or $2.1 million annually over the period of analysis.

4. Alternative 4: Revetting and Vegetating the Bluff Face - Weighted Toe

This alternative would reduce the volume of material cut from the bluff and use fill at the base to create a more stable slope. A stone revetment would be constructed at the base of the fill area. Slopes not protected by the revetment would be vegetated.

Filter fabric would separate the filter rock from the native material. The toe of the revetment would be constructed to launch material placed on the river side of the revetment to fill potential scour holes.

This alternative would require relocation or buyout of structures and infrastructure at the top of the bluff in order to facilitate a cut back to a stable slope angle of two to one. The number of buyouts, relocations, and/or replacements would be similar to what would occur under Alternative 3. A temporary easement would also be required at the top of the bluff for construction of the revetment. Costs associated with this easement are included as NED costs.

The estimated construction cost including interest during construction, real estate costs, PED, construction supervision and administration, and contingency is approximately $56.6 million, or $2.1 million annually.

It is not anticipated that there will be a significant loss of stone from the structure over the life of the project. It is estimated that approximately 2,900 cubic yards of armor stone will need to be replaced every 20 years.

The total economic (NED) cost including interest during construction and maintenance has a present value of approximately $58.1 million or $2.2 million annually over the period of analysis.

5. Alternative 5: Protective Berm at the Bluff Toe

This alternative would allow the bluff to reach a stable slope naturally by constructing a berm at the base of the bluff. The bluff would be allowed to naturally recede. Material lost from the bluff face would be protected from being washed away by the river and allowed to build up behind the berm. There would be no cutting or filling of the bluff face.

With the berm, it is anticipated that the bluff will eventually lay back to a two to one stable slope. It is estimated that 31 stabilized bluff parcels, as detailed in the OSE analysis, would be protected under this alternative. These parcels include structures such as the Kenai Senior Center and Vintage Pointe Independent Senior Housing Facility, as well as a family medical practice (Central Peninsula Family Practice) and the historic Kenai Joe's bar. This alternative would require the buyout and removal of some structures and infrastructure at the top of the bluff in order to prevent further loss due to erosion as the bluff stabilizes.

The estimated NED cost including interest during construction, real estate costs, PED, construction supervision and administration, cultural and archaeological site evaluations, and contingency is $33.0 million, or $1.3 million annually over the period of analysis.

It is not anticipated that there will be a significant loss of stone from the structure over the life of the project. It is estimated that approximately 4,200 cubic yards of armor stone will need to be replaced every 20 years.

The total economic (NED) cost including interest during construction and maintenance has a present value of approximately $34.5 million or $1.3 million annually over the period of analysis.

6. Alternative 6: Relocation

The Relocation Alternative would not construct a structural solution. Instead, all buildings in the area expected to erode over the 50-year period of analysis would be bought out and removed from the area through a plan that includes demolition of existing facilities. All known historical structures and archaeological sites would require mitigation associated with loss of context, and would require proper documentation of cultural resources. These activities would require coordination with the Kenaitze Indian Tribe and other tribal entities that may be associated with the area.

The total economic (NED) cost for this alternative has a present value of approximately $40.4 million or $1.5 million annually. This includes the appraised or fair market values for all properties, rather than assessed values, plus documentation costs for historic properties and archaeological resources. Appraised property values were considered a more conservative (or higher) estimation of costs than physically picking up buildings and moving them to other lots in Kenai, and thus were used. Buyouts at appraised property values were also deemed to be acceptable to the majority of bluff property owners who would otherwise be affected by erosion.

B. Total Project Costs

Table 11 summarizes project costs by alternative. For a detailed breakdown of project first costs, please see Table 31. Each alternative has a total construction cost estimate, or project first cost, prepared by Cost Engineering utilizing MCASES. The total economic (NED) cost is the sum of project first costs, interest during construction, and operations and maintenance expenses.

Table 11. Total Project Costs, by Alternative

Alt.	Description	Project First Cost	Interest During Construction	Operations & Maintenance	Present Value Economic (NED) Cost	Average Annual Cost
1	No Action	$0	$0	$0	$0	$0
2	River Mouth Relocation	$424,769,000	$25,016,000	$142,198,000	$591,983,000	$22,465,000
3	Revetting and Vegetating the Bluff Face – Buried Toe	$51,429,000	$1,486,000	$1,554,000	$54,469,000	$2,067,000
4	Revetting and Vegetating the Bluff Face – Weighted Toe	$55,040,000	$1,590,000	$1,502,000	$58,132,000	$2,206,000
5	Protective Berm at the Bluff Toe	$32,051,000	$926,000	$1,511,000	$34,488,000	$1,309,000
6	Relocation	$39,299,000	$1,135,000	$0	$40,434,000	$1,534,000

The project first cost includes contingency, mobilization and demobilization, and bank stabilization, which includes the costs of excavation of bluff material, placement of excavated and imported soil, instillation of rock, and erosion control fabric and vegetation. Project first costs also include costs for Lands, Easements, Rights of Way, Relocations, and Dredged Material Disposal Areas (LERRD); Planning, Engineering, and Design (PED); construction supervision and administration; and cultural and archaeological site evaluations.

The present value economic (NED) cost for each alternative includes the project first costs noted above as well as costs associated with interest during construction (IDC) and operations and maintenance. IDC assumes a 2-year construction window for alternatives 3-6 and a 4-year construction window for alternative 2. Operations, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) assumes 10 percent of armor rock is replaced every 20 years. Alternative 2 (river mouth relocation) also includes annual maintenance dredging.

Present value and average annual costs are calculated utilizing a 50-year project period of analysis and a Federal fiscal year 2017 discount rate of 2.875 percent.

VII. FUTURE WITH-PROJECT CONDITIONS

This section provides an analysis of the continued erosion damages that are expected to occur in the various future with-project (FWP) conditions. These are the costs which accrue over the 50-year period of analysis with the various Federal projects in place; they are not construction costs. Continued erosion damages in all FWP scenarios are lower than in the FWOP condition except for the No Action alternative. The differences in the FWP and the FWOP conditions are the monetary benefits discussed in section VIII.

In this section, the same categories for which damages were quantified for the FWOP condition are utilized, i.e. damages to land, structures, improved properties, infrastructure, and lost recreational opportunities. Also, some costs are still not included as they will be discussed in the other accounts. Again, there will be other losses recorded in other sections, including 1) historical and archeological losses beyond the documentation cost, which are discussed in OSE; 2) jobs lost, discussed in RED; 3) loss or gain of rugosity and environmental quality, discussed in EQ, and; 4) losses of subsistence, safety, or social justice, discussed in OSE.

Another important note for the analysis here is that all values in this section have been rounded to the nearest thousand and therefore may not exactly equal values presented elsewhere.

Table 12 summarizes future with-project conditions for each alternative considered, while the rest of the section details damages by specific categories. Please note that, compared to No Action and alternative 6, values are higher for alternatives 2 through 5 due to the improved recreation experience under these alternatives.

Table 12. Summary of Future With-Project Conditions

Alt.	Alternative Description	Damages Subtotal[1]	Recreation Value	Total Present Value[2]	Average Annual Value[3]
1	No Action	$12,304,000	$10,285,000	$22,590,000	$858,000
2	River Mouth Relocation	$1,154,000	$29,036,000	$30,190,000	$1,146,000
3	Revetting and Vegetating the Bluff Face – Buried Toe	$750,000	$29,036,000	$29,786,000	$1,130,000
4	Revetting and Vegetating the Bluff Face – Weighted Toe	$750,000	$29,036,000	$29,786,000	$1,130,000
5	Protective Berm at the Bluff Toe	$1,154,000	$29,036,000	$30,190,000	$1,146,000
6	Structure Relocation	$2,784,000	$10,285,000	$13,070,000	$496,000

Notes:

1. Damage subtotal category includes FWP expected damages to land, structures, and infrastructure.
2. Total Present Value equals the damages subtotal plus recreation value.
3. This is the average annual value of the total present value given the 50-year period of analysis and Federal fiscal year discount rate of 2.875 percent.

A. Assumptions

In general, the same assumptions utilized in the FWOP condition still apply. Key assumptions and any differences will be noted in the appropriate sections.

B. Land Damages

Expected land damages in the future with-project condition for each alterative are summarized in Table 13 below.

For all alternatives except no action, while some land damages occur, they would be mitigated by buyouts.

Table 13. Future With-Project Land Damages

Alt.	Alternative Description	Present Value	Average Annual Value	Quantity Lost (Acres)
1	No Action	$1,016,000	$39,000	17.2
2	River Mouth Relocation	$210,000	$8,000	3.4
3	Revetting and Vegetating the Bluff Face – Buried Toe	$750,000	$28,000	6.9
4	Revetting and Vegetating the Bluff Face – Weighted Toe	$750,000	$28,000	6.9
5	Protective Berm at the Bluff Toe	$210,000	$8,000	3.4
6	Structure Relocation	$1,016,000	$39,000	17.2

Alternative 1: No action

Land damages for this alternative are the same as for the future without project condition. If no action is taken, approximately 17.2 acres along the top of the bluff are expected to be lost due to erosion over the period of analysis.

Alternative 2: Relocating the mouth of the Kenai River
This alternative would allow the natural erosion process that the bluff experiences to continue, but would reduce the river currents and storm waves that wash the eroded material away. This would allow the naturally eroded material to accumulate and, overtime, the bluff would lay back to a stable slope. With this alternative, land damages are expected to coincide with the natural layback of the bluff.

Relocating the mouth of the Kenai would require the excavation of a new channel through the mud flats, construction of two jetties to train the new river mouth, and construction of a cut-off dike to prevent wave attack at the bluff toe during storm events. It is estimated that it would take between 3-15 years for the bluff to stabilize assuming an erosion rate of 3 feet per year. Over that period approximately 3.4 acres are expected to be lost along the top of the bluff. Damages that occur in the future under this alternative have been appropriately discounted with their year of loss.

Alternative 3: Revetting and vegetating the bluff face with a buried toe

This alternative would protect the bluff by laying it back on a stable slope, armoring the lower slope, and vegetating the upper slope. This alternative would provide immediate bluff protection from each erosion mechanism. However, to achieve an engineered/stable slope, approximately 60 feet of layback would be required. Thus, about 6.9 acres of land would be lost.

Alternative 4: Revetting and vegetating the bluff face with a weighted toe
Future land damages under this project alternative are similar to what is expected under Alternative 3 above.

Alternative 5: Protecting the bluff toe to prevent eroded material from being washed away
This option would construct a protective berm at the toe of the bluff. The natural erosion processes that the bluff experiences would continue, but the berm would prevent the eroded material from being washed away by river currents or storm waves. This would allow the naturally eroded material to accumulate and, overtime the bluff would lay back to a stable slope. It is estimated that it would take between 3-15 years for the bluff to stabilize assuming an erosion rate of 3 feet per year. With this alternative, land damages are expected to coincide over time with the natural layback of the bluff after the toe of the bluff is armored. Land damages that occur in the future under this alternative have been appropriately discounted with their year of loss. The total amount of land lost from the top of the bluff is approximately 3.4 acres under this scenario.

Alternative 6: Structure Relocation

Land damages for this alternative are the same as for the future without project condition.

C. Structure Damages

Expected structure damages in the future with-project condition for each alterative are summarized in Table 14 below.

For all alternatives except no action, while structure damages occur, they are mitigated by buyouts.

Table 14. Future With-Project Structure Damages

Alt.	Alternative Description	Present Value	Average Annual Value	Quantity Lost (Number)
1	No Action	$9,520,000	$362,000	34
2	River Mouth Relocation	$0	$0	0
3	Revetting and Vegetating the Bluff Face – Buried Toe	$0	$0	0
4	Revetting and Vegetating the Bluff Face – Weighted Toe	$0	$0	0
5	Protective Berm at the Bluff Toe	$0	$0	0
6	Structure Relocation	$0	$0	0

Note: Values are rounded to the nearest thousand.

Alternative 1: No action

Structure damages for this alternative are the same as for the future without project condition. Approximately 34 structures would be lost within the 50 year period of analysis.

Alternative 2: Relocating the mouth of the Kenai River
Structure damages are expected to coincide with the natural layback of the bluff. It is estimated that it would take between 3-15 years for the bluff to stabilize assuming an erosion rate of 3 feet per year. Over that period no structures are lost; however, some structures that are close to the bluff would be bought out or relocated within the same parcel when possible. These structures are considered to be protected, and the costs associated with buyouts and relocation are captured in NED costs. Damages that occur in the future under this alternative have been appropriately discounted with their year of loss.

Alternative 3: Revetting and vegetating the bluff face with a buried toe
This alternative would provide immediate bluff protection from each erosion mechanism. However, construction of this alternative would be constrained by real estate at the top of the bluff. The impact to real estate at the top of the bluff is estimated to coincide approximately with the area of land that would be impacted in the absence of a project over the first 15 years of the period of analysis. However, losses are not incurred over time, but immediately and are calculated in current year dollars. Approximately 25 structures would be bought out or relocated.

Alternative 4: Revetting and vegetating the bluff face with a weighted toe
Future land damages under this project alternative are the same as under Alternative 3 above. Losses are incurred immediately and calculated in current year dollars. Approximately 25 structures would be bought out or relocated.

Alternative 5: Protecting the bluff toe to prevent eroded material from being washed away
Overtime the bluff would lay back to a stable slope. It is estimated that it would take between 3-15 years for the bluff to stabilize assuming an erosion rate of 3 feet per year. With this alternative, structure damages are expected to coincide over time with the natural layback of the bluff after the toe of the bluff is armored. Over that period some structures that are close to the bluff would be demolished and removed from the parcel, or relocated within the same parcel when possible. Such damages would be mitigated through buyouts. Structure damages that occur in the future under this alternative have been appropriately discounted with their year of loss.

Alternative 6: Structure Relocation

Structure damages for this alternative are the same as for the future without project condition; however, all structures would be bought out.

D. Public Infrastructure

Expected public infrastructure damages in the future with-project condition for each alterative are summarized in Table 15 below.

Table 15. Future With-Project Public Infrastructure Damages

Alt.	Alternative Description	Present Value	Average Annual Value
1	No Action	$1,767,000	$67,000
2	River Mouth Relocation	$944,000	$36,000
3	Revetting and Vegetating the Bluff Face – Buried Toe	$0	$0
4	Revetting and Vegetating the Bluff Face – Weighted Toe	$0	$0
5	Protective Berm at the Bluff Toe	$944,000	$36,000
6	Structure Relocation	$1,767,000	$67,000

Note: Values are rounded to the nearest thousand.

Alternative 1: No action

Infrastructure damages for this alternative are the same as for the future without project condition.

Alternative 2: Relocating the mouth of the Kenai River
Infrastructure damages are expected to coincide with the natural layback of the bluff. It is estimated that it would take between 3-15 years for the bluff to stabilize assuming an erosion rate of 3 feet per year. Damages that occur in the future under this alternative have been appropriately discounted with their year of loss, as displayed in Table 15.

Alternative 3: Revetting and vegetating the bluff face with a buried toe
This alternative would provide immediate bluff protection from each erosion mechanism. However, impacts to infrastructure at the top of the bluff would occur due to approximately 60 feet of layback. Losses do not incur over time, but immediately, and are calculated in current year dollars. These losses are accounted for in the project costs. The description of project costs further details the infrastructure to be removed and/or relocated.

Alternative 4: Revetting and vegetating the bluff face with a weighted toe
Future land damages under this alternative are similar to Alternative 3 above. Losses are incurred immediately and calculated in current year dollars. These losses are accounted for in the project costs, which detail the removal and/or relocation of infrastructure.

Alternative 5: Protecting the bluff toe to prevent eroded material from being washed away
Over time, the bluff would lay back to a stable slope. It is estimated that it would take between 3-15 years for the bluff to stabilize assuming an erosion rate of 3 feet per year. With this alternative, infrastructure damages are expected to coincide over time with the natural

layback of the bluff after the toe of the bluff is armored. Infrastructure damages that occur in the future under this alternative have been appropriately discounted with their year of loss.

Alternative 6: Structure Relocation

Infrastructure damages for this alternative are the same as for the future without project condition.

E. Recreation Value

Because construction of recreational facilities is not part of any alternative, there are no Future With-Project construction costs. However, preserving the recreational value provided to current bluff area users presents a reduction of the opportunity cost associated with taking no action. This is described below.

The future with-project recreation experience is quantified using the same method described in the future without-project section; however, some alternatives preserve the view better than others as follows:

Table 16. Future With-Project Recreation Value

Alt.	Alternative Description	Preserves View
1	No Action	No
2	River Mouth Relocation	Yes
3	Revetting and Vegetating the Bluff Face – Buried Toe	Maybe (yes with new trail)
4	Revetting and Vegetating the Bluff Face – Weighted Toe	Maybe (yes with new trail)
5	Protective Berm at the Bluff Toe	Yes
6	Structure Relocation	No

With the loss of view, and wildlife viewing opportunities, the primary driver of the specialized recreation activity is lost. Activities such as walking, biking, and skiing on roads would then become a general recreation activity as follows:

Table 17. Points and Unit Day Values for Kenai, Future Without- and Future With-Project Conditions

Type of Recreation	Points	UDV
General Recreation	50	$8.42
Specialized Recreation other than Fishing & Hunting	50	$23.77

Source: Points based on professional judgment. UDVs from USACE EGM 16-03.

Points remain the same because capacity remains the same (i.e. no parking spaces are lost in any alternative). See the Recreation Addendum for the full capacity analysis. Additionally, point value judgements remain the same because construction of additional recreational facilities is not part of any alternative. The specialized Average Annual Recreation Value (AARV) described in the Recreation Addendum captures the future with-project value of the recreation opportunity for the alternatives that protect the bluff from erosion. The generalized AARV used to calculate potential recreation benefits in the future without-project condition captures recreation benefits for Alternatives 1 and 6, the no action and structure relocation alternatives.

Again, it is important to note that no more than 50 percent of the benefits required for justification can be attributed to recreation. While the future with-project potential recreation benefits could exceed 50 percent of total benefits, only incidental recreation benefits comprising 50 percent of total benefits are included as benefits, as presented in Section VIII of this appendix.

Table 18 shows the net present value and average annual future with-project recreation unit day values for each alternative.

Table 18. Future With-Project Recreation Value

Alt.	Alternative Description	Present Value	Average Annual Value
1	No Action	$10,285,000	$390,000
2	River Mouth Relocation	$29,036,000	$1,102,000
3	Revetting and Vegetating the Bluff Face – Buried Toe	$29,036,000	$1,102,000
4	Revetting and Vegetating the Bluff Face – Weighted Toe	$29,036,000	$1,102,000
5	Protective Berm at the Bluff Toe	$29,036,000	$1,102,000
6	Structure Relocation	$10,285,000	$390,000

F. Cultural and Historic Resources

Costs would be incurred for alternatives that would impact cultural and historic resources. If an alternative that may affect these cultural resources is chosen (any alternative other than Alternative 5), then all of these structures, in addition to those already listed on the Alaska Heritage Resources Survey, must be investigated to determine their eligibility for listing on the National Register of Historic Places. It is the opinion of the USACE archaeologist that both of the archaeological sites are eligible for listing on the National Register of Historic Places. Concurrence from the Alaska State Historic Preservation Officer is forthcoming.

Protecting these cultural resources would involve full salvage recovery operations and Historic American Building Survey (HABS) recordation. Again, there are five historic

properties within the project area identified on the Alaska Heritage Resources Survey that are expected to be impacted without a project in place. This includes three historic house and two archaeological sites, one of which is known to contain a late nineteenth-century cemetery. A moderately-sized salvage archaeology operation could cost up to $938,000 per site.[45] It is important to note that this cost could also increase depending on the full extent of the sites, whether or not human remains are encountered, and soil conditions.

In addition to the five known historic properties, there are 13 additional structures of unknown historical relevance within the 50-year erosion zone. These structures have not been investigated for eligibility for listing on the National Register of Historic Place. The cost of documenting historical structures includes the initial survey, evaluation of eligibility, and HABS Level 1 documentation. An approximate estimate for the cost of these is $80,000 per structure. For 13 structures, this would be about $1 million. However, this cost could potentially decrease, as not all of the structures may be eligible for the National Register of Historic Places, and would therefore only require survey and evaluation, not HABS documentation.

The costs associated with the activities described above regarding cultural and historic resources would be incurred in future-with project scenarios for alternatives that would impact these resources. Please see Section XII on Other Social Effects for detailed discussion and breakdown of costs associated with salvage archaeological operations and documentation of historical structures. These are considered to be cultural mitigation costs and are included as NED costs in the benefit-cost analysis.[46]

G. Summary of Future With-Project Conditions

Table 19 summarizes future with-project conditions for each alternative considered. It adds the cost of land damages, structures, improved properties, infrastructure, and recreational value lost. Please note that, compared to No Action and alternative 6, values are higher for alternatives 2 through 5 due to the improved recreation experience under these alternatives.

[45] A breakdown of costs associated for salvage archaeological operations are included in Section XII on Other Social Effects.

[46] Memorandum for see distribution. “Corps of Engineers Civil Works Cost Definitions and Applicability.” 25 August 2011.

Table 19. Summary of Future With-Project Conditions

Alt.	Alternative Description	Damages Subtotal	Recreation Value	Total Present Value	Average Annual Value
1	No Action	$12,304,000	$10,285,000	$22,590,000	$858,000
2	River Mouth Relocation	$1,154,000	$29,036,000	$30,190,000	$1,146,000
3	Revetting and Vegetating the Bluff Face – Buried Toe	$750,000	$29,036,000	$29,786,000	$1,130,000
4	Revetting and Vegetating the Bluff Face – Weighted Toe	$750,000	$29,036,000	$29,786,000	$1,130,000
5	Protective Berm at the Bluff Toe	$1,154,000	$29,036,000	$30,190,000	$1,146,000
6	Structure Relocation	$2,784,000	$10,285,000	$13,070,000	$496,000

Notes:

- Damage subtotal Damage subtotal category includes FWP expected damages to land, structures, and infrastructure.
- Total net present value is the sum of the damages subtotal and Recreation Value categories.
- Values are rounded to the nearest thousand and may not sum from the previous tables due to rounding.
- Present value and average annual values are calculated utilizing a 50-year project period of analysis and a Federal fiscal year 2017 discount rate of 2.875 percent.

VIII. ANNUAL BENEFITS

This section serves to summarize the annual benefits, by category and by alternative. Annual benefits determined by comparing costs in the future without and future with project conditions, i.e. the expected damages prevented by taking action.

An important note is that all values presented in this section have been rounded to the nearest thousand and therefore may not exactly equal to values presented in the previous sections.

A. Benefits by Category

This section summarizes the average annual future without project condition costs, future with project condition costs, and benefits by benefit category.

1. Land

No land damages are avoided in the No Action or Structure Relocation alternatives so the FWP land damages for these options remain the same as the FWOP condition.

Table 20. Land Damages, Average Annual Values

Scenario	Average Annual Values		
	FWOP	FWP	Benefit
FWOP	$39,000		
Alt. 1	$39,000	$39,000	$0
Alt. 2	$39,000	$8,000	$31,000
Alt. 3	$39,000	$28,000	$11,000
Alt. 4	$39,000	$28,000	$11,000
Alt. 5	$39,000	$8,000	$31,000
Alt. 6	$39,000	$39,000	$0

2. Structures

Table 21. Structure Damages, Average Annual Values

Scenario	Average Annual Values		
	FWOP	FWP	Benefit
FWOP	$362,000		
Alt. 1	$362,000	$362,000	$0
Alt. 2	$362,000	$0	$362,000
Alt. 3	$362,000	$0	$362,000
Alt. 4	$362,000	$0	$362,000
Alt. 5	$362,000	$0	$362,000
Alt. 6	$362,000	$0	$362,000

3. Public Infrastructure

Table 22. Public Infrastructure Damages, Average Annual Values

Scenario	Average Annual Values		
	FWOP	FWP	Benefit
FWOP	$67,000		
Alt. 1	$67,000	$67,000	$0
Alt. 2	$67,000	$36,000	$31,000
Alt. 3	$67,000	$0	$67,000
Alt. 4	$67,000	$0	$67,000
Alt. 5	$67,000	$36,000	$31,000
Alt. 6	$67,000	$67,000	$0

4. Recreation

Table 23. Recreation Benefits, Average Annual Values

Scenario	Average Annual Values			
	FWOP	FWP	Total Potential Benefit	Incidental Recreation Benefits
FWOP	$390,000			
Alt. 1	$390,000	$390,000	$0	$0
Alt. 2	$390,000	$1,102,000	$712,000	$423,000
Alt. 3	$390,000	$1,102,000	$712,000	$438,000
Alt. 4	$390,000	$1,102,000	$712,000	$438,000
Alt. 5	$390,000	$1,102,000	$712,000	$423,000
Alt. 6	$390,000	$390,000	$0	$0

Note: Incidental recreation benefits utilized in the benefit-cost analysis comprise 50 percent of total benefits and are shown in the rightmost column.

B. Benefits by Alternative

This section summarizes the future without project costs, future with project costs, and benefits by alternative and benefit category. Calculations utilize a 50-year project period of analysis and a federal fiscal year 2017 discount rate of 2.875 percent. Please note that average annual benefits associated with reducing damages to land, structures, and infrastructure are calculated by subtracting expected future with-project damages from future without-project damages, while benefits for enhancing the recreational experience are calculated as the increase in recreation value between the future-without project and future-with project conditions.

Table 24. Alternative 1 No Action, Benefits Summary

Alternative 1	Future Without Project		Future With Project		Benefits	
Category:	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**
Land damages	$1,016,000	$39,000	$1,016,000	$39,000	$0	$0
Structure damages	$9,520,000	$362,000	$9,520,000	$362,000	$0	$0
Infrastructure damages	$1,768,000	$67,000	$1,768,000	$67,000	$0	$0
Damage subtotal	**$12,304,000**	**$468,000**	**$12,304,000**	**$468,000**	**$0**	**$0**
Recreation Value	$10,285,000	$390,000	$10,285,000	$390,000	$0	$0
Total	**$22,589,000**	**$858,000**	**$22,589,000**	**$858,000**	**$0**	**$0**

Note: Values are rounded to the nearest thousand and may not sum from the previous tables due to rounding.

Table 25. Alternative 2 River Mouth Relocation, Benefits Summary

Alternative 2	Future Without Project		Future With Project		Benefits	
Category:	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**
Land damages	$1,016,000	$39,000	$210,000	$8,000	$806,000	$31,000
Structure damages	$9,520,000	$362,000	$0	$0	$9,520,000	$361,000
Infrastructure damages	$1,768,000	$67,000	$944,000	$36,000	$824,000	$31,000
Damage subtotal	**$12,304,000**	**$468,000**	**$1,154,000**	**$44,000**	**$11,150,000**	**$423,000**
Recreation Value	$10,285,000	$390,000	$29,036,000	$1,102,000	$11,150,000	$423,000
Total	**$22,589,000**	**$858,000**	**$30,190,000**	**$1,146,000**	**$22,300,000**	**$846,000**

Note: Values are rounded to the nearest thousand and may not sum from the previous tables due to rounding.

Table 26. Alternative 3 Revetting and Vegetating the Bluff Face – Buried Toe, Benefits Summary

Alternative 3	Future Without Project		Future With Project		Benefits	
Category:	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**
Land damages	$1,016,000	$39,000	$750,000	$28,000	$266,000	$10,000
Structure damages	$9,520,000	$362,000	$0	$0	$9,520,000	$361,000
Infrastructure damages	$1,768,000	$67,000	$0	$0	$1,768,000	$67,000
Damage subtotal	**$12,304,000**	**$468,000**	**$750,000**	**$28,000**	**$11,554,000**	**$438,000**
Recreation Value	$10,285,000	$390,000	$29,036,000	$1,102,000	$11,554,000	$438,000
Total	**$22,589,000**	**$858,000**	**$29,786,000**	**$1,130,000**	**$23,108,000**	**$876,000**

Note: Values are rounded to the nearest thousand and may not sum from the previous tables due to rounding.

Table 27. Alternative 4 Revetting and Vegetating the Bluff Face – Weighted Toe, Benefits Summary

Alternative 4	Future Without Project		Future With Project		Benefits	
Category:	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**
Land damages	$1,016,000	$39,000	$750,000	$28,000	$266,000	$10,000
Structure damages	$9,520,000	$362,000	$0	$0	$9,520,000	$361,000
Infrastructure damages	$1,768,000	$67,000	$0	$0	$1,768,000	$67,000
Damage subtotal	**$12,304,000**	**$468,000**	**$750,000**	**$28,000**	**$11,554,000**	**$438,000**
Recreation Value	$10,285,000	$390,000	$29,036,000	$1,102,000	$11,554,000	$438,000
Total	**$22,589,000**	**$858,000**	**$29,786,000**	**$1,130,000**	**$23,108,000**	**$876,000**

Note: Values are rounded to the nearest thousand and may not sum from the previous tables due to rounding.

Table 28. Alternative 5 Protective Berm at the Bluff Toe, Benefits Summary

Alternative 5	Future Without Project		Future With Project		Benefits	
Category:	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**
Land damages	$1,016,000	$39,000	$210,000	$8,000	$806,000	$31,000
Structure damages	$9,520,000	$362,000	$0	$0	$9,520,000	$361,000
Infrastructure damages	$1,768,000	$67,000	$944,000	$36,000	$824,000	$31,000
Damage subtotal	**$12,304,000**	**$468,000**	**$1,154,000**	**$44,000**	**$11,150,000**	**$423,000**
Recreation Value	$10,285,000	$390,000	$29,036,000	$1,102,000	$11,150,000	$423,000
Total	**$22,589,000**	**$858,000**	**$30,190,000**	**$1,146,000**	**$22,300,000**	**$846,000**

Note: Values are rounded to the nearest thousand and may not sum from the previous tables due to rounding.

Table 29. Alternative 6 Structure Relocation, Benefits Summary

Alternative 6	Future Without Project		Future With Project		Benefits	
Category:	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**
Land damages	$1,016,000	$39,000	$1,016,000	$39,000	$0	$0
Structure damages	$9,520,000	$362,000	$0	$0	$9,520,000	$361,000
Infrastructure damages	$1,768,000	$67,000	$1,768,000	$67,000	$0	$0
Damage subtotal	**$12,304,000**	**$468,000**	**$2,784,000**	**$106,000**	**$9,520,000**	**$361,000**
Recreation Value	$10,285,000	$390,000	$10,285,000	$390,000	$0	$0
Total	**$22,589,000**	**$858,000**	**$13,069,000**	**$496,000**	**$9,520,000**	**$361,000**

Note: Values are rounded to the nearest thousand and may not sum from the previous tables due to rounding.

IX. SUMMARY OF BENEFITS AND COSTS

The summary of total present value of future without project costs, with project costs, benefits, residual damages, and the average annual estimated benefits for each alternative is summarized in Table 30. Please note that Alternatives 2 through 5 offer similar benefits, and thus can be compared using the least cost method, whereas Alternative 6 offers less than half of the benefits of Alternatives 2 through 5, and thus, isn't comparable.

Table 30. Summary of Benefits by Alternative

Alternative Number	Total Present Value Future Without-Project Costs	Total Present Value Future With-Project Costs	Total Present Value Benefits	Residual Damages	Average Annual Benefits
1	$22,590,000	$22,590,000	$0	$22,590,000	$0
2	$22,590,000	$30,190,000	$22,300,000	$290,000	$846,000
3	$22,590,000	$29,786,000	$23,108,000	-$518,000	$877,000
4	$22,590,000	$29,786,000	$23,108,000	-$518,000	$877,000
5	$22,590,000	$30,190,000	$22,300,000	$290,000	$846,000
6	$22,590,000	$13,070,000	$9,520,000	$13,070,000	$361,000

Table 31 summarizes project first costs, interest during construction, operations and maintenance along with the present value of total project costs and the average annual equivalents.

Table 31. Summary of Costs by Alternative

Description	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Lands and Damages	$1,626,000	$7,511,000	$7,511,000	$1,820,000	$22,999,000
Relocations	$0	$435,000	$428,000	$718,000	$10,410,000
Mob & Demob	$1,321,000	$2,118,000	$2,060,000	$2,084,000	$0
Channels and Canals	$403,822,000	$0	$0	$0	$0
Bank Stabilization	$0	$30,675,000	$34,351,000	$22,629,000	$0
Cultural Mitigation	$0	$3,490,000	$3,490,000	$0	$3,490,000
PED	$12,000,000	$4,800,000	$4,800,000	$3,000,000	$1,200,000
SIOH	$6,000,000	$2,400,000	$2,400,000	$1,800,000	$1,200,000
Project First Cost[1]	**$424,769,000**	**$51,429,000**	**$55,040,000**	**$32,051,000**	**$39,299,000**
IDC[2]	$25,016,000	$1,486,000	$1,590,000	$926,000	$1,135,000
PV O&M[3]	$142,198,000	$1,554,000	$1,502,000	$1,511,000	$0
PV Total Economic (NED) Costs[4]	**$591,983,000**	**$54,469,000**	**$58,132,000**	**$34,488,000**	**$40,434,000**
Average Annual Cost	**$22,465,000**	**$2,067,000**	**$2,206,000**	**$1,309,000**	**$1,534,000**

Notes:

1. First costs are estimated at the October 2016 price level. All costs rounded to the nearest thousand.
2. For all alternatives except alternative 2, project costs assume a 2-year (24-month) construction window with construction beginning in 2018 and completed in 2020. A 4-year construction window is assumed for alternative 2.
3. Operations, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) costs include armor rock (10% of initial quantity) at 20 year intervals. The river mouth relocation alternative also includes annual maintenance dredging.
4. Present value and average annual costs are calculated utilizing a 50-year project period of analysis and a Federal fiscal year 2017 discount rate of 2.875 percent.

The economic benefits for each plan are the future without project costs minus the future with project costs. The National Economic Development (NED) plan is defined as the plan which maximizes the net annual benefits. The benefit to cost ratio is the average annual benefits divided by the average annual costs. Table 32 summarizes the benefits and costs for each alternative. As indicated below, no alternative analyzed in this study yields positive net annual benefits so there is no NED plan. The plan with the highest benefit-cost ratio is highlighted in yellow.

Table 32. Summary of Benefits and Costs, by Alternative

Alt.	Present Value Benefits	Average Annual Benefits	Present Value Economic (NED) Costs	Average Annual Costs	Benefit to Cost Ratio	Net Annual NED Benefits	Rank by Net NED Benefits
1 No Action	$0	$0	$0	$0	N/A	$0	1
2	$22,300,000	$846,000	$591,983,000	$22,465,000	0.04	-$21,619,000	6
3	$23,108,000	$877,000	$54,469,000	$2,067,000	0.42	-$1,190,000	4
4	$23,108,000	$877,000	$58,132,000	$2,206,000	0.40	-$1,329,000	5
5	$22,300,000	$846,000	$34,488,000	$1,309,000	0.65	-$463,000	2
6	$9,520,000	$361,000	$40,434,000	$1,534,000	0.24	-$1,173,000	3

Evaluation of benefits and costs for the given alternatives reveal that no alternative plan yields a benefit-cost ratio greater than 1. Alternative 5 has the greatest net annual NED benefits. The benefit-cost ratio associated with Alternative 5 is 0.65 with net annual NED benefits of negative $463,000.

X. SENSITIVITY ANALYSIS

As in any planning process, some of the assumptions and input data used in this report are subject to complex social, economics, and natural variables. These assumptions and data are also prone to risk and uncertainty. The intent of this section is to test the sensitivity of alternatives to changes in the major variables used to compute project benefits. The value of this analysis is to reveal how the economic results might vary if inputs are applied differently; thereby providing insight into the amount of confidence in the economic analysis. A discussion of risk and uncertainty issues regarding key input variables follows.

A. Erosion Rate

Some additional damages to land, structures and other non-structural improvements, and infrastructure are anticipated when the erosion rate is increased from 3 feet to 4 feet per year. However, these changes do not have a large bearing on the NED analysis, especially as additional damages primarily occur near the end of the period of analysis. Increasing the erosion rate from 3 feet to 4 feet per year resulted in an approximately 0.05 increase in the benefit-to-cost (BCR) for the alternative with the highest BCR, Alternative 5.

An increase in benefits associated with land, structures, and non-structural improvements would lead to a corresponding increase in incidental recreation benefits. Since total recreation benefits exceed 50 percent of total project benefits, an increase in non-recreation benefits allows for a slight increase in incidental recreation benefits.

B. Value of Land, Structures, Non-Structural Improvements, and Infrastructure

Assuming 3 feet per year of erosion, a sensitivity analysis was performed in which a 15 percent contingency was added to the value of all land, structures, non-structural improvements, and infrastructure in the erosion zone. This analysis yielded less than a 0.10 increase in the BCR of Alternative 5, which indicates that the value of these categories is not driving BCR changes. Since the value of these categories does not drive BRC change, the model developers determined it was not necessary to apply this analysis at the 4 feet per year erosion rate.

XI. ENVIRONMENTAL QUALITY

One of the major opportunities or enhancements that could be realized as a result of the proposed project is the restoration of degraded environmental functions and values in the study area, including establishment of an ecologically stable and functional streambank.

Following Section 116 implementation guidance[47] that allows for selection of a plan based in part or whole on non-monetary units in the Environmental Quality and/or Other Social Effects accounts, a rugosity index was proposed to evaluate the non-monetary effects of alternatives on ecological resources. In order to evaluate each alternative for its contribution to the Environmental Quality account under ER 1105-2-100, this index was proposed to 1) identify and inventory existing (baseline) natural resources in the study area, 2) provide decision makers with the non-monetary effects on the significant natural resources within the study area, 3) quantify the projected environmental benefits and costs associated with each of the alternatives, 4) provide environmental input into the development of project objectives by identifying opportunities to restore the health of damaged ecosystems to an improved state, and, 5) contribute to plan selection. The index sought to provide insight into the function and value of adding topographic complexity to an otherwise unstable, ecologically barren, tidally-influenced riverine shoreline.

As a measure of complexity, rugosity is presumed to be an indicator of the amount of habitat available for colonization by benthic organisms (those attached to the seafloor), and shelter and foraging area for mobile organisms. The rugosity index was initially proposed as a CE/ICA metric; however, it did not meet the needs of the study, as habitat complexity was similar among alternatives so the index did not distinguish benefits.

While the alternatives may increase the amount of habitat available for some organisms, there is also potential for direct and indirect loss of other habitat resulting from the construction of bank stabilization measures. Placing armor stone in the intertidal area would result in the loss of swallow nesting areas if the bank grade is altered. In addition, any re-grading of the slope would require the removal of numerous spruce trees, which provide perching areas for Bald Eagles. Loss of bird watching opportunities are not expected to be profound enough to impact the preserved recreational value in Alternatives 2 through 5. Additionally, loss of commercial or subsistence fish stocks are not expected in any alternative.

Indirect effects are those effects induced outside of the project footprint. These impacts include altered sedimentation rates, a temporary decrease in bird nesting habitat, and harassment of seals foraging in the mouth of the Kenai River. Sedimentation effects are likely to be negligible since the amount of sediment entering the system from bluff erosion is very small compared to the amount of sediment in the river at that point. Impacts to bird nesting habitat would likely be temporary and could be mitigated with a well-executed

[47] Memorandum for Commander, Pacific Ocean Division, 10 May 2012. "Implementation of Studies and Projects Under Section 116 of the Energy and Water Development and Related Agencies Appropriation Act, 2010, Public Law 111-85."

planting regime on the slope should it be re-graded. The effects to seals will occur mainly during construction when excavation and armoring are taking place. Post-construction impacts to seals will likely be minimal. There may be EQ benefits related to maintaining bird habitat on the bluff but these are likely to be minimal.

Regarding climate change, short observational records in Alaska make it difficult to separate climate change from natural multi-decadal variability. There are also quality problems, especially for measurements of precipitation and discharge. While there is evidence of a statewide average temperature increase of approximately 3 degrees Fahrenheit over the last 60 years, there are few spatially coherent trends in precipitation.[48] Thus an increase in precipitation and resulting changes in stream discharge for this study area are considered unlikely.

Concerning sea level change (SLC), an increase in erosion is not anticipated due to SLC in the future. Three SLC scenarios were estimated by H&H project engineers and are detailed in the H&H appendix of the main report. For an assumed construction start in 2018 and a fifty year project period of analysis, a project at Kenai could see the relative sea level fall by 1.60 feet or rise by as much as 0.29 feet. In 100 years, the relative sea level could fall by 3.21 feet or rise by 2.43 feet. It is unlikely that the sea level would rise as much as predicted under the High scenario since, in general, the southcentral area of Alaska has been experiencing isostatic rebound. The intermediate relative sea level rise scenario is a potential at the site, and will be used for design purposes. In the unlikely event that High Level of Relative Sea Level Change occurs, the design can be adapted to increase the revetment height. See the H&H appendix for more details.

[48] McAfee, *et al*

XII. OTHER SOCIAL EFFECTS

This section describes: what the other social effects account is, how it is used to inform plan selection for this project, and how the analysis was carried out.

The OSE account focuses on social well-being factors that represent non-monetary benefits to the people and residents of a community. It includes cultural vulnerability, and environmental justice (or disproportionate environmental impacts on segments of the population), and health and safety issues. Additionally, in Alaska, "subsistence," or the ability to live off of the land, is a source of well-being for Alaskan native groups. IWR 09-R-4 also discusses economic vitality (such as the ability to find fair and gainful employment), social connectedness, identity, resiliency, leisure and recreation. All will be discussed here.

For Kenai Bluffs specifically, guidance was given to the U.S. Army Corps' Pacific Ocean Division for the Implementation of Section 116 Authorized projects as follows:[49]

1. If there is no NED Plan and/or the selection of a plan other than the NED Plan is based in part or whole on non-monetary units (Environmental Quality and/or Other Social Effects), then the selection will be supported by a cost effectiveness/incremental cost analysis (CE/ICA) consistent with established evaluation procedures (see ER 1105-2-100, Appendix E).
2. The decision document will present the tradeoffs of impacts in the four accounts for the plans contained in the final array and describe in detail the compelling justification for any plan that is not the NED Plan.
3. Non-monetary benefits that may be considered include such things as public health and safety; local and regional economic opportunities; and, social and cultural value to the community… In addition, an ability to pay analysis will be conducted in accordance with existing Ability to Pay Guidance in the Final Amended Rule, Federal Register, (60 FR 5133), 26 January 1995 and included in the feasibility report.

The identification of a recommended plan is thus supported, in part, by CE/ICA for the OSE account, as no alternatives had a benefit-cost ratio greater than one under NED analysis.

A. Cost Effectiveness/Incremental Cost Analysis (CE/ICA)

Similar to how rugosity was chosen in coordination with ECO-PCX as the initial metric of analysis for CE/ICA in the Environmental Quality account, Stabilized Bluff Parcels was chosen in coordination with the Vertical Team as the metric of analysis for CE/ICA in the OSE account. However, just like rugosity, based on additional review by the Vertical Team, it was determined that the CE/ICA metric did not provide enough granularity to interpolate results and choose a plan, nor did it fully encapsulate the damages prevented. Additional metrics considered included the number of structures protected and the number of historic/potentially historic structures protected, but none of these effectively represented the resource of significance or damages prevented under each alternative. While the CE/ICA

[49] Memorandum dated May 10, 2012 from Theodore Brown, P.E.

performed for this study is discussed below, it does not provide the basis for plan selection. Based on additional guidance from HQUSACE, the recommended plan is thus the least cost and environmentally acceptable alternative.

At the same time, Alternative 5 under the CE/ICA that used Stabilized Bluff Parcels is the most cost effective plan and provides the best buy – meaning it protected the most parcels at the least cost. Because of this, no incremental cost analysis was needed. Under Alternative 5, 31 bluff parcels are protected at an average annual cost of approximately $1.3 million.

As the CE/ICA metric, stabilized bluff parcels was thought to directly address the project's problem statement that "coastal erosion at the mouth of the Kenai River … negatively impacts and continues to threaten commercial, municipal, and private property (land, structures, and infrastructure), as well as cultural and historical resources at Kenai, Alaska."

Stabilized Bluff Parcels are thought to:

- Protect against cultural vulnerability such as the loss of historical and archaeological sites. Please note that this component is extremely important to the analysis here. The Environmental Assessment (EA) discusses historical and archaeological sites in-depth but there is also a short summary at the bottom of this OSE account.
- Provide some environmental justice, as the coastal and riverine erosion primarily affects residents of Old Town Kenai.
- Provide residents of Old Town Kenai, and transient area users, greater safety.

Additionally, stabilized bluff parcels may provide slight benefits to fishermen for the few individuals who fish at the toe of the bluff on rod/reel or fly gear (see Figure 7 and Figure 14), or those who gain access to fishing grounds from the Future With-Project properties protected above. Please recall that the majority of fishing activities occur just west of the project area with over 30,000 active subsistence permits issued by the State annually, for fishing the Kenai dipnet fishery (see Figure 15).

Figure 14. Toe of Bluff

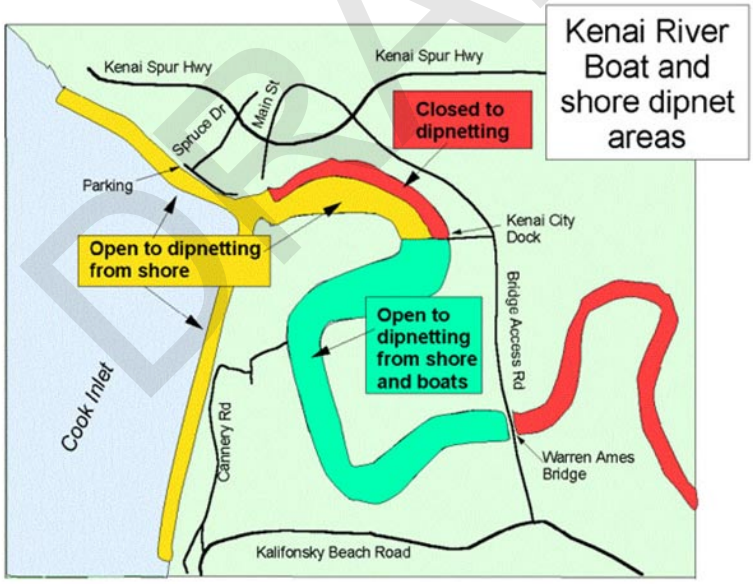

Figure 15. Dipnetting Areas

The stabilized bluff parcel metric may also serve as a proxy for jobs saved or economic vitality at the top of the bluff. Please recall that in the No Action alternative several commercial businesses are expected to suffer property losses. Upon suffering property loss and the associated financial consequences, these businesses may not be able to relocate, or if they are able to relocate, they may not be able to hire as many employees.

Stabilizing the bluff would help preserve the social identity associated with Old Town Kenai residents and bluff residents specifically. Primarily, this identity would be recognized by the larger Kenai community but it is also recognized by many others around the state of Alaska. While the mouth of the Kenai River is famous even outside of Alaska, the type of people who live there may not be well known beyond the borders of the state. Many residents of the state of Alaska recognize that the City of Kenai is very diverse and that the people of Kenai are proud of the city's history, opportunities for recreation, inherent beauty, and world-class natural resources. Protecting the bluff provides resiliency in protecting the city's diversity, recreational opportunities, beauty, and access to resources.

Additionally, stabilizing the bluff would protect the $7.9 million Senior Center. Providing an opportunity for seniors who live in the area and value the bluff for its views, history, fishing, walking, and leisure. This also provides a type of social justice, and seems to say that we as Alaskans, and we as society, care for our seniors.

The following graph compares each alternative's average annual economic (NED) cost to stabilized bluff parcels protected. This graph was generated using the Institute of Water Resources Planning Suite. Please note that the costs were so high for Alternative 2 that they are actually off the chart, and that Alternative 5 is both the best buy and the most cost effective plan:

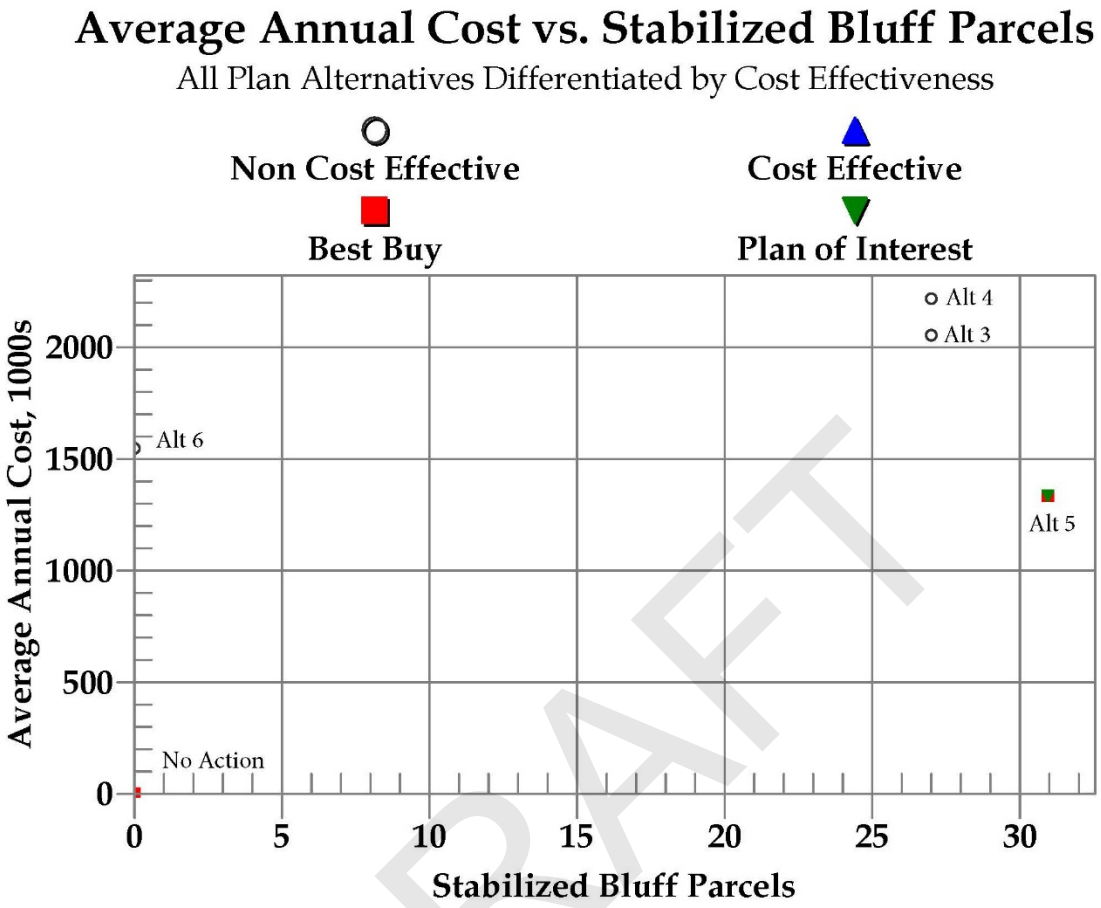

Figure 16. Cost Effectiveness for Stabilized Bluff Parcels

1. **Summary of Alternative 5**

Alternative 5 establishes a protective berm at the bluff toe and allows the bluff to naturally erode to a stabilized slope. Since slope stabilization occurs naturally in this alternative, an exact date of when stabilization would occur isn't possible; however, the estimate is that it would occur in three to fifteen years and assumes an erosion rate of three feet per year during those years. For the purposes of estimating loss, 10 years or 30 feet of lay back is estimated. Therefore, Alternative 5 has less cut back from the top of the bluff than Alternatives 3 and 4, construction access from the top of the bluff. For the purposes of estimating loss, approximately 60 feet of engineered layback is estimated for Alternatives 3 and 4.

In addition to the slope cutback for Alternatives 3 and 4, a temporary construction easement would be necessary at the top of the bluff. This would not be needed under Alternative 5.

2. **Risk and uncertainty in Other Social Effects:**

Risk and uncertainty with the number of Stabilized Bluff Parcels protected can be likened to the risk and uncertainty associated with the erosion rate that is discussed in the Sensitivity

Analysis section of this Economics Appendix. It is not thought that using Stabilized Bluff Parcels carries additional risk beyond the uncertainty with the erosion rate.

B. Three Types of Significance for Other Social Effects:

Because of the challenge of dealing with non-monetized benefits, the concept of significance is here forth used – as described in 1105-2-100, Appendix E, and IWR 97-R-4 – as follows:

1. Institutional Significance

Significance based on institutional recognition means that the importance of other social effects are acknowledged in the laws, adopted plans, and other policy statements of public agencies, tribes, or private groups. For instance,

- Subsistence has significance that is institutionalized in Alaska.
- Historical and archeological properties have significance that are institutionalized in Alaska.
- Health and safety issues have institutional significance in Alaska.

2. Public Significance

Significance based on public recognition means that some segment of the general public recognizes the importance of a social effect.

- Environmental and social justice have public significance in Alaska.
- Social connectedness, identity, resiliency, leisure and recreation have public significance in Kenai.

3. Technical Significance

Technical significance for the Kenai River Bluff Erosion project may be:

- The importance of a property or asset's other social effects related to a specific quality.
- It could include a property or asset's scarcity, its representativeness, community status, or trending importance.
- Its technical significance may be its connectivity to other properties of importance, or if it limits the ability of other assets to exist, and its value for adding diversity in the community makeup. One such place would be the Kenai Bible Church. Another is the Kenai Senior Center.
- Archaeological sites (Kili Betnu and Shk'ituk't) as well as the historic and potentially historic properties that have cultural and historic value, and present opportunities for research and improving social and community awareness of the region's history.

C. Stabilized Bluff Parcels Related to Significance

In the context of protecting assets of significance, Stabilized Bluff Parcels were considered to be an acceptable and effective metric; however, the metric did not define which assets were the most significant/important. Since the metric does not sufficiently differentiate among the types of damages avoided, it does not fully encapsulate damages prevented. Additionally, not all potentially historic properties were protected under any alternative using Stabilized Bluff Parcels as a metric.

D. Specific Cultural Resource Concerns

There are five historic properties within the project area identified on the Alaska Heritage Resources Survey, maintained by the State Historic Preservation Office: three historic houses and two archaeological sites. One of these archaeological sites is known to contain a late nineteenth-century cemetery.

In addition to these resources, there are 13 additional structures of unknown historical relevance within the 50-year erosion zone. If an alternative that may affect these cultural resources is chosen, then all of these structures in addition to those already listed on the Alaska Heritage Resources Survey must be investigated to determine their eligibility for listing on the National Register of Historic Places.[50] It is the opinion of the USACE archaeologist that both of the archaeological sites are eligible for listing on the National Register of Historic Places. Concurrence from the Alaska State Historic Preservation Officer is forthcoming.

1. Technical Significance Brief

The two Alaska Native village sites identified on the Alaska Heritage Resources Survey, Kili Betnu (KEN-710) and Shk'ituk't (KEN-020) are technically significant in that they represent traditional Kenaitze settlement patterns before and during the nineteenth century contact period with Russian colonists. These sites are both rare in terms of the scientific and historic data possibilities, and culturally important for the descendants of the Federally-recognized tribe.[51,52]

The historic houses identified on the Alaska Heritage Resources Survey are technically significant in that they represent early American-period settlement patterns in a unique frontier setting. Built in 1916, the Hermansen/Miller House (KEN-279), for example, is considered to be the oldest frame building in Kenai. During its lifetime, it served as a grocery, an ice cream parlor, the post office, a medical clinic, and was at one point used to hold church services. The Showalter House (KEN-276), built in 1936, served as a post office before becoming the residence of a commercial fisherman. Other historic structures, including Kenai

[50] USACE. 2008. Kenai River Bluff Erosion, Bluff Stabilization Design Alternatives, Design Alternatives Report

[51] Boraas, Alan. 2009. Location and Brief History of Shk'ituk't and Shk'ituk'tnu: Kenai River Mouth, Alaska.

[52] de Laguna, Frederica. 1975. The Archaeology of Cook Inlet, 2nd ed. Cook Inlet Historical Society. Anchorage, AK.

Joe's Bar; and the Kenai Bible Church, represent the unique history and community culture of Kenai residents of the past 100 years.

Additional information on the above threatened cultural resources can be found in the EA.

2. Estimated Cost of Lost Cultural Resources

Under Alternative 5, allowing the upper bluff face to erode to its natural angle-of-repose is not considered to be an "action" on the part of USACE under the National Historic Preservation Act; therefore, Alternative 5 is the only alternative in which no historic properties are affected. The State Historic Preservation Officer concurred with this assessment of effect on July 20, 2016.[53]

If a plan other than Alternative 5 is selected, the only way to protect important cultural resources would involve full salvage recovery operations and Historic American Building Survey (HABS) recordation. A moderately-sized salvage archaeology operation could cost up to approximately $938,000 per site (Table 33). This cost could also increase, depending on the full extent of the sites, whether or not human remains are encountered, and soil conditions.

Table 33. Estimated Budget for salvage archaeological operations at one site on the Kenai River Bluff

Action	Duration	Personnel	Estimated Cost
Survey	2 – 4 days	4	$5,120 - $10,240
Excavation	2 – 6 weeks	10	$64,000 - $192,000
Artifact Analysis	5 – 15 weeks	4	$80,000 - $240,000
Faunal Analysis	5 – 15 weeks	4	$80,000 - $240,000
Data Recovery Report	5 – 15 weeks	4	$80,000 - $240,000
Accession to Repository	1 week	[$400/box]	$8,000 +
Present data to Community	2 – 4 days	2	$2,560 - $5,120
Present data to Professionals	2 – 4 days	1	$1,280 - $2,560
TOTAL: $320,960 – $937,920 +			

Budget Calculations:
2 weeks field (10 people) = 6 weeks lab (10 people) = 15 weeks lab (4 people) (~4 months)
6 weeks field (10 people) = 18 weeks lab (10 people) = 45 weeks lab (4 people) (~11.5 months)
Lab = $100/hour/person
Field = $80/hour/person
$400/box to accession at University of Alaska Museum of the North repository.

[53] SHPO. 2016. Letter from SHPO (Bittner) to USACE (Eldridge) re: Kenai River Bluff erosion undertaking. July 20, 2016.

Estimate does not include shipping costs.
Note: Community and Professional presentations do not include TDY costs.

The cost of documenting historical structures includes the initial survey, evaluation of eligibility, and HABS Level 1 documentation. A rough estimate for the cost of these activities is $80,000 per structure. For 13 structures, this would be approximately $1 million. However, this cost could potentially decrease, as not all of the structures may be eligible for the National Register of Historic Places, and would therefore only require survey and evaluation, not HABS documentation.

E. Specific Health and Safety Concerns

Another social effect with a specific concern is public health and safety. There is a large inherent safety risk to structures being eroded away and falling down the bluff. There may also be an increase of "fear" among the land owners in the threatened area leading to negative public health effects, especially as these land owners reach out to media outlets and fear spreads. Many bluff residents may not have the financial wherewithal to relocate their homes, causing them a great deal of consternation. This could also become vocalized. While some risk to public health and safety remains under the recommended plan, it is reduced. Once the bluff is stabilized, further measures to implement safety at the edge of the bluff are outside the scope of the project and may be more applicable to other agencies or public institutions.

XIII. REGIONAL ECONOMIC DEVELOPMENT

Economic benefits that accrue to the region but not necessarily the nation include increased income and employment associated with the construction of a project at Kenai Bluff. Additionally, commercial businesses subject to erosion are expected to experience income/revenue losses as a result of erosion. If erosion continues at the current rate, commercial activities will be disrupted as businesses will eventually have to relocate or shut down completely. As a result, these businesses will experience a loss in income and the city/borough government will experience a loss of tax revenue.

Income losses are not quantified for this analysis due to the uncertainty associated with a business owner's ability to relocate and their possible downsizing behavior as erosion encroaches.

Regarding construction spending, further analysis of regional economic benefits is performed below. The U.S Army Corps of Engineers (USACE) Institute for Water Resources, the Louis Berger Group, and Michigan State University have developed a regional economic impact modeling tool called RECONS (Regional ECONomic System) to provide estimates of regional and national job creation, retention, and other economic measures such as sales, or value added.

The RECONS analysis for Alternative 5 is summarized below. A Regional Economic Development Addendum to this appendix shows model outputs for all other alternatives, as well as extended analysis on Alternative 5.

Table 34. Economic Impact Regions

Economic Impact Regions

Regional Impact Area:	Rural Area Generic Model
Regional Impact Area ID:	RURAL
Counties Included	N/A
State Impact Area:	Alaska
National Impact:	Yes

Table 35. Input Assumptions (Spending and LPCs)

Input Assumptions (Spending and LPCs)

Category	Spending (%)	Spending Amount	Local LPC (%)	State LPC (%)	National LPC (%)
Erosion Control and Earthwork Activities	100%	$30,756,153	33%	66%	100%
Total	**100%**	**$30,756,153**	**-**	**-**	**-**

Under Alternative 5, the USACE is planning on expending $30,756,153 (total present value cost) on the project. Of this expenditure $10,187,286 will be captured within the regional impact area. The rest will benefit the state. The expenditures made by the USACE for various

services and products are expected to generate additional economic activity in that can be measured in jobs, income, sales, and gross regional product as summarized in the following table. The table includes benefits to the region, the state impact area, and the Nation. Table 36 is the overall economic impacts for this analysis. Please note that all benefits are to construction firms incorporated in the state of Alaska, with an estimated one third of that firms workers being from Kenai. All spending, direct and indirect, except 1% (that was required to make the model run properly) occurs within the state of Alaska. Direct spending, means on construction. Indirect spending is on other regional goods and services.

Table 36. Overall Summary of Economic Impacts

Overall Summary Economic Impacts[54]

		Regional	State	National
Total Spending		$30,756,153	$30,756,153	$30,756,153
Direct Impact				
	Output	$10,187,286	$20,429,714	$30,756,153
	Job	80.99	162.43	244.53
	Labor Income	$2,814,464	$7,472,802	$12,169,350
	GRP	$3,674,290	$9,118,541	$14,607,447
Total Impact				
	Output	$13,415,927	$34,885,417	$89,229,268
	Job	109.75	254.89	582.68
	Labor Income	$3,797,387	$12,448,816	$31,296,564
	GRP	$5,492,280	$17,608,664	$46,787,428

The Regional Economic Development Addendum to this appendix shows model outputs for all alternatives, as well as extended analysis on Alternative 5.

[54] The outputs of the RECONS model are in FY 2015 dollars, as the model will not run using FY 2016 or FY 2017 dollars.

XIV. FOUR ACCOUNTS SUMMARY

USACE planning guidance establishes four accounts to facilitate and display effects of alternative plans. Previous studies have relied primarily on the use of the National Economic Development (NED) account showing the changes in the economic value of the national output of goods and services. As previously noted, the analysis described in this report follows implementation guidance for Section 116 Authorized projects, which states:

> *"Each decision document will present the National Economic Development (NED) analysis for all viable alternative and identify the NED Plan when alternatives exist with net positive NED benefits. If there is no NED Plan and/or the selection of a plan other than the NED Plan is based in part or whole on non-monetary units (Environmental Quality and/or Other Social Effects), then the selection will be supported by a cost effectiveness/incremental cost analysis consistent with established evaluation procedures"* (Memorandum for Commander, Pacific Ocean Division, 10 May 2012).

This appendix presents the NED analysis and analysis of the Other Social Effects (OSE), Environmental Quality (EQ), and Regional Economic Development (RED) accounts. OSE and EQ display the positive non-monetary benefits of the alternatives on natural/environmental and cultural/social resources. Additionally, the RED analysis, evaluated through use of the RECONS model, resulted in increased employment and income for the region and the state.

The CE/ICA conducted in the OSE account resulted in the protection of items of cultural or social significance for all alternatives except No Action. Alternative 5 protects the most parcels and structures in place, including historic and archaeological resources, resulting in a highly-beneficial OSE rating (see Table 37). Alternative 2 provides the same protection as Alternative 5 but at a substantially higher cost (the cost is literally off the CE/ICA charts). Alternatives 3 and 4 protect fewer parcels than Alternative 5 at higher cost, and would require mitigation for historic and archaeological resources impacted at the top of the bluff. Alternative 6 provides compensation to bluff residents and some social benefits through buyouts but provides no protection of parcels or structures in place and would do nothing to halt erosion.

Based on the analysis of the four accounts presented in this appendix and an evaluation of least cost among alternatives with similar benefits, the Tentatively Selected Plan for the Kenai River Bluff Erosion Feasibility Study is Alternative 5. Table 37 shows a summary of the four accounts for all alternatives, with the Tentatively Selected Plan highlighted in yellow.

Table 37. Four Accounts Evaluation Summary

Alternative	Net Annual NED Benefits (B/C Ratio)	Average Annual Cost	EQ	RED	OSE
1. No Action	*$0* *N/A*	$0	Negative	Reduced employment and income for the region and state	Non-Beneficial
2	-$21,619,000 *(0.04)*	$22,465,000	Mixed	Increased employment and income for the region and state	Mixed
3	-$1,190,000 *(0.42)*	$2,067,000	Positive	Increased employment and income for the region and state	Beneficial
4	-$1,329,000 *(0.40)*	$2,206,000	Positive	Increased employment and income for the region and state	Beneficial
5	-$463,000 *(0.65)*	$1,309,000	Positive	Increased employment and income for the region and state	Highly-Beneficial
6	-$1,173,000 *(0.24)*	$1,534,000	Positive	Limited construction spending; Negligible changes in employment and income for the region and state	Mixed

XV. ABILITY TO PAY

An ability to pay analysis for the Kenai River Bluff Erosion project assesses the ability of the City of Kenai to cost share construction expenditures as required (generally it does not include operations, maintenance, and rehabilitation). This analysis is required by the Section 116 Guidance authorizing this project; therefore, while the regulations (33 CFR 241) only discuss that ability to pay tests are required for flood control projects, in this instance, it is also required for this erosion project.

The ability to pay "test" described in 33 CFR 241 depends not only on the economic circumstances within the project area but also on the economic circumstances of the state in which the project is located. Additionally, it is governed in part by project benefits.

The test is also referred to as the "alternative level of cost-sharing determined under the ability to pay principle" (33 CFR 241.4(f)(3)) and the procedures for determining ability to pay are also referred to as "procedures for estimating the alterative cost-share" (33 CFR 241.5). The procedures thus aim to reduce non-Federal cost share to the extent possible, and involve several steps.

The first step in the ability to pay analysis is to divide the project's benefit-to-cost ratio (BCR) by four.[55] If this amount (expressed as a percentage) is greater than the current level of cost sharing, which is 65 percent Federal and 35 percent Non-Federal, then no reduction is possible. For the Kenai Bluffs project, a BCR of 0.65 divided by 4 is 0.16, which is less than 0.35, so the next step is applicable.

The next step determines eligibility using an eligibility factor (EF), where EF = $a - b_1$*(state factor) – b_2*(area factor). If the EF is zero or less, "the project is not eligible for a reduction" (33 CFR 241.5(b)(5)). Coefficients a, b_1, and b_2 are given by USACE Headquarters and are: 19.59, 0.082, and 0.164, respectively.[56] The state factor is calculated by comparing Alaska's adjusted per capita income to the U.S.'s given income and cost of living differences. The area factor is then an adjustment to the state factor based on area income and cost of living differences.

For the Kenai River Bluff Erosion project, EF is negative (-3.832) so no reduction in cost sharing is available.[57]

[55] For this step, including O&M costs is acceptable per 33 CFR 241.5(a)(1).

[56] Economic Guidance Memorandum 14-04. 19 November 2013.

[57] EF = 19.59 – .082(84.54) – 0.164(100.55) = -3.832

RECREATION ADDENDUM

KENAI BLUFFS BANK STABILIZATION
SECTION 116 FEASIBILITY STUDY

Table of Contents

1.0 Recreational Development Plan 2
1.1 Introduction 2
1.2 Recreation Supply and Demand Analysis 3
1.2.1 Overview 3
1.2.1 Demand 3
1.2.2 Supply 6
1.3 Need 9
1.4 Capacity Analysis 10
1.5 Unit Day Value Calculations 11

1.0 Recreational Development Plan

1.1 Introduction

Recreation facilities provide community citizens with social opportunities, physical activities, educational programs, and community pride. Access to recreational facilities is a crucial component to community health. It is important to residents to provide future generations with natural resources that are minimally impacted and recreationally enjoyable. Natural areas can facilitate multiple uses outside of coastal storm risk management including: outdoor recreation, environmental education, tourism, community and cultural activities, and fish and wildlife habitat preservation. Recreation features provide opportunities for various age groups and abilities to engage in physical activity, education, and social interaction.

In September 2009, The State of Alaska Department of Natural Resources prepared the Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2009-2014. This document cites outdoor participation rates across a wide array of recreational activities including (but not limited to):

- Backpacking
- Camping
- Jogging/Running
- Hiking
- Skiing (Downhill, Cross-Country, and Backcountry)
- Trapping
- Dog-Mushing and Skijoring
- Berry Picking
- Snow Machining (Snowmobiling)
- Walking

Health and fitness, education and sustainability, and community cohesiveness are all components of recreation that contribute to the quality of life for citizens. It is the goal of the Kenai River Bluff Section 116 Recreation Development Plan to provide the highest quality, sustainable features to promote recreational outdoor activities, enhancing the quality of life for users. Quality of life can be an economic driver for an area as it attracts businesses and industries. In Alaska in particular, quality of life as it relates to recreational opportunities is of great importance to residents.

The recreation features described in this development plan are based upon expressed needs and activity participation rates listed in the SCORP. The citizens of Alaska have expressed a desire and need for recreation facilities that would help bring communities together while offering a place for both passive and active recreational and educational opportunities.

An opportunity for recreation exists at the site of the selected project. While recreational activities currently take place along the bluff, and are considered in the NED analysis, the features described in this plan are only for potential future development once the bluff is

stabilized. They are not part of the construction of Coastal Storm Risk Management (CSRM) measures at the project site. The features could include a multi-use trail and wildlife and fisheries viewing areas overlooking the mouth of the Kenai River at Cook Inlet, parking and picnicking areas, and vault toilets. Please note that potential future developments may not occur, and thus cannot be considered as part of the feasibility study; however, preservation of existing recreational opportunities are considered in the NED analysis.

1.2 Recreation Supply and Demand Analysis

1.2.1 Overview

Recreational needs are determined by using a regional analysis or "market area" approach. The approach is a generalized way of presenting recreational supply/demand relationships for land and water use within the project area and is similar to that used by many states in preparing their SCORP. The analysis has three objectives:

- Determine the demand for recreational activities within the project market area
- Translate these demands into potential facility needs
- Identify future recreational development in the project area

The demand-need determination is composed of three elements: demand, supply, and need (where need is demand minus supply). For this analysis, the "capacity method" was utilized. This method is typically used when:

- The project is small in nature
- Recreation is facility-oriented as opposed to resource-oriented
- There is limited data or ability to gather data and use of alternative use-estimating procedures would be less useful or efficient

All of these conditions are present at the project site. The project is fairly small in nature. Use is primarily focused on viewing opportunities from the top of the bluff. There is limited existing data about site-specific recreation trends and a survey effort would be very costly compared to the total study cost. Therefore, some assumptions were made. Throughout the analysis, when assumptions were made, they were conservative in nature and every attempt is made to explain the rationale and background thinking that lead to the assumptions.

1.2.1 Demand

Demand is commonly viewed as an expression of desire to engage in an activity by an individual in a given area. Activities and the portions of the year in which they are available are listed in Table 1. These activities are those listed in the SCORP that would reasonably be available at the project site.

Table 1. Recreational Opportunities Listed in the SCORP Available at Kenai Bluff

Activity	Season (Months)	Approximate Season Days
Summer Activities		
Bird Watching or Wildlife Viewing	Apr-Oct	210
Hiking (Day)	Apr-Oct	210
Jogging or running out-of-doors	Apr-Oct	210
Bicycling or Mountain Biking	Apr-Oct	210
Picnicking	Apr-Oct	210
Walking for Fitness	Apr-Oct	210
Walking the Dog	Apr-Oct	210
Winter Activities		
Skiing (cross-country)	Nov-Mar	150
Snow Shoeing	Nov-Mar	150

While many of the summer activities such as hiking and walking can be done year-round, the participation rates are likely to be far less in the winter. Because of this, the activities were generally divided into those which were primarily done when there is no snow cover (April-October) and those that are done when there is adequate snow cover (November-March).

Participation rates in these activities were derived from a survey effort of 600 Alaskans whose details were listed in the SCORP. For each listed activity, respondents were asked to state whether they participated in the activity “very frequently” (nearly every day in season), “frequently” (a few times per week in season), “occasionally” (a few times per month in season), “rarely” (a few times per season), or “never”. For the activities listed in Table 1, the following participation rates were noted by the survey results.

Table 2. Participation Rates

Activity	Very Frequently	Frequently	Occasionally	Rarely	Never
Summer Activities					
Bird Watching or Wildlife Viewing	34.0%	24.5%	18.3%	8.3%	14.8%
Hiking (Day)	22.0%	23.5%	22.0%	9.7%	22.8%
Jogging or running out-of-doors	22.0%	23.5%	22.0%	9.7%	22.8%
Bicycling or Mountain Biking	22.0%	23.5%	22.0%	9.7%	22.8%
Picnicking	34.0%	24.5%	18.3%	8.3%	14.8%
Walking for Fitness	34.0%	24.5%	18.3%	8.3%	14.8%
Walking the Dog	34.0%	24.5%	18.3%	8.3%	14.8%
Winter Activities					
Skiing (cross-country)	7.8%	22.2%	21.3%	12.3%	36.3%
Snow Shoeing	7.8%	22.2%	21.3%	12.3%	36.3%

Note: Responses to certain activities were grouped together for reporting purposes in the SCORP. For instance, responses to frequency of participation in "Specific Outdoor Winter Sports" (Table A3.5 in the SCORP) included all winter activities available at this site. "Specific Non-Winter Outdoor Sports" (Table A3.6 in the SCORP) included Bicycling or Mountain Biking, Hiking (Day), Horseback Riding, and Jogging or running out-of-doors. The only activities which the SCORP reported specific participation rates for were: "ATV Riding" and "Walking, parks, picnic, berry picking, bird watching" (Table A3.8 in the SCORP). While this is not ideal, it is the best information available on participation in the listed activities.

Kenai is a recreation destination for people from all of Southcentral Alaska so it is reasonable to assume that people from the Kenai Peninsula Borough, Municipality of Anchorage, and the southern Matanuska-Susitna Borough (including the cities of Palmer and Wasilla) could make use of recreational opportunities at the project site. Therefore, this area is assumed to make up the market area for this study. The population of the market area is shown in Table 3.

Table 3. Total Population of Market Area

Area	Sub-Area	Population
Kenai Peninsula Borough		57,763
Municipality of Anchorage		298,908
Matanuska-Susitna Borough	City of Palmer	6,135
Matanuska-Susitna Borough	City of Wasilla	8,468
Total		**371,274**

Source: State of Alaska Department of Labor and Workforce Development

Even though all of Southcentral Alaska makes up the larger market area for recreation opportunities in the project area, there is a smaller market area that makes up what is likely to constitute the population that will use recreation facilities on a daily basis throughout the calendar year (instead of only during the summer tourist season). This area is considered to be within a one-hour travel time by car to the project site. This focused market area includes the City of Kenai, the City Soldotna, and ten census-designated places (CDPs). The area has a population of 37,988 with a breakdown of population by area and travel time from each area to the project site shown in Table 4.

Table 4. Area Population and Travel Times to Project Site

Area	2015 Estimated Population	Percent of Total Market Area Population	Estimated Travel Time to Project Site (minutes)
City of Kenai	7,229	19.0%	5-10
City of Soldotna	4,319	11.4%	18
Clam Gulch CDP	178	0.5%	34
Cohoe CDP	1,463	3.9%	36
Funny River CDP	943	2.5%	44

Kalifornsky CDP	8,534	22.5%	16
Kasilof CDP	560	1.5%	24
Nikiski CDP	4,553	12.0%	21
Ninilchik CDP	849	2.2%	54
Ridgeway CDP	2,205	5.8%	12
Salamatof CDP	1,163	3.1%	11
Sterling CDP	5,992	15.8%	31
Total	**37,988**		**27 (average)**

Source: Population Estimates: State of Alaska Department of Labor and Workforce Development estimates
Travel Times: Google Earth

1.2.2 Supply

Existing supply of facilities was determined by aggregating the number of similar recreational opportunities within the market area. There are no other known trail facilities that present this type of opportunity within the market area due to the specialized view and the location near area population centers. However, there are many trailheads and recreational areas that provide a similar-enough experience to be counted as contributing to the overall supply of recreational opportunities.

There are a number of recreation providers in the larger market area including: the City of Kenai, the City of Soldotna, the City of Homer, the City of Seward, the Municipality of Anchorage, the City of Palmer, the City of Wasilla, the State of Alaska, and the United States Forest Service. Each of those providers and the opportunities they provide are discussed below.

1.2.2.1 City of Kenai

The City of Kenai provides thirteen parks throughout the city limits. These facilities provide such recreational opportunities such as parks, playgrounds, picnic shelters, community memorials, gardens, basketball courts, volleyball courts, baseball fields, river access, restrooms, and a disc-golf course.

1.2.2.2 City of Soldotna

The City of Soldotna provides eleven of parks throughout the city. These facilities provide camping, river access, boat launches, RV waste dumps, wood and ice vending, baseball and soccer fields, playgrounds, picnic pavilions, restrooms, dog areas, open fields, and a skate park.

1.2.2.3 City of Homer

The City of Homer provides 19 parks throughout the city. These facilities provide campgrounds, playgrounds, community memorials, picnic pavilions, multiple sports opportunities, restrooms, a skate park, gardens, horseback riding, bird watching, kite surfing, grilling facilities, RV waste dumps, a disc-golf course, fishing, and ski trails.

1.2.2.4 City of Seward

The City of Seward Department of Parks and Recreation owns and operates Waterfront Park which provides tent camping opportunities. This facility is approximately seven miles from the project area. The City also has approximately five miles of walking and bike paths, many of them along city streets.

1.2.2.5 Municipality of Anchorage

The Municipality of Anchorage provides 223 parks, 250 miles of trails, 110 athletic fields, 5 pools, 11 recreation centers, and 82 playgrounds. These facilities provide a wide range of recreational opportunities including running and ski trails, picnic shelters, playgrounds, dog areas, campgrounds, lakes, ice rinks, sledding hills, grilling facilities, restrooms, bird watching, etc.

1.2.2.6 Mat-Su Borough

The Mat-Su Borough provides 2 pools, 6 urban parks, and multiple trails.

1.2.2.7 City of Palmer

The City of Palmer provides eight parks throughout the city. These facilities include picnic pavilions, a municipal airport, golf course, skateboard park, restrooms, and soccer fields.

1.2.2.8 City of Wasilla

The City of Wasilla provides six parks throughout the city. These facilities include a skateboard park, volleyball courts, basketball courts, a BMX track, outdoor amphitheater, playgrounds, camping facilities, ball fields, gardens, multi-use trails, and restrooms.

1.2.2.9 State of Alaska

The State of Alaska Division of Parks & Outdoor Recreation owns and operates well over 50 facilities in the larger market area. Because of the large number of facilities owned and operated by the state, a brief listing is provided below. The State facilities provide a wide range of recreational opportunities.

1.2.2.9.1 Tony Knowles Coastal Trail

The Tony Knowles Coastal Trail (Coastal Trail) is located in Anchorage approximately 160 miles from the proposed recreation facilities in Kenai. While the Coastal Trail is not within the focused market area of the proposed Kenai site, it is considered to offer a similar recreational user experience. The Coastal Trail spans 11 miles of coastline from downtown Anchorage to Kincaid Park and has facilities such as a multi-use trail, benches, overlooks, etc. It is one of the most popular and well-used recreational assets of the Anchorage community and Turnagain Arm residents, providing recreational users including walkers, runners, cross country skiers, and cyclists a unique view of Turnagain Arm and Cook Inlet. A portion of the trail is located along the Point Woronzof Bluff area and is being endangered by erosion.

1.2.2.9.2 State Recreation Areas

Table 5 lists state recreation areas within the larger market area of the proposed Kenai site, including approximate travel time and distance to the Kenai site.

Table 5. State Recreation Areas in Market Area

State Recreation Areas	Estimated travel time to project site (minutes)	Distance to project site (miles)
Anchor River	71	61.3
Bing's Landing	35	24.8
Caines Head	138	106
Captain Cook	32	25.3
Clam Gulch	34	28.4
Deep Creek	63	51.2
Ninilchik	43	37.4
Johnson Lake	31	24.4
Morgan's Landing	33	20
Swiftwater	20	12

Source: Travel Times and distances per Google Earth

1.2.2.9.3 State Recreation Sites

Table 6 lists state recreation sites within the larger market area, including approximate travel time and distance to the proposed Kenai site.

Table 6. State Recreation Sites in Market Area

State Recreation Sites	Estimated travel time to project site (minutes)	Distance to project site (miles)
Cooper Landing	76	60.6
Crooked Creek	31	24.4
Diamond Creek	95	80
Eveline	100	83
Izaak Walton	32	22.9
Kasilof	31	24.4
Lowell Point	138	106
The Pillars	13	7.7
Stariski	71	61.3

Source: Travel Times and distances per Google Earth

1.2.2.9.4 Special Management Areas

- Kenai River Special Management Area
- Captain Cook Special Management Area
- Anchor River Special Management Area

1.2.2.9.5 State Parks

1.2.2.9.5.1 Chugach State Park

Chugach State Park is located almost entirely within the Municipality of Anchorage and provides a number of hiking and camping opportunities. The park provides four vehicle-accessible campgrounds providing a total of 179 camping sites including overflow accommodations.

1.2.2.9.5.2 Kachemak Bay State Park

Kachemak State Park and Kachemak Bay Wilderness Park are located in and around Kachemak Bay in the southwestern portion of the Kenai Peninsula. Access to the park is by boat or airplane, as there are no roads to or within the park. The park provides numerous hiking and camping opportunities, including access to more than 80 miles of trail, camp sites, and public use cabins.

1.2.2.10 United States National Park Service

The United States National Park Service provides recreation opportunities within the Kenai National Wildlife Refuge and Kenai Fjords National Park. Most of this park is difficult to access and covered by the Harding Ice Field.

1.2.2.11 United States Fish and Wildlife Service

The United States Fish and Wildlife Service provides recreation opportunities within the Kenai National Wildlife Refuge. Opportunities include fishing, hunting, hiking, skiing, canoeing, and camping.

1.2.2.12 United States Forest Service

The United States Forest Service's (USFS) Chugach National Forest Eastern Kenai Peninsula and Seward Ranger District provides a wide array of recreation opportunities. USFS owns and operates a number of public-use trails ranging in difficulty from easy to very difficult. Some of the trails offer dispersed camping opportunities at designated backcountry sites. In the winter, some of these trails double as cross-country and backcountry skiing trails.

1.3 Need

In 2015, the Kenai Peninsula Tourism and Marketing Council reported visitation to the Peninsula of 730,577 million visitors, a little more than twice the population of the market area. There are also multiple federal and local recreation facilities throughout the market area that experience additional visitation. In 2013, 72 percent of visitors to State of Alaska facilities within the Kenai Peninsula area were State of Alaska residents. The remaining 28 percent were non-residents.[1] Given that the local population engages heavily in recreation throughout the year and that there are hundreds of thousands of annual non-resident visitors to the market area, it is reasonable to assume that excess demand exists to fill the capacity of a small-scale recreational development such as the one proposed at Kenai. This assumption is further supported by visitation to the Tony Knowles Coastal Trail in Anchorage. While there are some differences between the recreational

[1] State of Alaska Parks Visitor Counts for the Kenai Peninsula and Prince William Sound

opportunities provided by the Coastal Trail and those in Kenai, the two sites are similar enough for comparison's sake. The Coastal Trail experienced 250,200 visitations in 2014.[2] Considering the population differences between Anchorage and Kenai, the visitation opportunity in Kenai is expected to be lower – as discussed in the capacity analysis below.

It is assumed that there is sufficient demand for recreational opportunities in Kenai. Despite the abundance of recreational facilities in the larger market area, there are relatively few opportunities such as the one at Kenai. This area is somewhat unique in that it provides for wildlife and fisheries viewing.

1.4 Capacity Analysis

Utilizing guidance published in two IWR documents, a capacity analysis was performed for future-without and future-with project recreational activities at Kenai.[3,4] The capacity analysis is performed in two steps. The first step produces an average "design day load" (DDL). The second step produces assumed daily use. This daily use estimate is then annualized to produce capacity and visitation, (which are assumed to be equal under the capacity method).[5]

For the Kenai Bluff project, it is assumed that recreational participation is limited by the number of parking spaces available. Calculation of the DDL is expressed as:

DDL = Instantaneous Capacity per Unit x Daily Turnover Rate x Number of Units

Given that the limiting factor is parking availability, the DDL calculation is:

1.5 (people per car x 1 car per space) x 2.0 x 20 (number of spaces) = DDL of 60
Note: The turnover rate is within the range of 1.0 to 2.0 as set forth by IWR Report 74-R1.

The second step in the calculation is to determine the average daily use (ADU). Calculation of the ADU is expressed as:

ADU = DDL x Average Number of Weekend Days in Peak Season x Proportion of Peak Season Use Expected on Weekend Days x Proportion of Annual Use Expected During Peak Season

While Alaska's peak season is generally assumed to include the three months of June, July, and August, (and therefore approximately 26 weekend days), IWR Report 74-R1 states that nationwide, the average number of weekend days is nine. In an effort to be conservative with assumptions, (given the uncertainty associated with these calculations), the IWR average number of weekend days in the peak season was used. The report further states that generally between 50 percent and 60 percent of peak season use occurs on weekends. The most conservative estimate

[2] Municipality of Anchorage Parks and Recreation Department,
[3] IWR Report 86-R-4
[4] IWR Report 74-R-1
[5] The formula used for calculating annual visitation was adapted from the original IWR Report 86-R-4, and was also used in the approved Salmon Creek feasibility study. Using the exact formula in IWR Report 86-R-4 yields annual visitation of approximately 2,300, which does not seem reasonable given census and tourism data for the area.

in this range was utilized (50%). The State of Alaska provided visitation data for the area for calendar year 2013. That data showed that 47 percent of all visitations occurred in the months of June and July, therefore this percentage was utilized. The ADU calculation is therefore:

60 (DDL) x 9 x 0.50 x 0.47 = ADU of 127

When annualized, (multiplying by 365), the average annual use expected at the Kenai site is 46,355 visits. This is approximately 203,900 annual visits (81 percent) less than estimated annual use of the Tony Knowles Coastal Trail in Anchorage. While the market area for the Tony Knowles Coastal Trail is considerably larger than that of Kenai, estimated use of the Kenai facilities is reasonable considering the population differences between the two market areas. The average annual visitation number derived using the capacity method is multiplied by the difference in the without-project and with-project Unit Day Value (UDV) to produce annual recreation benefits. Given the census data of area residents, as well as the tourism numbers, this level of use seems rational.

1.5 Unit Day Value Calculations

The benefits for recreation development can be estimated using Economic Guidance Memorandum 17-03 entitled "Unit Day Values for Recreation, Fiscal Year 2017". The Average Annual Recreation Value (AARV) is calculated from the determined Unit Day Value (UDV) and the Annualized Visitation (AV).

The UDV is converted from the assigned point value for the existing site. The assigned point value is determined using judgment factors for five criteria. While some of the activities at Kenai Bluff could be considered "General Recreation", the opportunities to view wildlife from the top of the bluff—including marine mammals such as beluga whales, harbor seals, and porpoise—are unique to the region. Therefore, recreation opportunities at Kenai Bluff are considered "Specialized Recreation". Viewing fishing activities during the fishery openers is also a special opportunity. If this opportunity is foregone by allowing the bluff to erode or lay back further than 30 feet, the viewing opportunity is diminished. Walking, hiking, and other uses of the top of the bluff would be pushed back to streets in Old Town Kenai that do not have a view and would become General Recreation.

EGM 17-03 lists guidelines for calculating point values for recreation sites. These guidelines are listed in Table 7.

Table 7. Recreation Point Value Guidelines

Criteria	Judgment Factors				
Recreation Experience[1]	Heavy use or frequent crowding or other	Moderate use, other users evident and likely to	Moderate use, some evidence of other users and occasional	usually little evidence of other users,	Very low evidence of other users,

[1] Value for water-oriented activities should be adjusted if significant seasonal water level changes occur.

Total Points: 30 Point Value:	interference with use 0-4	interfere with use 5-10	interference with use due to crowding 11-16	rarely if ever crowded 17-23	never crowded 24-30
Availability of opportunity[2] Total Points: 18 Point Value:	Several within 1 hr. travel time; a few within 30 min. travel time 0-3	Several within 1 hr. travel time; non within 30 min. travel time 4-6	One or two within 1 hr. travel time; none within 45 min. travel time 7-10	None within 1 hr. travel time 11-14	None within 2 hr. travel time 15-18
Carrying capacity[3] Total Points: 14 Point Value:	Minimum facility for development for public health and safety 0-2	Basic facility to conduct activity(ies) 3-5	Adequate facilities to conduct without deterioration of the resource or activity experience 6-8	Optimum facilities to conduct activity at site potential 9-11	Ultimate facilities to achieve intent of selected alternative 12-14
Accessibility Total Points: 18 Point Value:	Limited access by any means to site or within site 0-3	Fair access, poor quality roads to site; limited access within site 4-6	Fair access, fair road to site; fair access, good roads within site 7-10	Good access, good roads to site; fair access, good roads within site 11-14	Good access, high standard road to site; good access within site 15-18
Environmental quality Total Points: 20	Low aesthetic factors[4] that significantly lower quality[6]	Average aesthetic quality; factors exist that lower	Above average aesthetic quality; any limiting factors can be	High aesthetic quality; no factors exist that lower quality	Outstanding aesthetic quality; no factors exist that lower quality

[2] Likelihood of success at fishing and hunting.
[3] Value should be adjusted for overuse.
[4] Major esthetic qualities to be considered include geology and topography, water, and vegetation.
[6] Factors to be considered to lowering quality include air and water pollution, pests, poor climate, and unsightly adjacent areas.

Point Value:	0-2	quality to minor degree 3-6	reasonably rectified 7-10	11-15	16-20

Given these guidelines, recreation point values were determined for the existing and foregone opportunity. For both conditions, the assigned point value is 51 (rounded to 50), which converted to the UDV of $23.77 in the specialized case, and a UDV of $8.42 in the general case.

Assigned points, criteria, and judgment factors are shown in Table 8.

Table 8. Existing Recreation Point Value

Criteria (Maximum Points)	Judgment Factors (Range of Points)	Assigned Point Value & Rationale
Recreation Experience (30)	Very low evidence of other users, never crowded (24-30)	24 – The area currently offers no formal recreation opportunities for specialized wildlife viewing and trail-specific outdoor activities such as hiking, biking, and skiing.
Availability of Opportunity (18)	None within 2 hr. travel time (15-18)	15 – There are some opportunities for wildlife viewing and trail-specific activities within the market area, but no sites overlook Cook Inlet at the mouth of the Kenai River.
Carrying Capacity (14)	Minimum facility for development for public health and safety (0-2)	1 - There are two existing parking lots that would provide access to the trail. There are no other facilities in the area.
Accessibility (18)	Good access, good roads to site; fair access, good roads within site (11-14)	11 - Current access to the area is by two-way road maintained by the City of Kenai. No access within the site.
Environmental Quality (20)	Above average aesthetic quality; any limiting factors can be reasonably rectified (7-10).	0 – The area overlooks Cook Inlet at the mouth of the Kenai River. Erosion along the bluff lowers the aesthetic quality but this factor can be reasonably rectified with a project.
Total (100)	Range for factors (26-40)	Total Assigned Points: 51

The Unit Day Values for the Specialized Recreation opportunity and the General Recreation opportunity are multiplied by the area's estimated annual visitation, which yields the average annual value for recreation shown in Table 9 below. The general AARV captures the future without-project value of the recreation opportunity in the absence of a project to address erosion, while the specialized AARV captures the future with-project value of the recreation opportunity. The difference between the two is the opportunity cost or average annual benefit of recreation.

Table 9. Average Annual Recreation Opportunity Foregone

Item	Annual Visitations	UDV	Value
Specialized AARV	46,355	$23.77	$1,101,858
General AARV	46,355	$8.42	$390,309
Difference or Opportunity Cost			$711,549

Over the 50-year period of analysis, this recreation opportunity has a present value of approximately $29 million, a total value of $55 million, and an average annual value of $712,000.

Table 10 Potential Benefits: Lost Recreation Opportunities

Category	Total Value	Present Value	Average Annual
Potential Recreation benefits	$55,093,000	$29,035,940	$711,549

KENAI BLUFFS BANK STABILIZATION SECTION 116 FEASIBILITY STUDY
REGIONAL ECONOMIC DEVELOPMENT ADDENDUM

This document presents the model outputs of the RECONS analysis for the alternatives considered in the Kenai Bluff Section 116 feasibility study, and serves as an addendum to the economics appendix.

1. ALTERNATIVE 1:

There are no RED benefits to No Action. Some losses to local businesses are expected as are documented elsewhere in the Economics Appendix. While businesses will experience a loss in income and the city/borough government will experience a loss of tax revenue, income losses are not quantified due to difficulty in predictions business owner's behavior in this type of loss scenario. It's unknown whether or not businesses will move or shut down completely.

2. ALTERNATIVE 2:

Alternative 2 has the highest cost, and would require the most construction, operations and maintenance. It would therefore be the preferred RED plan and create the most jobs. It is also quantified as navigation construction versus erosion control and earthwork activities, which is how the other Alternatives are quantified. Categorizing the work activity as navigation construction created a more detailed breakdown of how the benefits would flow to different industrial sectors. Lastly, due to the large amount of construction spending for this alternative and the engineering expertise required to relocate the river mouth (compared to the other Alternatives), it was supposed that a higher percentage of spending would be distributed to out-of-state firms and experts.

The RECONS outputs are as follows. The outputs of the RECONS model are in FY 2015 dollars, as the model will not run using FY 2016 or FY 2017 dollars:

Table 1: Project Information

Project Name:	
Project ID:	
Division:	
District:	
Type of Analysis:	Civil Works Budget Analysis
Business Line:	
Work Activity:	CWB - Navigation Construction

Table 2: Economic Impact Regions

Regional Impact Area:	Rural Area Generic Model
Regional Impact Area ID:	RURAL
Counties Included:	
State Impact Area:	Alaska
National Impact:	Yes

Table 3: Input Assumptions (Spending and LPCs)

Category	Spending (%)	Spending Amount	Local LPC (%)	State LPC (%)	National LPC (%)
Dredging Fuel	4%	$16,517,217	32%	80%	90%
Metals and Steel Materials	10%	$40,234,247	12%	24%	90%
Textiles, Lubricants, and Metal Valves and Parts (Dredging)	2%	$6,352,776	7%	8%	65%
Pipeline Dredge Equipment and Repairs	4%	$14,823,144	12%	35%	100%
Aggregate Materials	5%	$19,481,846	49%	87%	97%
Switchgear and Switchboard Apparatus Equipment	1%	$4,658,702	7%	8%	80%
Hopper Equipment and Repairs	2%	$8,470,368	1%	1%	97%
Construction of Other New Nonresidential Structures	17%	$70,304,052	50%	68%	100%
Industrial and Machinery Equipment Rental and Leasing	12%	$49,128,133	28%	82%	100%
Planning, Environmental, Engineering and Design Studies and Services	5%	$19,481,846	37%	63%	100%
USACE Overhead	4%	$15,246,662	52%	52%	100%
Repair and Maintenance Construction Activities	3%	$13,129,070	37%	82%	100%
Industrial Machinery and Equipment Repair and Maintenance	8%	$31,763,879	64%	95%	100%
USACE Wages and Benefits	7%	$30,493,324	75%	100%	100%
Private Sector Labor or Staff Augmentation	18%	$77,927,383	100%	100%	100%
Dredging Food and Beverages	1%	$5,505,739	9%	20%	90%
Total	**100%**	**$423,518,388**	**-**	**-**	**-**

The USACE is planning on expending $423,518,388 on the project. Of this total project expenditure $213,088,780 will be captured within the regional impact area. The rest will benefit the state or the nation. The expenditures made by the USACE for various services and products are expected to generate additional economic activity in that can be measured in jobs, income, sales and gross regional product as summarized in the following table and includes impacts to the region, the State impact area, and the Nation. Table 4 is the overall economic impacts for this analysis.

Table 4: Overall Summary Economic Impacts

Impacts	Impact Areas	Regional	State	National
Total Spending		$423,518,388	$423,518,388	$423,518,388
Direct Impact				
	Output	$213,088,780	$305,045,890	$413,090,462
	Job	4,582.00	5,198.64	5,926.82
	Labor Income	$138,056,824	$175,662,956	$219,289,679
	GRP	$156,012,382	$208,824,821	$264,702,869
Total Impact				
	Output	$287,425,564	$523,274,458	$1,111,170,473
	Job	5,261.48	6,689.76	10,095.13
	Labor Income	$159,409,327	$248,520,732	$447,131,008
	GRP	$199,316,728	$339,127,821	$657,701,924

Table 5: Economic Impact at Regional Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$3,980,163	0.47	$91,610	$563,979
171	Steel product manufacturing from purchased steel	$285,590	0.59	$43,461	$53,897

198	Valve and fittings other than plumbing manufacturing	$46,582	0.16	$10,149	$20,398
201	Fabricated pipe and pipe fitting manufacturing	$401,436	1.43	$79,413	$158,474
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$3,414,523	23.55	$1,442,740	$1,736,498
268	Switchgear and switchboard apparatus manufacturing	$10,874	0.03	$2,004	$4,516
290	Ship building and repairing	$4,472	0.02	$1,577	$1,807
319	Wholesale trade businesses	$3,533,587	24.18	$1,235,055	$2,621,699
322	Retail Stores - Electronics and appliances	$60,673	0.71	$21,171	$29,977
323	Retail Stores - Building material and garden supply	$3,464,344	44.46	$1,509,178	$2,292,398
324	Retail Stores - Food and beverage	$33,596	0.63	$15,729	$23,899
326	Retail Stores - Gasoline stations	$435,899	6.20	$175,328	$303,043
332	Transport by air	$6,635	0.03	$645	$1,851
333	Transport by rail	$313,774	0.90	$99,330	$167,915
334	Transport by water	$48,120	0.12	$8,588	$14,192
335	Transport by truck	$6,411,241	53.73	$2,564,370	$3,201,935
337	Transport by pipeline	$62,859	0.12	$17,060	$16,144
36	Construction of other new nonresidential structures	$35,282,789	280.52	$9,747,653	$12,725,588
365	Commercial and industrial machinery and equipment rental and leasing	$13,996,658	53.31	$2,912,691	$7,155,926
375	Environmental and other technical consulting services	$7,295,921	88.44	$4,197,225	$4,222,545
386	Business support services	$7,906,928	202.19	$3,504,015	$3,435,759
39	Maintenance and repair construction of nonresidential structures	$4,816,326	43.54	$1,513,958	$2,032,649
417	Commercial and industrial machinery and equipment repair and maintenance	$20,317,731	215.25	$11,295,650	$14,393,892
439	* Employment and payroll only (federal govt, non-military)	$22,869,993	295.50	$19,620,861	$22,869,993
5001	Labor	$77,927,383	3,245.46	$77,927,383	$77,927,383
69	All other food manufacturing	$160,682	0.46	$19,977	$36,023
	Total Direct Effects	$213,088,780	4,582.00	$138,056,824	$156,012,382
	Secondary Effects	$74,336,784	679.48	$21,352,503	$43,304,346
	Total Effects	**$287,425,564**	**5,261.48**	**$159,409,327**	**$199,316,728**

Table 6: Economic Impact at State Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$11,667,755	1.40	$321,231	$1,653,291
171	Steel product manufacturing from purchased steel	$4,235,644	8.81	$1,384,915	$1,675,818
198	Valve and fittings other than plumbing manufacturing	$46,582	0.16	$10,149	$20,398
201	Fabricated pipe and pipe fitting manufacturing	$3,711,014	14.42	$772,613	$1,464,986
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$8,915,151	67.44	$3,766,924	$4,533,910
268	Switchgear and switchboard apparatus manufacturing	$10,874	0.03	$2,004	$4,516
290	Ship building and repairing	$26,282	0.12	$9,270	$10,617
319	Wholesale trade businesses	$3,835,582	26.24	$1,366,760	$2,856,846
322	Retail Stores - Electronics and appliances	$85,820	1.00	$32,016	$44,137
323	Retail Stores - Building material and garden supply	$4,058,577	52.09	$1,795,170	$2,706,305
324	Retail Stores - Food and beverage	$38,076	0.71	$18,005	$27,184
326	Retail Stores - Gasoline stations	$442,337	6.29	$177,982	$307,550
332	Transport by air	$28,435	0.14	$6,420	$11,951
333	Transport by rail	$313,774	0.90	$99,330	$167,915
334	Transport by water	$101,823	0.26	$18,682	$36,302
335	Transport by truck	$8,757,217	73.40	$3,666,227	$4,531,821
337	Transport by pipeline	$176,530	0.33	$61,361	$58,722
36	Construction of other new nonresidential structures	$48,114,459	382.54	$15,583,600	$19,546,122
365	Commercial and industrial machinery and equipment rental and leasing	$40,306,819	153.51	$9,493,638	$22,310,020
375	Environmental and other technical consulting services	$12,350,884	149.71	$7,659,668	$7,697,870
386	Business support services	$7,906,928	202.19	$3,504,015	$3,435,759
39	Maintenance and repair construction of nonresidential structures	$10,761,097	97.28	$4,336,453	$5,548,269
417	Commercial and industrial machinery and equipment repair and maintenance	$30,055,371	318.41	$17,036,232	$21,625,455
439	* Employment and payroll only (federal govt, non-military)	$30,462,796	393.61	$26,524,800	$30,462,796
5001	Labor	$77,927,383	3,245.46	$77,927,383	$77,927,383

69	All other food manufacturing	$708,681	2.19	$88,108	$158,878
	Total Direct Effects	$305,045,890	5,198.64	$175,662,956	$208,824,821
	Secondary Effects	$218,228,567	1,491.12	$72,857,776	$130,303,000
	Total Effects	**$523,274,458**	**6,689.76**	**$248,520,732**	**$339,127,821**

Table 7: Economic Impact at National Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$12,367,215	1.48	$430,249	$2,099,276
171	Steel product manufacturing from purchased steel	$29,144,623	60.60	$9,844,102	$11,903,630
198	Valve and fittings other than plumbing manufacturing	$3,257,665	11.30	$807,752	$1,568,524
201	Fabricated pipe and pipe fitting manufacturing	$11,706,575	45.82	$2,806,905	$4,906,543
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$9,623,273	73.09	$4,302,877	$5,199,448
268	Switchgear and switchboard apparatus manufacturing	$2,912,801	9.35	$689,235	$1,421,655
290	Ship building and repairing	$8,103,304	38.08	$2,858,078	$3,307,110
319	Wholesale trade businesses	$8,986,977	61.49	$3,626,075	$6,867,944
322	Retail Stores - Electronics and appliances	$149,076	1.74	$61,896	$83,236
323	Retail Stores - Building material and garden supply	$4,058,577	52.09	$1,795,170	$2,706,305
324	Retail Stores - Food and beverage	$38,539	0.72	$18,240	$27,523
326	Retail Stores - Gasoline stations	$445,955	6.34	$179,474	$310,082
332	Transport by air	$28,435	0.14	$6,800	$12,617
333	Transport by rail	$705,366	3.07	$224,344	$379,479
334	Transport by water	$102,051	0.26	$19,636	$38,365
335	Transport by truck	$9,741,634	81.65	$4,128,588	$5,089,867
337	Transport by pipeline	$181,627	0.34	$69,485	$66,566
36	Construction of other new nonresidential structures	$70,304,052	558.96	$25,675,605	$31,340,758
365	Commercial and industrial machinery and equipment rental and leasing	$49,056,362	186.84	$12,098,624	$27,349,571
375	Environmental and other technical consulting services	$19,479,263	236.12	$12,647,644	$12,704,559

386	Business support services	$15,241,849	389.75	$8,152,247	$8,035,746
39	Maintenance and repair construction of nonresidential structures	$13,125,327	118.65	$5,458,957	$6,946,428
417	Commercial and industrial machinery and equipment repair and maintenance	$31,753,124	336.39	$18,318,205	$22,886,275
439	* Employment and payroll only (federal govt, non-military)	$30,493,321	394.00	$26,552,556	$30,493,321
5001	Labor	$77,927,383	3,245.46	$77,927,383	$77,927,383
69	All other food manufacturing	$4,156,090	13.10	$589,553	$1,030,658
	Total Direct Effects	$413,090,462	5,926.82	$219,289,679	$264,702,869
	Secondary Effects	$698,080,011	4,168.31	$227,841,329	$392,999,054
	Total Effects	**$1,111,170,473**	**10,095.13**	**$447,131,008**	**$657,701,924**

Table 8: Impact Region Definition (2008)

Regional Impact Area ID:	RURAL
Regional Impact Area Name:	Rural Area Generic Model
Impact Area Type	N/A
State Impact Region::	Alaska

County	FIPS	Area (sq. mi)	Population	Households	Total Personal Income (in millions)
Total		**0**	**0**	**0**	**$0**

Table 9: Impact Region Profile (2008)

Regional Impact Area ID:	RURAL
Regional Impact Area Name:	Rural Area Generic Model
Impact Area Type	N/A
State Impact Region::	Alaska

Section	Output (millions)	Labor Income (millions)	GRP (millions)	Employment
Accommodations and Food Service	$0	$0	$0	0

Administrative and Waste Management Services	$0	$0	$0	0
Agriculture, Forestry, Fishing and Hunting	$0	$0	$0	0
Arts, Entertainment, and Recreation	$0	$0	$0	0
Construction	$0	$0	$0	0
Education	$0	$0	$0	0
Finance, Insurance, Real Estate, Rental and Leasing	$0	$0	$0	0
Government	$0	$0	$0	0
Health Care and Social Assistance	$0	$0	$0	0
Imputed Rents	$0	$0	$0	0
Information	$0	$0	$0	0
Management of Companies and Enterprises	$0	$0	$0	0
Manufacturing	$0	$0	$0	0
Mining	$0	$0	$0	0
Professional, Scientific, and Technical Services	$0	$0	$0	0
Retail Trade	$0	$0	$0	0
Transportation and Warehousing	$0	$0	$0	0
Utilities	$0	$0	$0	0
Wholesale Trade	$0	$0	$0	0
Total	**$0**	**$0**	**$0**	**0**

Table 10: Top Ten Industries Affected by Work Activity (2008)

Project:	New Analysis
Business Line:	None specified
Work Activity:	CWB - Navigation Construction

The following table shows the top ten industries that typically benefit from the types of expenditures made for this project by the USACE. This analysis was conducted at the national level and thus it cannot be guaranteed that these industries would be present in the regional impact area as analyzed.

Rank	Industry (millions)	IMPLAN No.	% of Total Employment

Table 11: CO_2 Emission Intensities

Industry	Industry Name	Output Direct	CO_2 Emission Intensity Direct	Output Indirect	CO_2 Emission Intensity Indirect Domestic	CO_2 Emission Intensity Indirect Imported	CO_2 Emission Intensity Indirect Total	CO_2 Emission Intensity Total
115	Petroleum refineries	$12,367,215	49,829.09	$7,300,478	5,865.11	6,461.87	12,326.98	62,156.07
171	Steel product manufacturing from purchased steel	$29,144,623	67,755.14	$32,542,011	52,311.15	20,342.56	72,653.72	140,408.86
198	Valve and fittings other than plumbing manufacturing	$3,257,665	488.28	$2,459,978	764.33	395.73	1,160.06	1,648.34
201	Fabricated pipe and pipe fitting manufacturing	$11,706,575	3,496.31	$10,575,669	6,226.41	3,023.71	9,250.12	12,746.43
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$9,623,273	48,429.33	$6,976,685	4,326.86	976.12	5,302.98	53,732.30

268	Switchgear and switchboard apparatus manufacturing	$2,912,801	548.33	$2,050,696	566.32	355.45	921.77	1,470.10
290	Ship building and repairing	$8,103,304	2,137.41	$6,915,684	3,248.85	1,508.30	4,757.15	6,894.56
319	Wholesale trade businesses	$8,986,977	959.34	$2,814,313	246.63	53.38	300.02	1,259.36
322	Retail Stores - Electronics and appliances	$149,076	37.21	$85,138	9.58	1.66	11.24	48.45
323	Retail Stores - Building material and garden supply	$4,058,577	1,013.09	$1,824,120	205.22	35.50	240.72	1,253.81
324	Retail Stores - Food and beverage	$38,539	9.62	$14,760	1.66	0.29	1.95	11.57
326	Retail Stores - Gasoline stations	$445,955	111.32	$192,098	21.61	3.74	25.35	136.67
332	Transport by air	$28,435	76.87	$18,174	6.85	1.83	8.68	85.55
333	Transport by rail	$705,366	734.97	$518,681	103.52	28.25	131.77	866.74
334	Transport by water	$102,051	497.71	$67,474	11.70	2.79	14.49	512.19
335	Transport by truck	$9,741,634	22,349.71	$6,281,022	3,696.43	564.91	4,261.34	26,611.05
337	Transport by pipeline	$181,627	436.15	$143,533	68.46	24.55	93.01	529.16
36	Construction of other new nonresidential structures	$70,304,052	25,077.96	$58,934,643	31,363.94	11,311.19	42,675.13	67,753.09
365	Commercial and industrial machinery and equipment rental and leasing	$49,056,362	20,129.40	$32,256,079	4,330.45	737.99	5,068.44	25,197.84
375	Environmental and other technical consulting services	$19,479,263	387.09	$8,607,397	1,077.90	237.84	1,315.74	1,702.82
386	Business support services	$15,241,849	610.82	$8,207,324	1,845.36	383.61	2,228.97	2,839.79
39	Maintenance and repair construction of nonresidential structures	$13,125,327	5,592.54	$9,804,676	7,051.40	2,262.30	9,313.70	14,906.24

417	Commercial and industrial machinery and equipment repair and maintenance	$31,753,124	675.83	$10,920,004	3,954.65	2,062.77	6,017.42	6,693.25
439	* Employment and payroll only (federal govt, non-military)	$30,493,321	0.00	$0	0.00	0.00	0.00	0.00
69	All other food manufacturing	$4,156,090	1,003.00	$5,387,581	2,667.13	704.26	3,371.39	4,374.39
	Total	**$335,163,079**	**252,386.52**	**$214,898,218**	**129,971.52**	**51,480.60**	**181,452.12**	**433,838.64**

3. ALTERNATIVE 3:

Revetting and vegetating the bluff face with a buried toe also creates quite a few construction jobs. Here it was assumed that a construction firm based in Alaska would be awarded the work with one third of the workers originating from the Kenai area.

RECONS outputs are as follows:

Table 1: Project Information

Project Name:	New Analysis
Project ID:	
Division:	
District:	
Type of Analysis:	Civil Works Budget Analysis
Business Line:	None specified
Work Activity:	Erosion Control and Earthwork Activities

Table 2: Economic Impact Regions

Regional Impact Area:	Rural Area Generic Model
Regional Impact Area ID:	RURAL
Counties included	

State Impact Area:	Alaska
National Impact:	Yes

Table 3: Input Assumptions (Spending and LPCs)

Category	Spending (%)	Spending Amount	Local LPC (%)	State LPC (%)	National LPC (%)
Erosion Control and Earthwork Activities	100%	$45,193,071	33%	66%	100%
Total	**100%**	**$45,193,071**	**-**	**-**	**-**

The USACE is planning on expending $45,193,071 on the project. Of this total project expenditure $14,969,191 will be captured within the regional impact area. The rest will benefit the state. The expenditures made by the USACE for various services and products are expected to generate additional economic activity in that can be measured in jobs, income, sales and gross regional product as summarized in the following table and includes impacts to the region, the State impact area, and the Nation. Table 4 is the overall economic impacts for this analysis.

Table 4: Overall Summary Economic Impacts

Impacts	Impact Areas	Regional	State	National
Total Spending		$45,193,071	$45,193,071	$45,193,071
Direct Impact				
	Output	$14,969,191	$30,019,408	$45,193,071
	Job	119.01	238.67	359.31
	Labor Income	$4,135,571	$10,980,531	$17,881,634
	GRP	$5,398,999	$13,398,778	$21,464,173
Total Impact				
	Output	$19,713,354	$51,260,609	$131,113,428
	Job	161.26	374.53	856.18
	Labor Income	$5,579,878	$18,292,282	$45,987,151

GRP	$8,070,353	$25,874,160	$68,749,416

Table 5: Economic Impact at Regional Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
36	Construction of other new nonresidential structures	$14,969,191	119.01	$4,135,571	$5,398,999
	Total Direct Effects	$14,969,191	119.01	$4,135,571	$5,398,999
	Secondary Effects	$4,744,163	42.25	$1,444,307	$2,671,353
	Total Effects	**$19,713,354**	**161.26**	**$5,579,878**	**$8,070,353**

Table 6: Economic Impact at State Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
36	Construction of other new nonresidential structures	$30,019,408	238.67	$10,980,531	$13,398,778
	Total Direct Effects	$30,019,408	238.67	$10,980,531	$13,398,778
	Secondary Effects	$21,241,201	135.86	$7,311,751	$12,475,382
	Total Effects	**$51,260,609**	**374.53**	**$18,292,282**	**$25,874,160**

Table 7: Economic Impact at National Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
36	Construction of other new nonresidential structures	$45,193,071	359.31	$17,881,634	$21,464,173
	Total Direct Effects	$45,193,071	359.31	$17,881,634	$21,464,173

	Secondary Effects	$85,920,357	496.87	$28,105,517	$47,285,244
	Total Effects	**$131,113,428**	**856.18**	**$45,987,151**	**$68,749,416**

Table 8: Impact Region Definition (2008)

Regional Impact Area ID:	RURAL
Regional Impact Area Name:	Rural Area Generic Model
Impact Area Type	N/A
State Impact Region::	Alaska

County	FIPS	Area (sq. mi)	Population	Households	Total Personal Income (in millions)
Total		**0**	**0**	**0**	**$0**

Table 9: Impact Region Profile (2008)

Regional Impact Area ID:	RURAL
Regional Impact Area Name:	Rural Area Generic Model
Impact Area Type	N/A
State Impact Region::	Alaska

Section	Output (millions)	Labor Income (millions)	GRP (millions)	Employment
Accommodations and Food Service	$0	$0	$0	0
Administrative and Waste Management Services	$0	$0	$0	0
Agriculture, Forestry, Fishing and Hunting	$0	$0	$0	0
Arts, Entertainment, and Recreation	$0	$0	$0	0
Construction	$0	$0	$0	0
Education	$0	$0	$0	0
Finance, Insurance, Real Estate, Rental and Leasing	$0	$0	$0	0
Government	$0	$0	$0	0

Health Care and Social Assistance	$0	$0	$0	0
Imputed Rents	$0	$0	$0	0
Information	$0	$0	$0	0
Management of Companies and Enterprises	$0	$0	$0	0
Manufacturing	$0	$0	$0	0
Mining	$0	$0	$0	0
Professional, Scientific, and Technical Services	$0	$0	$0	0
Retail Trade	$0	$0	$0	0
Transportation and Warehousing	$0	$0	$0	0
Utilities	$0	$0	$0	0
Wholesale Trade	$0	$0	$0	0
Total	**$0**	**$0**	**$0**	**0**

Table 10: Top Ten Industries Affected by Work Activity (2008)

Project:	New Analysis
Business Line:	None specified
Work Activity:	Erosion Control and Earthwork Activities

The following table shows the top ten industries that typically benefit from the types of expenditures made for this project by the USACE. This analysis was conducted at the national level and thus it cannot be guaranteed that these industries would be present in the regional impact area as analyzed.

Rank	Industry (millions)	IMPLAN No.	% of Total Employment
1	Construction of other new nonresidential structures	36	37 %
2	Food services and drinking places	413	4 %
3	Architectural, engineering, and related services	369	4 %
4	Real estate establishments	360	3 %

5	Wholesale trade businesses	319	3 %
6	Employment services	382	2 %
7	Offices of physicians, dentists, and other health practitioners	394	2 %
8	Private hospitals	397	2 %
9	Retail Stores - General merchandise	329	1 %
10	Retail Stores - Food and beverage	324	1 %
			58 %

Table 11: CO_2 Emission Intensities

Industry	Industry Name	Output Direct	CO_2 Emission Intensity Direct	Output Indirect	CO_2 Emission Intensity Indirect Domestic	CO_2 Emission Intensity Indirect Imported	CO_2 Emission Intensity Indirect Total	CO_2 Emission Intensity Total
36	Construction of other new nonresidential structures	$45,193,071	16,120.69	$37,884,552	20,161.46	7,271.10	27,432.56	43,553.25
	Total	**$45,193,071**	**16,120.69**	**$37,884,552**	**20,161.46**	**7,271.10**	**27,432.56**	**43,553.25**

4. ALTERNATIVE 4

The RECONS output for Alternative 4, revetting and vegetating the bluff face with a weighted toe and the same assumptions as Alternative 3 are as follows:

Table 1: Project Information

Project Name:	New Analysis
Project ID:	
Division:	
District:	
Type of Analysis:	Civil Works Budget Analysis

Business Line:	None specified
Work Activity:	Erosion Control and Earthwork Activities

Table 2: Economic Impact Regions

Regional Impact Area:	Rural Area Generic Model
Regional Impact Area ID:	RURAL
Counties included	
State Impact Area:	Alaska
National Impact:	Yes

Table 3: Input Assumptions (Spending and LPCs)

Category	Spending (%)	Spending Amount	Local LPC (%)	State LPC (%)	National LPC (%)
Erosion Control and Earthwork Activities	100%	$48,803,457	33%	66%	100%
Total	**100%**	**$48,803,457**	**-**	**-**	**-**

The USACE is planning on expending $48,803,457 on the project. Of this total project expenditure $16,165,051 will be captured within the regional impact area. The rest will benefit the state or the nation. The expenditures made by the USACE for various services and products are expected to generate additional economic activity in that can be measured in jobs, income, sales and gross regional product as summarized in the following table and includes impacts to the region, the State impact area, and the Nation. Table 4 is the overall economic impacts for this analysis.

Table 4: Overall Summary Economic Impacts

Impact Areas Impacts	Regional	State	National
Total Spending	$48,803,457	$48,803,457	$48,803,457
Direct Impact			

	Output	$16,165,051	$32,417,600	$48,803,457
	Job	128.52	257.74	388.02
	Labor Income	$4,465,954	$11,857,744	$19,310,163
	GRP	$5,830,315	$14,469,180	$23,178,903
Total Impact				
	Output	$21,288,216	$55,355,719	$141,587,823
	Job	174.15	404.46	924.58
	Labor Income	$6,025,644	$19,753,616	$49,660,975
	GRP	$8,715,077	$27,941,196	$74,241,673

Table 5: Economic Impact at Regional Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
36	Construction of other new nonresidential structures	$16,165,051	128.52	$4,465,954	$5,830,315
	Total Direct Effects	$16,165,051	128.52	$4,465,954	$5,830,315
	Secondary Effects	$5,123,165	45.62	$1,559,690	$2,884,762
	Total Effects	**$21,288,216**	**174.15**	**$6,025,644**	**$8,715,077**

Table 6: Economic Impact at State Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
36	Construction of other new nonresidential structures	$32,417,600	257.74	$11,857,744	$14,469,180
	Total Direct Effects	$32,417,600	257.74	$11,857,744	$14,469,180
	Secondary Effects	$22,938,119	146.72	$7,895,873	$13,472,016
	Total Effects	**$55,355,719**	**404.46**	**$19,753,616**	**$27,941,196**

Table 7: Economic Impact at National Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
36	Construction of other new nonresidential structures	$48,803,457	388.02	$19,310,163	$23,178,903
	Total Direct Effects	$48,803,457	388.02	$19,310,163	$23,178,903
	Secondary Effects	$92,784,366	536.57	$30,350,811	$51,062,769
	Total Effects	**$141,587,823**	**924.58**	**$49,660,975**	**$74,241,673**

Table 8: Impact Region Definition (2008)

Regional Impact Area ID:	RURAL
Regional Impact Area Name:	Rural Area Generic Model
Impact Area Type	N/A
State Impact Region::	Alaska

County	FIPS	Area (sq. mi)	Population	Households	Total Personal Income (in millions)
Total		**0**	**0**	**0**	**$0**

Table 9: Impact Region Profile (2008)

Regional Impact Area ID:	RURAL
Regional Impact Area Name:	Rural Area Generic Model
Impact Area Type	N/A
State Impact Region::	Alaska

Section	Output (millions)	Labor Income (millions)	GRP (millions)	Employment
Accommodations and Food Service	$0	$0	$0	0
Administrative and Waste Management Services	$0	$0	$0	0
Agriculture, Forestry, Fishing and Hunting	$0	$0	$0	0
Arts, Entertainment, and Recreation	$0	$0	$0	0
Construction	$0	$0	$0	0
Education	$0	$0	$0	0
Finance, Insurance, Real Estate, Rental and Leasing	$0	$0	$0	0
Government	$0	$0	$0	0
Health Care and Social Assistance	$0	$0	$0	0
Imputed Rents	$0	$0	$0	0
Information	$0	$0	$0	0
Management of Companies and Enterprises	$0	$0	$0	0
Manufacturing	$0	$0	$0	0
Mining	$0	$0	$0	0
Professional, Scientific, and Technical Services	$0	$0	$0	0
Retail Trade	$0	$0	$0	0
Transportation and Warehousing	$0	$0	$0	0
Utilities	$0	$0	$0	0
Wholesale Trade	$0	$0	$0	0
Total	**$0**	**$0**	**$0**	**0**

Table 10: Top Ten Industries Affected by Work Activity (2008)

Project:	New Analysis
Business Line:	None specified
Work Activity:	Erosion Control and Earthwork Activities

The following table shows the top ten industries that typically benefit from the types of expenditures made for this project by the USACE. This analysis was conducted at the national level and thus it cannot be guaranteed that these industries would be present in the regional impact area as analyzed.

Rank	Industry (millions)	IMPLAN No.	% of Total Employment
1	Construction of other new nonresidential structures	36	37 %
2	Food services and drinking places	413	4 %
3	Architectural, engineering, and related services	369	4 %
4	Real estate establishments	360	3 %
5	Wholesale trade businesses	319	3 %
6	Employment services	382	2 %
7	Offices of physicians, dentists, and other health practitioners	394	2 %
8	Private hospitals	397	2 %
9	Retail Stores - General merchandise	329	1 %
10	Retail Stores - Food and beverage	324	1 %
			58 %

Table 11: CO_2 Emission Intensities

Industry	Industry Name	Output Direct	CO_2 Emission Intensity Direct	Output Indirect	CO_2 Emission Intensity Indirect Domestic	CO_2 Emission Intensity Indirect Imported	CO_2 Emission Intensity Indirect Total	CO_2 Emission Intensity Total
36	Construction of other new nonresidential structures	$48,803,457	17,408.54	$40,911,074	21,772.12	7,851.97	29,624.09	47,032.64
	Total	**$48,803,457**	**17,408.54**	**$40,911,074**	**21,772.12**	**7,851.97**	**29,624.09**	**47,032.64**

5. ALTERNATIVE 5:

While summarized in the Economics Appendix, the full RECONS output for Alternative 5 is as follows. The same assumptions of all work benefiting a state of Alaska firm, with one third of the workers regionally based in Kenai are used:

Table 1: Project Information

Project Name:	New Analysis
Project ID:	
Division:	
District:	
Type of Analysis:	Civil Works Budget Analysis
Business Line:	None specified
Work Activity:	Erosion Control and Earthwork Activities

Table 2: Economic Impact Regions

Regional Impact Area:	Rural Area Generic Model
Regional Impact Area ID:	RURAL
Counties included	
State Impact Area:	Alaska
National Impact:	Yes

Table 3: Input Assumptions (Spending and LPCs)

Category	Spending (%)	Spending Amount	Local LPC (%)	State LPC (%)	National LPC (%)
Erosion Control and Earthwork Activities	100%	$30,756,153	33%	66%	100%
Total	**100%**	**$30,756,153**	**-**	**-**	**-**

The USACE is planning on expending $30,756,153 on the project. Of this total project expenditure $10,187,286 will be captured within the regional impact area. The rest will benefit the state. The expenditures made by the USACE for various services and products are expected to generate additional economic activity in that can be measured in jobs, income, sales and gross regional product as summarized in the following table and includes impacts to the region, the State impact area, and the Nation. Table 4 is the overall economic impacts for this analysis.

Table 4: Overall Summary Economic Impacts

Impacts	Impact Areas	Regional	State	National
Total Spending		$30,756,153	$30,756,153	$30,756,153
Direct Impact				
	Output	$10,187,286	$20,429,714	$30,756,153
	Job	80.99	162.43	244.53
	Labor Income	$2,814,464	$7,472,802	$12,169,350
	GRP	$3,674,290	$9,118,541	$14,607,447
Total Impact				
	Output	$13,415,927	$34,885,417	$89,229,268
	Job	109.75	254.89	582.68
	Labor Income	$3,797,387	$12,448,816	$31,296,564
	GRP	$5,492,280	$17,608,664	$46,787,428

Table 5: Economic Impact at Regional Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
36	Construction of other new nonresidential structures	$10,187,286	80.99	$2,814,464	$3,674,290
	Total Direct Effects	$10,187,286	80.99	$2,814,464	$3,674,290
	Secondary Effects	$3,228,641	28.75	$982,924	$1,817,990

	Total Effects	**$13,415,927**	**109.75**	**$3,797,387**	**$5,492,280**

Table 6: Economic Impact at State Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
36	Construction of other new nonresidential structures	$20,429,714	162.43	$7,472,802	$9,118,541
	Total Direct Effects	$20,429,714	162.43	$7,472,802	$9,118,541
	Secondary Effects	$14,455,703	92.46	$4,976,014	$8,490,124
	Total Effects	**$34,885,417**	**254.89**	**$12,448,816**	**$17,608,664**

Table 7: Economic Impact at National Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
36	Construction of other new nonresidential structures	$30,756,153	244.53	$12,169,350	$14,607,447
	Total Direct Effects	$30,756,153	244.53	$12,169,350	$14,607,447
	Secondary Effects	$58,473,115	338.15	$19,127,215	$32,179,981
	Total Effects	**$89,229,268**	**582.68**	**$31,296,564**	**$46,787,428**

Table 8: Impact Region Definition (2008)

Regional Impact Area ID:	RURAL
Regional Impact Area Name:	Rural Area Generic Model
Impact Area Type	N/A
State Impact Region::	Alaska

County	FIPS	Area (sq. mi)	Population	Households	Total Personal Income (in millions)
Total		**0**	**0**	**0**	**$0**

Table 9: Impact Region Profile (2008)

Regional Impact Area ID:	RURAL
Regional Impact Area Name:	Rural Area Generic Model
Impact Area Type	N/A
State Impact Region::	Alaska

Section	Output (millions)	Labor Income (millions)	GRP (millions)	Employment
Accommodations and Food Service	$0	$0	$0	0
Administrative and Waste Management Services	$0	$0	$0	0
Agriculture, Forestry, Fishing and Hunting	$0	$0	$0	0
Arts, Entertainment, and Recreation	$0	$0	$0	0
Construction	$0	$0	$0	0
Education	$0	$0	$0	0
Finance, Insurance, Real Estate, Rental and Leasing	$0	$0	$0	0
Government	$0	$0	$0	0
Health Care and Social Assistance	$0	$0	$0	0
Imputed Rents	$0	$0	$0	0
Information	$0	$0	$0	0
Management of Companies and Enterprises	$0	$0	$0	0
Manufacturing	$0	$0	$0	0
Mining	$0	$0	$0	0
Professional, Scientific, and Technical Services	$0	$0	$0	0
Retail Trade	$0	$0	$0	0
Transportation and Warehousing	$0	$0	$0	0
Utilities	$0	$0	$0	0

Wholesale Trade	$0	$0	$0	0
Total	**$0**	**$0**	**$0**	**0**

Table 10: Top Ten Industries Affected by Work Activity (2008)

Project:	New Analysis
Business Line:	None specified
Work Activity:	Erosion Control and Earthwork Activities

The following table shows the top ten industries that typically benefit from the types of expenditures made for this project by the USACE. This analysis was conducted at the national level and thus it cannot be guaranteed that these industries would be present in the regional impact area as analyzed.

Rank	Industry (millions)	IMPLAN No.	% of Total Employment
1	Construction of other new nonresidential structures	36	37 %
2	Food services and drinking places	413	4 %
3	Architectural, engineering, and related services	369	4 %
4	Real estate establishments	360	3 %
5	Wholesale trade businesses	319	3 %
6	Employment services	382	2 %
7	Offices of physicians, dentists, and other health practitioners	394	2 %
8	Private hospitals	397	2 %
9	Retail Stores - General merchandise	329	1 %
10	Retail Stores - Food and beverage	324	1 %
			58 %

Table 11: CO_2 Emission Intensities

Industry	Industry Name	Output Direct	CO_2 Emission Intensity Direct	Output Indirect	CO_2 Emission Intensity Indirect Domestic	CO_2 Emission Intensity Indirect Imported	CO_2 Emission Intensity Indirect Total	CO_2 Emission Intensity Total
36	Construction of other new nonresidential structures	$30,756,153	10,970.94	$25,782,339	13,720.89	4,948.35	18,669.23	29,640.17
	Total	**$30,756,153**	**10,970.94**	**$25,782,339**	**13,720.89**	**4,948.35**	**18,669.23**	**29,640.17**

6. ALTERNATIVE 6:

Alternative 6 does not have any construction spending and would create no jobs. Further, buyouts for properties lost does not guarantee relocation of bluff residents within the community or the state. Bluff residents' dollars may go elsewhere. Buyouts for properties, however, do create an opportunity for residents' dollars to stay in the local area and state, whereas under the No Action alternative this opportunity would not exist. The size of the opportunity is equal to the size of the buyout plus indirect and induced effects from regional spending.