Kotzebue Harbor Feasibility Study

Navigation Improvements at Cape Blossom

Kotzebue, Alaska

Economics Appendix

Kotzebue, Alaska

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US Army Corps of Engineers

Alaska District

RESULTS

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1. INTRODUCTION

This document presents the economic evaluations performed for the Cape Blossom (Kotzebue) Navigation Improvements project. In 2016, the U.S. Army Corps of Engineers (USACE) Alaska District began a multi-year feasibility study to determine if constructing navigation improvements is both economically beneficial and environmentally acceptable to the nation. The USACE Alaska District performed the economic analyses contained within this document in support of the feasibility study.

2. PROJECT DESCRIPTION

Kotzebue, Alaska is 26 miles north of the Arctic Circle on Alaska's western coast, 549 air miles northwest of Anchorage. It is situated on the northwestern tip of the Baldwin Peninsula, as it extends into Kotzebue Sound, as shown in the figure below. Cape Blossom is 12 miles southeast of Kotzebue, also on the Baldwin Peninsula.

Figure 1. Northwest Arctic Borough (NWAB)

Kotzebue is a transportation hub for the NWAB where fuel and goods are transported to Kotzebue or Kotzebue Sound, before being further distributed to at least 9 other communities including:

- Selawik, Noorvik, Kiana, Ambler, Shungnak, and Kobuk up the Kobuk River;
- Noatok, Kivalina, and Portsite\Red Dog Mine along the north coast of Kotzebue Sound; and
- Deering, and Buckland along the south coast.

Some fuel and goods to the coastal communities may also be delivered independently of goods received in Kotzebue. For Portsite\Red Dog specifically, the majority of their goods are received independently.

The Borough has a total area of 40,749 square miles; an area larger than the state of Indiana, and includes national protected areas, national monuments, preserves, and parks.

2.1 Climate

Kotzebue and the entire NWAB region is located in a transitional arctic climate zone characterized by long, cold winters, and temperate summers. For Kotzebue, the average low temperatures in winter months ranges from seven degrees below zero (Fahrenheit) to 12 degrees below zero. The average winter high temperatures range from two to nine degrees Fahrenheit. Summer lows range from 25 to 48 degrees Fahrenheit, with highs ranging from 50 to 60 degrees. Temperature extremes have been measured from 52 degrees below zero to 85 degrees above. The daily low temperature in Kotzebue dips below freezing 250 days per year. Kotzebue Sound is free of ice from early July to early October. Snowfall averages 40 inches per year, rainfall averages nine inches, with more than 100 days of precipitation per year.

Persistent sea ice in the spring, or early ice in the fall, and / or storms can cause delays and damages associated with high barge transportation costs in the region. The barge companies attempt their annual deliveries of fuel to the villages up the Kobuk and Noatak River shortly after or during the ice break up, to take advantage of the high spring-melt water levels that occur at the river mouths during that period. Often the high river water levels do not persist long enough to allow fully-ladened barges to reach Shugnak and Kobuk, and occasionally Ambler, resulting in the need for those communities to fly in fuel and goods.

3. STUDY PURPOSE

The purpose of this study is to evaluate the problems and opportunities for improved navigation at Cape Blossom and identify the plan that best satisfies the social, engineering, economic, and environmental criteria. The scope of this feasibility study involves analysis of existing conditions and requirements, identifying opportunities for improvement, preparing economic analyses of alternatives (Alt.), identifying environmental impacts, and analyzing the authorized plans.

3.1 Authority

This feasibility study is being conducted under authority granted by Section 204 of the Flood Control Act of 1948, as amended by Section 208 of the Flood Control Act of 1950, which authorizes a study of the feasibility for development of navigation improvements in various harbors and rivers in Alaska. Kotzebue is a coastal community of Northwestern Alaska. Section 204 states:

> *"The Secretary of the Army is hereby authorized and directed to cause preliminary examinations and surveys for flood control and allied purposes, including channel and major drainage improvements… to be made under the direction of the Chief of Engineers, in drainage areas of the United States and its Territorial Possessions, which include the following-named localities… Provided, that after the regular or formal reports made on any examination, survey, project, or work under way or proposed are submitted to Congress; Harbors and Rives in Alaska, with a view to determining the advisability of improvements in the interest of navigation, flood control, hydroelectric power, and related water uses."*

In addition, a Federal project at Cape Blossom may be justified with regional benefits as outlined in Section 2006 "Remote and Subsistence Harbors" of the Water Resources Development Act (WRDA) of 2007, as amended.[1] This allows for the consideration of benefits to communities located within the region served by a remote and subsistence harbor when evaluating navigation improvements for the harbor. This provision allows the approval for such harbors without the need to demonstrate justification solely on National Economic Development (NED) benefits if the long-term viability of a community located within the region served by the project would be threatened without the navigation improvements, the project is in Alaska or other select areas, and over 80% of goods imported into a region are consumed within the region.

Additional considerations are made under the Remote and Subsistence Authority for public health and safety, added social and cultural value, greater access to natural resources, increased welfare of the local population, and increased regional economic opportunities.

4. PROBLEMS AND OPPORTUNITIES

4.1 Economic Problems

Commodity costs in the Northwest Arctic Borough (NWAB) are elevated due to the practice of lightering (at-sea transfers of petroleum fuels and goods to smaller vessels) to get commodities ashore at Kotzebue, Alaska. For example, the 2016 retail price for residential heating oil provided by one provider in Kotzebue was priced at $5.48; however, higher prices of $7 to $9 per gallon

[1] Source: 33 USC 2242.

have been reported.[2] In comparison, according to the U.S. Energy Information Administration (EIA), the 2016 U.S. average in the lower 48 states was $2.27 per gallon.[3]

Lightering is necessary because the shallow sea conditions prevent deeper draft vessels from reaching shore-based Kotzebue facilities, as well as other remote coastal and riverine communities. Fuel and goods delivered are utilized in Kotzebue and distributed regionally to at least 9 other villages located in the NWAB.

The delivery costs associated with lightering increase the cost of fuel and goods to levels that may threaten the long-term viability of regional communities by imposing economic burdens on families and individuals; this, combined with high unemployment rates, contribute to rural-urban migration. This out-migration threatens the preservation of native cultures as well as community identity, pride, and self-determination.

4.2 Assumptions

The key assumption associated with this analysis is that reducing the cost of lightering fuel would provide the greatest benefit to the most people in the region. The cost of fuel affects all aspects of living in the region, from subsistence activities to local utilities and home heating. Additionally, it is assumed that navigation improvements could aid in the long-term sustainability of the region by reducing the cost of items that are cost-prohibitive to ship by air; items such as construction materials, vehicles, or appliances and other durable or non-perishable goods. This analysis also assumes that the high cost of construction materials results in a shortage of quality housing and facilities which are needed to retain professionals such as doctors and teachers that are fundamental to community viability. See Economics Addendum I for a flow chart demonstrating the beneficial effects of reducing transportation costs associated with lightering.

Another key assumption of this analysis is that the project alternative at Cape Blossom, the closest location to Kotzebue with deeper water near shore, would provide an opportunity for competition. A continuing assumption is that one party cannot capture all of the benefits of the project, nor can an agent organization ordering fuel and supplies for its principals, nor can a single retailer selling products, i.e. some benefits would reach end users. To the extent possible, this Appendix documents where benefits may be threatened by such market failures.

Data shortages are assumed to present risks as modeled, but not beyond. Last, this Appendix assumes that readers have a general understanding of Corps economics and data collection techniques. Of particular note, nominal pricing is used. This is in accordance with policy, but potentially has a substantial impact on results. To review the methodology and data sources used, please see Economics Addendum II.

[2] Source: commerce.alaska.gov, 2016.
[3] Source: eia.gov, 2018.

5. SOCIOECONOMICS

This section pertains to the socioeconomic composition of the study area. It is not intended to be comprehensive, but to provide planners and report reviewers with an understanding of the community and region, its infrastructure, and the level of economic activity, as well as the potential of the area to support the project under consideration.

5.1 History

Kotzebue and the surrounding villages have been occupied extensively by the Inupiat people for its maritime subsistence economy for thousands of years. Kotzebue is located near the mouths of the Noatak, Selawik, and Kobuk Rivers, which end in Kotzebue Sound. Historically, Kotzebue was known as Qikiqtagruk ("almost an island") and was primarily used as a trading and gathering hub. In addition, inhabitants of the Russian Far East came to Kotzebue to trade. The German Lt. Otto Von Kotzebue "discovered" Kotzebue Sound in 1818 for Russia. The Kotzebue area as a trading center expanded with the arrival of whalers, traders, gold seekers, and missionaries. By 1897, reindeer herding was introduced. In 1899, the settlement established a year-round population and was renamed Kotzebue. Today, Kotzebue's economy is dominated by subsistence, services and government (see Figure 10).

Hunting, fishing, and gathering of traditional foods are a priority for many Alaska Native residents of the NWAB region – a matter of economic necessity, as well as a way of maintaining cultural heritage. Traditional foods gathered locally and regionally sustain families nutritionally and spiritually – connecting people to each other, as well as the environment. Hunting and gathering maritime resources has traditionally been an important subsistence activity.

5.2 Subsistence Importance

The Alaska Department of Fish & Game reported that in 2014, Western and Arctic rural Alaskans harvested between 370 and 405 lbs. of wild foods per person, providing more than 230% of protein need, and 1/3 of all calories.[4] Subsistence harvest is a vital component of native culture and supplants high paying jobs in many cases. Most members of the native community participate in subsistence by harvesting food, bartering subsistence foods or goods, or by contributing fuel or services in exchange for food to the young men who can go out and hunt.

Subsistence harvest of land mammals focuses on caribou and is supplemented by moose, sheep, bear, and furbearers for food, clothing, and trade. Access to these land mammals is often initiated by boat and distances traveled to subsistence areas can be substantial, requiring large amounts of gas and travel time.

The key marine mammal harvested is seal, with bearded seal making up the largest portion of the harvest, although ringed seal and spotted seal are also harvested. Because Cape Blossom is ice free earlier in the spring than Kotzebue, a project at Cape Blossom would extend the harvest season by several weeks – by two weeks in the spring and a week in the fall on average.

[4] Source: Fall, 2016.

The whale species most often pursued has historically been beluga. During a 2017 focus group, it was indicated that belugas now often leave the Sound by the time vessels can launch in ice-free conditions.

Subsistence fishing is also a key component of native culture and a household food source. The most harvested species include Sheefish, Chum salmon, rainbow smelt, and other whitefish.

Birds and eggs are also a component of subsistence harvests, and include waterfowl and upland birds such as grouse and ptarmigan. Community members harvest wild berries, greens, and roots and would conduct more of this activity from the proposed road to Cape Blossom (according to the interviews USACE conducted).[5]

For a detailed discussion of the subsistence capacity of the region, please refer to the Resource Assessments in Sections 6.4 and 6.5 of this Appendix.

5.3 Population

5.3.1 Kotzebue City

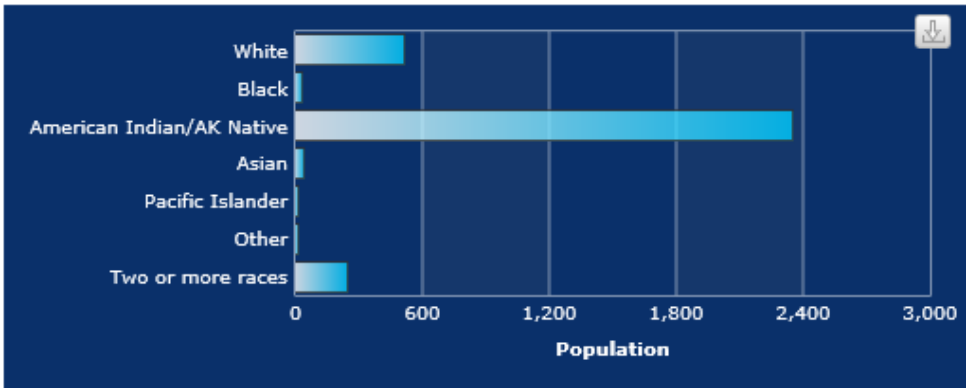
The 2017 population of Kotzebue was estimated to be 3,154, making it the largest city in the Northwest Arctic Borough.[6] Since the turn of the century, expansion of economic activities and services in the area have enabled Kotzebue to develop relatively rapidly. The city was officially formed in 1958. Kotzebue Air Force Station was constructed soon after, resulting in the increase in population observed in Table 1. It is located 4 miles south of Kotzebue. The station was closed in November 1983, and was re-designated as a Long Range Radar site as part of the Alaska Radar System. Below is the Census population history for Kotzebue since 1900.[7]

Table 1. Kotzebue Census Population History since 1900

Year	Population
1900	200
1910	193
1920	230
1930	291
1940	372
1950	623
1960	1,290
1970	1,696
1980	2,054
1990	2,751
2000	3,082
2010	3,201

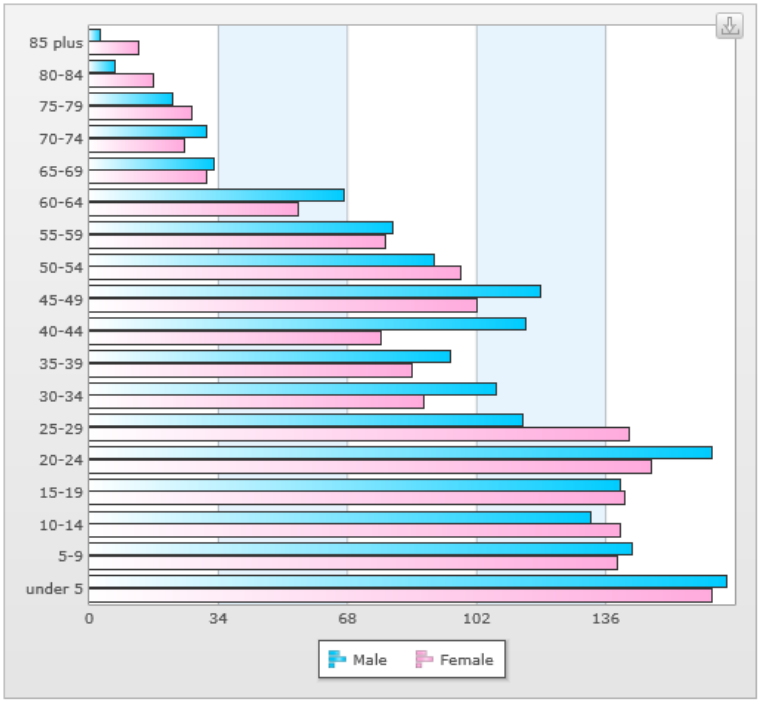
[5] Source: USACE, 2018. USACE Interviews.
[6] Source: commerce.alaska.gov, 2017. DCCED Certified Population.
[7] Source: commerce.alaska.gov, 2018. Community Details, Census Population History.

Figure 2. Kotzebue Population by Race[8]



The population is approximately 16 percent white, 74 percent Alaska Native, and 8 percent of the population makes up two or more races in combination. Other small groups include 1 percent Asian, and less than 1 percent for both Pacific Islander and Other. The population is 51 percent male and 49 percent female. The residents of Kotzebue are primarily Inupiat Eskimo. The chart below shows the population distribution of Kotzebue by age and sex.

Figure 3. Kotzebue Population by Age and Sex[9]



[8] Source: laborstats.alaska.gov, 2018. Population by Race.
[9] *ibid*

The median age of the population is 27.2 years. Anecdotally, NANA (the Alaska Native regional corporation representing northwest Alaska) asserts that the population may be shifting both towards young and elderly age groups indicating mobilization of wage earners out of the area.

5.3.2 Northwest Arctic Borough

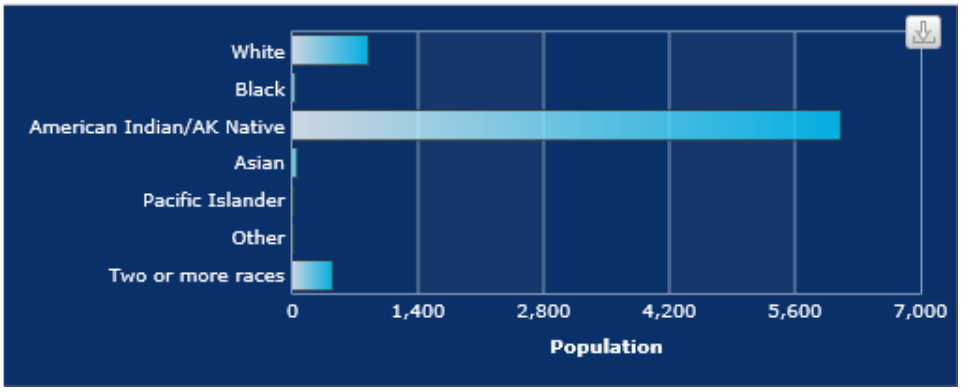
The 2017 population of the Northwest Arctic Borough was estimated at 7,850.[10] Most cities in the borough developed as supply stations for Alaskan interior gold mining and were settled around schools and churches. The Northwest Arctic Borough was established in 1986, after a very large mineral deposit was confirmed on land owned by NANA. The borough collects payments in lieu of taxes from the operators of the Red Dog mine, which primarily produces zinc but also smaller quantities of lead and silver.[11] One contributor to the increase in population between 1980 and 1990 was the opening of the Red Dog Mine and the Delong Mountain Transportation System in the NWAB in 1989. It is one of the largest zinc-producing mines in the world.[12] The population history for the region in shown below in Table 2. Until 2017, the population had been increasing since 1960.

Table 2. NW Arctic Borough Census Population History Since 1960

Year	**Census Population[13]**	**ADOL&WD Estimates[14]**
2017		7,850
2016		7,937
2015		7,883
2014		7,810
2013		7,808
2012		7,712
2011		7,637
2010	7,523	
2000	7,208	
1990	6,113	
1980	4,831	
1970	4,434	
1960	3,560	

[10] Source: commerce.alaska.gov, 2017. DCCED Certified Population.
[11] Source: Goldsmith, 2008. Understanding Alaska's Remote Rural Economy.
[12] Source: DeLong, 2018. DeLong Mountain Transportation Project Factsheet.
[13] Source: commerce.alaska.gov, 2018. Community Details and Census Population History.
[14] Source: laborstats.alaska.gov, 2018. Population Estimates.

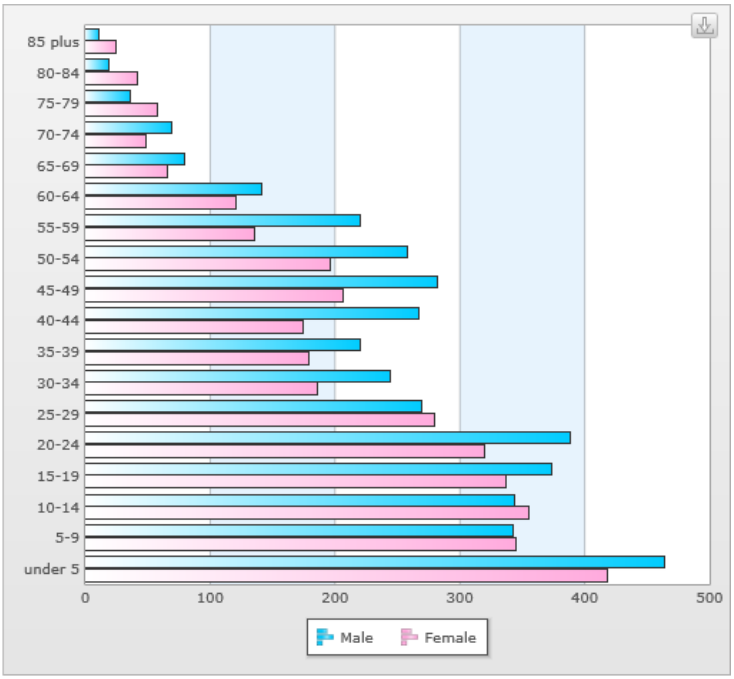
Figure 4. NW Arctic Borough Population by Race[15]



As shown in the table above, the regional ethnic makeup consisted of about 10% more Alaskan Natives than in Kotzebue and 40% reported speaking Inupiaq at home.[16] The average household size was around 4.

The chart below shows the population distribution of the region by age and sex.

Figure 5. NW Arctic Borough Population by Age and Sex[17]



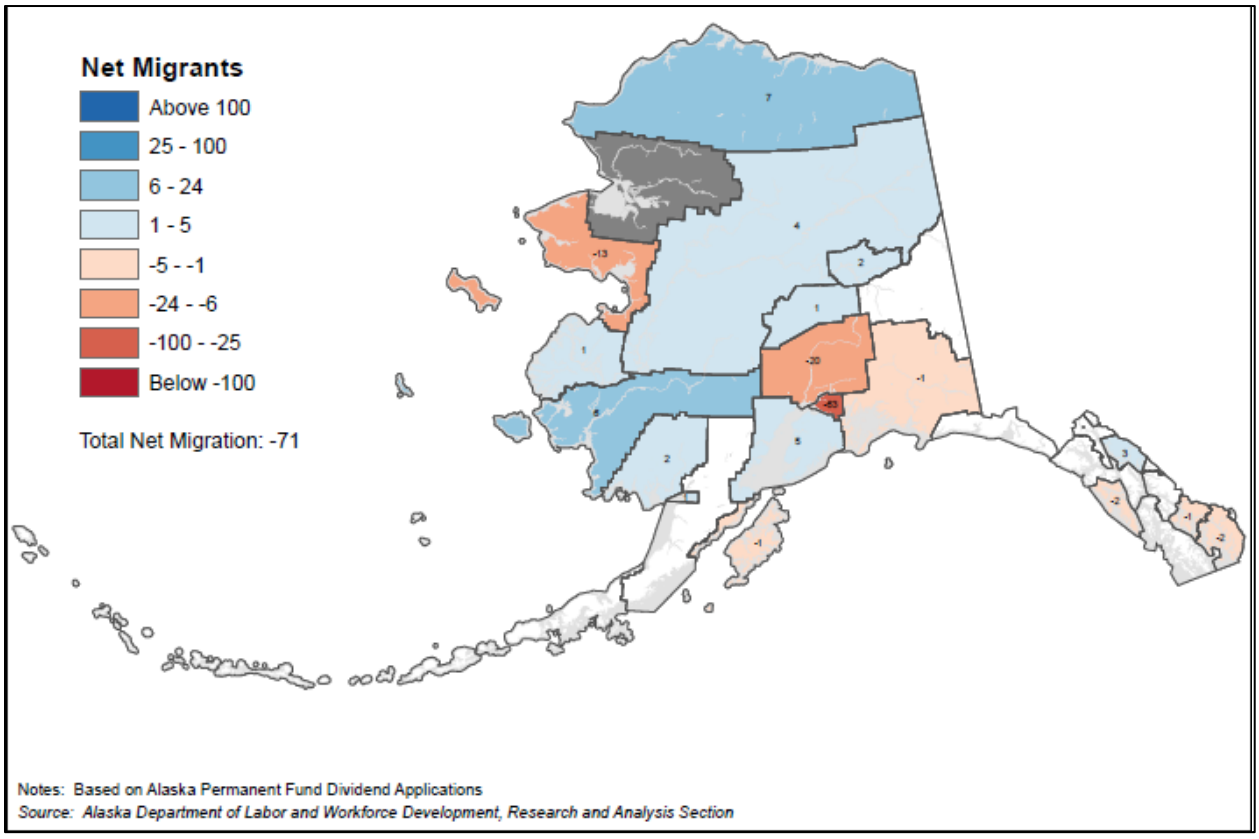
[15] Source: laborstats.alaska.gov, 2018. Population by Race.
[16] Source: mla.org, 2017.
[17] Source: laborstats.alaska.gov, 2018. Population by Age and Sex.

5.3.3 Migration

The movement of native peoples amongst communities in Alaska has been occurring for hundreds of years or more. Multiple studies have investigated the causes of migration going back to the 1800s. Recent efforts tend to use Alaska Permanent Fund Dividend (PFD) applications for tracking individuals combined with counts of births and deaths from the Alaska Division of Vital Statistics. In addition to movement from rural areas, there is movement into rural areas as well. Additionally, there appears to be evidence that movements occur from rural communities to regional hubs, like Kotzebue, and back.

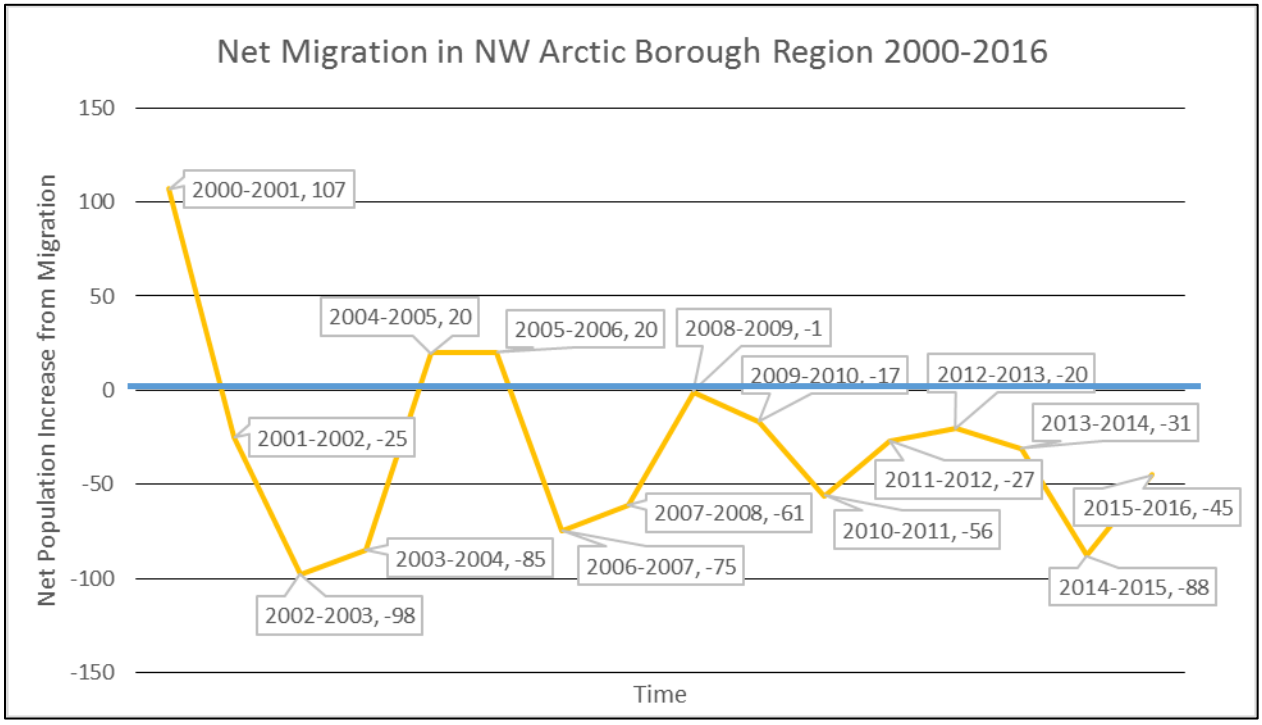
The figure below shows a map of net in-state migration both to and from the region from 2015-2016. It shows that over the two year period, the region lost 71 more people than they gained within the state of Alaska, or about 1% of the total regional population. The city of Anchorage and surrounding regions were the largest net recipients of people from the region, while the Northern region was the largest donor.

Figure 6. Net In-State Migration 2015-2016



This level of negative net migration is consistent with the historical trend since 2000, as the chart below shows. Both net increases and decreases over that period range between +/-100 people per year, or +/- 12.7% of the regional population. Total net migration over that period was -1,071 people. Despite that, the overall regional population increased by 10% from 2000-2016. Note that this period of time contained significant swings in employment, fuel prices, and other factors.

Figure 7. Net Migration in NW Arctic Borough from 2000-2016[18]



Martin, Killorin, and Colt of the Institute of Social and Economic Research (ISER) at the University of Alaska Anchorage put forth many observations and hypotheses surrounding rural-urban migration in Alaska over the last 20 years.[19] Low employment, high fuel costs, and public safety are all listed reasons for why people left rural areas. However, the same phenomenon exists in their data that is highlighted in this section: a negative net migration occurring at the same time as positive overall population growth. This could be attributed to migration into the region from outside the state of Alaska, immigration from other countries, or natural population increases. They leave the question unanswered and to rely on more data over time.

Another study from ISER in 2017 downplayed the effect of fuel prices on migration:

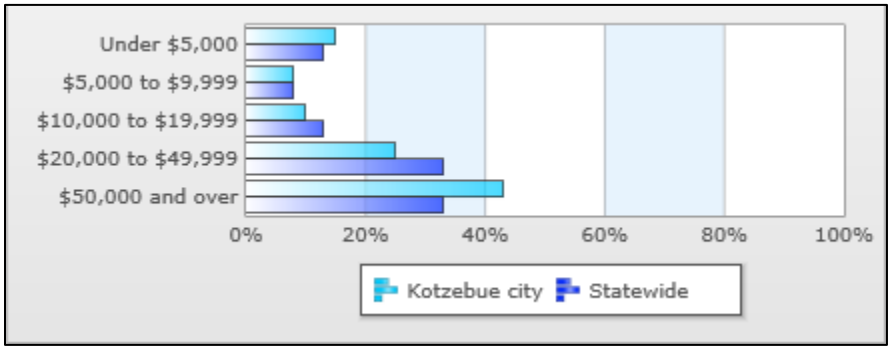
> "The study found that high fuel prices were associated with more rural Alaska residents moving to urban Alaska, but the size of the effect was relatively small: less than 40 adults each year for each $1 rise in fuel prices…Other factors besides fuel prices that change over time also affect migration decisions. The study found that local labor market conditions, as well as the individual's employment status and earnings had much stronger effects on out-migration than fuel prices." (Berman 2017) [20]

[18] Source: laborstats.alaska.gov, 2018.
[19] Source: Martin, 2008. Fuel Costs, Migration, and Community Viability.
[20] Source: Berman, 2017. Energy Costs and Rural Alaska Out-Migration.

5.4 Employment and Income

Median household income in Kotzebue is $85,278 per year. This is higher than $74,444 per year for the state of Alaska and $55,322 per year for the United States.[21] However, the share of people living below the federal poverty threshold in Kotzebue is 18.1%, which is higher than the state's percentage of 10.1%.[22] In the Northwest Arctic Borough, 26.3% of persons are living in poverty. Given price indexing disparities for fuel and goods, as well as the availability of subsistence resources, poverty may be higher or lower than this estimate. The regional businesses focus group verbally estimated a poverty rate of 33% to 40% depending on the community on August 16 and 17 of 2017. The wage range of resident workers in Kotzebue is distributed in a similar way to resident wages statewide, as the graph below shows.

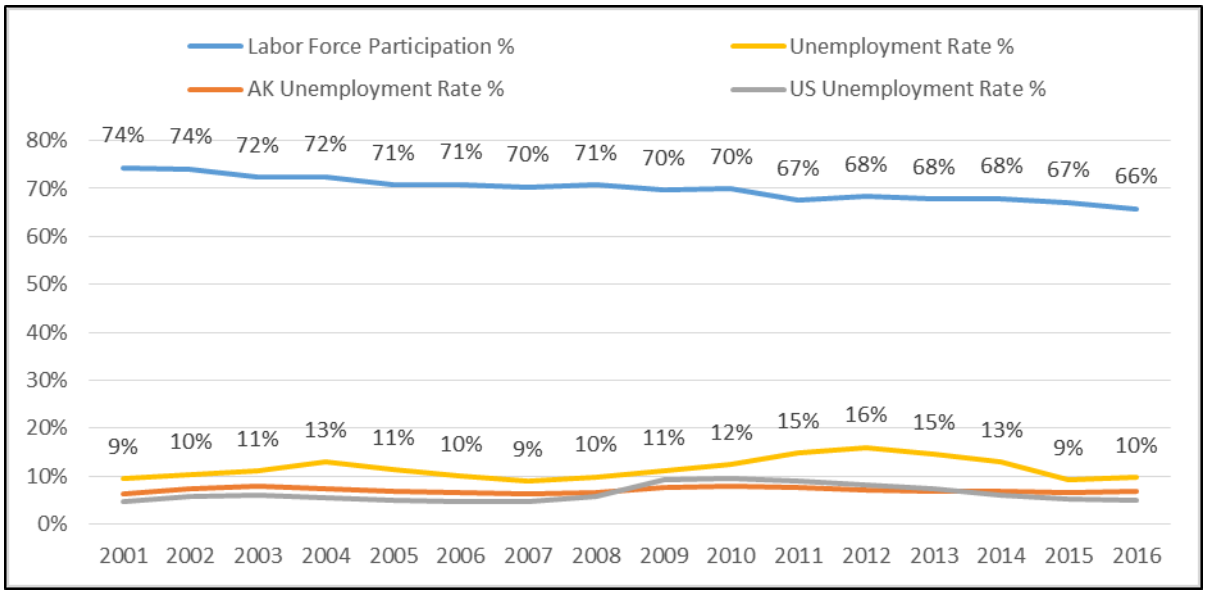
Figure 8. 2016 Percent of Resident Workers by Wage Range[23]



According to the AKDOL&WD, 66 percent of resident workers were employed during 2016. Approximately 10% of residents over the age of 16 were unemployed. As shown in the chart below, this is representative of the overall trend in Kotzebue over time, as the rate has never gone below 9.0%. By comparison, the state's unemployment rate has stayed between 6.5-8.0% since 2001 and the national rate has fluctuated between 4.2-10.0%.

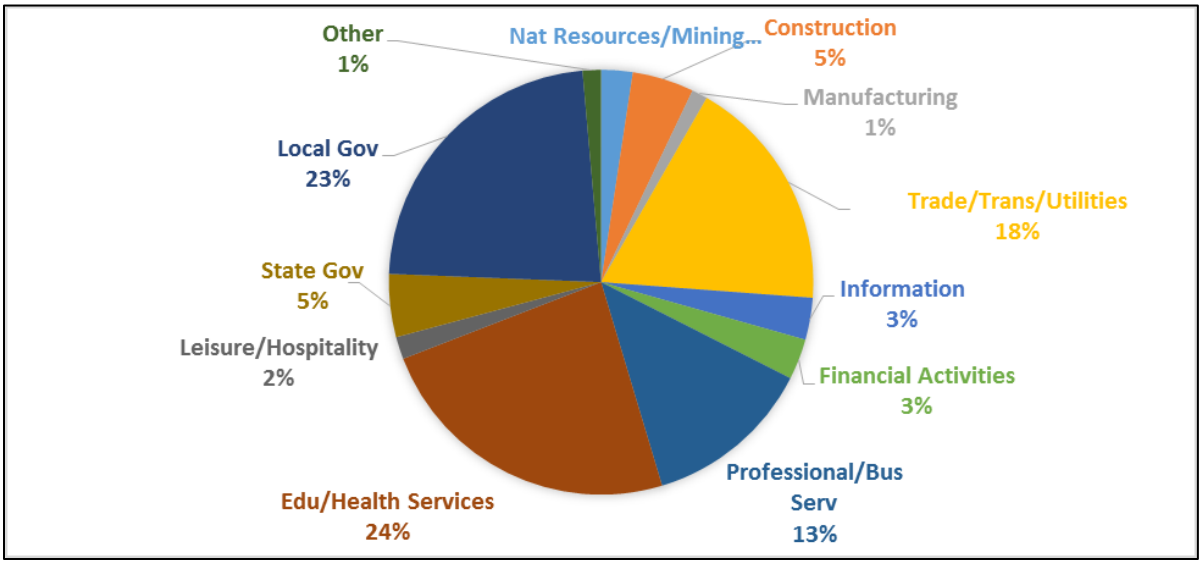
[21] Source: census.gov, 2018. Selected Economic Characteristics, American Community Survey.
[22] *ibid.*
[23] Source: laborstats.alaska.gov, 2018.

Figure 9. Labor Statistics for Kotzebue 2001-2016[24]



The chart below shows that approximately 23.8 percent of the resident workforce was employed in educational and health services, 23 percent were employed in local government, and 17.9 percent are employed in trade, transportation, and utilities.

Figure 10. 2014 Kotzebue Workers by Industry[25]



[24] Source: laborstats.alaska.gov, 2018. Current Population Survey.
[25] Source: laborstats.alaska.gov, 2018.

Regionally, for the Northwest Arctic Borough, 63% of the labor force is employed.[26] The sector breakdown for the NWAB is unknown.

As previously discussed, unemployment is part of the explanation for net negative migration from the region (Berman). Population movements regularly occur from rural communities to regional hubs and back as employment dynamics change.

5.4.1 Professional Services Retention

The retention of qualified professionals has been an issue for remote Alaskan communities. This is true for medical professionals, teachers, and other specialists. Typical turnover for these professions is 2 years. A lack of many key community characteristics contribute to this high rate of turnover, such as inadequate transportation infrastructure, entertainment, housing, relationships, recreation, vehicles, and access to healthcare.[27]

Occupations requiring skilled labor, like small engine repair and maintenance, are rare in rural Alaska as well. This work is often completed by the vehicle owner or by community members rather than by a mechanic with vocational training.

The problem of retaining professionals may also contribute to out-migration and long-term regional and community instability. Theoretically, if doctors (or physician's assistants (PA's) that can prescribe medications) are retained, families with seniors and elders needing more medical care are less likely to leave – families that need a lot of medical care may move to areas where those services are provided. Similarly, if teachers are retained, families with children could be more likely to stay versus leaving to seek better education elsewhere for their kids. This professional retention problem, as well as out-migration from rural communities in general, will require a complex solution that is beyond the scope of this study.

5.5 Education Levels

In the NWAB, 7.4% of persons aged 25 and older have a bachelor's degree[28]. This is significantly lower than the state rate of 18.4%; however, specialization, the division of labor, and comparative advantage within the NWAB usually considers traditional knowledge and access to resources as important as formal education. The society passes on specialized resource availability knowledge, divides labor into hunting, gathering, and processing tasks among families and groups, and trades regionally as well as with neighboring regions to support the populace. At the same time, higher levels of resident professional education would help in the retention of important professionals as discussed previously.

[26] Source: census.gov, 2018. Selected Economic Characteristics, American Community Survey.
[27] Source: DeFeo, 2018. It's More Than Just Dollars: Problematizing salary as the sole mechanism for recruiting and retaining teachers in rural Alaska.
[28] Source: census.gov, 2018. Educational Attainment.

5.6 Property Values

The median home value in the NWAB in 2016 was $146,400. This is significantly lower than the state median value of $257,100. NWAB property values are depressed for numerous reasons. According to the interviews conducted in August of 2017, housing demand is insufficient to raise home prices. The high price of construction materials can also make repairs cost-prohibitive for some. This can result in sub-standard living conditions for many, causing families to vacate rather than repair houses. This, in turn, can result in multiple family groupings of up to 7-9 individuals in single structures. The increased expense of lightering these materials more significantly affects low-income families in remote areas. This crowding effect, the availability of quality housing, and poor housing conditions are also contributors to out-migration and the aforementioned professional retention problems.

5.7 Infrastructure

There is a small road system, an airport that services jet and small airplane traffic, and private and public harbors in Kotzebue. None of the NWAB villages are connected to the road system in Kotzebue.

The other NWAB villages typically have airstrips and barge landings, with very limited or no local roads. Since there is no road system, connections between any of the communities is by boat, or sometimes, by snow machine, all-terrain vehicles (ATVs), or aircraft.

5.7.1 Marine Facilities

In Kotzebue, fuel and non-perishable goods are brought in by small barge and landing craft to the existing dock and adjacent tank farm. Barges and landing craft are docked, then unloaded by crane or forklift. More information on the vessels calling can be found in Section 7 of this Appendix.

Figure 11. Tug and Barge transferring cargo by forklift via ramp at Kotzebue

Figure 12. Tug and Barge docking alongside at Kotzebue

Additionally, Swan Lake serves as a small boat harbor with moorage slips for numerous craft. Most of the subsistence activities are initiated from this location during times of the year when snow machine use is not available.

Figure 13. Swan Lake Small Boat Harbor

Marine transportation infrastructure and marine facilities at communities within the borough is also underdeveloped. The U.S. Army Corps of Engineers published the *Fuel Transportation Improvement Report* for the Alaska Energy Authority in October 2016 that outlines some of those infrastructure improvements. For instance, establishing mooring points in Kiana and Noorvik for fuel barge deliveries resulted in benefit to cost ratios (BCRs) of 2.38 and 3.09 respectively. Additional details can be found in that report.

5.7.2 Airport

The Ralph Wien Memorial Airport in Kotzebue (OTZ) has two runways: one paved, and the other gravel. Multiple airlines of various sizes service the airport. The largest of them provides jet service to Nome and Anchorage daily, primarily with Boeing 737's. Smaller companies service the borough's other communities from Kotzebue. It's unlikely that if a small firm stopped service to a community that another carrier would replace them.[29] At the same time, there are hundreds of personal aircraft flights from OTZ annually to small communities, for hunts, to lodges, or for flightseeing and tourism. Aviation gasoline (Av-Gas) and jet fuel (Jet-A) are stored at OTZ. For all NWAB communities, perishable and ordered goods arrive by jet or other smaller aircraft.

5.7.3 Road System

None of the communities with in the NWAB are connected to the State of Alaska main road system. Kotzebue has a road system within the town, which includes approximately 25 blocks. Ted Stevens Way, commonly referred to as the loop road, extends from Swan Lake around Kotzebue Lagoon, through the tundra and back by the airport into town. Air Force Road also extends south from town along the outside of Baldwin Peninsula.

The Cape Blossom road construction project was started in 2017; however, final design, right-of-way acquisition, permitting, and securing construction for the road is scheduled for 2018.[30] The approximately 11-12 miles of all-season gravel road will connect Kotzebue to a beach access ramp above the high tide line at Cape Blossom, which would be the location for the proposed new port facility. Building the access ramp into a boat launch is part of the future with-project designs.

Roads, mostly unpaved, within the other communities in the NWAB are limited or not present. Throughout the region, ATVs are used in place of cars or trucks for short trips between residences, workplaces, and locations of interest. In the winter, ground transportation between communities may be by snow machine, along the Kobuk River for example, or by other trail systems.

5.7.1 Utilities

The municipal facilities and services available in Kotzebue include: piped water and sewer, refuse collection, landfill, police, fire and EMS. The City of Kotzebue operates the public water system including distribution, wastewater collection, and wastewater treatment. A landfill is also operated by the City. In addition to these municipal facilities, local, state, tribal, educational, and health

[29] Economics Addendum IV shows limited competition.
[30] Source: dot.alaska.gov, 2017. Cape Blossom Road Timeline.

service organizations may assist with providing utility and community services as documented in Section 5.9 below.

The other communities in the NWAB may or may not have piped water and sewer. Some are honey bucket communities in that sewage is hauled by residents from buildings to a central sewage lagoon then dumped. Water and wastewater, as well as landfill operations are conducted by City governments as summarized in Table 3. Villages may have a State Trooper and volunteers for emergency response. These operations are supported by a network of tribal, state, federal, and other programs.

Table 3. Utility Summary by Community[31]

Community	Utility Summary
Ambler	Piped Water, Piped Sewer, Roads, Landfill, Health Clinic, Electric (AVEC), Volunteer Fire, Cable TV, Dock, Sewage Lagoon
Buckland	Water, Sewer, Flush Haul, Washeteria, Electric, Refuse Collection, Landfill, Health Clinic, Police (VPO), Volunteer Fir, Public Safety Office, Dock, Roads, Ice Roads, Recreation, Cable TV, Gravel Sales, Sewer Lagoon
Deering	Piped Vacuum Sewer, Water Delivery, School Water, Watering Point, Washeteria, Electric, Volunteer Fire, Public Safety Office, Post Office Lease, Health Clinic, Library, Roads
Kiana	Piped Water, Watering Point, Piped Sewer, Electric (AVEC), Landfill, Health Clinic, Police, Public Safety Building, Volunteer Fire, Fire Hall, Dock, Lodging, City Office, Bingo Hall, Old Bingo Hall, Roads, Fuel Sales, Equipment Rental
Kivalina	Watering Point, School Water, Washeteria, Electric (AVEC), Volunteer Fire, Fire Hall, Airport (State Contract), Roads, Ice Roads, Bingo, Bingo Hall, City Office
Kobuk	Watering Point, School Water, Honey Bucket Hauling, Washeteria, Electric, Health Clinic, Dock, Airport, Fuel/Oil Sales, Roads, Post Office, Equipment Rental, Hotel, State Funded Public Safety Officer, Bureau Funded Village Police Officer
Kotzebue	Piped Water, Piped Sewer, Refuse Collection, Landfill/Baling Facility, Harbor/Dock, Police, Volunteer Fire/EMS/Ambulance, Fire Training Center, City Hall, Recreation Center (Adult Programs), Bingo/Pull Tabs, Parks, Roads
Noorvik	Piped Water, Piped Sewer, Electric(AVEC), Refuse Collection, Landfill, Health Clinic, Volunteer Fire, Public Safety Building, Roads, Ice Roads, Bingo/Pull Tabs, Equipment, Office and Shop Rental
Shungnak	Piped Water, Watering Point, Piped Sewer, Honey Bucket Hauling, Electric (AVEC), Refuse Collection, Landfill, Health Clinic, Police, Volunteer Fire, Public Safety Building, Dock, Post Office, Cable TV, Roads, Building Rental

[31] Source: commerce.alaska.gov, 2018. Utilities by Community.

Electricity is usually a city fuel project, or electric cooperative. Fuel is delivered annually or perhaps two times a year (more for Kotzebue). Wind projects may supplement diesel power plants for 5% to 20% of electric needs in a community. Fuel costs for electricity are subsidized by the State of Alaska's power cost equalization (PCE) program. Participating utilities are required to reduce each eligible customer's bill by the subsidy amount in order to lessen the impact of higher rural fuel prices.[32]

If a project at Cape Blossom lowered electricity costs by lowering diesel fuel costs, the savings would be passed on to the State of Alaska's PCE program. The customer would not be impacted as their rates are already comparable to the average cost of power in Anchorage, Fairbanks or Juneau, for example. The customer's average unit cost of electricity for the Northwest Arctic Borough was $0.25 per kWh in FY 2016 as shown in the table below.

[32] Source: akenergyauthority.org, 2017. Power Cost Equalization Program: Statistical Data by Community.

Table 4. NWAB Fuel capacity, use, electrical generation, and subsidy by community in 2016[33]

Community	Fuel Capacity (Gallons)	Usage (Gallons)	Diesel for Electrical Generation (Gallons)	PCE Subsidy (Dollars)	Non-Diesel kWh Generated (%)	Cost of kWh (Dollars)	Cost of kWh to Residential Customer (Dollars)
Kotzebue	6,132,000	6,065,370	1,200,444	$1,153,179	20.04%	$0.41	$0.19
Selawik	629,500	1,267,157	196,437	$471,220	4.36%	$0.55	$0.22
Noorvik	755,200	662,757	131,544	$382,083	0.00%	$0.59	$0.22
Kiana	419,700	510,019	113,839	$262,987	0.00%	$0.59	$0.22
Ambler	410,400	376,461	94,586	$228,552	0.00%	$0.72	$0.23
Shungnak	236,400	428,824	Intertie Total 121,883	$217,216	0.00%	$0.73	$0.23
Kobuk	44,100	137,236		$199,080	0.00%	$0.73	$0.23
Noatok*							
Portsite**							
Kivalina	297,800	593,356	87,675	$200,102	0.00%	$0.57	$0.22
Buckland	451,000	501,967	110,049	$113,849	10.51%	$0.47	$0.30
Deering	252,000	168,690	44,154	$83,721	0.00%	$0.70	$0.39
Totals	9,628,100	10,711,837	2,100,611	$3,311,989			Unweighted Average $0.25

* No data.

** No data for Portsite, Red Dog, or Delong Mountain Terminal.

[33] Source: akenergyauthority.org, 2017. Power Cost Equalization Program: Statistical Data by Community.

Approximately 20% (19.6%) of fuels used in the NWAB are used for electricity generation. The 80% of remaining fuel use largely goes towards heating needs, but a portion also goes to powering vehicles and generators. During the August 2017 focus group meetings in Kotzebue, regional leaders estimated that 33% to 40% of household income goes towards home heating needs.[34]

Communities require multiple fuel deliveries during the ice-free portion of the year to keep pace with demand. USACE also provided recommendations on expanding fuel storage capacity in their November 2016 report for the Alaska Energy Authority.

5.8 Services

In Kotzebue, community services include: libraries, meeting rooms and activities centers, local transportation, a swimming pool, parks and recreation areas, health clinics, and daycare assistance. The public areas are popular with the community and help to host activities that promote the culture and the way of life. Clinics on fur-bearing crafts and clothes making, traditional arts, food preparation (like making jams from berry picking, or canning salmon), and other subsistence activities often occur.

Regionally, villages may also have a community health clinics or daycare (but no swimming pools). Schools function as public meeting areas in many villages, and business (outside of the City or tribal offices) is occasionally conducted in schools.

5.8.1 Retail Services

Nearly every community in the NWAB has a trading post, market, or store that supplies food and other amenities. Appendix IV lists 19 retail businesses. There are also hardware, hunting, and fishing stores in the borough. Subsistence foods are usually traded outside of store fronts, and this type of trading is part of the daily lives of residents. Only a few select subsistence foods like smoked salmon, caribou packaged as reindeer, and other products can be found in stores.[35]

In Kotzebue, a few stores may operate with an address on their business license that's in Anchorage (and thus wouldn't appear in Appendix IV). Kotzebue's regular flights ensure that the community gets fresh fruit and vegetables, and western meats like steak, chicken, and pork, but again, the costs of these foods is very high compared to other areas of the state and country. Other communities in the region may have periodic shortages on fresh foods.

Lumber and building materials can be found, as well as durable household items. The demand and supply of these items is further evaluated in the Resource Assessments Section.

5.8.2 Hotels & Lodges

The Nullagvik Hotel in Kotzebue is a modern and comfortable hotel built in 2011 with 71 rooms and 7 suites. Occasionally it's overbooked and tourists visiting the region must be absorbed by other establishments. The Nullagvik Hotel is owned by NANA.

[34] With No. 2 Heating Oil\Fuel Oil specifically mentioned.
[35] To some extent laws and regulations limit what can be sold in stores.

Regionally, the Kobuk River Lodge and Kiana Lodge are popular for large Sheefish runs, grayling, and pike fishing, as well as tours, hikes, and caribou herd viewing. The region also has public use and emergency shelter cabins along some trails.

Locals may have fish and hunting camps that they invite others to, to teach traditional and subsistence ways and to help process fish and game. Gathering activities are also initiated from these camps.

Business travelers will want to make arrangements with the City, tribe, or utility that they are visiting in the community that they are traveling to. Some villages may house travelers in the school or other public buildings.

5.8.3 Hospital

The Maniilaq Health Center in Kotzebue provides numerous health services such as: a 17 bed inpatient medical care unit, EMS (emergency medical services), a 5 bed trauma unit, immunization and disease prevention (including high risk groups, those created naturally by village/island biogeographies), pharmaceutical needs, diagnostic screenings, radiology, eye care, dental services, tobacco cessation and consultation, WIC programs (women, infant, children), physical therapy, outpatient services from prenatal to geriatrics, health information distribution, and patient financial services. During interviews with Maniilaq employees, USACE heard about the prevalence of diabetes and the importance of nutrition coming from traditional foods, as well as the positive health effects of the physical exercise required by hunting and gathering activities and lifestyles. Maniilaq also advocated for increasing injury prevention awareness in these activities, especially if a project at Cape Blossom would increase subsistence activities.

Maniilaq works with Guardian Flight and other air carriers for higher level care needs. Often these care needs can be taken to the southcentral Alaska\Anchorage area.

While these services meet most health needs, Maniilaq did describe professional retention of Doctors and PA's as a problem. Better housing could help through lowering the cost of bringing additional residential construction materials into the region. Additionally, while Economics Addendum I reasons that more families with elders or seniors will leave the area without longer medical professional retention, what is known, is that rural villagers move to Kotzebue seeking health care from time to time, and moves to Kotzebue provide a stepping stone for families to out-migrate to urban areas. Again, moves from villages to urban areas aren't statistically significant, and moves to regional hubs like Kotzebue aren't statistically significant as there is a lot of movement back to villages from hubs; however, movement from regional hubs to urban areas has been shown, so there appears to be a stepping stone effect.

5.9 Government

The City of Kotzebue was incorporated on October 14, 1958 as a second class city in the Northwest Arctic Borough.[36] The City operates under a mayor/council form of government with a mayor who

[36] Source: ADCRA, 2016.

is elected to a term of 1-year and 7 council members, all of whom are elected at-large. The City Administrator oversees day-to-day city operations. The City levies a 0.00 mill property tax, a 6 percent bed tax, 6 percent sales tax, and 6 percent alcohol tax for total 2015 tax revenues of $3.92 million. The City is a co-sponsor to USACE on this study.

The local tribal government is the Native Village of Kotzebue. The Native Village of Kotzebue (Tribe) is also a co-sponsor to USACE on this study.

The Kikiktagruk Inupiat Corporation (KIC) is the village corporation for the Kotzebue area. Like most Alaska Native corporations, KIC has many business interests. Some of those include a construction business, gravel pits, and other NWAB based businesses that would benefit from a project at Cape Blossom.

Regionally, there is a City government and a tribe in each village. Most get fuel and supplies ordered through the NANA Regional Corporation, Inc. (NANA). Additionally, all of the businesses listed under the Community Corporations heading in Addendum IV have seats on the board of NANA.

5.9.1 NANA

NANA was created under the Alaska Native Claims Settlement Act of 1971 (ANCSA). NANA's approximately 14,000 shareholders are, at least in part, of Inupiat descent.

NANA has economic, social, and cultural responsibilities to its shareholders and is a huge advocate of a navigation improvements project at Cape Blossom for those reasons.

As an entity that orders of fuel and goods, NANA represents community, retail, and end users who might benefit from navigation improvements that reduce lightering costs, if cost savings are passed on to the end user.

5.9.2 Other Regional Organizations

The Alaska Native Tribal Health Consortium (ANTHC) is a non-profit health organization based in Anchorage which provides health services to 158,000 Alaska Natives. ANTHC assists NWAB communities with sewer, water, and waste disposal related issues. ANTHC would benefit from a Cape Blossom project by lowered transportation costs on tanks, piping, and refuge transportation.

The Northwest Arctic Borough School District (School District) also transports energy\fuels and materials to their facilities in every community and would benefit through the lower transportation cost of goods. Schools and educational facilities are further described in 5.10.

The Northwest Inupiat Housing Authority (NWIHA) offers programs that help low-income families, builds residential units, and provides rental assistance. These programs subsidize the cost of living for Alaskan Natives. During interviews in August 2017, NWIHA described the benefits they would receive from a project constructed at Cape Blossom to include the lowered cost of residential construction materials transported.

5.9.3 State

The State of Alaska supports Kotzebue and the region in numerous ways. As it relates to the proposed project at Cape Blossom, the Alaska Department of Transportation and Public Facilities (ADOT&PF) will oversee the road built with support from the Department of Natural Resources for land leases, and the Department of Fish and Game (ADF&G) for stream crossings. Permits to cross wetlands come from USACE – with certification from the Department of Environmental Conservation (ADEC).

State agencies also support the population and infrastructure through agencies like the Division of Community and Regional Affairs, the Department of Health and Social Services, Village Safe Water, and the Division of Education. A project at Cape Blossom may benefit State agencies in other ways. For instance, the costs of construction materials for ADOT&PF road construction, and other civil engineering projects, may be reduced by eliminating lightering costs for materials like gravel and cement.

Similar to ANTHC (5.9.2), additional direct benefits may accrue by providing the Remote Maintenance Workers Program with water and wastewater tanks, piping, and supplies at a lowered costs by reducing the cost to bring these materials in.

5.9.4 Federal Agencies

Federal agencies who might be impacted by the project include: the U.S. Fish & Wildlife Service (USFWS) (in relation to the Selawik National Wildlife Refuge), the National Oceanic & Atmospheric Administration\National Marine Fisheries Service (NOAA\NMFS) (in relation to marine mammal protection), the Arctic & Bering Sea Fisheries Management Council (ABFMC), the Environmental Protection Agency (EPA), and Federal Aviation Administration (FAA). Further, a few to consider are the U.S. Postal Service, the Department of Homeland Security\U.S. Coast Guard (DHS\USCG), Department of Interior\Bureau of Land Management (DOI\BLM), and Bureau of Ocean Energy Management\Bureau of Safety & Environmental Enforcement (BOEM\BSEE). Federal agencies should be able to absorb any increases in managed resource use due to the project. Additionally, it's conceivable that agencies like the U.S. Postal Service and the U.S. Coast Guard could benefit directly through greater coastal access and transportation of goods cost reductions.

5.10 Schools

Schools are a vital part of each community in the NWAB. Again, schools function as public meeting areas and support business meetings when in town. Moreover, villagers enjoy school sports, holiday festivals, and other activities at schools. Schools may provide library resources, and other common facilities as well.

The School District (NWABSD) operates eleven schools; however, there are 18 schools in the region in total. Addendum IV names them all. There is a University of Alaska, Fairbanks (UAF) campus in Kotzebue, as well as a magnet school, and a technical center.

All borough schools support a bilingual\bicultural, English\Inupiaq learning environment. Two distinct dialects may be taught, either coastal or upper Kobuk. At the same time, scheduling academics around subsistence activities is a struggle for many schools, especially at higher grade levels.

Numerous state and federal programs support the academic environment. School facilities, construction, maintenance, and teachers' salaries are paid for through these programs. There may be private money for some students but it is a small amount generally speaking.

It was stated to USACE that many of the Borough's school facilities are nearing the end of their planned life. Improvements to facilities include energy efficiency through advancements in building techniques (especially for Arctic environments), technology advances, and changed demographic needs. A navigation improvements project at Cape Blossom would benefit schools by lowering the construction costs associated with bringing materials in, as well as durable goods and teacher retention, as mentioned.

5.10.1 Enrollment

There are approximately 1850 students in the NWABSD. "Schools range in size from Deering with 30 students and 4 teachers, to Kotzebue with 664 students and 54 teachers."[37]

School enrollment numbers have neither statistically increased, nor declined since the mid-1990's.

5.10.2 Teacher Retention

Teachers in the Northwest Arctic Borough only stay for two years (on average). Teachers who stay longer have a better understanding of siblings within families, family involvement in school activities, and the needs at certain grade levels – such as education learning requirements that didn't carry over from previous grade levels, and workload easement at subsistence times of year.

Numerous variables lead to poor teacher retention: home heating, housing costs, and poor housing conditions being among them according to the focus group USACE met with in August 2017.

6. INDUSTRIAL RESOURCE ASSESSMENTS

This section discusses the relationship between resources found in the region and their use, specifically as that use relates to proposed navigation improvements. It focuses on supply of resources and demand for resource use during the project timeline, and the navigation improvements ability to handle increases in supply or demand.

6.1 Fuel and Freight

The proposed improvements on fuel and freight volumes, were initially thought to cause a price elasticity of demand effect. In this scenario, this means that as the prices of those goods fall, more

[37] Source: nwarctic.org, 2017. Northwest Arctic Borough School District. Student Numbers.

of it will be consumed by the people of the region. However, a survey instrument with price elasticity of demand questions was not approved for use by the Office of Management and Budget (OMB). Also, alternate data collection techniques were not successful in quantifying the effects of lowered prices as a result of the project improvements. Answers collected were neither detailed enough, nor well distributed enough to infer changes in preferences.

At the same time, it is assumed that all the relevant shipping companies in the project area would be able to respond to any increased demand for fuel and freight with sufficient supply if one did occur.

Ten commodity groups of fuel and freight were examined during the study: Heating oil, diesel, gasoline, other energy, construction materials and equipment (including gravel, vehicles used specifically for construction, and commercial building materials for non-residential buildings), residential construction materials (including pre-fabricated homes), durable goods and household furnishings, private vehicles (including snow machines and boats), non-perishable foods and dry goods, and mining equipment (and vehicles for mining). Construction and mining are discussed separately below.

For heating oil, it was assumed that home heating is of primary concern for the people of the region. Because of this, residents will purchase heating oil for their homes before most other goods, or at the expense of some of those goods. Therefore, heating oil demand is somewhat inelastic with respect to price. Anecdotally, residents said that they would buy more fuel, and keep heating oil tanks closer to full with reduced prices, but this feedback was not significant enough to change the assumption.

Diesel and other energy was similar, anecdotally, interviews indicated that more diesel and other energy (especially gasoline) would be purchased with lower prices. The figure below shows retail fuel prices in August 2017. Residential construction material purchases ranked next, followed by durable goods and household furnishings which were viewed as less important. Obtaining new private vehicles (including vessels and snow machines) was very appealing to a few, although, we also heard that some individuals were transporting vehicles into Nome or Red Dog and able to pick them up from there. Non-perishable foods and dry goods, were last according to the interviewees that the District spoke to.

Figure 14: Retail Fuel Price - August 2017

6.2 Construction

Regional demand for construction activity is highly dependent on federal funding of ADOT&PF projects, schools, etc. One major project that supports the proposed modifications at the port is the road to Cape Blossom.

Figure 15. Cape Blossom Road Project Overview

As of summer 2018, ADOT&PF is finalizing the design, acquiring the needed rights-of-way, and securing construction funding. Construction advertisements will be made in spring 2019.[38] The assumption at this time is that the rate of state-wide construction activities will remain steady, and the likelihood of new large projects given State funding is low. It may also be unlikely that new work supply is high enough that it would benefit a construction company that doesn't already have an established regional presence.

6.3 Tourism

Despite the region having more tourists in the past, the capacity to absorb additional tourism is not high. The Nullagvik hotel, for example, was originally intended to be double its current size. The

[38] Source: dot.alaska.gov, 2017. Cape Blossom Road Timeline.

adjacent lot reserved for the hotel's expansion is still available; however, there are no current plans to expand.

The assumption at this time is that the level of current tourism will persist into the future. At the same time, Arctic cruises have gained popularity in recent years. And vessel traffic has been known to duck into Kotzebue Sound to avoid weather. That traffic is not expected to sail all the way into Kotzebue or Cape Blossom at this time.

Fish and game species that are taken for sport are generally done by tourists; whereas, fish and game species harvested by locals are generally done for subsistence. Sport fish and game are discussed next but please also remember that they relate to tourism here.

6.4 Hunting & Gathering – Terrestrial Resource Assessment

Tetra Tech Inc. conducted a Marine Resource Assessment that included a Marine-related Resource Assessment for the U.S. Army Corps of Engineers published in August 2016. The Marine-related Resource Assessment focused on resources that are hunted or gathered. Again, many land-based subsistence activities are initiated by boat, or have a portion of the activity that uses navigable waterways. During hunts initiated by boat, community members also harvest wild berries, greens, and roots.

Biologically, the report found that terrestrial resources harvested are stable. This included big game, furbearers, marine mammals, and a variety of birds. Further demand for game is thought to exist. It's thought to exist in two distinct ways. First, from the bottom-up, where less wealthy families desire foods they view as less expensive. Next, from the top down, for additional subsistence takes of higher trophic species like moose, caribou, and beluga whale. One native woman described that, "beluga is our favorite food," but that stocks are "depressed," and "not healthy." This contrasts Tetra Tech's finding somewhat, but it is important to listen to the traditional ecological knowledge of native elders.

Cape Blossom is a popular area to take Ugruk, or bearded seal. A project would provide access to this resource, and approximately three weeks of extra hunting due to earlier ice-free and later ice-up conditions at Cape Blossom. That access however, is not expected to decrease population health.

In other parts of the NWAB, the cost to take game restricts overharvesting in a couple of different ways important to population dynamics. First, the spatial density of game resources relates to the spatial density of human populations. The cost (including time-costs) to successfully harvest game are reduced the further a village is located from population centers like Kotzebue.[39] As population movements have been discussed, subsistence cost is one factor contributing to those movements.

Caribou is a very popular hunt for both locals and tourists that visit the region. However, sport hunts are restricted both institutionally and socially. Both local communities and the Alaska Department of Fish and Game put subsistence use above sport. ADF&G specifically manages

[39] See the Little Diomede study, 2012, for more on this effect. Source: USACE, 2014.

game populations with this in mind. Our interviews were inconclusive if additional tourism was desired, but as additional tourism puts additional cost on subsistence activity success, there are both pros and cons to increased tourism.

For additional information on the Marine-related Resource Assessment, please see the Tetra Tech report.

6.5 Fisheries – Marine Resource Assessment

When building ports and harbors, the U.S. Army Corps of Engineers takes a close look at impacts to fish resources and fishing industries. In the Kotzebue region, there is a subsistence fishery, a sport\tourism fishery, and a commercial fishery. Please recall that harvesting marine mammals is discussed above.

6.5.1 Outlook

Tetra Tech reviewed the current status of the regions fisheries and reported that biologically, the fisheries in and around Kotzebue Sound are stable. Like hunts, fisheries are also managed such that the subsistence needs are prioritized, followed by commercial and sport participation. Often priorities are coordinated through federal, state, and regional agencies, and through research and data collected.

6.5.2 Subsistence

The Noatak and Kobuk river communities of Ambler, Kiana, Kobuk, Noatak, Noorvik, and Shugnak, account for about half of the region's subsistence harvest; whereas, Kotzebue accounts for much of the other half. Fishing activities can be year-round under subsistence rights.

The harvest, stock availability, and community demand were reported to vary highly year-to-year, partly based on weather. Salmon are an important part of the harvest, not only for human consumption, but also for dog teams. At the same time, dog populations have been declining and so has salmon demand. In addition, Dolly Varden, Sheefish, and whitefish are essential to community livelihood.

In 2017 conversations with locals, valuable King salmon have been showing up in recent years although the salmon catch is still 95% chum.

6.5.3 Sport

The region has a number of charter and lodge businesses that cater to sport fishermen (please see Addendum IV). Nearly all of the sport fishing is done by tourists; whereas, even if fish are caught by locals during an open sport season, they are usually caught for a subsistence need. This differs from other regions in Alaska where most of the fishing done is for sport purposes.

The sport fishing effort in the Northwest Arctic Borough can also be variable, ranging from 3,100 to 7,400 angler-days per year from 2004 to 2013. Much of this activity focuses on the trophy sized Dolly Varden and Sheefish that can be found. The Tetra Tech report also states that while there is

an abundant opportunity for sport fishing, the expense of travel and the difficulty of access limits participation.

6.5.4 Commercial

The active management of the chum salmon fishery in Kotzebue Sound has maintained a stable population over time, and run forecasts suggest that the population will remain healthy and capable of supporting a commercial fishery. As such, the outlook for the chum salmon commercial fishery is largely a function of commercial demand, and in turn, whether commercial buyers continue to operate at Kotzebue.

Tetra Tech reported that one major buyer, and one minor buyer, from the 2015 season indicated returning to Kotzebue for the 2016 season. However, coordination with ADF&G indicated that no buyers had registered yet. The 2015 season saw 6 to 12 hour fishing periods, except on Saturdays, in the first two weeks of July, and shorter fishing periods with the peak run later in the season. Fish & Game noted that if buyers preferred longer 12- hour days, 1-day closures midweek may also be required. Alternatively, buyers can limit what they will buy from each fisherman, and in these cases, ADF&G could open commercial fishing continuously and let the buyers decide when the fleet would fish. The outlook further in the future would be expected to be similar, with the chum salmon population capable of supporting a fishery – and the availability of buyers in Kotzebue and the price for salmon determining the size of harvest each year.

Additionally, it was reported to USACE that there was high participation in the 2017 fishery, as chum was bought for $0.38 a pound and gas prices were lower than in recent years. Indeed, the Corps believes that the desire to participate in the fishery not only relates to salmon prices and having buyers, but on vessel operating costs tied to gas prices. At this time, buyers fly all product out, and air transportation costs also drive buyer's margins and salmon prices down.

There isn't any direct evidence that a reefer vessel would sail to Kotzebue with navigation improvements at Cape Blossom and\or if fish buyers would use marine transport over air transportation to export product; therefore, the conservative assumption is continued air transport.

Please see the Tetra Tech report, and the Future-With Project section for further information and discussion.

6.5.5 Fisheries Management Institutions

In the analysis of supply and demand of fish populations and harvests, the Alaska Department of Fish & Game was heavily relied on; however, the Arctic and Bering Sea Fisheries Management Council sets the initial catch limits and collects data from vessels. Local governments can also take action, but usually work with the State and Federal authorities on any concerns.

6.6 Oil and Gas

Even during Shell's exploration of the Chukchi Sea, there was little interest in sailing vessels into Kotzebue Sound. This was due to ice and depth restrictions in the Sound, as well as Nome being more attractive for a deep draft port. A deep draft port would be necessary to support the multi-

billion barrel prospects in the Chukchi, and the cost to sail deep draft vessels into Kotzebue is simply too high.[40]

Next, supply vessels bound for Prudhoe Bay or Point Thomson have been known to duck into the Sound to avoid weather, but their demand for navigation improvements are also thought to be negligible. Moreover, there was only a little anecdotal testimony of the need to provide safe harbor (such as for medical or emergency needs) in the instances when vessels did duck into the western part of the Sound.

Last, at least two exploratory wells have been drilled in Kotzebue Sound and there is additional interest in oil and gas exploration in the region. USACE does not have details on the vessels that drilled these wells at this time.

6.7 Mining

There has been talk for years about expanding the Ambler gold mining district into one of the premier ore producing regions of the world. Mining expansion is unlikely without the discussed Ambler mining district road (see Economics Addendum II for more). At this time, a port at Cape Blossom is not thought to lower the transportation cost of construction materials for the road; rather road construction would connect from the Dalton Highway. If road construction did begin it would have large regional benefits, but it would not replace those of a port at Cape Blossom. It's simply too difficult to connect the road all the way into Kotzebue. Therefore, even if some fuel and goods came in on the road, low draft barges would still be required for the last forty river and sound miles (roughly estimated). The likelihood of a road is also very low.

The Red Dog mine is one of the world's largest zinc mines, and exports large amounts of lead as well. Materials and ore are transported through Delong Mountain Terminal (DMT). DMT is a transloading facility at the end of a caisson supported 1000' long trestle that extends into the Bering Sea/Artic Ocean completed circa 1989. DMT does not provide network wealth to other communities, even nearby Kivalina. All benefits go directly to the mine. Individuals may sometimes ship vehicles to DMT to reduce their lightering cost but this is not a rare practice. Red Dog's needs are met at this time, but the mine may receive incidental benefits from a port at Cape Blossom. These could include lowered airline transportation costs for traveling employees on rotating schedules through lowered fuel prices regionally, etc.

USACE focus group efforts ranked the priority of lowering the cost to transport mining equipment, including vehicles used for mining, and ore, near the bottom of the 10 goods categories inquired about.

6.8 Other

Other regional exports like native arts and traditional goods will still likely be transported by airline. There are no other agricultural or manufacturing exports.[41]

[40] See Arctic Deep Draft for more. Source: USACE, 2015.

[41] Besides fish. Fish is a USDA category, but isn't traditionally considered agriculture.

7. VESSELS

This section looks at the vessels that have sailed to Kotzebue in the last ten years. Focus group efforts obtained ranges on local sailing and lightering costs. Additional data obtained via USACE's Waterborne Commerce Statistics Center complemented the description of activities given during focus groups. Mainly, that larger vessels sail up the west coast of Alaska and offload by lightering to smaller vessels. Movement totals from 2006-2016 are shown in the table below.

Table 5. Historical Vessel Movements to Kotzebue Sound 2006-2016[42]

Vessel Type	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Cargo Barge	20	46	27	10	10		16	30	14	5	
Liquid Barge	14	23	29	16	27	35	29	27	75	56	32
Towboat	5	16	10	6	8	2	14	6	21		7
Products Tanker								2	6	2	11
Cruise Vessel							2				
Landing Craft							2			2	

7.1 Line Ships

Line ships, such as tanker vessels hauling bulk fuel, may come up the outer west coast of Alaska, paralleled by a coastal barge. This phenomenon has appeared over the last 5 years, and is reflected in the tanker movement totals appearing in 2013. Typically, tankers will transfer fuel to a coastal barge, which then brings fuel into a community. If a coastal barge cannot make it all the way into a community like Kotzebue, a second at-sea transfer to a lightering barge is performed.

Vessels involved in this type of operation range in size depending on the distribution contract awarded by the local governments to provide fuel. Since 2013, line ships have ranged between 400-600 feet long, 66-106 feet wide, 27-42 feet deep, and had capacities between 11,000-48,000 deadweight tons. These vessels are typically chartered from Asia (mainly South Korea) by western Alaska fuel distributors 2-3 times a year. Any other line ships in the area are usually bulk carriers used to haul raw materials from the Red Dog mine near Kivalina.

7.2 Barges and Tugs

Lightering barges and tugs bring fuel, freight, and construction material into Kotzebue. Landing craft are also used. An articulated tug barge setup is preferred by some companies as the linkage from the rear of the barge to the front of the tug allows easier channel navigation and beaching when required. A portion of the fuel and goods (usually initially delivered to Kotzebue) are loaded onto river bound barges for transportation to the outlying communities up the Kobuk River and Noatak River and to the coastal communities in the NWAB region. River bound barges are likely

[42] Source: USACE, 2018. Waterborne Commerce Statistics Center.

the same barges used for lightering. For these reasons, the port at Kotzebue is integral to all of the communities in the region, and navigation issues affecting access and cost to deliver to Kotzebue have direct down line effects on the price of goods in the outlying communities.

7.2.1 Fuel

Several barges bring fuel into Kotzebue through two companies, with another sometimes contracted. In the past, a fourth company also sailed into the sound. The proposed channel designs for a port at Cape Blossom use a hybrid vessel that measures 380 feet in length, 96 feet in width, and draft 20 feet. These barges often are affected by the areas high winds, which also cause a “draw down” effect. The draw down can be as much as 4 feet lower than MLLW levels. Thus, for the design barge to make it all the way in, it would need 25/27 ft. at MLLW.

One vessel operator reported that they do 2 to 4 trips per year with lightering operations at Kotzebue taking 3 to 5 days for each trip. The cost to the consumer for lightering is about $44,000 per day. Ideally, offloading could be done in 12 to 18 hours with proper facilities at Cape Blossom. This vessel suffered some scratches and dents sailing into the Sound, but nothing major. Also, in the past five years they had difficulties getting injured\ill crew members to proper medical facilities. The focus group interviewee reported transporting 80,000 to 90,000 bbl. of fuel a year (3.36 to 3.78 million gallons). The captain also stated that there can be indirect benefits to the next community up\down the coast – for instance if they offload most fuel at DeLong Mountain Terminal first, they can more efficiently lighter at Kotzebue.

Another operator claimed that they deliver 1 to 2 million gallons to the region annually (and some propane). They don't deliver a significant amount of commodities. They usually do two large fuel deliveries per year, and perhaps a smaller delivery at the end of the year before the ocean freezes. They charter a tanker with a pilot on board and plan two weeks for the voyage. Lightering takes 6 to 10 days at worst, conservatively costing $50,000 a day to the consumer. Ideally, that would take 1 to 2 days with appropriate facilities at Cape Blossom. They usually keep lightering costs in the $250,000 to $400,000 range per voyage. When delivering to the electric association, they deliver to the Crowley dock, but pay only a wharfage fee, and not a per gallon fee. Next, the company has a small articulated tug-barge (ATB) for some of their work, including deliveries to Buckland and Deering. In the NWAB they also deliver to Kivalina, Noorvik, and Kiana. The vessel’s captain would like to see a tank farm at Cape Blossom as well as a 15 foot channel. A 12 foot channel may still benefit them, but they do often suffer delays during low tides, and wear and tear costs from lightering operations. More information on damages wasn't available during the interview. Sometimes this company makes "mercy runs" to communities that have fuel shortages as winter approaches.

Another company brokers, stores, and delivers fuel making up the difference between regional use and the deliveries documented in the preceding two paragraphs. The cost to that company to lighter fuel from the 9 fathom buoy is estimated to be in the tens of thousands of dollars per day although stated costs were not given. The company delivers to communities and consumers not otherwise contracted.

Communities in the NWAB don't usually coordinate orders between users – such as the school, electric utility or co-op, and home heating needs. At the same time, this does create some competition in an otherwise monopolistic or duopolistic market.

7.2.2 Freight

One of the main companies sailing freight to the NWAB uses a tug on trailer set-up where the vessels draft 12.5 ft. However, the barge's load line is actually 15'. This vessel is 250' long by 70' wide. The company's preferred channel depth is 15 to 18 ft. MLLW according to the interviewee. The preferred facility design for cargo is pass-pass with a drive-down ramp and a travel lift considered. The travel lift may be for bringing small craft and vehicles ashore. The barge has a 435 twenty-foot equivalent unit (TEU) container capacity. They usually use a landing craft to lighter goods from the 9 fathom buoy, but in the past have run up to three different lightering vessels to get commodities into Kotzebue. Additionally, they have also dropped all goods bound for Kotzebue off in Nome. They do 2 sailings per year and it takes 10 to 15 lightering trips per sailing to fully unload. The lightering vessels can do 2 trips per day. With the barges draft, it's 10 miles from anchor or 2 hours travel each way, but 4 to 5 hours are spent loading and unloading. This equals 9-10 hours per round trip. The minimum to unload was 5 lightering trips. Additionally, the company felt that an ideal situation would be unloading in 24 hours like in Nome. They estimated that lightering costs to consumers were $20,000 per day (quite a bit less than fuel). Each landing craft trip is loaded to 200 tons, so total amounts are greater than a million pounds delivered. They transport goods for all Northwest Arctic Borough communities except Shungnak, Kobuk, and Noatok. Commodity amounts transported increase when there is a project such as a school or health clinic. Generally, the captain interviewed thought that there may be additional demand for transporting stick construction and construction equipment in the region.

7.2.3 Construction

Several companies were able to provide insight into construction materials and equipment transported. The results described are generalized and assumptions about the industry are made that don't always occur year-to-year. USACE assumes that each company gets one large project once every five years. For instance, transporting materials for the Cape Blossom road construction project underway, or transporting rock and armor rock for the Kotzebue Airport renovations project recently finished. For that project, 100 loads of 1000 tons of rock were sailed over 75 days. Rock construction material stockpiling work was also occurring continuously during USACE's time in Kotzebue in August 2017. Construction companies described a desire to have upland pad space for material storage, warehouses to lease, and at least a six inch fuel transfer line to tank farm storage. Other facility features that were desired were drive down access, or a conveyor for aggregate, and cranes for passing cargo and containers.

One company was able to provide a case where shallow channel depths and wind draw down resulted in significant damages and time-costs to one of their vessels. However, damages more than $100,000 once every five years, or $20,000 per year are not likely. Thus, benefits associated with preventing damages are small in comparison to those from reduced lightering.

7.3 Fishing Vessels

Figure 16: Fishing Vessel in Kotzebue Sound

7.3.1 Commercial

Data available did not track any refrigerated products vessels. Also, ADF&G's commercial fishing database only has six vessels homeported in Kotzebue, all less than 30 feet long, and less than 200 horsepower (drafts were not available). During August interviews, we both observed more fishing vessels than this (Figure 16) and had frozen fish exports from Cape Blossom described as possible. However, given the quantity and quality of commercial fish produced by the region, continuing to fly the product out is equally likely.

7.3.2 Subsistence

Many of the fishing vessels observed in Swan Lake or transiting in front of the Kotzebue Sea Wall were obviously subsistence vessels. The majority were skiffs with outboards. USACE expects subsistence vessels to be trailerable.

7.3.3 Sport and Charter

Addendum IV names companies which provide fishing charters. Websites for several of these businesses show boats with open decks and fishing from them with rod and reel gear. Vessels used for charters are also expected to be trailerable.

7.4 Mining Ore, Equipment, and Personnel Transportation

7.4.1 Red Dog

As mentioned above, there may be benefits to offloading fuel at DMT first and then sailing a lighter vessel into Kotzebue. Also, as mentioned above, there wouldn't likely be direct benefits to Red Dog from a project at Cape Blossom; however, there may be secondary benefits, in that their employees get cheaper prices or cheaper goods when in the region.

7.4.2 Private Claims

Sailing additional equipment into Kotzebue for use on private claims in the Ambler mining district or within NWAB could occur, but associated cost savings are not quantifiable without conducting a larger survey effort.

7.5 Other

It's possible that traditional Inupiat vessels would launch from Cape Blossom's boat ramp area in the future with-project; however, generally these vessels are smaller than trailerable skiffs.

8. EXISTING CONDITIONS

This section describes the existing conditions for Kotzebue, including current facilities, i.e. the Crowley dock and Swan Lake small boat harbor facilities, and their usage. For other communities in the region, please see the USACE\AEA Transportation Improvements Report (2016).[43] The specific issues described in this section are the foundation for the analysis of these items in the future without-project (FWOP), and the future with-project (FWP) conditions.

8.1 Current Waterway Conditions

Fuel barges currently travel 2,450 miles from Puget Sound to Kotzebue. Or recently, a line ship has also sailed northward from Asia. Freight might come from Anchorage, Dutch Harbor, or

[43] Source: USACE, 2016.

elsewhere. Deliveries start occurring as soon as the ice goes out and end when the sea begins to ice up again.

Compulsory pilotage is required for vessels larger than 300 GRT or longer than 65 ft. (although there are exemptions for vessels up to 175 ft.). These vessels must contact the Alaska Marine Pilots when sailing to Kotzebue. NOAA's Coast Pilot reads, "During ice-free months privately maintained buoys mark the entrance to the navigation channel. The channel is difficult to follow and is restricted to vessels with drafts under 6 feet… The trip by small boat from the anchorage to Kotzebue is about 15 miles and over many sandbars that are constantly shifting." The Coast Pilot also describes the local draw down condition, including observations of draw down and ebbs and flows at Cape Blossom.

8.2 Infrastructure Damages

The Corps heard from Crowley that their existing dock in Kotzebue will need repair within the foreseeable future. The total cost and timeline of the repairs necessary was still being researched. There is also a small portion of the dock, or rather, an area immediately adjacent to the Crowley dock, that is not owned by Crowley, but is used for unloading and loading of fuel and goods.

9. FUTURE WITHOUT-PROJECT CONDITIONS

The expected without-project conditions form the basis of evaluation against which the with-project conditions are compared. The future without-project conditions mirror those under the No Action Plan.

9.1 Future of the Fleet

In the without-project condition, there is no change in the future of the fleet predicted, it will remain the same as the vessels described in Section 7 of this Appendix. Lightering craft will still be used for transportation of fuel and goods from Kotzebue to the smaller communities.

9.2 Future of Waterway

Without federal action, no significant improvements to the waterway are expected. For certain construction jobs, temporary dredging efforts could possibly occur to bring an ATB or landing craft into a more optimal beaching point for unloading; but this would be job specific, rather than an improvement to the waterway into Kotzebue.

9.2.1 Existing Dock

The existing dock is expected to be repaired in the future without a disruption in service.

9.3 Cape Blossom Road

The Cape Blossom road is being constructed and will be finished in the future without-project construction.

9.4 Delay Cost

As mentioned, lightering is the main economic problem associated with high prices. Lightering can be thought of as a delay cost.

Annual lightering costs were modelled to be $2,206,000.

9.5 Damages Cost

Only one company provided an account of damages in the last five years. The grounding cost the company about $100,000. Other companies provided anecdotal evidence of breaking lines and swapping paint during lightering activities. Annual damages due to lightering and limited draft conditions are estimated to be $20,000 to $40,000 annually, with a $30,000 mean. This assumes that the frequency of damage reported could affect one other company in the population of shipping firms. Damages are about 1% of the average annual cost total.

9.6 Lightering and Subsistence Vessel Use

Table 5 only shows vessel movement into and out of the Sound and not lightering activity from anchorage to the dock. Cargo and liquid barge movement into the sound has varied from 32 sailings to 89. Table 5 also does not provide a good indicator of construction vessel activity which lighter rock and aggregate from staged barges. Construction activity to move materials from staged barges is estimated to be 68 days annually and vary between companies more from year-to-year than the total amount of work. Total lightering days for all vessels is estimated to average 130. This would put the Crowley dock and the space next to it in use for a large portion of the time when the Sound has open water.

No vessels currently launch for subsistence purposes from Cape Blossom. Ugruk hunters motor around the tip of Baldwin Peninsula after there is open water; however, good information on the number of existing days the Cape Blossom area is used, and the number of days in the future when the Cape Blossom road will be used instead of motoring around the Peninsula was not available. Calculations on the area's increased subsistence use in the following sections therefore is based on the fact that the Cape Blossom area has a longer open-water season compared to Swan Lake.

10. FUTURE WITH-PROJECT CONDITIONS

The following sections describe each alternative's associated costs, benefits, and CE/ICA metrics. Costs and benefits for all alternatives are in FY 2018 dollars using an annual discount rate of 2.75%. These costs and benefits were used at the time of plan selection and numbers for the selected plan will be updated prior to the final version of this report. Costs were estimated from congressional authorization (estimated to be the same as the earliest possible PED start date, FY 2020 Q1) forward for 50-years, and benefits were estimated from first full fiscal year after the earliest possible completion of construction, 2026. The schedule is the same for every alternative. Costs include project engineering and design (PED), lands, easements, relocations, rights-of-way, and disposal sites (LERRS), construction, operations, maintenance, repair, replacement, and

rehabilitation (OMRR&R), and other opportunity costs as specified in Economics Addendum II. Benefits include reduced delays, reduced damages, and transportation cost savings (all coming from reduced lightering).

In addition to costs and benefits, the number of days which an alternative would reduce annual lightering is discussed, as is the number of increased subsistence vessel days. These metrics are considered institutionally, publically, and technically significant under the project's WRDA 2006 authority.

10.1 Reduced Lightering Days, Increased Subsistence Vessel Days

The CE/ICA metric for this study is reduced lightering days, increased subsistence vessel days. Neither of the two components of the metric is weighted. Reduced lightering days allows for vessel-class specific evaluation of each alternative. This metric directly addresses the study's objectives. Increased subsistence vessel days then addresses the studies remote and subsistence authority and ensures that alternative designs allow for subsistence use of the port.

10.1.1 Non-monetary Significance

As the output of the CE/ICA, reduced lightering days, increased subsistence vessel days are also significant for non-monetary benefits in terms of the output's institutional, public, and technical significance (further described in Economics Addendum II).

The combined metric is institutionally significant in that it supports our Trust responsibility to Tribes from the Indian Self-Determination and Education Assistance Act of 1975.

By including a boat ramp in each alternative design, the future with-project provides opportunities for additional subsistence resource use. This increases the continuity of culture, heritage, and traditional customs that have been built on subsistence lifestyles. Should inclement weather arise, the boat ramp also promotes life, health, and safety by providing mariners a safe spot where they can pull their vessels out of the water instead of having to motor around Cape Blossom. Increased safety and increased subsistence are publically significant in Alaska as well and were considered important during the Corps focus group interviews in Kotzebue.

Reduced lightering days is significant in that it will lower the cost on fuel and goods required to live subsistence lifestyles and keep NWAB communities viable. Viability at risk within communities of the region is documented in the data for distressed communities in the Northwest Arctic Borough from the 2017 Distressed Communities Report.[44] For 2017, only Kotzebue and Deering were not in a "Distressed" status. As mentioned, rural/urban outmigration in areas with higher fuel prices is statistically significant according to Berman.[45] High cost of living has negative sociological, psychological, health, and anthropological consequences. See Economics Addendum I for more on how reduced lightering days alleviates these negative effects.

[44] Source: Denali Commission, 2018. Historical Distressed Communities Reports.
[45] But only a very small contributor to net migration.

10.2 Alternatives Considered

The planning charrette was held in Kotzebue on 11-12 January 2016 with representatives from the U.S. Army Corps of Engineers (Corps), Native Village of Kotzebue (non-Federal Sponsor), City of Kotzebue (City) (non-Federal co-Sponsor), Northwest Arctic Borough (NWAB), Kikiktagruk Inupiat Corporation (KIC), NANA Regional Corporation (NANA), U.S. Fish and Wildlife Service (USFWS), and National Park Service (NPS). The charrette resulted in the development of seven alternative plans (alternatives) carried forward for further evaluation (including the no action alternative).

All of the alternatives were developed with the on-shore facilities located where a new road will terminate at Cape Blossom about 12 miles from Kotzebue.

Cape Blossom was selected as the new port facility location because of the more favorable bathymetry, in that the sea floor is deeper near shore when compared to other locations near Kotzebue. This site condition should reduce port development and potentially future maintenance costs associated with dredging and dock facilities. In addition, the Cape Blossom location provides other social effect (OSE) benefits associated with subsistence activities and marine safety as discussed.

The 7 alternatives forwarded for evaluation (Table 6) have remained essentially unchanged since the charrette in 2016 with some refinements to address constructability issues.

Table 6. Alternatives

Number	**Description**
Alt. 1	No action
Alt. 2	Dredge to shore
Limited Dredging or Deep Water Alternatives	
Alt. 3	Lightering with detached breakwater and dolphins
Alt. 4	Trestle with gravity-filled support structures to a dock
Alt. 5	Causeway to dock
Alt. 6	Trestle and causeway combination to dock
Optimized Dredged Channel Design with Dredging	
Alt. 7	Dredged channel with trestle and/or causeway to dock (optimized design)

For each action alternative above, upland and in-water Local Service Facilities (LSFs) are needed to realize benefits. These LSFs (Table 7) are relatively consistent between alternatives, and as a result, the LSFs are not anticipated to differentiate between alternatives. Alternatives 2 and 3 are exceptions. Alternative 2 has no dock facilities (similar to the picture in Figure 11) and Alternative 3 has a detached breakwater, and a shore side dock. Alternatives with a trestle or causeway have a driving surface on the trestle or causeway.

Table 7. Local Service Facilities Considered

In-Water LSF (as to applicable Alternative)
• Marine fueling head (8") and pipeline to the bulk fuel storage facility
• Pass-pass facilities (ship-to-ship or ship-to-dock)
• Trestle
• Causeway
• Docks
• Bridge to Trestle/Causeway
Uplands LSF
• Bulk fuel storage facility with pipeline to Kotzebue and truck fueling rack
• Boat ramp for increased subsistence and marine safety
• Gravel pad area for future upland LSFs that may include:
o Lay-down yard for incoming and outgoing cargo
o Parking areas
o Warehouses, maintenance shops

There are basic dock-to-shore LSFs that are mostly associated with the trestle and causeway design features that are needed to acquire benefits. These LSFs include:

- An 8" marine header and associated fuel pipeline from dock to upland tank farm, and
- Road surface down to the dock.

Given that upland LSFs are the same between alternatives, the variables driving the economic analysis are the cost of trestle, causeway, and dock, cost of dredging, and the amount which Alternatives reduce lightering.

10.2.1 Alternative 1: No Action

The No Action Alternative provides no navigation improvements. Fuel and freight deliveries would continue to be inefficient and limited. There would be no reduced lightering days for the shipping fleet. The Cape Blossom road would still be constructed, but no boat launch would be constructed. Therefore, there would be no increased subsistence vessel days. The CE/ICA benefits are thus [0 reduced lightering days | 0 increased subsistence vessel days].

10.2.2 Alternative 2: Dredge to Shore (No Dock)

Alternative 2 would dredge a channel from deep water to shore at Cape Blossom in order to accommodate the design vessel. Barges would essentially conduct a shore landing similar to what is shown in Figure 11 above.

Alternative 2 includes constructing a 5600 foot long by 448 foot wide dredged channel from deep water with a turning basin near shore. Over all, approximately 1.3 million cubic yards of dredged material would be created and placed to the east of the channel in about 13 to 19 feet of water. After deposition, natural forces may lead to some beach development.

The rough order of magnitude cost is $115,434,000, or $4,086,000 million annually. Maintenance dredging is estimated to be needed 5 years after construction, and then at years 15 and 25 after construction as well. Maintenance dredging costs are included in the $115.4 million figure above, but at $38,625,000 should be considered preliminary, conservative, and less refined than maintenance dredging costs for Alternative 7. The cost sharing amounts for this alternative can be found in Section 19 (below).

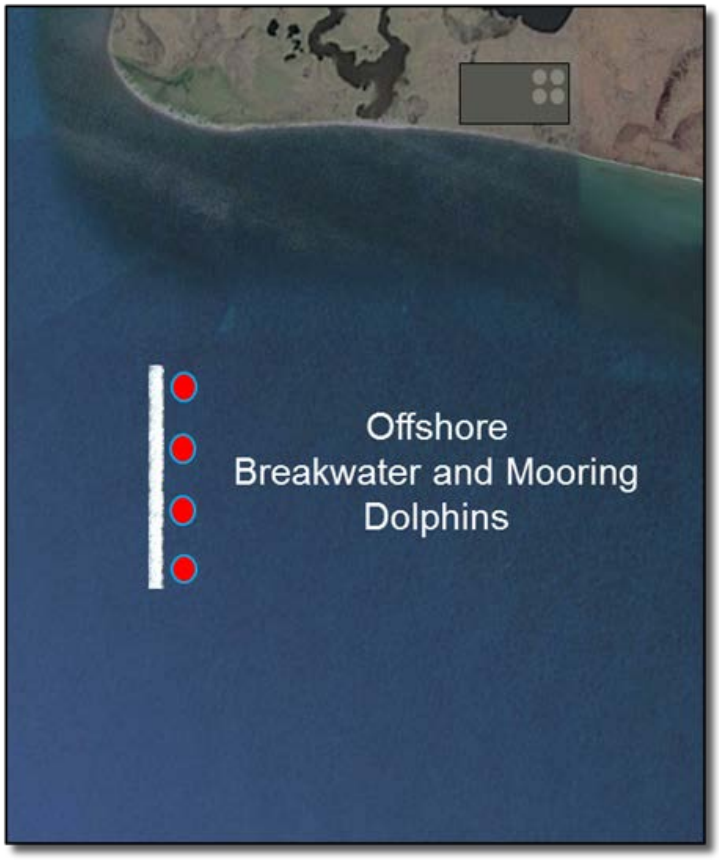
There is a slightly negative effect on environmental quality through temporary water quality disturbances associated with construction, and from three additional weeks of subsistence hunting.

This alternative does not have any dock features, distinguishing it from Alternative 7. Testimony from shipping companies during the course of the study indicated that the existing lightering setup would be preferred over beaching with no dock (despite the fact that this is an existing practice displayed by lightering vessels in Figure 11). Therefore, this alternative results in 0 reduced lightering days for the shipping fleet, and thus $0.00 benefits. As a boat launch ramp would still be implemented in this alternative, this alternative does result in an estimated 21 increased subsistence days. Therefore, the CE/ICA benefits are [0 | 21].

10.2.3 Alternative 3: Lightering With Detached Breakwater and Mooring Dolphins

Alternative 3 would construct an offshore detached breakwater with associated mooring dolphins in deep water off of Cape Blossom, allowing the mainline barge to pull into a protected area from which smaller barges could lighter fuel and goods to shore (Figure 18). The breakwater and dolphins would be located approximately 6,000 feet from shore given that the design vessel requires a depth of -25/27 feet MLLW.

Figure 17. Alternative 3 – Lightering with Detached Breakwater and Dolphins



In this alternative, coastal barges must moor behind the detached breakwater, and offload to lightering barges, those barges then sail a distance fifteen times shorter than they currently do and offload again on a shore side dock. This is less efficient than a coastal barge unloading at a dock. Given that there is twice as much loading/unloading as in the ideal condition, and that loading/unloading is less efficient. A rough estimate is that 75% of project benefits are achieved. Given that project costs for this alternative are more than other alternatives which achieve higher benefits such a rough estimate is acceptable.

Costs for this Alternative are $163,114,000, or $5,774,000 annually with OMRR&R included. Benefits are $35,556,000, or $1,259,000 annually, resulting in a BCR of 0.2180 or a discounted net present value (NPV) of negative $127,557,000. This results in an equivalent annual cost (EAC) of negative $4,516,000 (also net of course). Again, cost sharing amounts are in Section 19.

This alternative is estimated to reduce annual lightering days by 97.5, and it results in the cost of a reduced lightering day of $59,220. This alternative preserves more of the captain and crew jobs for lightering vessels than other alternatives where the need for lightering barge services only exists when goods are transported from Kotzebue to the surrounding communities. It also has a positive effect on job creation through construction spending, and regional job creation through annual benefits to the area.

There is also a slightly negative effect on environmental quality through temporary water quality disturbances associated with construction, and from three additional weeks of subsistence hunting in this alternative.

There is a positive effect with regard to other social effects, but it's less than in Alternatives 4 through 7. Future fuel costs will reflect reduced lightering costs. Lowered fuel costs and home heating costs will have stemming from effects as graphically illustrated in Economics Addendum I. Lowered freight and construction costs will also follow Addendum I. There are subsistence benefits from the additional three weeks of hunting, and life and safety benefits from not having to sail around the tip of the Baldwin Peninsula if inclement weather were to occur while hunters are in the Cape Blossom area. The CE/ICA value for this Alternative is [97.5 | 21].

10.2.4 Alternative 4: Trestle to Dock in Deep Water (No Dredging)

Alternative 4 would construct a pile or gravity structure-supported pier from shore to deep water off of Cape Blossom similar to what is shown in Figure 18. It would not afford any wave protection. The structure includes robust ice-protection measures for long term endurance. The dock would be located 5,250 feet from shore.

Figure 18. Alternative 6, Trestle to Dock (Example)

No dredging is anticipated for this alternative. The trestle and dock are supported by gravity structures (sheet pile cells). The design also includes a bridged open span from the shore line the start of the trestle to allow passage for fish, marine mammals (as large as beluga whales), and local boats. After the initial shore attached bridge, the design includes open spans between the trestle support structures. These open spans allow a flow-through structure.

Costs for this Alternative are $155,590,000, or $5,508,000 annually. There is no maintenance dredging. All lightering is eliminated. Therefore, benefits are $47,409,000, or $1,678,000 annually. See Economics Addendum III for the conversion from the existing cost of $2,206,000

annually to the present value in 2018 dollars.[46] The resulting BCR is 0.3047. The net present value (NPV) is negative $108,181,000. This results in an equivalent annual cost (EAC) of $3,830,000.

This alternative is estimated to reduce annual lightering days by 130, and it results in the cost of a reduced lightering day of $42,370. This alternative has a slightly positive effect on job creation through construction spending, and on regional job creation through annual benefits to the area; however, the only need for small barge operations will be from Kotzebue to surrounding communities, so some work associated with small barge operations may be lost.

Again, there is a slightly negative effect on environmental quality through temporary water quality disturbances associated with construction and from three additional weeks of subsistence hunting.

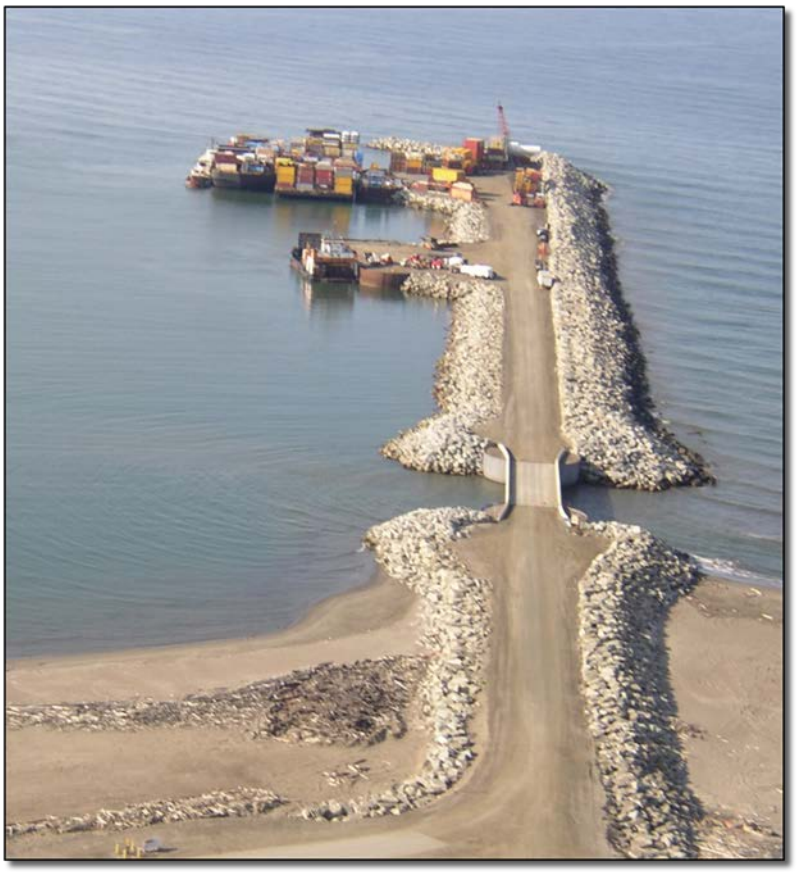
There is a positive effect with regard to other social effects. Future fuel costs will reflect reduced lightering costs. Lowered fuel costs, home heating costs, freight and construction materials transportation costs will have stemming from effects as graphically illustrated in Economics Addendum I. There are subsistence benefits from the additional three weeks of hunting, and life and safety benefits from not having to sail around the tip of the Baldwin Peninsula in bad weather. The CE/ICA value for this Alternative is [130 | 21].

10.2.5 Alternative 5: Causeway to Dock in Deep Water (No Dredging)

Alternative 5 would construct a rubblemound causeway and integrated breakwater from shore to deep water off of Cape Blossom similar to what is shown in Figure 19. This alternative could provide some additional wave protection to vessels during certain storm and tide conditions. Depending on tide and draw down, certain vessels could weather out storms on one side or the other side of the causeway. The dock would located 5,760 feet from shore.

[46] While Economics Addendum III calculates present value benefits for Alternative 7, the numbers for Alternative 4 here are the same.

Figure 19. Alternative 5, Causeway to Dock (Example)



No dredging is anticipated for this alternative. The dock at the end of the causeway is supported by gravity structures appropriate for site conditions, including sea ice. This design includes several bridged open spans, including at the shoreline, to allow passage for fish, marine mammals, and boats. Causeways designs are proven resistant to sea ice forces.

Costs for this Alternative are $416,923,000, or $14,759,000 annually. Benefits are $47,409,000, or $1,678,000 annually. The resulting BCR is 0.1137. The discounted net present value (NPV) is negative $369,515,000. This results in an EAC of $13,081,000.

This alternative is estimated to reduce annual lightering days by 130, and it results in the cost of a reduced lightering day of $113,530. This alternative has a positive effect on job creation through construction spending, and as before, on regional job creation through annual benefits to the area.

EQ and OSE effects are the same as Alternative 4. The CE/ICA value for this Alternative is [130 | 21].

10.2.6 Alternative 6: Combination No.1 – Trestle with Causeway to Dock in Deep Water (No Dredging)

Alternative 6 would include a combination of Alternatives 4 and 5 to see if there is some optimization between the two design types.

Costs for this Alternative are $153,206,000, or $5,424,000 annually. No maintenance dredging would occur. Benefits are $47,409,000, or $1,678,000 annually. The resulting BCR is 0.3094. The discounted net present value (NPV) is negative $105,797,000. This results in an EAC of $3,745,000.

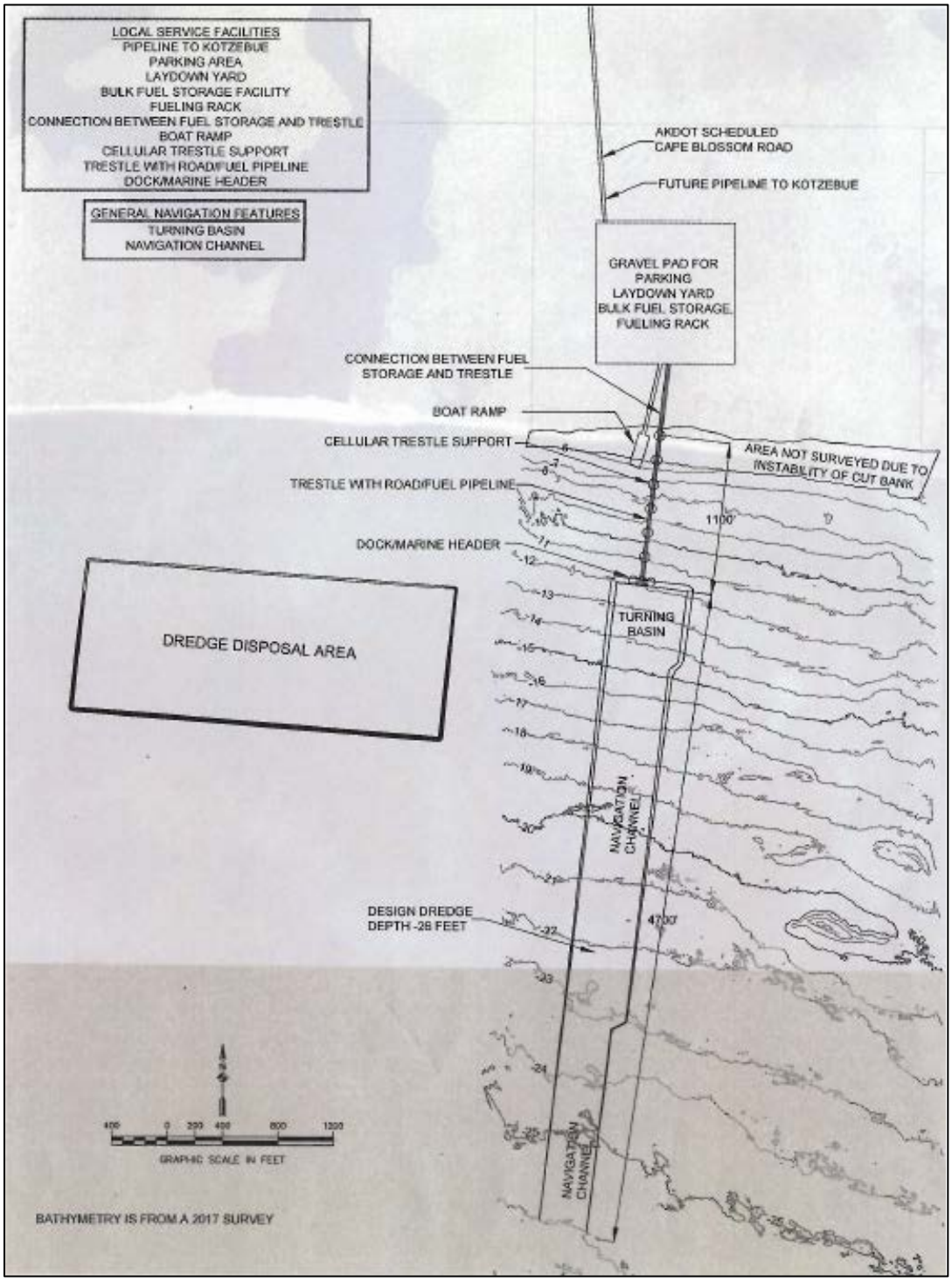
This alternative is estimated to reduce annual lightering days by 130, and it results in the cost of a reduced lightering day of $41,720. This alternative has a positive effect on job creation through construction spending, and on regional job creation through annual benefits to the area.

Other RED, EQ, and OSE effects are the same as Alternatives 4 and 5. The CE/ICA value for this Alternative is [130 | 21].

10.2.7 Alternative 7: Combination No.2 – Trestle/Causeway/Dock with Dredging

Alternative 7 is a combination of Alternatives 2, 4, and 5 and seeks to minimize the cost of a pier/causeway and dredging combination. The dock for this alternative would likely be located at a depth of -12 feet MLLW which is 1100 feet from the shoreline (please see the design graphic below).

Figure 20. Alternative 7 Design



Costs for this Alternative are $99,101,000, or $3,508,000 annually. Maintenance dredging would occur at years 5, 15, and 25 after construction and the OMRR&R cost is $9,651,000. Benefits are

$47,409,000, or $1,678,000 annually. The resulting BCR is 0.4784. The discounted net present value (NPV) is negative $51,692,000. This results in an EAC of $1,830,000.

This alternative is estimated to reduce annual lightering days by 130, and it results in the cost of a reduced lightering day of $26,990. This alternative has a positive effect on job creation through construction spending, and on regional job creation through annual benefits to the area.

Other RED, EQ, and OSE effects are the same as Alternatives 4, 5, and 6. The CE/ICA value for this Alternative is [130 | 21].

10.3 Future With-Project Conditions Summary

The FWP condition is summarized in the three tables below:

Table 8. CE/ICA Summary

Alternative	Reduced Lightering Days	Increased Subsistence Vessel Days	Annual Cost of A Reduced Day	Incremental Cost of Day Gained (Annualized)
1	0	0	N/A	N/A
2	0	21	N/A	N/A
3	97.5	21	$59,220	N/A
4	130	21	$42,370	N/A
5	130	21	$113,530	N/A
6	130	21	$41,720	N/A
7	130	21	$26,990	N/A

Table 9. Plus, Minus, Implications for RED, EQ, and OSE

Alternative	RED	Jobs	EQ	OSE
1	Neutral	Neutral	Neutral	Negative
2	Positive	Positive	Slightly Negative	Negative
3	Positive	Positive (*)	Slightly Negative	Slightly Positive
4	Positive	Positive	Slightly Negative	Positive
5	Positive	Positive	Slightly Negative	Positive
6	Positive	Positive	Slightly Negative	Positive
7	Positive	Positive	Slightly Negative	Positive
Please recall that Jobs for Alternative 3 has the following implications: that more existing lightering jobs could be preserved than other alternatives.				

Table 10. NED Summary

Alt.	PV Cost	PV Benefits	AAC	AAB	BCR	NPV	EAC
1	$0	$0	$0	$0	0.0000	$ -	$ -
2	$115,434,000	$0	$4,086,000	$0	0.0000	$(115,434,000)	$(4,086,000)
3	$163,114,000	$35,556,000	$5,774,000	$1,259,000	0.2180	$(127,557,000)	$(4,516,000)
4	$155,590,000	$47,409,000	$5,508,000	$1,678,000	0.3047	$(108,181,000)	$(3,830,000)
5	$416,923,000	$47,409,000	$14,759,000	$1,678,000	0.1137	$(369,515,000)	$(13,081,000)
6	$153,206,000	$47,409,000	$5,424,000	$1,678,000	0.3094	$(105,797,000)	$(3,745,000)
7	$99,101,000	$47,409,000	$3,508,000	$1,678,000	0.4784	$(51,692,000)	$(1,830,000)

11. SENSITIVITY ANALYSIS

This section presents the risk and uncertainty of the FWP analysis and summary presented above. Sample error from the small number of shipping and construction companies interviewed was estimated using Student's T-distribution. A factor of 1.533 was applied to the standard deviation of the mean to get an 80% confidence level around the reported costs and benefits from Section 10 above. As some inputs were variable, a Monte Carlo simulation using @Risk software and 1000 iterations of the model were run (see Addendum II for more on this methodology). The resulting ranges in costs and benefits were found:

Table 11. Results with Uncertainty

Alt	10% Reduced Lightering Days	90% Reduced Lightering Days	10% Annual Cost of a Reduced Lightering Day	90% Annual Cost of a Reduced Lightering Day	10% NPV	90% NPV	10% EAC	90% EAC	10% BCR	90% BCR
1	0	0	N/A	N/A	$ -	$ -	$ -	$ -	1.0000	1.0000
2	0	0	N/A	N/A	$(123,467,000)	$(70,304,000)	$(4,410,000)	$(2,512,000)	0.0000	0.0000
3	91.5	102.75	$32,000	$86,860	$(202,769,000)	$(53,187,000)	$(7,148,000)	$(1,883,000)	0.1776	0.5672
4	121	139	$23,840	$60,750	$(175,574,000)	$(40,122,000)	$(6,215,000)	$(1,420,000)	0.2067	0.5453

5	121	139	$68,890	$158,100	$(532,113,000)	$(207,974,000)	$(18,837,000)	$(7,362,000)	0.0797	0.1862
6	121	139	$23,120	$60,210	$(175,158,000)	$(35,653,000)	$(6,201,000)	$(1,262,000)	0.2029	0.5682
7	121	139	$18,780	$35,570	$(82,483,000)	$(20,738,000)	$(2,920,000)	$(734,000)	0.3473	0.7079

Plan selection under uncertainty does not change due to these results. While Alternative 6 could have a higher BCR than Alternative 7 in the future given uncertainty, plan selection should remain determinant on the mean or most likely future condition (ER 1105-2-100 Chapter 2, Paragraph, 2-3, d., (2)). If the federal government had competition, for instance, if a two-player economic game was being played, where one player could impose cost on the other player, the solution in light of uncertainty would be determined by the minimization of maximum regret (minimax). This is only applicable in rare cases of federal work, for instance spending federal monies to reduce air pollution when other countries are not doing the same. Only for the purpose of discussion here, the minimax is still Alternative 7 at negative $82,483,000.

Another expected result of future conditions is that these numbers will change at the time of project authorization and for the final version of this report. Usually, cost engineering gains knowledge of cost items and reduces uncertainty of cost during the course of a study, so the ranges of benefits and costs reported in Table 11 should change.

12. NED SUMMARY

The NED Summary is the same as

Table 10, there is a cost to the nation of constructing this project for each alternative. This cost would be widely dispersed, as well as dispersed over time, and if a project is constructed this cost would support Northwest Artic Borough communities through a transfer from the nation and through non-monetary benefits. As there is no NED justified plan, this project will rely on Section 2006 of WRDA 2007, the remote and subsistence harbors authority, to decide the tentatively selected plan.

13. REGIONAL ECONOMIC DEVELOPMENT

To understand the regional impacts of construction under Alternative 7, USACE's Regional Economic System (RECONS) was used. RECONS is a certified\approved model that assesses the number of jobs created due to the tentatively selected plan. The NED cost of $99,101,000 was used for the estimate. Alaska, rural, and navigation (CWB – Navigation) construction parameters were used for the estimate. FY 2015 was selected due to model updates to costs in later years still occurring.

Table 12. RECONS - Alternative 7 Results

		Regional	**State**	**National**
Total Spending		$99,101,000	$99,101,000	$99,101,000
Direct Impact				
	Output	$51,925,016	$73,721,818	$96,912,955
	Job	1,039.66	1,198.71	1,395.19
	Labor Income	$33,886,358	$43,619,938	$53,387,194
	GRP	$38,511,061	$51,429,301	$63,761,723
Total Impact				
	Output	$70,281,268	$125,137,686	$257,969,670
	Job	1,207.41	1,549.60	2,365.58
	Labor Income	$39,117,995	$60,754,714	$105,947,181
	GRP	$49,228,481	$82,326,514	$154,798,433

Construction will mostly benefit companies statewide; however, local job creation in road and pad construction is expected.

In addition to jobs created through construction spending, some permanent jobs will be created through the benefits of the project. For instance, POA expects that increased expenditures on fuel, hunting and fishing, and durable goods will create jobs in subsistence, retail, and other direct and indirect spending areas. Increased tourism is also thought to be possible. At the same time, lightering jobs will be reduced for all alternatives. Unfortunately, data collected was not sufficient

to determine the net effect. Gross permanent jobs created is estimated to be 40 jobs.[47] Again, the costs expenditures used for Table 12 will be updated before the final version of this report.

14. ENVIRONMENTAL QUALITY

There are no expected impacts to species of economic importance as a result of the project for any alterative. While lower fuel prices may prompt more commercial fishing, catch limits set by ADF&G will cause any impacts to be avoided. At the same time, the potential of reducing fuel spills with less lightering could plausibly occur as a result of navigation improvements; however, USACE was unable to quantify this effect during the study.

Next, species of concern, as described in the Environmental Assessment, would not have their food sources, water sources, or breeding habitat substantially impacted, so a separate CE/ICA for these species is not necessary.

15. OTHER SOCIAL EFFECTS

As described in Economics Addendum I, POA believes that lowered fuel costs will equal more affordable housing, especially as 33% to 40% of regional incomes currently goes to heating. This will also provide opportunity to participate in additional subsistence activities by freeing up resources and it might allow families to save for travel that's needed for medical\dental\ or social services. Increased subsistence and increased health to the populace builds community identity, pride, and self-determination in line with the guidance written for the 2006 authority for navigation improvements projects. More affordable housing could also result in greater professional retention and better services in the NWAB.

Lowered gasoline prices directly results in more vessel and snow machine days. It also could result in greater safety with boaters and snow machiners potentially going out in pairs more often. A lower cost to bring vessels and snow machines into the region also results in more subsistence and greater safety in line with 2006.

A lowered cost on durable goods like TV's, washing machines, and other amenities could also result in housing improvements that could result in professional retention and opportunity for additional lodging for tourists. Greater tourism would create local jobs.

Next, lowered costs for construction companies or lowered transportation costs for mining equipment and ore could result in local job creation. Jobs that stay in the community lessen outmigration pressure and add to community viability.

Last, increasing professional retention reduces the burden on families and increases their likelihood to stay. If there are good teachers in a community, families with children are more likely to stay. If there are good doctors or physician's assistants who can proscribe medicines in a

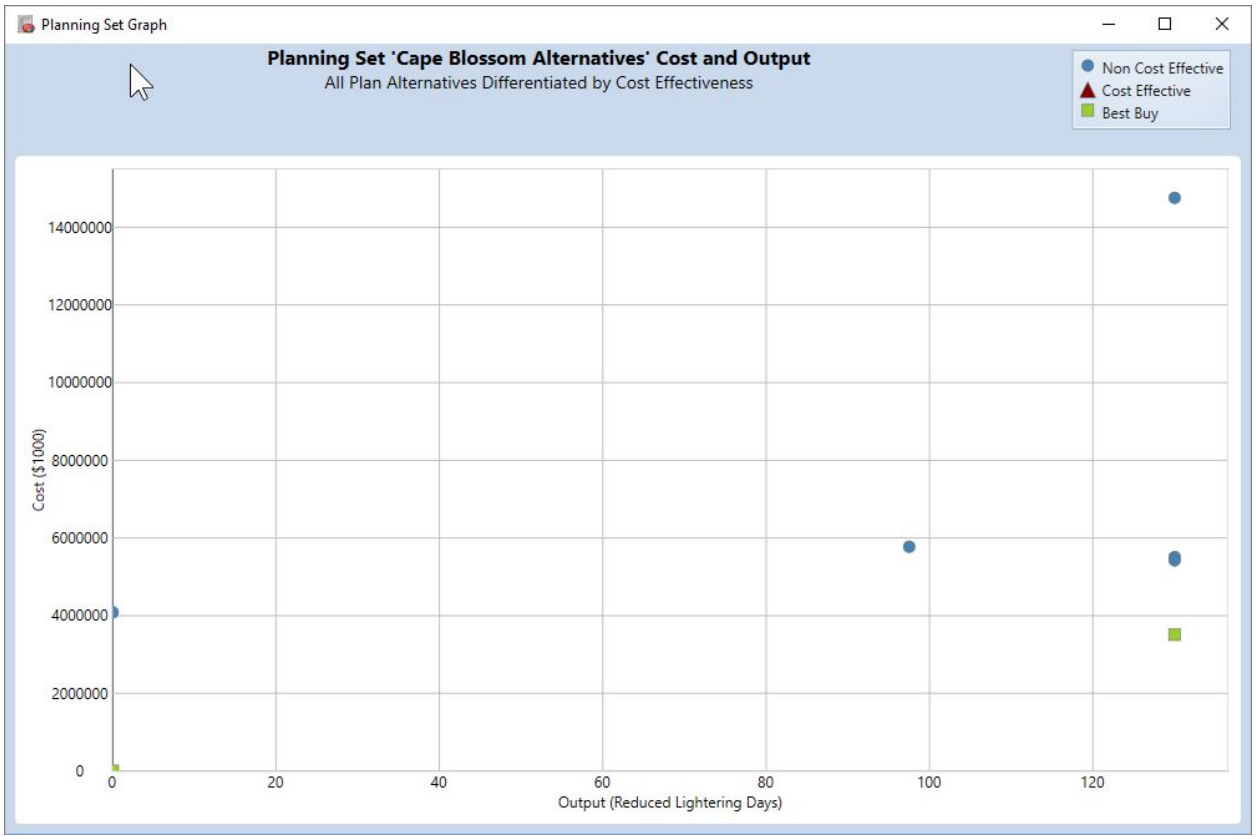
[47] See Economics Addendum III and laborstats.alaska.gov references.

community, families with elders or seniors are more likely to stay. Families that stay in a community directly add to that community's long-term viability.

Removing lightering costs from the cost of fuels, home heating, residential and commercial construction materials, durable goods and other items that need to be transported into the Northwest Arctic Borough will have these non-monetary effects just described. A proxy for the effects is reduced lightering days, increased subsistence vessel days.

The figure below shows the output from IWR Planning Suite:

Figure 21. CE/ICA Results



Only one plan is cost effective, Alternative 7; therefore, an incremental cost analysis is not performed.

16. FOUR ACCOUNTS SUMMARY

A summary of the four accounts just described is presented in the table below. Net present value numbers are negative, so the highest net present value plan other than Alternative 1 is Alternative 7. Additionally, other than Alternative 1, no other plan provides a higher BCR, or a higher RED, EQ, or OSE rating than Alternative 7.

Table 13. Four Accounts Summary

Alt.	NPV	BCR	RED	EQ	OSE
1	$ -	0.0000	Neutral	Neutral	N/A
2	$(115,434,000)	0.0000	Positive	Slightly Negative	Non-Cost Effective
3	$(127,557,000)	0.2180	Positive	Slightly Negative	Non-Cost Effective
4	$(108,181,000)	0.3047	Positive	Slightly Negative	Non-Cost Effective
5	$(369,515,000)	0.1137	Positive	Slightly Negative	Non-Cost Effective
6	$(105,797,000)	0.3094	Positive	Slightly Negative	Non-Cost Effective
7	$(51,692,000)	0.4784	Positive	Slightly Negative	Best Buy

Table 14. OSE Matrix Comparison

Alt.	Reduced Lightering Days	Increased Subsistence Vessel Days
1	0	0
2	0	21
3	97.5	21
4	130	21
5	130	21
6	130	21
7	130	21

17. PLAN SELECTION

Alternative 7 is the tentatively selected plan. The project would result in $47,409,000 worth of benefits, as well as non-monetary benefits from the 130 reduced lightering days, and the 21 increased subsistence vessel days that will provide long-term viability for communities in the Northwest Arctic Borough. Upon construction completion of Alternative 7, increased public health and safety, greater access to natural resources, and increased welfare of the population, will add to social and cultural value, as well as regional stability. The main negative effects are the cost to the federal government, that construction costs exceed monetary benefits, and that some lightering jobs will be lost while overall navigation efficiency is gained.

Please see the main feasibility report or the other appendixes for effects that go beyond the scope of this Economic Appendix.

18. LOCALLY PREFERRED PLAN

On July 17, 2018, the non-Federal sponsors, the Native Village of Kotzebue and the City of Kotzebue, voiced their support for the recommended plan as formulated.

19. AUTHORIZED COST, COST SHARE, AND ABILITY TO PAY

Presently, "Project First Cost" and cost share is reported by cost engineering as follows:

Project First Cost Share			
Alternative	GNF	LSF	LERRS
1	$0.00	$0.00	$0.00
2	$39,325,000	$50,113,000	$0.00
3	$23,405,000	$167,557,000	$0.00
4	$34,631,000	$147,683,000	$0.00
5	$11,500,000	$478,305,000	$0.00
6	$22,555,000	$156,943,000	$0.00
7	$38,927,000	$65,437,000	$0.00

Please recall that maintenance dredging for this project is 100% federal as depths do not exceed -45 MLLW. Recall also that LERRS is reimbursable to the local sponsor at the end of construction, up to the eligible cost share threshold. The cost share should be considered preliminary and will be revised before the final version of this report.

Please see Economics Addendum III for the conversion of Project First Cost for Alternative 7 to present value (i.e. from $104,365,000 shown here to $99,101,000 reported above).

The sponsor is self-certifying their ability to pay at this time. The self-certification will be complete before DE Transmittal.

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Kotzebue Harbor Feasibility Study

Navigation Improvements at Cape Blossom

Kotzebue, Alaska

Appendix D: Economics

Addendum I – Effects of Reducing Transportation Cost Inefficiencies

January 9, 2019

US Army Corps of Engineers
Alaska District

1. Stemming from Effects of Reducing Transportation Cost Inefficiencies by Constructing Navigation Improvements at Cape Blossom

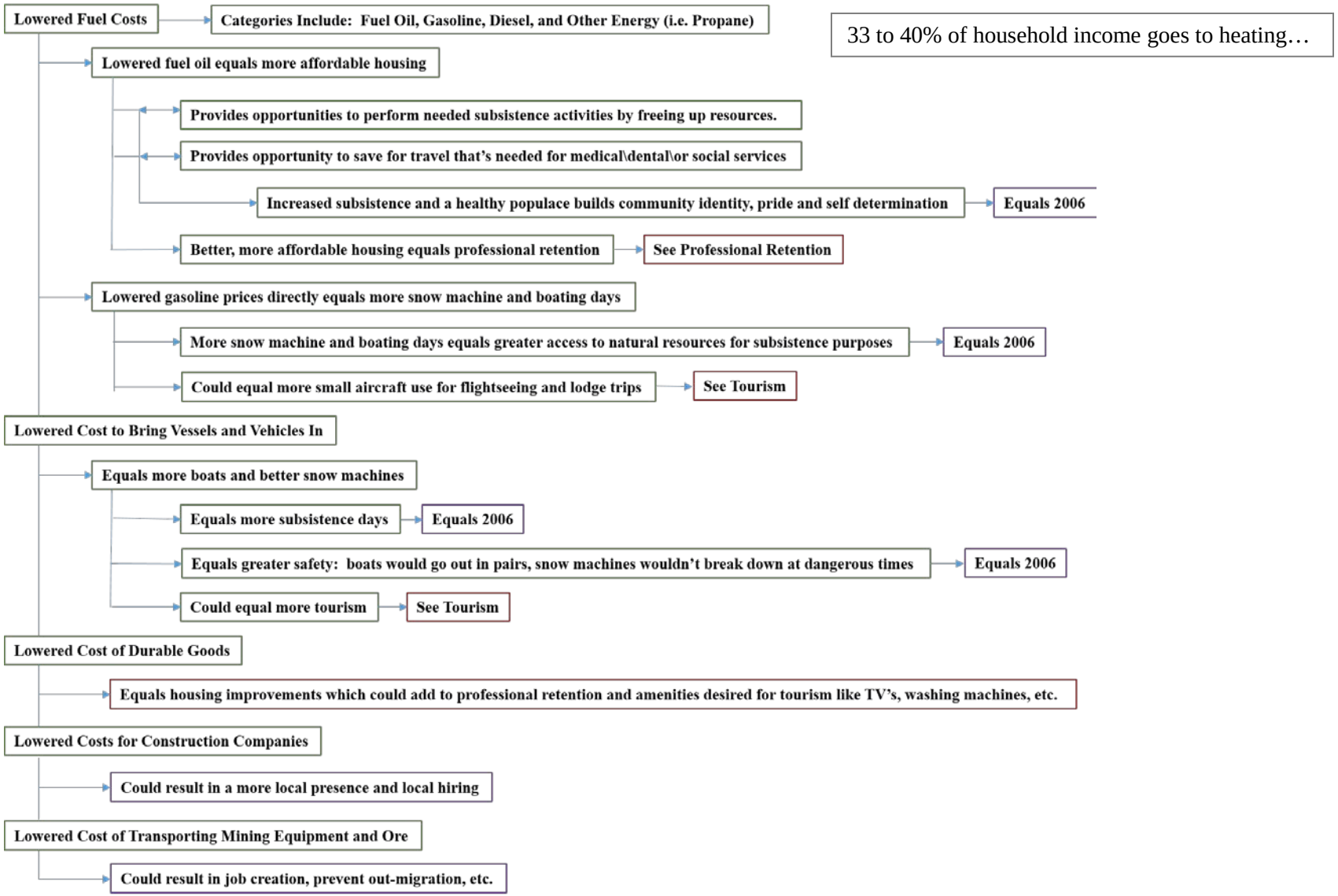
1.1 Description

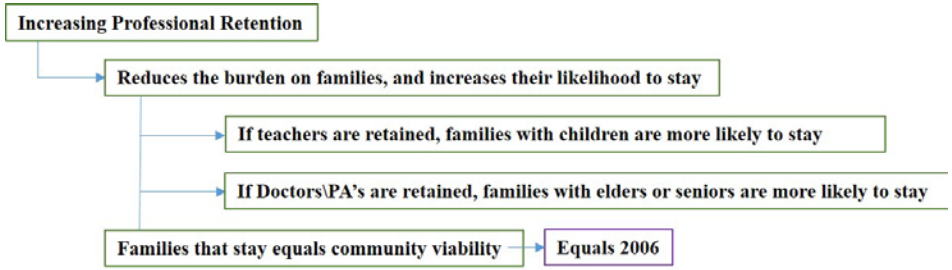
Building a port at Cape Blossom has both direct and indirect or induced effects for individuals living in the Northwest Arctic Borough (NWAB). This addendum attempts to relate the effects of lowering the transportation costs of fuel and goods to the Section 2006 authority of the Water Resources and Development Act (WRDA) of 2007 (as amended by Section 2104 of the Water Resources Reform and Development Act of 2014). Section 2006 of 2007 allows the U.S. Army Corps of Engineers (USACE) to recommend harbor and navigation projects to the Assistant Secretary of the Army and the Office of Management and Budget for remote and subsistence communities in Alaska that protect the long-term viability of the community. Section 2104 of 2014 then expands that authority to recommend projects that may provide region-wide stability. Implementation guidance suggests that the Secretary will consider the following criteria for these projects: public health and safety, subsistence (food gathering) activity increases, local and regional economic opportunities, and the preservation or promotion of culture and social welfare.

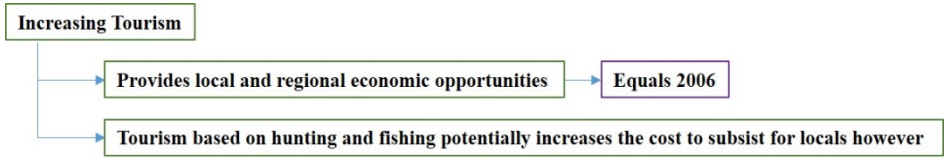
1.2 Assumptions

The flow charts that follow make broad assumptions about the stemming from effects of navigation improvements. First, it is assumed that by eliminating lightering (the practice of transferring commodities at sea onto smaller vessels to get them ashore) fuel and energy costs would be lowered. Similarly, it is assumed that eliminating lightering would cause vehicle and durable goods prices to decrease. Although the flow charts are useful to help visualize the connections between navigation improvements and the indirect or induced effects and how they relate to the 2006 authority, please do not assume that the connections are proven. The Economics Appendix provides better supporting evidence than is shown by this abbreviated illustration:

1.3 Flow Charts




Increasing Professional Retention
Reduces the burden on families, and increases their likelihood to stay
If teachers are retained, families with children are more likely to stay
If Doctors\PA's are retained, families with elders or seniors are more likely to stay
Families that stay equals community viability
Equals 2006


Increasing Tourism
Provides local and regional economic opportunities
Equals 2006
Tourism based on hunting and fishing potentially increases the cost to subsist for locals however

Kotzebue Harbor Feasibility Study

Navigation Improvements at Cape Blossom

Kotzebue, Alaska

Appendix D: Economics

Addendum II – Methodology & Data Collection

January 9, 2019

US Army Corps of Engineers
Alaska District

This Addendum discusses the economics methodology and data collection techniques used for the Cape Blossom, Alaska navigation improvements feasibility study.

1. METHODOLOGY

This section describes the methods used to formulate alternative plans and conduct the economic analysis of navigation improvements at Cape Blossom. It presents the National Economic Development (NED) methodology required by all USACE projects, as well as the Regional Economic Development (RED) methodology, the Environmental Quality (EQ) analysis procedures, and the Other Social Effects (OSE) account analysis procedures. Rather than present a step-by-step technique for each of these accounts, this Methodology section presents an overview of the approach used and may utilize examples where it's helpful to that overview.

1.1 Evaluation Framework

USACE planning is conducted by comparing with-project forecasts to without-project forecasts of future conditions in a study area. Certain developments may occur regardless of whether or not a project is actually constructed. These developments are considered, but benefits from developments that the Corps is not responsible for cannot be counted to help justify a project. These periods may be called the existing conditions, the future without-project condition (FWOP), and the future with-project (FWP) condition. Once FWOP conditions are determined, the impacts of each alternative plan are described and compared for each account.

1.2 Alternative Plan Formulation

The formulation, evaluation, and comparison of alternative plans is primarily described in the main feasibility report. Potentially, the formulation of a competitive alternative can be eliminated from consideration in a feasibility study in several ways, but economic analysis and the use of strategic tools can prevent such failures. The individual project components (management measures, or measures) either engineered or non-structural, that make up an alternative are usually determined at an initial stakeholders meeting (called a charrette) at the beginning of a project. The project components decided upon at that meeting are then combined to become an alternative.

Alternatives must be complete, effective (in that an alternative meets objectives), efficient, and acceptable (which means lawful).[1] All potential stakeholders were invited to this project's charrette and it was open to the public, adding completeness to the alternatives formulated. Additionally, the charrette decision rules, including the rules of subdivision and order during a charrette, ensured that project components were acceptable to all and will be effective. For this project, the decision rule for including or eliminating a proposed engineered or non-structural measure was consensus among the charrette attendees. Unanimity reduces the risk that a competitive alternative will be eliminated. Only in rare cases does consensus suffer from groupthink or other failures. The alternatives formulated and described should be

[1] Source: ER 1105-2-100.

methodologically sound and there is only a small chance that a more efficient alternative could be designed by the U.S. Army Corps of Engineers.

1.3 CE/ICA

To recommend a plan from formulated plan alternatives, a Cost Effectiveness, Incremental Cost Analysis (CE/ICA) on non-monetary benefits is performed. An evaluation metric or several metrics that capture non-monetary benefits by addressing project objectives are required for making comparisons. When including cost, the metric(s) chosen distinguish tradeoffs between alternatives. If several metrics are selected, the comparison of different alternatives is presented as a matrix comparison. Weights may also be applied to selected metrics if recommending a plan from the matrix comparison is not obvious and weighting can be justified.

The U.S. Army Corps of Engineers uses the Institute for Water Resources (IWR) Planning Suite for CE/ICA. This software charts cost against a specific metric. If a plan charts with less benefit at greater cost than other plans, it is not cost effective and is eliminated from further consideration. If a plan generates more benefits than other plans, but at greater costs, the incremental cost for the additional benefits is looked at. The plan that's the most efficient incrementally becomes the studies tentatively selected plan (TSP).

As is discussed throughout the Economics Appendix, the CE/ICA metric for navigation improvements at Cape Blossom is [Reduced Lightering Days | Increased Subsistence Days]. The comparison of plans is presented in the Appendix.

1.4 NED

For the NED analysis still required, plans are ranked according to their (discounted) net present value (NPV) or their Equivalent Annual (net) Benefit (EAB) (which, as suggested, are equal to each other). Where costs are greater than benefits, net annual costs may be referred to as equivalent annual costs (EAC). Generally, the use of "discounted" in front of NPV, or "net" when discussing EAB/EAC is inferred. The Corps uses end-of-period (i.e. end-of fiscal year) payments for reporting annual benefits and costs.

Under the NED account, only benefits that can be assigned tangible monetary values resulting directly from the proposed navigation improvements are used. Net present value is then the present value (PV) of benefits (described next) minus the present value of the required construction/investment cost. Ex ante (i.e. before annualization can occur), it considers the period, the year, when benefits and costs are expected to be realized.

Benefits include reduced transportation costs, reduced delays and damages, and increased commercial use, and are presented with variation or uncertainty. Additionally, benefits from the recreational use of a port or harbor are based on an average recreational user's unit day value (UDV) multiplied by the number of users expected. Differences between the existing condition, the FWOP condition, and FWP condition are calculated. The value that recreational users get, combined with reductions in inefficiencies and damages expected, and increases in commercial use result in the monetary benefits of a project.

Costs for the purpose of comparing plans are the total project costs of an alternative. They include the cost of physically constructing project components, and operations, maintenance, repair, replacement, and rehabilitation (OMRR&R, or if in a casual context, O&M) costs, and potentially other opportunity costs. Construction costs include general navigation features (GNF), and in-water and upland local service facilities (LSF) in-so-far-as LSF features are required to achieve benefits. While GNF costs are financed (or cost shared) by the federal government, and LSF costs are financed by the project sponsor, total project costs are looked at for the NED analysis.

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, to tentatively select an alternative, dollars are reported as federal fiscal year 2018 dollars. The federal fiscal year 2018 discount rate of 2.75 percent (r), and 50 years forward from the project's authorization date (t),[2] is used. In some cases, NPV can be maximized in a year other than the very first year a project can be finished. While not applicable for this project, in such cases, a construction delay would be recommended. The discount rate and period of analysis described for the TSP here will be updated before the final version of this report.

For the navigation improvements at Cape Blossom, the first year which construction can be finished is 2025, so benefits begin accruing in the next year.[3] All benefits are then discounted back to 2018 dollars.

Costs may accrue from the construction start date to the period of analysis end date; for example, from 2020 to 2070. For more information on the actual proposed construction timeline and costs, see the Cost Engineering Appendix. For the final version of this report, construction costs for the TSP will be updated. This update will allow the congressional authorization to estimate the correct amount of funds to be appropriated.

PV costs, once figured, are then subtracted from PV benefits for each alternative, such that net present value can be compared. The highest ranked NED plan then, is the one that maximizes NPV.[4] To see the equations and amortization tables that this study used for costs and benefits please see Economics Addendum III.

For the analysis presented, PV benefits and costs are also annualized separately. The Corps likes to then divide "average annual benefits" (AAB) by "average annual costs" (AAC) to show a benefit-to-cost ratio (BCR).

Since variation is modeled, NPV, EAB, AAB, AAC, and BCR presented are what's expected, and can be given a confidence range (this study reports a two-tailed 80% confidence range for both costs and benefits). The summary information still uses a mean to show the expected result, with confidence ranges discussed or displayed in the sensitivity analysis that follows.

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2 t equals 52 in the example.

[3] Each Cape Blossom navigation improvement alternative thus counts 44 years of benefits.

[4] Please note: whereas in business, the conversion of NPV to EAB could be thought of as an annual cash flow that the business gets back from a project, the federal government receives no such cash flow. Rather benefits are distributed to all of the eventual users of the project and are widely disbursed.

Not included in NED are: job creation, environmental quality decreases/increases, or the protection of social value. In this report, job creation is evaluated in the RED account, possible economic impacts from environmental quality gains or losses are evaluated in the EQ account, and remote and subsistence considerations are evaluated under the OSE account. These are expounded upon later in this Addendum as well.

Full salvage recovery of historical and cultural items and full documentation of historical areas of importance can be expressed in dollar terms, but more often (including in the Economic Appendix) historical importance is considered for its non-monetary value. Historical importance is therefore also included in the OSE account.

1.4.1 Discount Rate

Economic Guidance Memorandum (EGM) 18-01, signed in October of 2017, specified the FY 2018 discount rate of 2.75%. This rate was used in the alternative comparison for the tentatively selected plan. USACE obtains the rate from U.S. Department of the Treasury, which computes it as the average market yield on interest-bearing marketable securities of the United States that have 15 or more years remaining to maturity. However, the discount rate could differ from actual average market yield per 18 Code of Federal Regulations (CFR) 704.39, which only allows the calculated rate to change by a quarter percent from year-to-year. Additionally, yield curve premium to forecast a variable discount rate into the future with uncertainty is not calculated. Instead, the discount rate will just be updated (to its 2020 value) before the final version of this report. Another assumption here is that the local sponsor has a cost of debt that is the same as the federal government, and that their rate is also fixed. Thus, in accordance with policy, a variable weighted average cost of capital is not used. Making costs and benefits equivalent on the time value of money using a discount rate that is only inclusive of the risk-free U.S. Treasury yield indicates a time-preference, to proceed now with a project or issue U.S. government debt at the present time.

The Office of Management and Budget has prescribed that a discount rate of 7.000% be used to report the NPV of a project at the Agency Decision Milestone.[5] This rate is only used for projects seeking administration support, and is therefore not reported as part of the feasibility study here.[6,7]

1.4.2 Price Elasticity

Interviews indicated there could be a short period of growth in commodities shipped to Kotzebue and the NWAB in response to lower prices; however, it is unknown what the length or size of the growth period will be. Applying price elasticity to the first several years of benefits is therefore not appropriate without further study.

[5] Source: OMB Circular A-94.
[6] Note: The period of analysis is also different from the TSP milestone or final report.
[7] Note: The rate is fixed and does vary into the future.

1.4.3 Growth Rate

For the economic evaluation, and in accordance with policy,[8] 0.0% price growth from present to end of the period of analysis is used for both costs and benefits.[9]

1.4.4 Risk & Uncertainty

Input variables, such as cost information which we obtained from shipping companies, construction firms, and regional representatives may have been described to us as a minimum, maximum, or most likely cost, or as a uniform, discrete, or another type of distribution. The distributions described to USACE were placed within a spreadsheet model using Palisades Software @Risk Excel Add-In. Delay and damage costs (generally from lightering) were summed within the spreadsheet to get existing costs. The reduction in costs projected in the future with-project scenario provided expected results. The software considered the distributions entered and ran a Monte Carlo simulation to generate outputs with a confidence range. Usually 1,000 iterations were run as this was a simple model. The outputs of the modeling are described throughout the Economics Appendix.

Additionally, sampling error, based on the total population of shipping and construction companies USACE believes to be operating in the area and the number of companies interviewed was figured into total uncertainty. This was accomplished using the known variation in costs described by the companies interviewed and using Student's t-distribution to correct the sampling error. A two-tailed distribution was assumed so values reported in the Sensitivity Analysis section of the Appendix are the 10% and 90% certain values. This is the same as reporting an 80% confidence level.

1.4.5 UDV

Again, recreation benefits are calculated by the expected number of recreational users annually multiplied by a UDV. EGM 18-03 (issued in October 2017) specifies the UDV applied to calculating recreational benefits at TSP. Judgment factors are used to assign point values to general or specialized recreation, which can then be further categorized as hunting or fishing if applicable. Point values are based on the availability of the opportunity, accessibility, the carrying capacity and environmental quality of the area, and the scarcity of the recreational experience. Once aesthetics, access, facilities for recreational users, travel times, and crowding are judged and point values are assigned, the points are summed and given a dollar value according to the EGM. This value is multiplied by the expected number of future users. At the same time, for navigation projects, recreation benefits may only be used for half of the benefits counted to justify a project

[8] The guidance states, "The general level of prices for outputs and inputs prevailing during or immediately preceding the period of planning is to be used for the entire period of analysis" (Principals and Guidelines 1.4.10(b), 1983); therefore, "nominal" pricing is used.

[9] Based on existing regional price indexes, and using chi-squared (the sum of least squared errors for distributions fit), the assumption of 0.0% price growth, has a less than 5% chance of being correct over the period of analysis.

under NED (ER 1105-2-100, Appendix E, Section 47).[10] After justification has been achieved, other incidental recreation benefits can be counted (when allowed by policy).

For this project, the Corps expects all users to be commercial or subsistence, so a UDV for the average recreational user was not applied.

1.4.6 Unemployed or Underemployed Labor Resources

Policy that allows unemployed or underemployed labor resources to be counted as an NED benefit may be utilized before the final version of this report. However, this study currently uses the requirement of a national projection of full employment in-line with ER 1105-2-100 E-3.a.(5)(a). Jobs created are therefore discussed in the RED account, but are not counted as NED benefits.

1.5 RED

Construction expenditures made by USACE generate additional economic activity that can be measured in jobs, income, sales, and gross regional product. IWR, the Louis Berger Group, and Michigan State University developed a regional economic impact modeling tool called RECONS (Regional ECONomic System) that is used for this project to measure these effects, see Economics Addendum V for the impacts of each alternative. The model calculates the effects from direct spending on construction, as well as indirect spending, such as by construction workers on other regional goods and services. The model went through a rigorous certification process and is used widely across the Corps.

Costs from cost engineering can be categorized in the model such that tank farm construction benefits add to the national production coefficient rather than the state or local production coefficients. While some cold weather tanks are built in Alaska creating regional income, most large tanks are built out of state and RECONS can be adjusted to account for the expenditures regionally versus nationally. For this project, the standardized model for rural Alaska was used and no adjustments were made.

Additionally, gross regional permanent job creation is estimated by dividing project benefits by the discounted total income, for the years of working life left, for an average regional resident. Net jobs created was not figured, so this is just a talking point in the Appendix. Please see Economics Addendum III for the equation described here.

1.6 EQ

Impacts to environmental quality are primarily documented in the Environmental Assessment; however, impacts to industrial resources, such as fish stocks that have economic impacts are also documented in the Economics Appendix. Further, if a species water or food source, or their breeding habitat, are substantially affected by the project, those affects would require a habitat unit value analysis (and usually a separate CE/ICA analysis conducted).

[10] Business lines other than navigation, may use a different justification rule.

For the proposed navigation improvements at Cape Blossom specifically, habitat and species impacts were not substantial enough to compare them quantitatively between alternatives; rather, project impacts, like the likelihood of reduced fuel spills through improved navigation conditions are discussed qualitatively.

1.7 OSE

Impacts to societal value, subsistence ability (the ability to "live off the land"), and safety are documented in this account. IWR 09-R-4 also discusses community connectedness, identity, and resiliency, and the ability to find fair and gainful employment. The OSE account discusses those items as well.

1.7.1 Significance

Because there is an inherent challenge in dealing with the non-monetized benefits of the other social effects account, the concept of significance is introduced. Significance is described in ER 1105-2-100, Appendix E, and IWR 97-R-4 as follows:

1.7.1.1 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.

1.7.1.2 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.

1.7.1.3 Technical Significance.

Technical significance may be an area; a species; or item's scarcity, its representativeness, its community status, or trending importance. Technical significance may be an area or item's connectivity to other areas of importance, its value for adding diversity, or its significance if it limits the ability of other assets to exist.

- Areas, species, or items that have published research work on them may have technical significance.

1.7.2 Metric Selection & Weighting

Metric selection and weighting must carefully consider OSE significance. Once metrics and weights are selected, Alternatives can be compared using CE/ICA as described above in 1.3.

1.8 Congressional Recommendation & Funding

The Economics Appendix makes informed estimates about when Congressional project authorization will occur, and when the appropriation of funds will occur; however, schedules and priorities can change and thereby affect the results reported. This risk is not quantified as part of the sensitivity analysis. Moreover, according to policy, the results presented in the Economics Appendix are valid for three years. Please remember too that costs and discounting will be updated for the TSP before the final version of this report.

2. DATA COLLECTION

This section gives an overview of the data collected to perform the economic analysis. Other sources are also independently cited.

2.1 Overview

The table below outlines normal data collection associated with the Corps' business lines and what the anticipated data need is for the economics appendix of this study. Acronym definitions can be found in the List of Acronyms in the main report.

Table 1. USACE Data Categories

Category	Study Belief	Problems & Decisions
Socioeconomic/ Demographic	Population trends are very important to the study and analysis is required by the 2006 authority. Sufficient information can be gathered from Census.gov, DCCED, and the sponsor.	Proving community viability was threatened was initially difficult, but information from the State of Alaska and the University of Alaska Anchorage's Institute for Social and Economic Research was able to show some outmigration occurring.
Structure/ Parcel	Real estate impacts due to construction of a project will be evaluated by the Corps' Real Estate branch. Land at Cape Blossom is undeveloped and the concerns for the area include the amount of upland pad space required for a tank farm and lay down facilities, especially as these facilities are required to achieve project benefits.	Different shipping companies wanted different storage and tank farm sizes, but it eventually became evident that to optimize reduced lightering, upland LSF was the same size for all alternatives.
Infrastructure	A road from Cape Blossom to Kotzebue is also necessary to achieve the benefits of the project. ADOT&PF has been clear that development of the road is going forward.	There was also a question of whether a pipeline from Cape Blossom into Kotzebue was required to achieve benefits. Pipeline design, if required, will occur in PED.
Navigation	The initial study belief was that shipping companies would keep some information confidential due to limited competition in the area. Additionally, commercial fishing is tracked by NOAA/NMFS, not USACE. Some fishing activity may be tracked by ADF&G and easier to obtain. Existing harbor activity, Swan Lake boating activity, and subsistence activity is not tracked. Given the above, interviews and a survey were thought to be required. Some information is also available from previous reports.	A survey was not approved by OMB. Therefore, this study relied heavily on interviews. Limited data collection presents inherent risk to the study, but as focus group efforts asked companies to give ranges on their sailing and lightering costs, the Corps expects that companies who were not part of the focus group, to have costs within those wide ranges.

Recreation	For this study it is believed that all sailings are either commercial or involve a component of subsistence and therefore looking at recreation separately isn't applicable.	Stakeholder input confirmed this belief.
Agricultural	For this study, supply, demand, and impacts to marine resources are looked at (fish is a USDA category). Limited terrestrial resources such as caribou population were also viewed.	Since these resource populations are professionally managed by NOAA and ADF&G, preventing expected damages to these resources is not relevant. Supply and demand information was able to be extracted from the reports USACE obtained from Tetra Tech Inc.
Coastal Storm	Economics is relying on H&H to collect ocean tidal and wave data and model port conditions. Icing, sea level rise, climate change, wave climate, and other considerations for this project will be gathered from internal and external sources, including traditional ecological knowledge.	Some data was empirical or gathered by USACE contractors, and some data was gathered "as reported" from other agencies. More information can be found in the H&H Appendix, Appendix G. ERDC modeling is not reported to be complete, and O&M costs from that modeling are incorporated into the economics.
Flooding	Flooding impacts are not expected to be an area of concern for this study.	Flooding information is not required for economic analysis for this study.
Erosion	As port designs were developed, erosion will be considered, especially from the bluff area to the shoreline.	There may be more information on erosion in the Geotech Appendix. For economics, costs due to erosion are rolled up in OMRR&R costs.
Sedimentation	The belief for this study is that feasibility will be impacted significantly by sedimentation. Therefore, geotechnical data will be collected and ERDC will model the impacts of sedimentation and analyze the frequency of dredging needs.	Sedimentation is rolled up into OMRR&R cost and economics calculates and discusses dredging cost in PV terms. The estimated frequency of dredging is at 5, 15, and 25 years after completion of construction. Dredging became more competitive through the course of the study and shortening trestle/causeway/dock features is still being looked at.
Hydropower	There is no hydropower in NWAB.	N/A.
Water Supply	This study assumes that navigation improvements will not directly affect water supply, but it does discuss the indirect impacts to local and regional water supply agencies.	Coordination with the local sponsor confirmed no additional data collection was necessary.

Species of Concern\ Importance	Several species are important to both human and ecological health; however, navigation improvements wouldn't adversely affect their population, water, food, or breeding habitat.	Subsistence benefits from three additional weeks of hunting have been added to the study; additional data in the form of a remote and subsistence focus group was collected in August of 2017 and a boots on the ground survey was conducted in August 2016. However, no CE/ICA analysis on habitat units under the EQ account is necessary. More information on impacts to species can be found in the Environmental Assessment portions of the report.
Historical\ Archaeological	Data will be acquired through the State of Alaska, and researched materials. This study assumes that full salvage recovery of historical and cultural items and full documentation of historical areas of importance will not be necessary.	Archaeologists were part of the boots on the ground in August 2016. Through the course of the study they concluded that full salvage recovery and documentation for the area of potential effect are not needed.
Other Significant Data Categories	Subsistence participation information will be gathered from the local sponsor and the survey/interview effort. Life safety will be discussed, but not quantified.	As [reduced lightering days | increased subsistence vessel days] became the CE/ICA metric. The metric's technical significance was added to by data and report gathering, and it's public and institutional significance were added to through focus group information.

2.2 Empirical Data

As this is a small boat harbor project located in rural Alaska, there is limited empirical data with which to conduct the economic analysis. To address the lack of data, the Alaska District attempted conducting a mail-out survey to business owners who order regional fuel and freight supplies, and successfully conducted two focus group interviewing sessions.

2.2.1 Survey

A survey was not conducted. Supplemental data was thus gathered through databases, website research, published studies, as well as through interviews of two different focus groups. The focus groups included shipping and construction companies, and regional business owners (such as NANA and Maniilaq) rather than all businesses. Economics Addendum IV lists all regional businesses.

2.2.2 Databases

Public databases accessed for this project included the State of Alaska's business license database, the Community Profile database at the Alaska Division of Community and Economic Development (DCCED), and information from the U.S. Census Bureau. All accessible online.

For vessel information, POA obtained access to W-DAPP, which is part of PIERS (the Port Import/Export Reporting Service) (and stands for the Waterborne Commerce Statistics Center (WCSC) Data Analysis and Pre-Processor application). In addition, the Alaska Department of Fish and Game's commercial fishing database had only six vessels homeported in Kotzebue. All were less than 30 feet long, and less than 200 horsepower.

2.2.3 Interviews

The Alaska District understood that obtaining information from shipping companies and construction firms would be difficult. Particularly, withholding information was thought economically rational for the firms due to limited competition and their incentives.[11] Thus, we were surprised by the friendly responses we were able to get.

Two focus group efforts were conducted with 9 or less businesses using a completely different set of questions for the two groups. The biggest businesses in the groups' respective categories were contacted. Again, the two categories were shipping companies and construction firms, and regional organizations, representing remote and subsistence interests.

2.2.3.1 Shipping Companies and Construction Firms

Phone interviews were conducted in January 2017. After an initial contact, follow-ups were conducted throughout the month. USACE was able to reach several captains of tugs and barges for both shipping companies and construction firms. At that time, a survey was still expected, so Captain's contacted were informed that a written follow-up would be coming. However, by June

[11] Such as fleet investments already made.

2017, it was suggested that a trimmed down version of the written survey submitted to OMB be sent to the shipping companies and construction firms we had already attempted contact with.

POA received two responses to the written survey (out of nine) (potentially because it was sent in the middle of the operational season). However, the phone interviews in January, supplemented by the written responses POA did receive, allowed the Corps to estimate existing lightering costs, and what companies thought lightering (or rather unloading) costs would be with "ideal" facilities. Cost reductions under ideal conditions are applicable only because no NED justified plan was found under ideal conditions, thus no NED plan could be had under a discreet alternative, and this changed the decision criteria for a project at Cape Blossom to the 2006 authority. Uncertainty due to incomplete information is modeled in the Future With-Project Conditions Section of the Economics Appendix.

2.2.3.2 Regional Organizations

Given USACE's authority to justify projects in remote parts of Alaska, a second focus group effort was conducted with 9 or less respondents in Kotzebue on August 16 and 17, 2017. The main intent of the interviews conducted on these dates was to discuss the connections shown in Addendum I, between navigation improvements at Cape Blossom and the 2006 Authority.

At the start (or near the start) of the interviews conducted in Kotzebue, regional organizations were asked to rank the importance of lowering prices on 10 commodities categories. They did this three times: once for the organization they represented, once for themselves or their families, and once for their perception of importance to the region as a whole. Because different design vessels could bring in different commodity types for different alternatives, experts ranking the importance of each commodity was thought to help USACE distinguish amongst designs, and select the alternative that maximized importance to the people of the region.

While each organization interviewed had a specific mission, such as to provide housing, health care, or education, overwhelmingly what the United States Army Corps of Engineers heard was that the biggest benefit of a project would be if it could reduce home heating costs for the region.

Next, the Corps heard how a project at Cape Blossom would provide additional subsistence hunting and gathering days. Specifically, with a road and boat launch at Cape Blossom, two additional weeks of Ugruk (bearded seal) hunting could be added to each spring and one week added to the fall, as the area is ice free sooner in the spring and ices later in the fall. Trailering vessels to and from Cape Blossom would also be less expensive than motoring around the Cape, and it would provide an area to safely come ashore if conditions around the Cape worsened while out hunting or fishing. Additionally, the road to Cape Blossom would provide easy access to berry picking, gathering, and fish camps. While it was anticipated that young men would still go farther out from Kotzebue to access resources, the facilities to and at Cape Blossom would provide subsistence activities for families with children and elders – for whom the costs to access resources is otherwise too great.

Last for this section, Corps employees heard that high prices, beyond just home heating and fuel costs, especially on food, but on everything else too, were a significant burden on NWAB

residents. Those owning homes and vehicles would like prices to come down just enough so that they can improve on what they have, save, hunt, fish, and gather, and build regional wealth.

2.3 Corps Reports

2.3.1 Previous Corps Reports

Previous reports and studies are documented in the main feasibility report.

A 2004 USACE report examined the potential for a port at Cape Blossom; however, an NED plan could not be identified. Some of the 2004 report was based on a 1983 study conducted by Tetra Tech Inc. The economic analysis provided in those reports was reviewed. The 2004 report focused on a per gallon savings on fuel transported rather than on lightering costs.

2.3.2 Contracted Reports

The Corps contracted Tetra Tech for a NWAB Marine Resource Assessment (MRA) published in July 2016. That report is used throughout the supply and demand sections of the Economics Appendix.

2.4 Websites and Other Reports

Many websites were used to document the findings in this Appendix. When documenting information, agencies or organizations websites were used to the fullest extent possible rather than third party websites or news sources.

As will be shown, this study relied heavily on *Energy Costs and Rural Alaska Out-Migration* by Matthew Berman of the Institute of Social and Economic Research (ISER) at the University of Alaska, Anchorage (UAA).

Kotzebue Harbor Feasibility Study

Navigation Improvements at Cape Blossom

Kotzebue, Alaska

Appendix D: Economics

Addendum III – Equations

January 9, 2019

US Army Corps of Engineers
Alaska District

This Addendum provides some mathematical context to the costs and benefits reported on in the Economics Appendix, and the methodology described in Economics Addendum II.

1. EQUATIONS USED

1.1 Present Value:

$$PV_C = \frac{C^1}{(1+r)^t} + \frac{C^2}{(1+r)^t} + \frac{C^3}{(1+r)^t} + \cdots + \frac{C^n}{(1+r)^t}$$

As costs (C) are not expected to be constant from year to year, the use of a series is required. (t) is the year in which costs or benefit occur minus the present year (i.e. 2019 – 2018 = 1, etc.). Discount rates (r) are held constant by policy, and are updated at the final version of the report. The discount rates used are further discussed in Economics Addendum II 1.4.1.

This same equation is used for benefits (PV_B).

1.1.1 For Any Period

The present value of costs (or benefits) in any singular period can be found using:

$$PV_C = \frac{C}{(1+r)^t}$$

1.2 Gross Permanent Regional Jobs from Benefits

Only used as a point of discussion in the Economics Appendix, gross regional jobs from benefits are figured. This is separate from jobs generated by construction spending (discussed elsewhere). This calculation uses a version of the present value equation as follows:

$$PV_B/(Median\ Regional\ Salary\left(\frac{1}{(r)} - \frac{1}{(r)(1+r)^t}\right))$$

Differing from 1.1, this equation expects that the discount rate, and median regional salary will be constant (jobs created is meant only to be an estimate however).[1, 2] Here, (*t*) equals years of working life left. Years of working life left is the regional median retirement age minus the median working age.

2. TABLES FOR THE CAPE BLOSSOM NAVIGATION IMPROVEMENTS STUDY

The tables below are based on the mean cost given by cost engineering, and the mean benefits level:

[1] This methodology is not defined by policy.

[2] Wage growth is again not included, if included the equation would be: $Avg.Annual\ (\frac{1}{r-g} - \left(\frac{1+g^t}{(r-g)(1+r)^t}\right))$.

Table 1: PV Cost Calculation for Alternative 7 at TSP

Discount Rate	Year	PV Period	Alt. 7 Costs	Alt. 7 PV
2.875%	2017	-1		
2.750%	2018	0		
2.750%	2019	1		
2.750%	2020	2	$7,816,000	$7,403,224
2.750%	2021	3		$0
2.750%	2022	4		$0
2.750%	2023	5		$0
2.750%	2024	6	$96,550,000	$82,046,733
2.750%	2025	7		$0
2.750%	2026	8		$0
2.750%	2027	9		$0
2.750%	2028	10		$0
2.750%	2029	11		$0
2.750%	2030	12		$0
2.750%	2031	13	$5,859,000	$4,117,747
2.750%	2032	14		$0
2.750%	2033	15		$0
2.750%	2034	16		$0
2.750%	2035	17		$0
2.750%	2036	18		$0
2.750%	2037	19		$0
2.750%	2038	20		$0
2.750%	2039	21		$0
2.750%	2040	22		$0
2.750%	2041	23	$5,859,000	$3,139,362
2.750%	2042	24		$0
2.750%	2043	25		$0
2.750%	2044	26		$0
2.750%	2045	27		$0
2.750%	2046	28		$0
2.750%	2047	29		$0
2.750%	2048	30		$0
2.750%	2049	31		$0
2.750%	2050	32		$0
2.750%	2051	33	$5,859,000	$2,393,443
2.750%	2052	34		$0
2.750%	2053	35		$0
2.750%	2054	36		$0
2.750%	2055	37		$0
2.750%	2056	38		$0

2.750%	2057	39	$0
2.750%	2058	40	$0
2.750%	2059	41	$0
2.750%	2060	42	$0
2.750%	2061	43	$0
2.750%	2062	44	$0
2.750%	2063	45	$0
2.750%	2064	46	$0
2.750%	2065	47	$0
2.750%	2066	48	$0
2.750%	2067	49	$0
2.750%	2068	50	$0
2.750%	2069	51	$0
2.750%	2070	52	$0
Total Construction			$104,365,000
Total O&M			$17,577,000
Total Project Cost (w/ O&M)			$121,943,000
PV Construction			$89,449,957
PV O&M			$9,650,552
O&M Annual			$341,638
PV Total			$99,100,510
Annual			$3,508,249
* Interest during construction is included…			
* Numbers may not sum exactly due to rounding…			

Table 2: PV Benefits Calculation at TSP for Alternative 7

Discount Rate	Year	PV Period	Alt. 7 Benefits Estimate	Alt. 7 PV
2.875%	2017	-1		
2.750%	2018	0		
2.750%	2019	1		
2.750%	2020	2		
2.750%	2021	3		
2.750%	2022	4		
2.750%	2023	5		
2.750%	2024	6		
2.750%	2025	7		
2.750%	2026	8	$2,236,000	$1,799,771
2.750%	2027	9	$2,236,000	$1,751,602
2.750%	2028	10	$2,236,000	$1,704,722
2.750%	2029	11	$2,236,000	$1,659,097
2.750%	2030	12	$2,236,000	$1,614,693
2.750%	2031	13	$2,236,000	$1,571,477

2.750%	2032	14	$2,236,000	$1,529,418
2.750%	2033	15	$2,236,000	$1,488,485
2.750%	2034	16	$2,236,000	$1,448,647
2.750%	2035	17	$2,236,000	$1,409,875
2.750%	2036	18	$2,236,000	$1,372,141
2.750%	2037	19	$2,236,000	$1,335,417
2.750%	2038	20	$2,236,000	$1,299,676
2.750%	2039	21	$2,236,000	$1,264,892
2.750%	2040	22	$2,236,000	$1,231,038
2.750%	2041	23	$2,236,000	$1,198,091
2.750%	2042	24	$2,236,000	$1,166,025
2.750%	2043	25	$2,236,000	$1,134,818
2.750%	2044	26	$2,236,000	$1,104,445
2.750%	2045	27	$2,236,000	$1,074,886
2.750%	2046	28	$2,236,000	$1,046,118
2.750%	2047	29	$2,236,000	$1,018,119
2.750%	2048	30	$2,236,000	$990,870
2.750%	2049	31	$2,236,000	$964,351
2.750%	2050	32	$2,236,000	$938,541
2.750%	2051	33	$2,236,000	$913,422
2.750%	2052	34	$2,236,000	$888,975
2.750%	2053	35	$2,236,000	$865,183
2.750%	2054	36	$2,236,000	$842,027
2.750%	2055	37	$2,236,000	$819,491
2.750%	2056	38	$2,236,000	$797,558
2.750%	2057	39	$2,236,000	$776,212
2.750%	2058	40	$2,236,000	$755,438
2.750%	2059	41	$2,236,000	$735,219
2.750%	2060	42	$2,236,000	$715,542
2.750%	2061	43	$2,236,000	$696,391
2.750%	2062	44	$2,236,000	$677,753
2.750%	2063	45	$2,236,000	$659,613
2.750%	2064	46	$2,236,000	$641,959
2.750%	2065	47	$2,236,000	$624,778
2.750%	2066	48	$2,236,000	$608,056
2.750%	2067	49	$2,236,000	$591,782
2.750%	2068	50	$2,236,000	$575,944
2.750%	2069	51	$2,236,000	$560,529
2.750%	2070	52	$2,236,000	$545,527
Total Benefits			$100,620,000	
PV Benefits				$47,408,613
PV Annual				$1,678,308

NPV is thus negative $51,692,000 for Alternative 7, as follows: $47,409,000 - $99,101,000. And EAC is negative $1,830,000.

The discounted value of Alternative 7 will be updated before the final version of this report.

Kotzebue Harbor Feasibility Study

Navigation Improvements at Cape Blossom

Kotzebue, Alaska

Appendix D: Economics

Addendum IV – Region-Wide Business Listing

January 9, 2019

US Army Corps of Engineers
Alaska District

1. GOVERNMENT ORGANIZATIONS & REGIONAL CORPORATIONS

Regional Corporations
NANA
Northwest Arctic Borough
Northwest Inupiat Housing Authority
Health Consortiums
Maniilaq Association
Maniilaq Health Center
School District
Northwest Arctic Borough School District
Schools
University of Alaska Fairbanks, Kotzebue Campus
June Nelson Elementary Kotzebue
Selawik School
Aqqaluk High\Noorvik Elementary
Kiana School
Ambler School
Shungnak School
Kobuk School
Napaaqtugmiut School Noatok
McQueen School Kivalina
Buckland School
Deering School
Alaska Technical Center
Star of the Northwest Magnet School
NWABSD Home School Kotzebue
Chukchi College & Library
Kotzebue Middle School
Kotzebue High School
Community Corporations
Kikiktagruk Inupiat Corporation
Kikiktagruk Inupiat Corporation
Akuliuk Incorporated
Putoo Corporation
Katyaak Corporation
lvaisaapaagmit Corporation
lsingnakmeut Corporation
Koovukmeut Incorporation
Noatak Napaaktukmeur Corporation
Kivalina Sinnigaakmiut
Buckland Nunachiak Corporation

Deering lpnatchiak Corporation
Tribes
Native Village of Kotzebue
Selawik IRA Council
Noorvik Native Community
Native Village of Kiana
Native Village of Ambler
Native Village of Shungnak
Native Village of Kobuk
Native Village of Noatok
Native Village of Kivalina
Native Village of Buckland
Native Village of Deering
City Governments
City of Kotzebue
City of Selawik
City of Noorvik
City of Kiana
City of Ambler
City of Shungnak
City of Kobuk
City of Kivalina
City of Buckland
City of Deering
State Programs
Northern Region ADOT&PF – Alaska Department of Transportation & Public Facilities
DOT Kotzebue Maintenance Station
DOT Statewide Harbors
DOT Northern Region Regional Planner
Kotzebue Public Works
State of Alaska Drinking Water
RUBA – Rural Business Administration
ANTHC – Alaska Native Tribal Health Consortium
VSW – Village Safe Water
RMW – Remote Maintenance Workers Program
ARUC – Alaska Rural Utilities Collaborative

2. SHIPPERS & AIRLINES

Shippers, Airlines, & Airports

Ambler Airport
Buckland Airport
Dahl Creek Airport
Deering Airport
Selawik Airport
Noorvik Airport
Kiana Airport
Shungnak Airport
Kobuk Airport
Noatok Airport
Kivalina Airport
Hotham Aircraft Maintenance
Moonlight Aviation Maintenance
Northwestern Aviation Services
ORV Airport Maintenance
Selawik Airport Maintenance
Shippers
Crowley
Vitus Marine
Teck Cominico Traffic Group
Northland Services
Alaska Marine Lines\Lynden
Delta Western
Inland Barge
Ruby Marine
Brice Marine
Drake
Airlines
Alaska Airlines
Ravn\Corvus\Hageland\Frontier
Bering Air
Everts Air
Northern Air Cargo
Ambler Air Service
Arctic Backcountry Flying
Baker Aviation
Flying Buck Aviation

3. CONSTRUCTION

Construction Companies
Drake Construction
KIC – Kikiktagruk Inc. Construction
Cruz Construction
Bering Pacific
STG
Brice Construction
Kycel Construction
Gravel Pits
Hotham Inlet Drake Gravel Pit
Kiana East Pit Legacy Material Site
Kotzebue Sound Brice Gravel Site
Kotzebue Sound KIC Gravel Pit 2
NoatakR Drake Gravel Mining
Noorvik Native Community Gravel Sales

4. ELECTRIC COMPANIES AND COOPERATIVES

Fuel Projects & Electric Cooperatives
City of Ambler Fuel Sales
Deering IRA Fuel Project
Buckland Fuel Project
Ipnatchiaq Electric Company
Ivisaappaat Tribal Fuel
Kotzebue Electric Association
Selawik IRA Fuel Project
Selawik IRA Fuel Project

5. TOURISM ORIENTED BUSINESSES

Adams B&B
Ambler & Kobuk River Charters
Arctic Boating Adventures & Charters
Arctic Fishing Adventures
Bayside Inn & Restaurant
Kobuk River Lodge
Kotzebue Sound Charters
Lee's Sea Air
Nullagvik

Nullagvik Hotel
Midnight Sun Tours
Northern Boat Adventures
Sunny Willow B&B

6. RETAIL

Akitchiaq'S Store
Ambler Tony's Store
Bison Street Store
Blankenship Trading Post
Buckland Native Store
Deering Native Store
Emma & Ted'S Store
EZ Market
Kiana Trading Post
Kinnaq Store
Kivalina Native Store
Kobuk Store
Morris Trading Post
Noorvik Native Store
North Star Market
Myra's Store
Rotman Stores
Shungnak Native Store
Uutuku Store & Fast Food Services

7. PRIVATELY OWNED BUSINESSES NOT OTHERWISE SPECIFIED

Arctic Greens
Iten Kennels
AJ's
Alaska Janitorial, S. F., Inc.
Alaska Universal Services
Alaska Universal Services
Alaskan Savage
AQIWO-MST JV
Aqqaluk Trust
Arctic Aerial Photographs
Arctic ProShop

Arctic Science Logistics
Arctic Sun Coffee
ASA Soda Club
Aurora Creek
AUS - Veterans NW JV
B & D Maintenance
B & P Heating
Baker Logistics
Baker Professional Services
Empress Chinese Restaurant
Evan's Electric
Ferguson Property Services
Gavin's Guns
Gram's Food Truck
Gustavo Hernandez General Contractor
Harry O' Brown Trading
Heidi's Bible & Gift Shop
Helena's Gift Store
Husky Enterprises
ILA
Inutek Ventures
Jeremiah's Place
Josh's Cafeteria
KIC Development
KIC Facilities Management
KIC Logistics
Kobuk Cab Company
Kobuk River Valley Supplies
Kobuk Valley Company
Kotch Services
Kotzebue Auto Service
Kotzebue Automotive Services Inc.
Kotzebue Broadcasting
Kotzebue Kuspuks
Leyna's
Little Louie's
LJ's
Lulu's Coffee Shop
Maniilaq Services
Maniilaq/FedCon JV
Margie's Material

Mau's Shop
Midnight Sun Global Services
Midnight Sun Technologies
Mikki's
Northwest Electric
Ohana's
Otto's Pizza
OTZ Telecommunications
OTZ Telephone Cooperative
Polar Auto & Services
Polar Contracting
Qupak's
Rainbow Cash & Carry
Remote Solutions
Richards Cab Company
Rural Pacific
Russell Ann's
Skin & Bones
Snack Attack
Tam's Store
Thompson Services
TNT Sales
Tunuuruk Repair Shop
Wolf Creek Sales & Service

Kotzebue Harbor Feasibility Study

Navigation Improvements at Cape Blossom

Kotzebue, Alaska

Appendix D: Economics

Addendum V – RECONS

January 9, 2019

US Army Corps of Engineers
Alaska District

US Army Corps of Engineers
Regional Economic System

Civil Works Budget Analysis

US Army Corps of Engineers
Louis Berger Group
Michigan State University

September 24, 2018

Executive Summary

This report provides estimates of the economic impacts of Civil Works Budget Analysis for New Analysis Project.

The U.S Army Corps of Engineers (USACE) Institute for Water Resources, the Louis Berger Group and Michigan State University has developed a regional economic impact modeling tool called RECONS (Regional ECONomic System) to provide estimates of regional and national job creation, and retention and other economic measures such as income, value added, and sales.This modeling tool automates calculations and generates estimates of jobs and other economic measures, such as income and sales associated with USACE's ARRA spending, annual Civil Work program spending and stem-from effects for Ports, Inland Water Way, FUSRAP and Recreation. This is done by extracting multipliers and other economic measures from more than 1,500 regional economic models that were built specifically for USACE's project locations. These multipliers were then imported to a database and the tool matches various spending profiles to the matching industry sectors by location to produce economic impact estimates. The tool will be used as a means to document the performance of direct investment spending of the USACE as directed by the American Recovery and Reinvestment Act (ARRA). The Tool will also allow the USACE to evaluate project and program expenditures associated with the annual expenditure by the USACE.

1. ALTERNATIVE 1: NO ACTION

This alternative provides no regional benefits from construction spending, and is therefore not further described.

2. ALTERNATIVE 2: DREDGE TO SHORE (NO DOCK)

Table 1: Project Information

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

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	6%	$7,041,444	32%	80%	90%
Metals and Steel Materials	4%	$4,963,641	12%	24%	90%
Textiles, Lubricants, and Metal Valves and Parts (Dredging)	2%	$2,424,104	7%	8%	65%
Pipeline Dredge Equipment and Repairs	5%	$6,002,542	12%	35%	100%
Aggregate Materials	3%	$3,347,572	49%	87%	97%
Switchgear and Switchboard Apparatus Equipment	0%	$346,301	7%	8%	80%
Hopper Equipment and Repairs	2%	$2,193,237	1%	1%	97%
Construction of Other New Nonresidential Structures	14%	$15,698,956	50%	68%	100%
Industrial and Machinery Equipment Rental and Leasing	7%	$8,426,646	28%	82%	100%
Planning, Environmental, Engineering and Design Studies and Services	5%	$5,309,941	37%	63%	100%
USACE Overhead	7%	$7,618,611	52%	52%	100%
Repair and Maintenance Construction Activities	4%	$4,732,774	37%	82%	100%
Industrial Machinery and Equipment Repair and Maintenance	11%	$12,120,518	64%	95%	100%

USACE Wages and Benefits	13%	$15,352,656	75%	100%	100%
Private Sector Labor or Staff Augmentation	15%	$17,661,326	100%	100%	100%
All Other Food Manufacturing	2%	$2,193,237	9%	20%	90%
Total	**100%**	**$115,433,500**	**-**	**-**	**-**

The USACE is planning on expending $115,433,500 on the project. Of this total project expenditure $60,482,602 will be captured within the regional impact area. The rest will be dispersed to 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		$115,433,500	$115,433,500	$115,433,500
Direct Impact				
	Output	$60,482,602	$85,871,661	$112,884,851
	Job	1,211.00	1,396.26	1,625.13
	Labor Income	$39,471,054	$50,808,792	$62,185,756
	GRP	$44,857,938	$59,905,189	$74,270,076
Total Impact				
	Output	$81,864,086	$145,761,204	$300,484,777
	Job	1,406.40	1,804.98	2,755.44
	Labor Income	$45,564,899	$70,767,492	$123,407,977
	GRP	$57,341,661	$95,894,468	$180,310,239

Table 5: Economic Impact at Regional Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$1,696,780	0.20	$39,054	$240,429
171	Steel product manufacturing from purchased steel	$35,233	0.07	$5,362	$6,649
198	Valve and fittings other than plumbing manufacturing	$17,775	0.06	$3,873	$7,783
201	Fabricated pipe and pipe fitting manufacturing	$162,559	0.58	$32,158	$64,173
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$586,719	4.05	$247,907	$298,383

268	Switchgear and switchboard apparatus manufacturing	$808	0.00	$149	$336
290	Ship building and repairing	$1,158	0.00	$408	$468
319	Wholesale trade businesses	$1,055,095	7.22	$368,775	$782,814
322	Retail Stores - Electronics and appliances	$4,510	0.05	$1,574	$2,228
323	Retail Stores - Building material and garden supply	$529,020	6.79	$230,458	$350,059
324	Retail Stores - Food and beverage	$13,383	0.25	$6,266	$9,520
326	Retail Stores - Gasoline stations	$185,828	2.64	$74,744	$129,190
332	Transport by air	$1,566	0.01	$152	$437
333	Transport by rail	$60,906	0.17	$19,281	$32,593
334	Transport by water	$18,177	0.05	$3,244	$5,361
335	Transport by truck	$1,138,376	9.54	$455,328	$568,533
337	Transport by pipeline	$26,797	0.05	$7,273	$6,882
36	Construction of other new nonresidential structures	$7,878,678	62.64	$2,176,659	$2,841,635
365	Commercial and industrial machinery and equipment rental and leasing	$2,400,760	9.14	$499,596	$1,227,412
375	Environmental and other technical consulting services	$1,988,565	24.10	$1,143,989	$1,150,890
386	Business support services	$3,951,016	101.03	$1,750,923	$1,716,816
39	Maintenance and repair construction of nonresidential structures	$1,736,191	15.69	$545,752	$732,730
417	Commercial and industrial machinery and equipment repair and maintenance	$7,752,876	82.13	$4,310,214	$5,492,447
439	* Employment and payroll only (federal govt, non-military)	$11,514,492	148.78	$9,878,632	$11,514,492
5001	Labor	$17,661,326	735.55	$17,661,326	$17,661,326
69	All other food manufacturing	$64,009	0.18	$7,958	$14,350
	Total Direct Effects	$60,482,602	1,211.00	$39,471,054	$44,857,938
	Secondary Effects	$21,381,484	195.40	$6,093,845	$12,483,722
	Total Effects	**$81,864,086**	**1,406.40**	**$45,564,899**	**$57,341,661**

Table 6: Economic Impact at State Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$4,974,073	0.60	$136,944	$704,813
171	Steel product manufacturing from purchased steel	$522,545	1.09	$170,855	$206,743
198	Valve and fittings other than plumbing manufacturing	$17,775	0.06	$3,873	$7,783
201	Fabricated pipe and pipe fitting manufacturing	$1,502,753	5.84	$312,865	$593,237

26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$1,531,893	11.59	$647,272	$779,063
268	Switchgear and switchboard apparatus manufacturing	$808	0.00	$149	$336
290	Ship building and repairing	$6,805	0.03	$2,400	$2,749
319	Wholesale trade businesses	$1,145,268	7.84	$408,101	$853,027
322	Retail Stores - Electronics and appliances	$6,379	0.07	$2,380	$3,281
323	Retail Stores - Building material and garden supply	$619,762	7.95	$274,130	$413,265
324	Retail Stores - Food and beverage	$15,168	0.28	$7,172	$10,829
326	Retail Stores - Gasoline stations	$188,572	2.68	$75,875	$131,111
332	Transport by air	$6,712	0.03	$1,515	$2,821
333	Transport by rail	$60,906	0.17	$19,281	$32,593
334	Transport by water	$38,462	0.10	$7,057	$13,713
335	Transport by truck	$1,554,926	13.03	$650,973	$804,667
337	Transport by pipeline	$75,256	0.14	$26,159	$25,034
36	Construction of other new nonresidential structures	$10,744,001	85.42	$3,479,831	$4,364,666
365	Commercial and industrial machinery and equipment rental and leasing	$6,913,580	26.33	$1,628,385	$3,826,700
375	Environmental and other technical consulting services	$3,366,337	40.81	$2,087,707	$2,098,119
386	Business support services	$3,951,016	101.03	$1,750,923	$1,716,816
39	Maintenance and repair construction of nonresidential structures	$3,879,166	35.07	$1,563,207	$2,000,043
417	Commercial and industrial machinery and equipment repair and maintenance	$11,468,582	121.50	$6,500,716	$8,251,880
439	* Employment and payroll only (federal govt, non-military)	$15,337,285	198.17	$13,354,599	$15,337,285
5001	Labor	$17,661,326	735.55	$17,661,326	$17,661,326
69	All other food manufacturing	$282,306	0.87	$35,098	$63,290
	Total Direct Effects	$85,871,661	1,396.26	$50,808,792	$59,905,189
	Secondary Effects	$59,889,542	408.72	$19,958,700	$35,989,279
	Total Effects	**$145,761,204**	**1,804.98**	**$70,767,492**	**$95,894,468**

Table 7: Economic Impact at National Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$5,272,259	0.63	$183,419	$894,941
171	Steel product manufacturing from purchased steel	$3,595,530	7.48	$1,214,453	$1,468,534

198	Valve and fittings other than plumbing manufacturing	$1,243,066	4.31	$308,223	$598,520
201	Fabricated pipe and pipe fitting manufacturing	$4,740,506	18.55	$1,136,639	$1,986,875
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$1,653,570	12.56	$739,365	$893,423
268	Switchgear and switchboard apparatus manufacturing	$216,521	0.69	$51,234	$105,677
290	Ship building and repairing	$2,098,192	9.86	$740,043	$856,312
319	Wholesale trade businesses	$2,683,425	18.36	$1,082,711	$2,050,702
322	Retail Stores - Electronics and appliances	$11,081	0.13	$4,601	$6,187
323	Retail Stores - Building material and garden supply	$619,762	7.95	$274,130	$413,265
324	Retail Stores - Food and beverage	$15,352	0.29	$7,266	$10,964
326	Retail Stores - Gasoline stations	$190,115	2.70	$76,511	$132,191
332	Transport by air	$6,712	0.03	$1,605	$2,978
333	Transport by rail	$136,916	0.60	$43,547	$73,659
334	Transport by water	$38,548	0.10	$7,417	$14,492
335	Transport by truck	$1,729,718	14.50	$733,069	$903,753
337	Transport by pipeline	$77,429	0.14	$29,622	$28,378
36	Construction of other new nonresidential structures	$15,698,956	124.82	$5,733,385	$6,998,418
365	Commercial and industrial machinery and equipment rental and leasing	$8,414,335	32.05	$2,075,202	$4,691,103
375	Environmental and other technical consulting services	$5,309,237	64.36	$3,447,222	$3,462,734
386	Business support services	$7,616,206	194.75	$4,073,600	$4,015,386
39	Maintenance and repair construction of nonresidential structures	$4,731,424	42.77	$1,967,847	$2,504,052
417	Commercial and industrial machinery and equipment repair and maintenance	$12,116,413	128.36	$6,989,893	$8,732,986
439	* Employment and payroll only (federal govt, non-military)	$15,352,654	198.37	$13,368,574	$15,352,654
5001	Labor	$17,661,326	735.55	$17,661,326	$17,661,326
69	All other food manufacturing	$1,655,598	5.22	$234,851	$410,567
	Total Direct Effects	$112,884,851	1,625.13	$62,185,756	$74,270,076
	Secondary Effects	$187,599,926	1,130.31	$61,222,221	$106,040,163
	Total Effects	**$300,484,777**	**2,755.44**	**$123,407,977**	**$180,310,239**

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
Accomodations 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:	Navigation
Work Acitiy:	CWB - Navigation

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	* Employment and payroll only (federal govt, non-military)	439	8 %
2	Business support services	386	7 %
3	Construction of other new nonresidential structures	36	6 %
4	Food services and drinking places	413	5 %
5	Commercial and industrial machinery and equipment repair and maintenance	417	4 %
6	Real estate establishments	360	3 %
7	Wholesale trade businesses	319	3 %
8	Employment services	382	3 %
9	Maintenance and repair construction of nonresidential structures	39	3 %
10	Offices of physicians, dentists, and other health practitioners	394	2 %
			43 %

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	$5,272,259	21,242.60	$3,112,262	2,500.35	2,754.75	5,255.11	26,497.71
171	Steel product manufacturing from purchased steel	$3,595,530	8,358.85	$4,014,661	6,453.55	2,509.63	8,963.18	17,322.04
198	Valve and fittings other than plumbing manufacturing	$1,243,066	186.32	$938,683	291.66	151.00	442.66	628.98
201	Fabricated pipe and pipe fitting manufacturing	$4,740,506	1,415.81	$4,282,553	2,521.35	1,224.43	3,745.78	5,161.59
26	Mining and quarrying sand, gravel,	$1,653,570	8,321.63	$1,198,806	743.48	167.73	911.21	9,232.84

	clay, and ceramic and refractory minerals							
268	Switchgear and switchboard apparatus manufacturing	$216,521	40.76	$152,437	42.10	26.42	68.52	109.28
290	Ship building and repairing	$2,098,192	553.44	$1,790,681	841.23	390.55	1,231.77	1,785.21
319	Wholesale trade businesses	$2,683,425	286.45	$840,327	73.64	15.94	89.58	376.03
322	Retail Stores - Electronics and appliances	$11,081	2.77	$6,329	0.71	0.12	0.84	3.60
323	Retail Stores - Building material and garden supply	$619,762	154.70	$278,551	31.34	5.42	36.76	191.46
324	Retail Stores - Food and beverage	$15,352	3.83	$5,880	0.66	0.11	0.78	4.61
326	Retail Stores - Gasoline stations	$190,115	47.46	$81,893	9.21	1.59	10.81	58.26
332	Transport by air	$6,712	18.14	$4,290	1.62	0.43	2.05	20.19
333	Transport by rail	$136,916	142.66	$100,680	20.09	5.48	25.58	168.24
334	Transport by water	$38,548	188.00	$25,487	4.42	1.05	5.47	193.47
335	Transport by truck	$1,729,718	3,968.40	$1,115,254	656.34	100.30	756.64	4,725.04
337	Transport by pipeline	$77,429	185.94	$61,190	29.19	10.46	39.65	225.58
36	Construction of other new nonresidential structures	$15,698,956	5,599.93	$13,160,157	7,003.59	2,525.80	9,529.39	15,129.32
365	Commercial and industrial machinery and equipment rental and leasing	$8,414,335	3,452.67	$5,532,686	742.77	126.58	869.36	4,322.03
375	Environmental and other technical consulting services	$5,309,237	105.50	$2,346,019	293.79	64.82	358.61	464.12
386	Business support services	$7,616,206	305.22	$4,101,121	922.11	191.69	1,113.80	1,419.02
39	Maintenance and repair construction of	$4,731,424	2,016.00	$3,534,394	2,541.89	815.52	3,357.41	5,373.41

	nonresidential structures							
417	Commercial and industrial machinery and equipment repair and maintenance	$12,116,413	257.88	$4,166,875	1,509.02	787.11	2,296.14	2,554.02
439	* Employment and payroll only (federal govt, non-military)	$15,352,654	0.00	$0	0.00	0.00	0.00	0.00
69	All other food manufacturing	$1,655,598	399.55	$2,146,168	1,062.46	280.55	1,343.01	1,742.56
	Total	**$95,223,525**	**57,254.53**	**$52,997,381**	**28,296.58**	**12,157.52**	**40,454.09**	**97,708.62**

3. ALTERNATIVE 3: LIGHTERING WITH DETACHED BREAKWATER AND MOORING DOLPHINS

Table 1: Project Information

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

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	6%	$9,949,930	32%	80%	90%
Metals and Steel Materials	4%	$7,013,885	12%	24%	90%
Textiles, Lubricants, and Metal Valves and Parts (Dredging)	2%	$3,425,386	7%	8%	65%
Pipeline Dredge Equipment and Repairs	5%	$8,481,907	12%	35%	100%
Aggregate Materials	3%	$4,730,294	49%	87%	97%
Switchgear and Switchboard Apparatus Equipment	0%	$489,341	7%	8%	80%
Hopper Equipment and Repairs	2%	$3,099,158	1%	1%	97%
Construction of Other New Nonresidential Structures	14%	$22,183,450	50%	68%	100%
Industrial and Machinery Equipment Rental and Leasing	7%	$11,907,293	28%	82%	100%
Planning, Environmental, Engineering and Design Studies and Services	5%	$7,503,226	37%	63%	100%
USACE Overhead	7%	$10,765,498	52%	52%	100%
Repair and Maintenance Construction Activities	4%	$6,687,658	37%	82%	100%
Industrial Machinery and Equipment Repair and Maintenance	11%	$17,126,928	64%	95%	100%
USACE Wages and Benefits	13%	$21,694,109	75%	100%	100%
Private Sector Labor or Staff Augmentation	15%	$24,956,381	100%	100%	100%

All Other Food Manufacturing	2%	$3,099,158	9%	20%	90%
Total	**100%**	**$163,113,600**	**-**	**-**	**-**

The USACE is planning on expending $163,113,600 on the project. Of this total project expenditure $85,465,094 will be captured within the regional impact area. The rest will be dispersed to 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		$163,113,600	$163,113,600	$163,113,600
Direct Impact				
	Output	$85,465,094	$121,341,169	$159,512,225
	Job	1,711.21	1,972.99	2,296.40
	Labor Income	$55,774,673	$71,795,493	$87,871,740
	GRP	$63,386,623	$84,649,180	$104,947,519
Total Impact				
	Output	$115,678,254	$205,968,238	$424,600,777
	Job	1,987.31	2,550.53	3,893.58
	Labor Income	$64,385,596	$99,998,184	$174,381,955
	GRP	$81,026,779	$135,503,921	$254,787,840

Table 5: Economic Impact at Regional Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$2,397,640	0.29	$55,186	$339,739
171	Steel product manufacturing from purchased steel	$49,786	0.10	$7,576	$9,396
198	Valve and fittings other than plumbing manufacturing	$25,117	0.09	$5,472	$10,998
201	Fabricated pipe and pipe fitting manufacturing	$229,705	0.82	$45,441	$90,680
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$829,064	5.72	$350,305	$421,631

268	Switchgear and switchboard apparatus manufacturing	$1,142	0.00	$211	$474
290	Ship building and repairing	$1,636	0.01	$577	$661
319	Wholesale trade businesses	$1,490,905	10.20	$521,099	$1,106,158
322	Retail Stores - Electronics and appliances	$6,373	0.07	$2,224	$3,149
323	Retail Stores - Building material and garden supply	$747,534	9.59	$325,649	$494,652
324	Retail Stores - Food and beverage	$18,911	0.35	$8,854	$13,453
326	Retail Stores - Gasoline stations	$262,585	3.74	$105,617	$182,553
332	Transport by air	$2,213	0.01	$215	$617
333	Transport by rail	$86,063	0.25	$27,245	$46,056
334	Transport by water	$25,685	0.07	$4,584	$7,575
335	Transport by truck	$1,608,584	13.48	$643,402	$803,368
337	Transport by pipeline	$37,866	0.07	$10,277	$9,725
36	Construction of other new nonresidential structures	$11,132,985	88.51	$3,075,734	$4,015,379
365	Commercial and industrial machinery and equipment rental and leasing	$3,392,401	12.92	$705,955	$1,734,397
375	Environmental and other technical consulting services	$2,809,946	34.06	$1,616,517	$1,626,268
386	Business support services	$5,582,993	142.76	$2,474,146	$2,425,951
39	Maintenance and repair construction of nonresidential structures	$2,453,330	22.18	$771,177	$1,035,387
417	Commercial and industrial machinery and equipment repair and maintenance	$10,955,221	116.06	$6,090,559	$7,761,116
439	* Employment and payroll only (federal govt, non-military)	$16,270,582	210.23	$13,959,026	$16,270,582
5001	Labor	$24,956,381	1,039.36	$24,956,381	$24,956,381
69	All other food manufacturing	$90,447	0.26	$11,245	$20,277
	Total Direct Effects	$85,465,094	1,711.21	$55,774,673	$63,386,623
	Secondary Effects	$30,213,160	276.11	$8,610,922	$17,640,156
	Total Effects	**$115,678,254**	**1,987.31**	**$64,385,596**	**$81,026,779**

Table 6: Economic Impact at State Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$7,028,626	0.84	$193,508	$995,938
171	Steel product manufacturing from purchased steel	$738,384	1.54	$241,427	$292,139
198	Valve and fittings other than plumbing manufacturing	$25,117	0.09	$5,472	$10,998

201	Fabricated pipe and pipe fitting manufacturing	$2,123,468	8.25	$442,095	$838,275
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$2,164,645	16.37	$914,629	$1,100,857
268	Switchgear and switchboard apparatus manufacturing	$1,142	0.00	$211	$474
290	Ship building and repairing	$9,616	0.04	$3,392	$3,885
319	Wholesale trade businesses	$1,618,324	11.07	$576,669	$1,205,372
322	Retail Stores - Electronics and appliances	$9,014	0.11	$3,363	$4,636
323	Retail Stores - Building material and garden supply	$875,757	11.24	$387,360	$583,965
324	Retail Stores - Food and beverage	$21,433	0.40	$10,135	$15,302
326	Retail Stores - Gasoline stations	$266,463	3.79	$107,216	$185,267
332	Transport by air	$9,484	0.05	$2,141	$3,986
333	Transport by rail	$86,063	0.25	$27,245	$46,056
334	Transport by water	$54,349	0.14	$9,972	$19,377
335	Transport by truck	$2,197,191	18.42	$919,859	$1,137,037
337	Transport by pipeline	$106,341	0.20	$36,964	$35,374
36	Construction of other new nonresidential structures	$15,181,837	120.70	$4,917,184	$6,167,502
365	Commercial and industrial machinery and equipment rental and leasing	$9,769,252	37.21	$2,300,994	$5,407,328
375	Environmental and other technical consulting services	$4,756,812	57.66	$2,950,040	$2,964,753
386	Business support services	$5,582,993	142.76	$2,474,146	$2,425,951
39	Maintenance and repair construction of nonresidential structures	$5,481,465	49.55	$2,208,893	$2,826,166
417	Commercial and industrial machinery and equipment repair and maintenance	$16,205,709	171.68	$9,185,853	$11,660,339
439	* Employment and payroll only (federal govt, non-military)	$21,672,390	280.03	$18,870,750	$21,672,390
5001	Labor	$24,956,381	1,039.36	$24,956,381	$24,956,381
69	All other food manufacturing	$398,914	1.23	$49,595	$89,432
	Total Direct Effects	$121,341,169	1,972.99	$71,795,493	$84,649,180
	Secondary Effects	$84,627,069	577.54	$28,202,691	$50,854,741
	Total Effects	**$205,968,238**	**2,550.53**	**$99,998,184**	**$135,503,921**

Table 7: Economic Impact at National Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				

115	Petroleum refineries	$7,449,979	0.89	$259,181	$1,264,599
171	Steel product manufacturing from purchased steel	$5,080,672	10.56	$1,716,085	$2,075,115
198	Valve and fittings other than plumbing manufacturing	$1,756,517	6.09	$435,536	$845,740
201	Fabricated pipe and pipe fitting manufacturing	$6,698,585	26.22	$1,606,131	$2,807,558
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$2,336,581	17.75	$1,044,761	$1,262,453
268	Switchgear and switchboard apparatus manufacturing	$305,955	0.98	$72,396	$149,328
290	Ship building and repairing	$2,964,856	13.93	$1,045,720	$1,210,013
319	Wholesale trade businesses	$3,791,820	25.94	$1,529,928	$2,897,749
322	Retail Stores - Electronics and appliances	$15,659	0.18	$6,501	$8,743
323	Retail Stores - Building material and garden supply	$875,757	11.24	$387,360	$583,965
324	Retail Stores - Food and beverage	$21,694	0.41	$10,267	$15,493
326	Retail Stores - Gasoline stations	$268,642	3.82	$108,115	$186,793
332	Transport by air	$9,484	0.05	$2,268	$4,208
333	Transport by rail	$193,470	0.84	$61,534	$104,085
334	Transport by water	$54,471	0.14	$10,481	$20,478
335	Transport by truck	$2,444,182	20.49	$1,035,865	$1,277,051
337	Transport by pipeline	$109,412	0.20	$41,858	$40,099
36	Construction of other new nonresidential structures	$22,183,450	176.37	$8,101,574	$9,889,133
365	Commercial and industrial machinery and equipment rental and leasing	$11,889,897	45.28	$2,932,370	$6,628,775
375	Environmental and other technical consulting services	$7,502,231	90.94	$4,871,106	$4,893,026
386	Business support services	$10,762,099	275.20	$5,756,210	$5,673,951
39	Maintenance and repair construction of nonresidential structures	$6,685,751	60.44	$2,780,672	$3,538,357
417	Commercial and industrial machinery and equipment repair and maintenance	$17,121,129	181.38	$9,877,086	$12,340,168
439	* Employment and payroll only (federal govt, non-military)	$21,694,107	280.31	$18,890,497	$21,694,107
5001	Labor	$24,956,381	1,039.36	$24,956,381	$24,956,381
69	All other food manufacturing	$2,339,446	7.37	$331,857	$580,153
	Total Direct Effects	$159,512,225	2,296.40	$87,871,740	$104,947,519

	Secondary Effects	$265,088,552	1,597.19	$86,510,215	$149,840,321
	Total Effects	**$424,600,777**	**3,893.58**	**$174,381,955**	**$254,787,840**

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
Accomodations 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:	Navigation
Work Acitiy:	CWB - Navigation

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	* Employment and payroll only (federal govt, non-military)	439	8 %
2	Business support services	386	7 %
3	Construction of other new nonresidential structures	36	6 %
4	Food services and drinking places	413	5 %
5	Commercial and industrial machinery and equipment repair and maintenance	417	4 %
6	Real estate establishments	360	3 %
7	Wholesale trade businesses	319	3 %
8	Employment services	382	3 %
9	Maintenance and repair construction of nonresidential structures	39	3 %
10	Offices of physicians, dentists, and other health practitioners	394	2 %
			43 %

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	$7,449,979	30,016.91	$4,397,790	3,533.13	3,892.61	7,425.74	37,442.66
171	Steel product manufacturing from purchased steel	$5,080,672	11,811.50	$5,672,926	9,119.21	3,546.24	12,665.45	24,476.95
198	Valve and fittings other than plumbing manufacturing	$1,756,517	263.28	$1,326,408	412.12	213.37	625.50	888.78
201	Fabricated pipe and	$6,698,585	2,000.62	$6,051,473	3,562.79	1,730.19	5,292.98	7,293.60

	pipe fitting manufacturing							
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$2,336,581	11,758.89	$1,693,976	1,050.58	237.01	1,287.59	13,046.49
268	Switchgear and switchboard apparatus manufacturing	$305,955	57.60	$215,401	59.49	37.34	96.82	154.42
290	Ship building and repairing	$2,964,856	782.04	$2,530,327	1,188.70	551.86	1,740.56	2,522.60
319	Wholesale trade businesses	$3,791,820	404.77	$1,187,426	104.06	22.52	126.58	531.35
322	Retail Stores - Electronics and appliances	$15,659	3.91	$8,943	1.01	0.17	1.18	5.09
323	Retail Stores - Building material and garden supply	$875,757	218.60	$393,607	44.28	7.66	51.94	270.55
324	Retail Stores - Food and beverage	$21,694	5.42	$8,309	0.93	0.16	1.10	6.51
326	Retail Stores - Gasoline stations	$268,642	67.06	$115,719	13.02	2.25	15.27	82.33
332	Transport by air	$9,484	25.64	$6,062	2.28	0.61	2.89	28.53
333	Transport by rail	$193,470	201.59	$142,265	28.39	7.75	36.14	237.73
334	Transport by water	$54,471	265.66	$36,015	6.25	1.49	7.73	273.39
335	Transport by truck	$2,444,182	5,607.56	$1,575,912	927.44	141.74	1,069.17	6,676.73
337	Transport by pipeline	$109,412	262.74	$86,464	41.24	14.79	56.03	318.76
36	Construction of other new nonresidential structures	$22,183,450	7,913.00	$18,595,993	9,896.45	3,569.09	13,465.53	21,378.53
365	Commercial and industrial machinery and equipment rental and leasing	$11,889,897	4,878.81	$7,817,976	1,049.58	178.87	1,228.45	6,107.26
375	Environmental and other technical consulting services	$7,502,231	149.08	$3,315,047	415.14	91.60	506.74	655.82

386	Business support services	$10,762,099	431.29	$5,795,100	1,302.99	270.86	1,573.85	2,005.15
39	Maintenance and repair construction of nonresidential structures	$6,685,751	2,848.72	$4,994,285	3,591.83	1,152.37	4,744.19	7,592.91
417	Commercial and industrial machinery and equipment repair and maintenance	$17,121,129	364.40	$5,888,013	2,132.33	1,112.23	3,244.56	3,608.97
439	* Employment and payroll only (federal govt, non-military)	$21,694,107	0.00	$0	0.00	0.00	0.00	0.00
69	All other food manufacturing	$2,339,446	564.59	$3,032,648	1,501.32	396.43	1,897.74	2,462.33
	Total	**$134,555,844**	**80,903.66**	**$74,888,084**	**39,984.55**	**17,179.21**	**57,163.76**	**138,067.42**

4. ALTERNATIVE 4: TRESTLE TO DOCK IN DEEP WATER (NO DREDGING)

Table 1: Project Information

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

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	6%	$9,490,996	32%	80%	90%
Metals and Steel Materials	4%	$6,690,374	12%	24%	90%
Textiles, Lubricants, and Metal Valves and Parts (Dredging)	2%	$3,267,392	7%	8%	65%
Pipeline Dredge Equipment and Repairs	5%	$8,090,685	12%	35%	100%
Aggregate Materials	3%	$4,512,113	49%	87%	97%
Switchgear and Switchboard Apparatus Equipment	0%	$466,770	7%	8%	80%
Hopper Equipment and Repairs	2%	$2,956,212	1%	1%	97%
Construction of Other New Nonresidential Structures	14%	$21,160,254	50%	68%	100%
Industrial and Machinery Equipment Rental and Leasing	7%	$11,358,077	28%	82%	100%
Planning, Environmental, Engineering and Design Studies and Services	5%	$7,157,145	37%	63%	100%
USACE Overhead	7%	$10,268,947	52%	52%	100%
Repair and Maintenance Construction Activities	4%	$6,379,194	37%	82%	100%
Industrial Machinery and Equipment Repair and Maintenance	11%	$16,336,961	64%	95%	100%
USACE Wages and Benefits	13%	$20,693,483	75%	100%	100%
Private Sector Labor or Staff Augmentation	15%	$23,805,285	100%	100%	100%
All Other Food Manufacturing	2%	$2,956,212	9%	20%	90%

Total	**100%**	**$155,590,100**	**-**	**-**	**-**

The USACE is planning on expending $155,590,100 on the project. Of this total project expenditure $81,523,076 will be captured within the regional impact area. The rest will be dispersed to 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		$155,590,100	$155,590,100	$155,590,100
Direct Impact				
	Output	$81,523,076	$115,744,393	$152,154,836
	Job	1,632.28	1,881.99	2,190.48
	Labor Income	$53,202,106	$68,483,976	$83,818,718
	GRP	$60,462,960	$80,744,796	$100,106,889
Total Impact				
	Output	$110,342,676	$196,468,098	$405,016,365
	Job	1,895.65	2,432.89	3,713.99
	Labor Income	$61,415,856	$95,385,839	$166,338,710
	GRP	$77,289,476	$129,253,898	$243,035,930

Table 5: Economic Impact at Regional Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$2,287,051	0.27	$52,640	$324,069
171	Steel product manufacturing from purchased steel	$47,490	0.10	$7,227	$8,962
198	Valve and fittings other than plumbing manufacturing	$23,958	0.08	$5,220	$10,491
201	Fabricated pipe and pipe fitting manufacturing	$219,110	0.78	$43,345	$86,497
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$790,824	5.45	$334,147	$402,183
268	Switchgear and switchboard apparatus manufacturing	$1,089	0.00	$201	$453

290	Ship building and repairing	$1,561	0.01	$551	$631
319	Wholesale trade businesses	$1,422,138	9.73	$497,064	$1,055,137
322	Retail Stores - Electronics and appliances	$6,079	0.07	$2,121	$3,003
323	Retail Stores - Building material and garden supply	$713,054	9.15	$310,629	$471,837
324	Retail Stores - Food and beverage	$18,039	0.34	$8,446	$12,832
326	Retail Stores - Gasoline stations	$250,473	3.56	$100,746	$174,133
332	Transport by air	$2,111	0.01	$205	$589
333	Transport by rail	$82,093	0.24	$25,988	$43,932
334	Transport by water	$24,500	0.06	$4,373	$7,226
335	Transport by truck	$1,534,390	12.86	$613,726	$766,313
337	Transport by pipeline	$36,119	0.07	$9,803	$9,277
36	Construction of other new nonresidential structures	$10,619,484	84.43	$2,933,868	$3,830,173
365	Commercial and industrial machinery and equipment rental and leasing	$3,235,929	12.32	$673,394	$1,654,400
375	Environmental and other technical consulting services	$2,680,340	32.49	$1,541,956	$1,551,258
386	Business support services	$5,325,482	136.18	$2,360,028	$2,314,056
39	Maintenance and repair construction of nonresidential structures	$2,340,172	21.15	$735,607	$987,630
417	Commercial and industrial machinery and equipment repair and maintenance	$10,449,919	110.71	$5,809,636	$7,403,140
439	* Employment and payroll only (federal govt, non-military)	$15,520,112	200.54	$13,315,175	$15,520,112
5001	Labor	$23,805,285	991.42	$23,805,285	$23,805,285
69	All other food manufacturing	$86,276	0.25	$10,726	$19,342
	Total Direct Effects	$81,523,076	1,632.28	$53,202,106	$60,462,960
	Secondary Effects	$28,819,599	263.37	$8,213,750	$16,826,516
	Total Effects	**$110,342,676**	**1,895.65**	**$61,415,856**	**$77,289,476**

Table 6: Economic Impact at State Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$6,704,435	0.80	$184,583	$950,001
171	Steel product manufacturing from purchased steel	$704,326	1.46	$230,291	$278,664
198	Valve and fittings other than plumbing manufacturing	$23,958	0.08	$5,220	$10,491
201	Fabricated pipe and pipe fitting manufacturing	$2,025,525	7.87	$421,703	$799,610

26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$2,064,803	15.62	$872,442	$1,050,081
268	Switchgear and switchboard apparatus manufacturing	$1,089	0.00	$201	$453
290	Ship building and repairing	$9,173	0.04	$3,235	$3,705
319	Wholesale trade businesses	$1,543,680	10.56	$550,070	$1,149,775
322	Retail Stores - Electronics and appliances	$8,599	0.10	$3,208	$4,422
323	Retail Stores - Building material and garden supply	$835,363	10.72	$369,494	$557,030
324	Retail Stores - Food and beverage	$20,444	0.38	$9,667	$14,596
326	Retail Stores - Gasoline stations	$254,172	3.62	$102,271	$176,722
332	Transport by air	$9,046	0.04	$2,042	$3,802
333	Transport by rail	$82,093	0.24	$25,988	$43,932
334	Transport by water	$51,842	0.13	$9,512	$18,483
335	Transport by truck	$2,095,848	17.57	$877,431	$1,084,592
337	Transport by pipeline	$101,436	0.19	$35,259	$33,742
36	Construction of other new nonresidential structures	$14,481,586	115.14	$4,690,383	$5,883,031
365	Commercial and industrial machinery and equipment rental and leasing	$9,318,652	35.49	$2,194,862	$5,157,919
375	Environmental and other technical consulting services	$4,537,407	55.00	$2,813,971	$2,828,006
386	Business support services	$5,325,482	136.18	$2,360,028	$2,314,056
39	Maintenance and repair construction of nonresidential structures	$5,228,636	47.26	$2,107,010	$2,695,811
417	Commercial and industrial machinery and equipment repair and maintenance	$15,458,232	163.77	$8,762,162	$11,122,514
439	* Employment and payroll only (federal govt, non-military)	$20,672,766	267.11	$18,000,350	$20,672,766
5001	Labor	$23,805,285	991.42	$23,805,285	$23,805,285
69	All other food manufacturing	$380,514	1.18	$47,308	$85,307
	Total Direct Effects	$115,744,393	1,881.99	$68,483,976	$80,744,796
	Secondary Effects	$80,723,705	550.90	$26,901,862	$48,509,102
	Total Effects	**$196,468,098**	**2,432.89**	**$95,385,839**	**$129,253,898**

Table 7: Economic Impact at National Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$7,106,354	0.85	$247,226	$1,206,270

171	Steel product manufacturing from purchased steel	$4,846,330	10.08	$1,636,932	$1,979,402
198	Valve and fittings other than plumbing manufacturing	$1,675,499	5.81	$415,447	$806,731
201	Fabricated pipe and pipe fitting manufacturing	$6,389,617	25.01	$1,532,049	$2,678,062
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$2,228,808	16.93	$996,572	$1,204,224
268	Switchgear and switchboard apparatus manufacturing	$291,843	0.94	$69,057	$142,440
290	Ship building and repairing	$2,828,104	13.29	$997,487	$1,154,202
319	Wholesale trade businesses	$3,616,925	24.75	$1,459,361	$2,764,093
322	Retail Stores - Electronics and appliances	$14,936	0.17	$6,202	$8,340
323	Retail Stores - Building material and garden supply	$835,363	10.72	$369,494	$557,030
324	Retail Stores - Food and beverage	$20,693	0.39	$9,794	$14,778
326	Retail Stores - Gasoline stations	$256,251	3.65	$103,128	$178,177
332	Transport by air	$9,046	0.04	$2,163	$4,014
333	Transport by rail	$184,546	0.80	$58,696	$99,284
334	Transport by water	$51,958	0.13	$9,997	$19,533
335	Transport by truck	$2,331,446	19.54	$988,087	$1,218,148
337	Transport by pipeline	$104,365	0.19	$39,927	$38,250
36	Construction of other new nonresidential structures	$21,160,254	168.24	$7,727,895	$9,433,004
365	Commercial and industrial machinery and equipment rental and leasing	$11,341,484	43.20	$2,797,116	$6,323,028
375	Environmental and other technical consulting services	$7,156,196	86.75	$4,646,429	$4,667,338
386	Business support services	$10,265,705	262.50	$5,490,709	$5,412,244
39	Maintenance and repair construction of nonresidential structures	$6,377,375	57.65	$2,652,415	$3,375,152
417	Commercial and industrial machinery and equipment repair and maintenance	$16,331,429	173.02	$9,421,513	$11,770,986
439	* Employment and payroll only (federal govt, non-military)	$20,693,481	267.38	$18,019,186	$20,693,481
5001	Labor	$23,805,285	991.42	$23,805,285	$23,805,285
69	All other food manufacturing	$2,231,541	7.03	$316,550	$553,394
	Total Direct Effects	$152,154,836	2,190.48	$83,818,718	$100,106,889
	Secondary Effects	$252,861,529	1,523.52	$82,519,992	$142,929,042

Total Effects	**$405,016,365**	**3,713.99**	**$166,338,710**	**$243,035,930**

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
Accomodations 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:	Navigation
Work Acitiy:	CWB - Navigation

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	* Employment and payroll only (federal govt, non-military)	439	8 %
2	Business support services	386	7 %
3	Construction of other new nonresidential structures	36	6 %
4	Food services and drinking places	413	5 %
5	Commercial and industrial machinery and equipment repair and maintenance	417	4 %
6	Real estate establishments	360	3 %
7	Wholesale trade businesses	319	3 %
8	Employment services	382	3 %
9	Maintenance and repair construction of nonresidential structures	39	3 %
10	Offices of physicians, dentists, and other health practitioners	394	2 %
			43 %

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	$7,106,354	28,632.41	$4,194,945	3,370.17	3,713.07	7,083.24	35,715.64
171	Steel product manufacturing from purchased steel	$4,846,330	11,266.70	$5,411,267	8,698.59	3,382.67	12,081.26	23,347.97
198	Valve and fittings other than plumbing manufacturing	$1,675,499	251.14	$1,265,228	393.12	203.53	596.65	847.78
201	Fabricated pipe and pipe fitting	$6,389,617	1,908.34	$5,772,353	3,398.46	1,650.39	5,048.85	6,957.19

	manufacturing							
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$2,228,808	11,216.52	$1,615,842	1,002.13	226.08	1,228.20	12,444.73
268	Switchgear and switchboard apparatus manufacturing	$291,843	54.94	$205,466	56.74	35.61	92.36	147.29
290	Ship building and repairing	$2,828,104	745.97	$2,413,617	1,133.87	526.41	1,660.28	2,406.24
319	Wholesale trade businesses	$3,616,925	386.10	$1,132,657	99.26	21.49	120.75	506.85
322	Retail Stores - Electronics and appliances	$14,936	3.73	$8,530	0.96	0.17	1.13	4.85
323	Retail Stores - Building material and garden supply	$835,363	208.52	$375,453	42.24	7.31	49.55	258.07
324	Retail Stores - Food and beverage	$20,693	5.17	$7,925	0.89	0.15	1.05	6.21
326	Retail Stores - Gasoline stations	$256,251	63.96	$110,382	12.42	2.15	14.57	78.53
332	Transport by air	$9,046	24.46	$5,782	2.18	0.58	2.76	27.22
333	Transport by rail	$184,546	192.29	$135,704	27.08	7.39	34.48	226.77
334	Transport by water	$51,958	253.40	$34,354	5.96	1.42	7.38	260.78
335	Transport by truck	$2,331,446	5,348.91	$1,503,225	884.66	135.20	1,019.86	6,368.77
337	Transport by pipeline	$104,365	250.62	$82,476	39.34	14.10	53.44	304.06
36	Construction of other new nonresidential structures	$21,160,254	7,548.01	$17,738,266	9,439.98	3,404.46	12,844.44	20,392.46
365	Commercial and industrial machinery and equipment rental and leasing	$11,341,484	4,653.78	$7,457,378	1,001.17	170.62	1,171.79	5,825.56
375	Environmental and other technical consulting services	$7,156,196	142.21	$3,162,143	395.99	87.38	483.37	625.57
386	Business support services	$10,265,705	411.40	$5,527,805	1,242.89	258.37	1,501.26	1,912.66

39	Maintenance and repair construction of nonresidential structures	$6,377,375	2,717.32	$4,763,927	3,426.15	1,099.22	4,525.37	7,242.69
417	Commercial and industrial machinery and equipment repair and maintenance	$16,331,429	347.60	$5,616,432	2,033.98	1,060.93	3,094.91	3,442.51
439	* Employment and payroll only (federal govt, non-military)	$20,693,481	0.00	$0	0.00	0.00	0.00	0.00
69	All other food manufacturing	$2,231,541	538.54	$2,892,769	1,432.07	378.14	1,810.21	2,348.76
	Total	**$128,349,551**	**77,172.03**	**$71,433,924**	**38,140.29**	**16,386.83**	**54,527.12**	**131,699.15**

5. ALTERNATIVE 5: CAUSEWAY TO DOCK IN DEEP WATER (NO DREDGING)

Table 1: Project Information

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

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	6%	$25,432,321	32%	80%	90%
Metals and Steel Materials	4%	$17,927,702	12%	24%	90%
Textiles, Lubricants, and Metal Valves and Parts (Dredging)	2%	$8,755,389	7%	8%	65%
Pipeline Dredge Equipment and Repairs	5%	$21,680,012	12%	35%	100%
Aggregate Materials	3%	$12,090,776	49%	87%	97%
Switchgear and Switchboard Apparatus Equipment	0%	$1,250,770	7%	8%	80%
Hopper Equipment and Repairs	2%	$7,921,543	1%	1%	97%
Construction of Other New Nonresidential Structures	14%	$56,701,569	50%	68%	100%
Industrial and Machinery Equipment Rental and Leasing	7%	$30,435,401	28%	82%	100%
Planning, Environmental, Engineering and Design Studies and Services	5%	$19,178,472	37%	63%	100%
USACE Overhead	7%	$27,516,938	52%	52%	100%
Repair and Maintenance Construction Activities	4%	$17,093,855	37%	82%	100%
Industrial Machinery and Equipment Repair and Maintenance	11%	$43,776,947	64%	95%	100%
USACE Wages and Benefits	13%	$55,450,799	75%	100%	100%
Private Sector Labor or Staff Augmentation	15%	$63,789,265	100%	100%	100%
All Other Food Manufacturing	2%	$7,921,543	9%	20%	90%

Total	**100%**	**$416,923,300**	**-**	**-**	**-**

The USACE is planning on expending $416,923,300 on the project. Of this total project expenditure $218,451,367 will be captured within the regional impact area. The rest will be dispersed to 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		$416,923,300	$416,923,300	$416,923,300
Direct Impact				
	Output	$218,451,367	$310,151,702	$407,718,076
	Job	4,373.89	5,043.02	5,869.66
	Labor Income	$142,561,754	$183,511,454	$224,602,828
	GRP	$162,018,128	$216,365,867	$268,249,037
Total Impact				
	Output	$295,677,119	$526,461,053	$1,085,292,440
	Job	5,079.64	6,519.23	9,952.12
	Labor Income	$164,571,532	$255,598,387	$445,725,556
	GRP	$207,106,900	$346,352,125	$651,245,434

Table 5: Economic Impact at Regional Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$6,128,440	0.73	$141,056	$868,384
171	Steel product manufacturing from purchased steel	$127,254	0.26	$19,365	$24,016
198	Valve and fittings other than plumbing manufacturing	$64,199	0.22	$13,988	$28,112
201	Fabricated pipe and pipe fitting manufacturing	$587,132	2.09	$116,148	$231,780
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$2,119,113	14.62	$895,390	$1,077,701

268	Switchgear and switchboard apparatus manufacturing	$2,919	0.01	$538	$1,213
290	Ship building and repairing	$4,182	0.02	$1,475	$1,690
319	Wholesale trade businesses	$3,810,797	26.07	$1,331,945	$2,827,372
322	Retail Stores - Electronics and appliances	$16,290	0.19	$5,684	$8,048
323	Retail Stores - Building material and garden supply	$1,910,719	24.52	$832,370	$1,264,346
324	Retail Stores - Food and beverage	$48,338	0.90	$22,631	$34,385
326	Retail Stores - Gasoline stations	$671,174	9.55	$269,961	$466,610
332	Transport by air	$5,656	0.03	$550	$1,578
333	Transport by rail	$219,979	0.63	$69,638	$117,721
334	Transport by water	$65,651	0.17	$11,717	$19,363
335	Transport by truck	$4,111,591	34.46	$1,644,556	$2,053,432
337	Transport by pipeline	$96,786	0.18	$26,268	$24,858
36	Construction of other new nonresidential structures	$28,456,247	226.24	$7,861,669	$10,263,431
365	Commercial and industrial machinery and equipment rental and leasing	$8,671,079	33.02	$1,804,443	$4,433,172
375	Environmental and other technical consulting services	$7,182,308	87.06	$4,131,865	$4,156,791
386	Business support services	$14,270,300	364.91	$6,323,992	$6,200,805
39	Maintenance and repair construction of nonresidential structures	$6,270,785	56.68	$1,971,151	$2,646,480
417	Commercial and industrial machinery and equipment repair and maintenance	$28,001,876	296.65	$15,567,654	$19,837,647
439	* Employment and payroll only (federal govt, non-military)	$41,588,099	537.36	$35,679,692	$41,588,099
5001	Labor	$63,789,265	2,656.65	$63,789,265	$63,789,265
69	All other food manufacturing	$231,186	0.66	$28,743	$51,829
	Total Direct Effects	$218,451,367	4,373.89	$142,561,754	$162,018,128
	Secondary Effects	$77,225,752	705.74	$22,009,779	$45,088,772
	Total Effects	**$295,677,119**	**5,079.64**	**$164,571,532**	**$207,106,900**

Table 6: Economic Impact at State Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$17,965,381	2.15	$494,613	$2,545,648

171	Steel product manufacturing from purchased steel	$1,887,332	3.92	$617,095	$746,716
198	Valve and fittings other than plumbing manufacturing	$64,199	0.22	$13,988	$28,112
201	Fabricated pipe and pipe fitting manufacturing	$5,427,649	21.10	$1,130,008	$2,142,657
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$5,532,899	41.85	$2,337,819	$2,813,824
268	Switchgear and switchboard apparatus manufacturing	$2,919	0.01	$538	$1,213
290	Ship building and repairing	$24,579	0.11	$8,669	$9,929
319	Wholesale trade businesses	$4,136,484	28.30	$1,473,983	$3,080,966
322	Retail Stores - Electronics and appliances	$23,041	0.27	$8,596	$11,850
323	Retail Stores - Building material and garden supply	$2,238,461	28.73	$990,105	$1,492,631
324	Retail Stores - Food and beverage	$54,783	1.02	$25,905	$39,111
326	Retail Stores - Gasoline stations	$681,087	9.69	$274,047	$473,548
332	Transport by air	$24,241	0.12	$5,473	$10,188
333	Transport by rail	$219,979	0.63	$69,638	$117,721
334	Transport by water	$138,918	0.35	$25,488	$49,528
335	Transport by truck	$5,616,088	47.07	$2,351,187	$2,906,301
337	Transport by pipeline	$271,811	0.51	$94,481	$90,417
36	Construction of other new nonresidential structures	$38,805,236	308.52	$12,568,472	$15,764,323
365	Commercial and industrial machinery and equipment rental and leasing	$24,970,503	95.10	$5,881,410	$13,821,295
375	Environmental and other technical consulting services	$12,158,555	147.38	$7,540,391	$7,577,998
386	Business support services	$14,270,300	364.91	$6,323,992	$6,200,805
39	Maintenance and repair construction of nonresidential structures	$14,010,790	126.65	$5,645,998	$7,223,765
417	Commercial and industrial machinery and equipment repair and maintenance	$41,422,282	438.83	$23,479,318	$29,804,180
439	* Employment and payroll only (federal govt, non-military)	$55,395,285	715.76	$48,234,209	$55,395,285
5001	Labor	$63,789,265	2,656.65	$63,789,265	$63,789,265
69	All other food manufacturing	$1,019,635	3.15	$126,767	$228,590
	Total Direct Effects	$310,151,702	5,043.02	$183,511,454	$216,365,867
	Secondary Effects	$216,309,351	1,476.21	$72,086,933	$129,986,259

	Total Effects	**$526,461,053**	**6,519.23**	**$255,598,387**	**$346,352,125**

Table 7: Economic Impact at National Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$19,042,371	2.28	$662,474	$3,232,353
171	Steel product manufacturing from purchased steel	$12,986,352	27.00	$4,386,366	$5,304,057
198	Valve and fittings other than plumbing manufacturing	$4,489,710	15.57	$1,113,243	$2,161,738
201	Fabricated pipe and pipe fitting manufacturing	$17,121,785	67.01	$4,105,320	$7,176,204
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$5,972,372	45.36	$2,670,441	$3,226,869
268	Switchgear and switchboard apparatus manufacturing	$782,030	2.51	$185,046	$381,686
290	Ship building and repairing	$7,578,262	35.61	$2,672,893	$3,092,831
319	Wholesale trade businesses	$9,692,007	66.31	$3,910,541	$7,406,735
322	Retail Stores - Electronics and appliances	$40,024	0.47	$16,618	$22,347
323	Retail Stores - Building material and garden supply	$2,238,461	28.73	$990,105	$1,492,631
324	Retail Stores - Food and beverage	$55,450	1.04	$26,244	$39,600
326	Retail Stores - Gasoline stations	$686,657	9.77	$276,344	$477,448
332	Transport by air	$24,241	0.12	$5,797	$10,756
333	Transport by rail	$494,516	2.15	$157,282	$266,044
334	Transport by water	$139,229	0.36	$26,789	$52,342
335	Transport by truck	$6,247,404	52.36	$2,647,703	$3,264,181
337	Transport by pipeline	$279,660	0.52	$106,990	$102,494
36	Construction of other new nonresidential structures	$56,701,569	450.81	$20,707,868	$25,276,923
365	Commercial and industrial machinery and equipment rental and leasing	$30,390,938	115.75	$7,495,226	$16,943,350
375	Environmental and other technical consulting services	$19,175,929	232.45	$12,450,693	$12,506,721
386	Business support services	$27,508,251	703.41	$14,713,048	$14,502,790
39	Maintenance and repair construction of	$17,088,982	154.48	$7,107,481	$9,044,147

	nonresidential structures				
417	Commercial and industrial machinery and equipment repair and maintenance	$43,762,124	463.62	$25,246,132	$31,541,842
439	* Employment and payroll only (federal govt, non-military)	$55,450,793	716.48	$48,284,683	$55,450,793
5001	Labor	$63,789,265	2,656.65	$63,789,265	$63,789,265
69	All other food manufacturing	$5,979,695	18.84	$848,236	$1,482,890
	Total Direct Effects	$407,718,076	5,869.66	$224,602,828	$268,249,037
	Secondary Effects	$677,574,364	4,082.46	$221,122,728	$382,996,397
	Total Effects	**$1,085,292,440**	**9,952.12**	**$445,725,556**	**$651,245,434**

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
Accomodations 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:	Navigation
Work Acitiy:	CWB - Navigation

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	* Employment and payroll only (federal govt, non-military)	439	8 %
2	Business support services	386	7 %
3	Construction of other new nonresidential structures	36	6 %
4	Food services and drinking places	413	5 %
5	Commercial and industrial machinery and equipment repair and maintenance	417	4 %
6	Real estate establishments	360	3 %
7	Wholesale trade businesses	319	3 %
8	Employment services	382	3 %
9	Maintenance and repair construction of nonresidential structures	39	3 %
10	Offices of physicians, dentists, and other health practitioners	394	2 %
			43 %

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	$19,042,371	76,724.14	$11,240,883	9,030.79	9,949.63	18,980.42	95,704.56

171	Steel product manufacturing from purchased steel	$12,986,352	30,190.55	$14,500,171	23,308.97	9,064.30	32,373.27	62,563.82
198	Valve and fittings other than plumbing manufacturing	$4,489,710	672.95	$3,390,339	1,053.40	545.39	1,598.79	2,271.74
201	Fabricated pipe and pipe fitting manufacturing	$17,121,785	5,113.63	$15,467,747	9,106.61	4,422.42	13,529.03	18,642.66
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$5,972,372	30,056.09	$4,329,853	2,685.32	605.80	3,291.12	33,347.21
268	Switchgear and switchboard apparatus manufacturing	$782,030	147.21	$550,572	152.05	95.43	247.48	394.69
290	Ship building and repairing	$7,578,262	1,998.92	$6,467,592	3,038.34	1,410.57	4,448.92	6,447.84
319	Wholesale trade businesses	$9,692,007	1,034.61	$3,035,097	265.98	57.57	323.55	1,358.16
322	Retail Stores - Electronics and appliances	$40,024	9.99	$22,858	2.57	0.44	3.02	13.01
323	Retail Stores - Building material and garden supply	$2,238,461	558.76	$1,006,073	113.19	19.58	132.77	691.52
324	Retail Stores - Food and beverage	$55,450	13.84	$21,237	2.39	0.41	2.80	16.64
326	Retail Stores - Gasoline stations	$686,657	171.40	$295,782	33.28	5.76	39.03	210.43
332	Transport by air	$24,241	65.54	$15,494	5.84	1.56	7.40	72.93
333	Transport by rail	$494,516	515.27	$363,635	72.58	19.81	92.38	607.65
334	Transport by water	$139,229	679.03	$92,055	15.96	3.80	19.76	698.79
335	Transport by truck	$6,247,404	14,333.08	$4,028,080	2,370.56	362.28	2,732.84	17,065.92
337	Transport by pipeline	$279,660	671.56	$221,005	105.41	37.79	143.20	814.77
36	Construction of other new nonresidential structures	$56,701,569	20,225.86	$47,531,922	25,295.62	9,122.69	34,418.31	54,644.17

365	Commercial and industrial machinery and equipment rental and leasing	$30,390,938	12,470.38	$19,982,984	2,682.76	457.20	3,139.95	15,610.33
375	Environmental and other technical consulting services	$19,175,929	381.06	$8,473,362	1,061.11	234.13	1,295.25	1,676.31
386	Business support services	$27,508,251	1,102.40	$14,812,450	3,330.48	692.33	4,022.82	5,125.22
39	Maintenance and repair construction of nonresidential structures	$17,088,982	7,281.40	$12,765,543	9,180.81	2,945.49	12,126.30	19,407.70
417	Commercial and industrial machinery and equipment repair and maintenance	$43,762,124	931.43	$15,049,939	5,450.30	2,842.90	8,293.20	9,224.63
439	* Employment and payroll only (federal govt, non-military)	$55,450,793	0.00	$0	0.00	0.00	0.00	0.00
69	All other food manufacturing	$5,979,695	1,443.10	$7,751,539	3,837.41	1,013.28	4,850.69	6,293.79
	Total	**$343,928,812**	**206,792.19**	**$191,416,210**	**102,201.72**	**43,910.58**	**146,112.30**	**352,904.50**

6. ALTERNATIVE 6: COMBINATION NO.1 – TRESTLE WITH CAUSEWAY TO DOCK IN DEEP WATER (NO DREDGING)

Table 1: Project Information

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

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	6%	$9,345,548	32%	80%	90%
Metals and Steel Materials	4%	$6,587,845	12%	24%	90%
Textiles, Lubricants, and Metal Valves and Parts (Dredging)	2%	$3,217,320	7%	8%	65%
Pipeline Dredge Equipment and Repairs	5%	$7,966,696	12%	35%	100%
Aggregate Materials	3%	$4,442,965	49%	87%	97%
Switchgear and Switchboard Apparatus Equipment	0%	$459,617	7%	8%	80%
Hopper Equipment and Repairs	2%	$2,910,908	1%	1%	97%
Construction of Other New Nonresidential Structures	14%	$20,835,975	50%	68%	100%
Industrial and Machinery Equipment Rental and Leasing	7%	$11,184,016	28%	82%	100%
Planning, Environmental, Engineering and Design Studies and Services	5%	$7,047,462	37%	63%	100%
USACE Overhead	7%	$10,111,576	52%	52%	100%
Repair and Maintenance Construction Activities	4%	$6,281,434	37%	82%	100%
Industrial Machinery and Equipment Repair and Maintenance	11%	$16,086,599	64%	95%	100%
USACE Wages and Benefits	13%	$20,376,358	75%	100%	100%
Private Sector Labor or Staff Augmentation	15%	$23,440,472	100%	100%	100%

All Other Food Manufacturing	2%	$2,910,908	9%	20%	90%
Total	**100%**	**$153,205,700**	**-**	**-**	**-**

The USACE is planning on expending $153,205,700 on the project. Of this total project expenditure $80,273,745 will be captured within the regional impact area. The rest will be dispersed to 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		$153,205,700	$153,205,700	$153,205,700
Direct Impact				
	Output	$80,273,745	$113,970,624	$149,823,081
	Job	1,607.26	1,853.15	2,156.91
	Labor Income	$52,386,790	$67,434,468	$82,534,206
	GRP	$59,536,372	$79,507,391	$98,572,763
Total Impact				
	Output	$108,651,687	$193,457,248	$398,809,536
	Job	1,866.60	2,395.61	3,657.08
	Labor Income	$60,474,665	$93,924,062	$163,789,589
	GRP	$76,105,024	$127,273,097	$239,311,433

Table 5: Economic Impact at Regional Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$2,252,002	0.27	$51,834	$319,103
171	Steel product manufacturing from purchased steel	$46,762	0.10	$7,116	$8,825
198	Valve and fittings other than plumbing manufacturing	$23,591	0.08	$5,140	$10,330
201	Fabricated pipe and pipe fitting manufacturing	$215,752	0.77	$42,680	$85,172
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$778,705	5.37	$329,027	$396,020

268	Switchgear and switchboard apparatus manufacturing	$1,073	0.00	$198	$446
290	Ship building and repairing	$1,537	0.01	$542	$621
319	Wholesale trade businesses	$1,400,344	9.58	$489,446	$1,038,967
322	Retail Stores - Electronics and appliances	$5,986	0.07	$2,089	$2,957
323	Retail Stores - Building material and garden supply	$702,127	9.01	$305,869	$464,606
324	Retail Stores - Food and beverage	$17,762	0.33	$8,316	$12,635
326	Retail Stores - Gasoline stations	$246,635	3.51	$99,202	$171,464
332	Transport by air	$2,078	0.01	$202	$580
333	Transport by rail	$80,835	0.23	$25,590	$43,259
334	Transport by water	$24,125	0.06	$4,306	$7,115
335	Transport by truck	$1,510,875	12.66	$604,320	$754,569
337	Transport by pipeline	$35,566	0.07	$9,653	$9,134
36	Construction of other new nonresidential structures	$10,456,742	83.14	$2,888,907	$3,771,476
365	Commercial and industrial machinery and equipment rental and leasing	$3,186,338	12.14	$663,074	$1,629,046
375	Environmental and other technical consulting services	$2,639,264	31.99	$1,518,326	$1,527,485
386	Business support services	$5,243,869	134.09	$2,323,860	$2,278,593
39	Maintenance and repair construction of nonresidential structures	$2,304,309	20.83	$724,334	$972,495
417	Commercial and industrial machinery and equipment repair and maintenance	$10,289,775	109.01	$5,720,604	$7,289,688
439	* Employment and payroll only (federal govt, non-military)	$15,282,269	197.46	$13,111,122	$15,282,269
5001	Labor	$23,440,472	976.23	$23,440,472	$23,440,472
69	All other food manufacturing	$84,953	0.24	$10,562	$19,046
	Total Direct Effects	$80,273,745	1,607.26	$52,386,790	$59,536,372
	Secondary Effects	$28,377,942	259.34	$8,087,875	$16,568,652
	Total Effects	**$108,651,687**	**1,866.60**	**$60,474,665**	**$76,105,024**

Table 6: Economic Impact at State Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$6,601,691	0.79	$181,754	$935,442
171	Steel product manufacturing from purchased steel	$693,533	1.44	$226,762	$274,394
198	Valve and fittings other than plumbing manufacturing	$23,591	0.08	$5,140	$10,330

201	Fabricated pipe and pipe fitting manufacturing	$1,994,484	7.75	$415,241	$787,356
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$2,033,160	15.38	$859,072	$1,033,988
268	Switchgear and switchboard apparatus manufacturing	$1,073	0.00	$198	$446
290	Ship building and repairing	$9,032	0.04	$3,186	$3,649
319	Wholesale trade businesses	$1,520,023	10.40	$541,641	$1,132,154
322	Retail Stores - Electronics and appliances	$8,467	0.10	$3,159	$4,354
323	Retail Stores - Building material and garden supply	$822,561	10.56	$363,831	$548,493
324	Retail Stores - Food and beverage	$20,131	0.38	$9,519	$14,372
326	Retail Stores - Gasoline stations	$250,277	3.56	$100,703	$174,014
332	Transport by air	$8,908	0.04	$2,011	$3,744
333	Transport by rail	$80,835	0.23	$25,590	$43,259
334	Transport by water	$51,048	0.13	$9,366	$18,200
335	Transport by truck	$2,063,729	17.30	$863,984	$1,067,971
337	Transport by pipeline	$99,882	0.19	$34,718	$33,225
36	Construction of other new nonresidential structures	$14,259,657	113.37	$4,618,503	$5,792,874
365	Commercial and industrial machinery and equipment rental and leasing	$9,175,844	34.95	$2,161,226	$5,078,874
375	Environmental and other technical consulting services	$4,467,872	54.16	$2,770,848	$2,784,667
386	Business support services	$5,243,869	134.09	$2,323,860	$2,278,593
39	Maintenance and repair construction of nonresidential structures	$5,148,508	46.54	$2,074,720	$2,654,498
417	Commercial and industrial machinery and equipment repair and maintenance	$15,221,336	161.26	$8,627,883	$10,952,063
439	* Employment and payroll only (federal govt, non-military)	$20,355,959	263.02	$17,724,497	$20,355,959
5001	Labor	$23,440,472	976.23	$23,440,472	$23,440,472
69	All other food manufacturing	$374,683	1.16	$46,583	$84,000
	Total Direct Effects	$113,970,624	1,853.15	$67,434,468	$79,507,391
	Secondary Effects	$79,486,624	542.46	$26,489,594	$47,765,706
	Total Effects	**$193,457,248**	**2,395.61**	**$93,924,062**	**$127,273,097**

Table 7: Economic Impact at National Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				

115	Petroleum refineries	$6,997,450	0.84	$243,438	$1,187,784
171	Steel product manufacturing from purchased steel	$4,772,060	9.92	$1,611,846	$1,949,068
198	Valve and fittings other than plumbing manufacturing	$1,649,822	5.72	$409,080	$794,368
201	Fabricated pipe and pipe fitting manufacturing	$6,291,697	24.63	$1,508,571	$2,637,021
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$2,194,652	16.67	$981,300	$1,185,769
268	Switchgear and switchboard apparatus manufacturing	$287,370	0.92	$67,998	$140,257
290	Ship building and repairing	$2,784,764	13.09	$982,201	$1,136,514
319	Wholesale trade businesses	$3,561,496	24.37	$1,436,996	$2,721,733
322	Retail Stores - Electronics and appliances	$14,707	0.17	$6,106	$8,212
323	Retail Stores - Building material and garden supply	$822,561	10.56	$363,831	$548,493
324	Retail Stores - Food and beverage	$20,376	0.38	$9,644	$14,552
326	Retail Stores - Gasoline stations	$252,324	3.59	$101,547	$175,446
332	Transport by air	$8,908	0.04	$2,130	$3,952
333	Transport by rail	$181,718	0.79	$57,796	$97,762
334	Transport by water	$51,162	0.13	$9,844	$19,234
335	Transport by truck	$2,295,717	19.24	$972,945	$1,199,480
337	Transport by pipeline	$102,766	0.19	$39,315	$37,663
36	Construction of other new nonresidential structures	$20,835,975	165.66	$7,609,466	$9,288,444
365	Commercial and industrial machinery and equipment rental and leasing	$11,167,677	42.53	$2,754,251	$6,226,128
375	Environmental and other technical consulting services	$7,046,528	85.42	$4,575,223	$4,595,812
386	Business support services	$10,108,384	258.48	$5,406,565	$5,329,302
39	Maintenance and repair construction of nonresidential structures	$6,279,643	56.77	$2,611,767	$3,323,429
417	Commercial and industrial machinery and equipment repair and maintenance	$16,081,152	170.36	$9,277,129	$11,590,597
439	* Employment and payroll only (federal govt, non-military)	$20,376,356	263.28	$17,743,044	$20,376,356
5001	Labor	$23,440,472	976.23	$23,440,472	$23,440,472
69	All other food manufacturing	$2,197,343	6.92	$311,699	$544,914
	Total Direct Effects	$149,823,081	2,156.91	$82,534,206	$98,572,763

	Secondary Effects	$248,986,456	1,500.17	$81,255,383	$140,738,671
	Total Effects	**$398,809,536**	**3,657.08**	**$163,789,589**	**$239,311,433**

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
Accomodations 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:	Navigation
Work Acitiy:	CWB - Navigation

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	* Employment and payroll only (federal govt, non-military)	439	8 %
2	Business support services	386	7 %
3	Construction of other new nonresidential structures	36	6 %
4	Food services and drinking places	413	5 %
5	Commercial and industrial machinery and equipment repair and maintenance	417	4 %
6	Real estate establishments	360	3 %
7	Wholesale trade businesses	319	3 %
8	Employment services	382	3 %
9	Maintenance and repair construction of nonresidential structures	39	3 %
10	Offices of physicians, dentists, and other health practitioners	394	2 %
			43 %

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	$6,997,450	28,193.62	$4,130,658	3,318.52	3,656.17	6,974.69	35,168.30
171	Steel product manufacturing from purchased steel	$4,772,060	11,094.04	$5,328,340	8,565.28	3,330.84	11,896.12	22,990.16
198	Valve and fittings other than plumbing manufacturing	$1,649,822	247.29	$1,245,839	387.09	200.41	587.50	834.79
201	Fabricated pipe and	$6,291,697	1,879.09	$5,683,892	3,346.38	1,625.09	4,971.48	6,850.57

	pipe fitting manufacturing							
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$2,194,652	11,044.63	$1,591,080	986.77	222.61	1,209.38	12,254.01
268	Switchgear and switchboard apparatus manufacturing	$287,370	54.10	$202,317	55.87	35.07	90.94	145.04
290	Ship building and repairing	$2,784,764	734.54	$2,376,629	1,116.49	518.34	1,634.83	2,369.37
319	Wholesale trade businesses	$3,561,496	380.18	$1,115,299	97.74	21.16	118.90	499.08
322	Retail Stores - Electronics and appliances	$14,707	3.67	$8,400	0.94	0.16	1.11	4.78
323	Retail Stores - Building material and garden supply	$822,561	205.32	$369,699	41.59	7.19	48.79	254.11
324	Retail Stores - Food and beverage	$20,376	5.09	$7,804	0.88	0.15	1.03	6.12
326	Retail Stores - Gasoline stations	$252,324	62.98	$108,690	12.23	2.12	14.34	77.33
332	Transport by air	$8,908	24.08	$5,693	2.14	0.57	2.72	26.80
333	Transport by rail	$181,718	189.34	$133,624	26.67	7.28	33.95	223.29
334	Transport by water	$51,162	249.52	$33,827	5.87	1.40	7.26	256.78
335	Transport by truck	$2,295,717	5,266.94	$1,480,188	871.10	133.13	1,004.23	6,271.17
337	Transport by pipeline	$102,766	246.78	$81,212	38.74	13.89	52.62	299.40
36	Construction of other new nonresidential structures	$20,835,975	7,432.34	$17,466,429	9,295.31	3,352.29	12,647.61	20,079.95
365	Commercial and industrial machinery and equipment rental and leasing	$11,167,677	4,582.46	$7,343,094	985.83	168.00	1,153.83	5,736.29
375	Environmental and other technical consulting services	$7,046,528	140.03	$3,113,684	389.92	86.04	475.96	615.99

386	Business support services	$10,108,384	405.10	$5,443,092	1,223.84	254.41	1,478.25	1,883.35
39	Maintenance and repair construction of nonresidential structures	$6,279,643	2,675.68	$4,690,920	3,373.65	1,082.37	4,456.02	7,131.70
417	Commercial and industrial machinery and equipment repair and maintenance	$16,081,152	342.27	$5,530,361	2,002.81	1,044.67	3,047.48	3,389.75
439	* Employment and payroll only (federal govt, non-military)	$20,376,356	0.00	$0	0.00	0.00	0.00	0.00
69	All other food manufacturing	$2,197,343	530.29	$2,848,437	1,410.12	372.35	1,782.47	2,312.76
	Total	**$126,382,609**	**75,989.38**	**$70,339,207**	**37,555.80**	**16,135.70**	**53,691.50**	**129,680.88**

7. ALTERNATIVE 7: COMBINATION NO.2 – TRESTLE/CAUSEWAY/DOCK WITH DREDGING

Table 1: Project Information

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

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	6%	$6,045,131	32%	80%	90%
Metals and Steel Materials	4%	$4,261,322	12%	24%	90%
Textiles, Lubricants, and Metal Valves and Parts (Dredging)	2%	$2,081,111	7%	8%	65%
Pipeline Dredge Equipment and Repairs	5%	$5,153,227	12%	35%	100%
Aggregate Materials	3%	$2,873,915	49%	87%	97%
Switchgear and Switchboard Apparatus Equipment	0%	$297,302	7%	8%	80%
Hopper Equipment and Repairs	2%	$1,882,910	1%	1%	97%
Construction of Other New Nonresidential Structures	14%	$13,477,669	50%	68%	100%
Industrial and Machinery Equipment Rental and Leasing	7%	$7,234,337	28%	82%	100%
Planning, Environmental, Engineering and Design Studies and Services	5%	$4,558,623	37%	63%	100%
USACE Overhead	7%	$6,540,634	52%	52%	100%
Repair and Maintenance Construction Activities	4%	$4,063,121	37%	82%	100%
Industrial Machinery and Equipment Repair and Maintenance	11%	$10,405,554	64%	95%	100%
USACE Wages and Benefits	13%	$13,180,368	75%	100%	100%
Private Sector Labor or Staff Augmentation	15%	$15,162,378	100%	100%	100%

All Other Food Manufacturing	2%	$1,882,910	9%	20%	90%
Total	**100%**	**$99,100,510**	**-**	**-**	**-**

The USACE is planning on expending $99,100,510 on the project. Of this total project expenditure $51,924,759 will be captured within the regional impact area. The rest will be dispersed to 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		$99,100,510	$99,100,510	$99,100,510
Direct Impact				
	Output	$51,924,759	$73,721,454	$96,912,476
	Job	1,039.65	1,198.70	1,395.19
	Labor Income	$33,886,191	$43,619,723	$53,386,930
	GRP	$38,510,870	$51,429,046	$63,761,407
Total Impact				
	Output	$70,280,921	$125,137,067	$257,968,395
	Job	1,207.40	1,549.59	2,365.57
	Labor Income	$39,117,801	$60,754,413	$105,946,657
	GRP	$49,228,238	$82,326,107	$154,797,668

Table 5: Economic Impact at Regional Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$1,456,699	0.17	$33,528	$206,410
171	Steel product manufacturing from purchased steel	$30,248	0.06	$4,603	$5,708
198	Valve and fittings other than plumbing manufacturing	$15,260	0.05	$3,325	$6,682
201	Fabricated pipe and pipe fitting manufacturing	$139,558	0.50	$27,608	$55,093
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$503,702	3.47	$212,830	$256,164
268	Switchgear and switchboard apparatus manufacturing	$694	0.00	$128	$288
290	Ship building and repairing	$994	0.00	$351	$402

319	Wholesale trade businesses	$905,807	6.20	$316,596	$672,052
322	Retail Stores - Electronics and appliances	$3,872	0.05	$1,351	$1,913
323	Retail Stores - Building material and garden supply	$454,168	5.83	$197,850	$300,528
324	Retail Stores - Food and beverage	$11,490	0.21	$5,379	$8,173
326	Retail Stores - Gasoline stations	$159,535	2.27	$64,168	$110,911
332	Transport by air	$1,344	0.01	$131	$375
333	Transport by rail	$52,288	0.15	$16,553	$27,982
334	Transport by water	$15,605	0.04	$2,785	$4,602
335	Transport by truck	$977,304	8.19	$390,902	$488,090
337	Transport by pipeline	$23,006	0.04	$6,244	$5,909
36	Construction of other new nonresidential structures	$6,763,903	53.78	$1,868,678	$2,439,564
365	Commercial and industrial machinery and equipment rental and leasing	$2,061,071	7.85	$428,907	$1,053,742
375	Environmental and other technical consulting services	$1,707,197	20.69	$982,123	$988,048
386	Business support services	$3,391,976	86.74	$1,503,180	$1,473,899
39	Maintenance and repair construction of nonresidential structures	$1,490,533	13.47	$468,532	$629,055
417	Commercial and industrial machinery and equipment repair and maintenance	$6,655,901	70.51	$3,700,351	$4,715,306
439	* Employment and payroll only (federal govt, non-military)	$9,885,276	127.73	$8,480,878	$9,885,276
5001	Labor	$15,162,378	631.47	$15,162,378	$15,162,378
69	All other food manufacturing	$54,952	0.16	$6,832	$12,320
	Total Direct Effects	$51,924,759	1,039.65	$33,886,191	$38,510,870
	Secondary Effects	$18,356,161	167.75	$5,231,610	$10,717,368
	Total Effects	**$70,280,921**	**1,207.40**	**$39,117,801**	**$49,228,238**

Table 6: Economic Impact at State Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$4,270,278	0.51	$117,567	$605,087
171	Steel product manufacturing from purchased steel	$448,609	0.93	$146,680	$177,491
198	Valve and fittings other than plumbing manufacturing	$15,260	0.05	$3,325	$6,682
201	Fabricated pipe and pipe fitting manufacturing	$1,290,124	5.01	$268,597	$509,298
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$1,315,141	9.95	$555,687	$668,831

268	Switchgear and switchboard apparatus manufacturing	$694	0.00	$128	$288
290	Ship building and repairing	$5,842	0.03	$2,061	$2,360
319	Wholesale trade businesses	$983,221	6.73	$350,358	$732,330
322	Retail Stores - Electronics and appliances	$5,477	0.06	$2,043	$2,817
323	Retail Stores - Building material and garden supply	$532,071	6.83	$235,343	$354,791
324	Retail Stores - Food and beverage	$13,022	0.24	$6,158	$9,297
326	Retail Stores - Gasoline stations	$161,891	2.30	$65,140	$112,560
332	Transport by air	$5,762	0.03	$1,301	$2,422
333	Transport by rail	$52,288	0.15	$16,553	$27,982
334	Transport by water	$33,020	0.08	$6,058	$11,772
335	Transport by truck	$1,334,915	11.19	$558,865	$690,813
337	Transport by pipeline	$64,608	0.12	$22,458	$21,492
36	Construction of other new nonresidential structures	$9,223,804	73.33	$2,987,461	$3,747,098
365	Commercial and industrial machinery and equipment rental and leasing	$5,935,359	22.61	$1,397,981	$3,285,250
375	Environmental and other technical consulting services	$2,890,026	35.03	$1,792,312	$1,801,251
386	Business support services	$3,391,976	86.74	$1,503,180	$1,473,899
39	Maintenance and repair construction of nonresidential structures	$3,330,292	30.10	$1,342,025	$1,717,052
417	Commercial and industrial machinery and equipment repair and maintenance	$9,845,862	104.31	$5,580,912	$7,084,299
439	* Employment and payroll only (federal govt, non-military)	$13,167,173	170.13	$11,465,022	$13,167,173
5001	Labor	$15,162,378	631.47	$15,162,378	$15,162,378
69	All other food manufacturing	$242,362	0.75	$30,132	$54,335
	Total Direct Effects	$73,721,454	1,198.70	$43,619,723	$51,429,046
	Secondary Effects	$51,415,613	350.89	$17,134,691	$30,897,061
	Total Effects	**$125,137,067**	**1,549.59**	**$60,754,413**	**$82,326,107**

Table 7: Economic Impact at National Level

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
115	Petroleum refineries	$4,526,273	0.54	$157,467	$768,314
171	Steel product manufacturing from purchased steel	$3,086,789	6.42	$1,042,616	$1,260,747
198	Valve and fittings other than plumbing manufacturing	$1,067,181	3.70	$264,612	$513,834

201	Fabricated pipe and pipe fitting manufacturing	$4,069,760	15.93	$975,813	$1,705,747
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	$1,419,602	10.78	$634,750	$767,010
268	Switchgear and switchboard apparatus manufacturing	$185,884	0.60	$43,984	$90,725
290	Ship building and repairing	$1,801,314	8.46	$635,333	$735,150
319	Wholesale trade businesses	$2,303,740	15.76	$929,515	$1,760,543
322	Retail Stores - Electronics and appliances	$9,513	0.11	$3,950	$5,312
323	Retail Stores - Building material and garden supply	$532,071	6.83	$235,343	$354,791
324	Retail Stores - Food and beverage	$13,180	0.25	$6,238	$9,413
326	Retail Stores - Gasoline stations	$163,215	2.32	$65,686	$113,487
332	Transport by air	$5,762	0.03	$1,378	$2,557
333	Transport by rail	$117,544	0.51	$37,385	$63,237
334	Transport by water	$33,094	0.08	$6,368	$12,442
335	Transport by truck	$1,484,976	12.45	$629,345	$775,879
337	Transport by pipeline	$66,474	0.12	$25,431	$24,362
36	Construction of other new nonresidential structures	$13,477,669	107.16	$4,922,153	$6,008,194
365	Commercial and industrial machinery and equipment rental and leasing	$7,223,769	27.51	$1,781,576	$4,027,347
375	Environmental and other technical consulting services	$4,558,019	55.25	$2,959,465	$2,972,783
386	Business support services	$6,538,569	167.20	$3,497,215	$3,447,238
39	Maintenance and repair construction of nonresidential structures	$4,061,963	36.72	$1,689,411	$2,149,747
417	Commercial and industrial machinery and equipment repair and maintenance	$10,402,030	110.20	$6,000,875	$7,497,333
439	* Employment and payroll only (federal govt, non-military)	$13,180,367	170.30	$11,477,019	$13,180,366
5001	Labor	$15,162,378	631.47	$15,162,378	$15,162,378
69	All other food manufacturing	$1,421,343	4.48	$201,621	$352,475
	Total Direct Effects	$96,912,476	1,395.19	$53,386,930	$63,761,407
	Secondary Effects	$161,055,918	970.38	$52,559,728	$91,036,261
	Total Effects	**$257,968,395**	**2,365.57**	**$105,946,657**	**$154,797,668**

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
Accomodations 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:	Navigation

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	* Employment and payroll only (federal govt, non-military)	439	8 %
2	Business support services	386	7 %
3	Construction of other new nonresidential structures	36	6 %
4	Food services and drinking places	413	5 %
5	Commercial and industrial machinery and equipment repair and maintenance	417	4 %
6	Real estate establishments	360	3 %
7	Wholesale trade businesses	319	3 %
8	Employment services	382	3 %
9	Maintenance and repair construction of nonresidential structures	39	3 %
10	Offices of physicians, dentists, and other health practitioners	394	2 %
			43 %

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	$4,526,273	18,236.93	$2,671,900	2,146.57	2,364.98	4,511.55	22,748.48
171	Steel product manufacturing from purchased steel	$3,086,789	7,176.14	$3,446,616	5,540.42	2,154.54	7,694.96	14,871.10
198	Valve and fittings other than plumbing manufacturing	$1,067,181	159.96	$805,866	250.39	129.64	380.02	539.98
201	Fabricated pipe and pipe fitting manufacturing	$4,069,760	1,215.48	$3,676,603	2,164.59	1,051.19	3,215.78	4,431.26
26	Mining and quarrying sand, gravel, clay, and ceramic and	$1,419,602	7,144.18	$1,029,184	638.29	144.00	782.28	7,926.46

	refractory minerals							
268	Switchgear and switchboard apparatus manufacturing	$185,884	34.99	$130,868	36.14	22.68	58.82	93.82
290	Ship building and repairing	$1,801,314	475.13	$1,537,313	722.20	335.29	1,057.48	1,532.62
319	Wholesale trade businesses	$2,303,740	245.92	$721,427	63.22	13.68	76.91	322.83
322	Retail Stores - Electronics and appliances	$9,513	2.37	$5,433	0.61	0.11	0.72	3.09
323	Retail Stores - Building material and garden supply	$532,071	132.81	$239,138	26.90	4.65	31.56	164.37
324	Retail Stores - Food and beverage	$13,180	3.29	$5,048	0.57	0.10	0.67	3.96
326	Retail Stores - Gasoline stations	$163,215	40.74	$70,306	7.91	1.37	9.28	50.02
332	Transport by air	$5,762	15.58	$3,683	1.39	0.37	1.76	17.34
333	Transport by rail	$117,544	122.48	$86,434	17.25	4.71	21.96	144.43
334	Transport by water	$33,094	161.40	$21,881	3.79	0.90	4.70	166.10
335	Transport by truck	$1,484,976	3,406.90	$957,454	563.47	86.11	649.58	4,056.48
337	Transport by pipeline	$66,474	159.63	$52,532	25.06	8.98	34.04	193.67
36	Construction of other new nonresidential structures	$13,477,669	4,807.58	$11,298,092	6,012.64	2,168.42	8,181.05	12,988.64
365	Commercial and industrial machinery and equipment rental and leasing	$7,223,769	2,964.14	$4,749,852	637.68	108.67	746.35	3,710.49
375	Environmental and other technical consulting services	$4,558,019	90.58	$2,014,074	252.22	55.65	307.87	398.45
386	Business support services	$6,538,569	262.03	$3,520,843	791.64	164.56	956.20	1,218.24
39	Maintenance and repair construction of nonresidential structures	$4,061,963	1,730.75	$3,034,303	2,182.23	700.13	2,882.36	4,613.11

417	Commercial and industrial machinery and equipment repair and maintenance	$10,402,030	221.40	$3,577,293	1,295.51	675.74	1,971.25	2,192.65
439	* Employment and payroll only (federal govt, non-military)	$13,180,367	0.00	$0	0.00	0.00	0.00	0.00
69	All other food manufacturing	$1,421,343	343.02	$1,842,501	912.13	240.85	1,152.98	1,496.00
	Total	**$81,750,098**	**49,153.43**	**$45,498,642**	**24,292.82**	**10,437.32**	**34,730.14**	**83,883.57**