Homer Planning Assistance to States (PAS) Section 22

Navigation Improvements

Technical Report

Homer, Alaska

May 2019

US Army Corps
of Engineers
Alaska District

Executive Summary

This study provides planning and technical assistance to the City of Homer (the City) related to the Homer Harbor Large Vessel Expansion Project. The purpose of this study is to provide planning/technical assistance to the local sponsor by developing a preliminary assessment of the benefits and costs of implementing navigation improvements to build a large vessel harbor to the north of Homer's existing small boat harbor.

The authority for this study is the Planning Assistance to States (PAS) Program Section 22 of WRDA 1974 (P.L. 93-251) as amended. Section 22(a)(2) provides authority for the U.S. Army Corps of Engineers (USACE), at the request of a non-Federal sponsor, to provide technical assistance with provisions and integration of hydraulic, economic, and environmental data and analyses. This analysis considers one alternative, which is consistent with the conceptual drawings developed by the non-Federal sponsor.

This technical report is a high-level preliminary economic analysis of the benefits and costs of implementing the proposed navigation improvements. The previous Homer Small Boat Harbor Navigation Improvements feasibility study in 2008 (USACE 2008a) resulted in a benefit-cost ratio (BCR) ranging from 0.5 to 0.7 for the array of alternatives considered. The current PAS effort uses new available information for re-evaluation of benefits and costs for the alternative considered. This results in a preliminary BCR range of 0.89 to 1.0 for a project cost range of $72.5 million to $81 million based on rough order magnitude (ROM) costs.

The analysis brought price level updates to 2018 prices, and applied the discount rate for fiscal year 2019. Each benefit category was assessed against readily available data. Transportation cost savings, through avoided travel for commercial fishing vessels, are quantified by cross-referencing data sets from the harbor office and other sources. The subsistence harvest evaluation is updated with the alternative method, Production Cost Analysis, which is used more commonly by the USACE Alaska District.

The project costs range is developed with two broad assumptions, which are discussed in subsequent sections. The considerations of the BCR range from a benefits perspective are constrained by limited data. There are potential increases to existing benefits if sufficient data are available. There are also potential new benefits that emerged during this study; however, these are unquantifiable at this time. As such, this report elaborates on data gaps as opportunities for the local sponsor to focus on data gathering for a more in-depth analysis.

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1. INTRODUCTION

1.1 Study Purpose and Authority

This study provides planning and technical assistance to the City of Homer (the City) related to the Homer Harbor Large Vessel Expansion Project. The purpose of this study is to provide planning/technical assistance to the local sponsor by developing a preliminary assessment of the cost and benefits of implementing navigation improvements to build a large vessel harbor to the north of Homer's harbor.

The authority for this study is the Planning Assistance to States (PAS) Program Section 22 of WRDA 1974 (P.L. 93-251) as amended. Section 22(a)(2) provides authority for the U.S. Army Corps of Engineers (USACE), at the request of a non-Federal Sponsor (the City), to provide planning and study services, and recommendations related to the Homer Large Vessel Expansion Project currently being considered by the City. The PAS Agreement with the City was executed on 10 August 2018.

This PAS study is pursued under the USACE Engineering Regulation (ER) 1105-2-100 guidance that states the USACE may provide technical assistance to support State or local governments in preparation of comprehensive water and related land resources development plans, including watershed and ecosystem planning and help conducting individual studies supporting the State water plan.

1.2 Scope of Work and Objective

This technical report includes developing a high-level preliminary economic analysis of the benefits and costs of implementing navigation improvements associated with the City's interest in developing a large vessel harbor project. This economic analysis re-evaluates National Economic Development (NED) benefits estimated during the 2008 USACE study using updated, readily available data, and by estimating additional benefits when data was available. The overall objective is to ascertain whether the project alternative proposed by the local sponsor may be justified to support comprehensive water and related land development plans the City may pursue. The scope of work for this study included:

- Gathering available data
- Identification of existing conditions
- Assessment of future without project economic conditions
- Assessment of future with project economic conditions
- Development of high-level cost estimates for alternatives
- Documentation of key assumptions and findings

1.3 Background

A previous feasibility study related to the potential expansion of the Homer Boat Harbor was initiated in 2004 by the USACE in partnership with the Alaska Department of Transportation and

Public Facilities (ADOT&PF) and the City. This effort culminated in the Homer Small Boat Harbor Navigation Improvements Economics Appendix (USACE 2008a). The economic analysis presented in the 2008 USACE study was conducted from a NED perspective, where economic benefits are defined as the change in value of goods and services that accrue to the Nation as a whole as a result of constructing the project. Costs are defined as the total economic costs of constructing and maintaining the project. The average annual economic benefits of the project are compared to the average annual economic costs to estimate the benefit-cost ratio (BCR). A project with a BCR greater than 1.0 is considered economically justified. In the 2008 USACE study all the alternatives evaluated showed BCRs of less than 1.0 and therefore the USACE did not pursue further investigation.

The BCRs estimated during the 2008 study ranged from 0.5 to 0.7. The key issues at the time that potentially resulted in the BCRs below one, as noted by the City at the initiation of this PAS study, were possibly a result of high implementation costs associated with materials (rock), dredged material disposal options available at the time, and underestimated benefits. These considerations are pivotal to this PAS effort and are discussed below.

1.3.1 Rock Pricing and Rock Source

The previous study (USACE 2008a) reported that a major contributor to high project costs was the cost of rock. The City believes there is an opportunity for the project to benefit from potentially lower rock costs in the future because they have identified at least one new rock quarry being developed in the region that may compete with established quarries. This rock cost savings opportunity is dependent on whether this quarry opens for business, and whether the rock meets the quality criteria for the project.

Rock prices from recent USACE construction projects at Valdez and Port Lions were compared to rock prices used in the 2008 Homer USACE study. This comparison was heavily constrained by uncertainties; however, the potential Homer Large Vessel Expansion Project is much larger when compared to both Valdez and Port Lions. As such, there is a potential for a decrease in the price of rock as quantity and scale increases. Assessing potential rock prices any further was beyond this study's scope.

1.3.2 Dredge Material Management

In the 2008 USACE study, the management method of the dredged material included land disposal. This requires trucking the material to an upland site at significant cost. Land disposal was considered at that time because in-water disposal/placement options were estimated to be even more costly. Additionally, no permitted in-water placement or disposal areas were available near the Homer Spit, and if an area was to be permitted, it would have had to be located a significant distance from the harbor project to reach an area outside the Kachemak Bay State Critical Habitat Area (SCHA) boundary (Figure 1). However, this SCHA boundary was revised recently to exclude the northern side of the Homer Port (Figure 2). There is potential to reduce dredge costs associated with a future Homer Large Vessel Expansion Project by permitting for a

dredge material placement area closer to the project site than what was possible in the 2008 USACE study. Specific collaboration with the State will still be required to verify the extent of the permitting efforts, but haulage fees would potentially be reduced.

In addition, other management methods with beneficial uses can be considered including using the dredged material for beach nourishment, which may count as a project benefit under NED criteria, as well as incorporating the dredged material in the design of the causeways or breakwater, if appropriate.

1.3.3 Other Considerations for Potential Benefit Analysis

Other considerations, including certain changes in conditions since the 2008 USACE study, that may influence project benefits include:

- Since the 2008 USACE study, the vessel dimensions of the fleet in Homer have changed. The number of larger vessels that are using, or have expressed interest to use, the existing small boat harbor has increased. These vessels are often turned away due to draft limitations or the lack of available dock and maneuvering space in the existing harbor. The increasing number of large vessels that seek moorage in Homer include oil exploration and research vessels that would prefer to winter in Homer rather than at ports further south. According to the City, oil rig support vessels frequently request harbor moorage in the Homer harbor, but they are turned away due to their size and draft.
- Derelict vessels were occupying harbor dock space and other harbor resources resulting in lost revenue and increased congestion; however, changes in state law and revised harbor policies has decreased this economic liability and increased revenues generated by the port.
- Ownership of the tidelands where the Deep Water dock and Pioneer dock are located were transferred from the State to the City in 2014 (Figure 2).
- Since the 2008 USACE study, Homer harbor has evolved to become a regional transportation hub, serving not only a local fishing fleet but vessels that participate in fisheries statewide. It is home port to the Alaska Marine Highway System (AMHS) ferry Tustumena, which serves the communities of Southcentral, Kodiak Island, and Southwest Alaska. Due to its size, the Tustumena is the only AMHS vessel capable of serving all 13 ports of call between Homer and Unalaska.
- The City implemented a new moorage rate structure aimed for an equitable distribution of moorage fees and a financially sustainable harbor.
- The City recognizes that the presence of the U.S. Coast Guard (USCG) has the potential to provide national security benefits when planning the Large Vessel Harbor Expansion Project. These benefits were not considered in the 2008 USACE study and are now a possible consideration in the future under the implementation guidance, Section 1202(c)(3) of the Water Resource Development Act (WRDA 2016). This guidance expands the feasibility justification of an arctic deep draft harbor and related navigation improvements to include benefits potentially associated with national security. In

addition to potential national security benefits, transportation cost savings that the USCG may realize if they were to use the Large Vessel Harbor are considered NED benefits. The USCG Hickory currently leases permanent moorage at the Pioneer Dock adjacent to the harbor entry, and because of the large tidal range and exposure to wind and waves, dedicated USCG personnel must man the ship during moorage to manage their moorage system lines. However, they recently installed a moorage system that was intended to reduce the need for continuous monitors. Unfortunately, the USACE understands that this new mooring system was damaged shortly after installation during inclement weather. If the USCG vessels could be in a protected harbor there would be benefits associated with reduced damages and less personnel requirements to manage the moorage system.

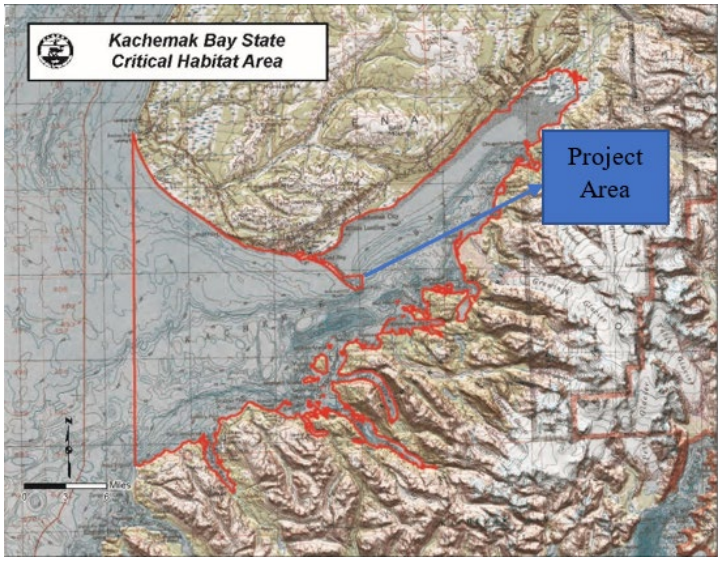

Figure 1. Former Kachemak Bay SCHA Boundary

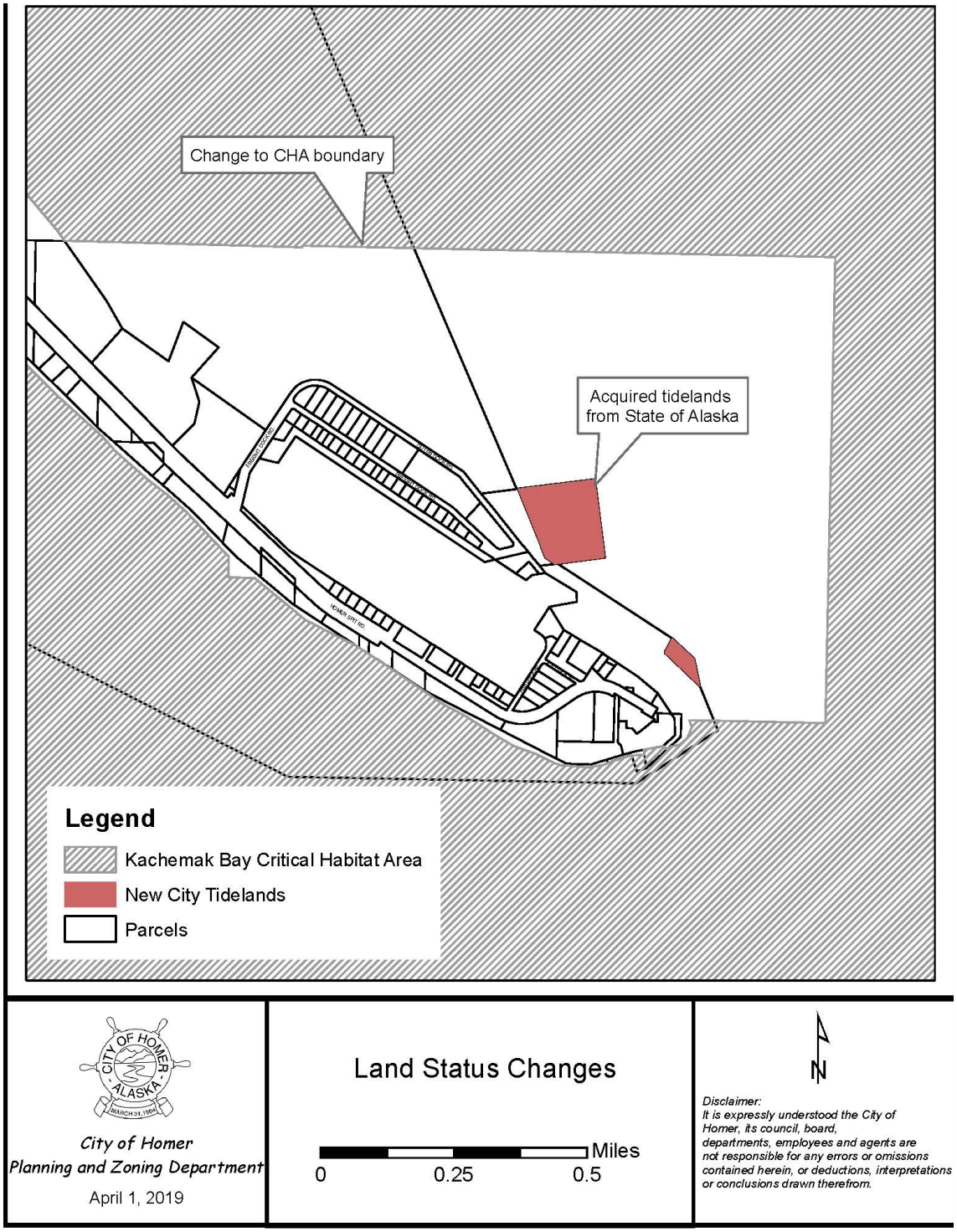

Figure 2. Current Kachemak Bay SCHA Boundary in Homer

1.4 Project Location and Description

The City of Homer is located on the north shore of Kachemak Bay on the southwestern edge of the Kenai Peninsula in Alaska. The Homer Spit is a 4.5 mile long gravel bar that extends from

the Homer shoreline. It is 227 road miles south of Anchorage at the southernmost point of the Sterling Highway at approximately 59° 38' north latitude and 151° 33' west longitude. (Sec. 19, T006S, R013W, Seward Meridian). Homer is in the Homer Recording District and hosts a population of 5,313 (State of Alaska 2019b). It is accessible via air, road, and water year round and is the economic center of the southern Kenai Peninsula. The area encompasses approximately 11 square (sq) miles of land and 16 sq miles of water. Homer lies in the maritime climate zone.

The Port of Homer is located at the end of the Homer Spit, a narrow promontory of land separating Kachemak Bay from Cook Inlet, with the proposed large vessel harbor located on the north side of the existing small boat harbor at the end of the spit (Figure 3). The area east of the spit is the inner Kachemak Bay and west of the spit is the outer bay. Facilities at the existing port include a deep-water cargo dock, a fish dock equipped with eight cranes and ice facility, an ocean pier, and a small boat harbor. This analysis focuses on the benefits and costs associated with the existing boat harbor and proposed large vessel harbor expansion.

Figure 3. Homer Harbor and Proposed Large Vessel Harbor

While commercial fishing has long been the mainstay of the Homer economy, tourism has become increasingly important. Subsistence fishing is also an important activity in the area. Homer is known as an arts community and is a gateway community in relation to more remote destinations, such as Kachemak Bay State Park and Lake Clark National Park and Preserve. Activities and

events, such as the Homer Jackpot Halibut Derby and Kachemak Bay Shorebird Festival, draw many participants.

1.4.1 Project Area and Study Area

This analysis makes the distinction between the study area and project area in accordance with the USACE planning guidelines. The project area refers to the locations of alternative plans. This analysis considers only one alternative which is the location and area of the proposed large vessel harbor expansion. The study area, on the other hand, refers to the area within which significant project impacts occur. For this high-level analysis the study area refers to the existing harbor and the Pioneer Dock where a substantial amount of benefit categories assessed would be realized. Throughout the analysis the Homer harbor is referred to as the existing harbor.

1.5 Methodology

The general methodology of this study consisted of a review of previous USACE reports, published materials on the study area, and data provided by the local sponsor. Benefits are updated to 2018 price levels and the discount rate for NED benefit calculations was updated to the FY2019 rate. The benefit categories in this analysis are benefits expected to be realized in the existing harbor as a result of a large vessel harbor expansion. Local port officials in Homer were consulted to gain a better understanding of the navigation problems and potential benefits that could result from a navigation improvements project. Available data on Homer harbor's fleet, moorage characteristics and damages to floats and docks were analyzed to compare with the conditions described in the 2008 USACE study. Finally, updates to NED benefits were made with assumptions established where data gaps persist. Data collection efforts were made with consideration to key issues noted by the City. Findings were constrained by available information and are discussed in subsequent sections.

The analysis considers the alternative identified in the 2008 USACE study which is most similar to the alternative proposed by the City. Benefits equal the difference between future without- and with-project costs associated with transportation delays, reduced damages to vessels and harbor facilities, and enhanced access for commercial, subsistence, and recreational activities.

Project costs calculated in the 2008 USACE study were updated to FY2019 (October 2018) price levels and then converted to Average Annual Equivalent (AAEQ) values using the FY19 Federal discount rate of 2.875 percent, assuming a 50-year period of analysis. Costs and benefits for the alternative were then compared to determine justification for further investigation.

1.6 Problems and Opportunities

The primary problems identified in this study are listed below:

- Infrastructure damages and transportation inefficiencies exist due to the existing harbor's lack of capacity to accommodate the growing number and changing features of the vessel fleet that use or wish to use the existing small boat harbor.

- The existing small boat harbor is severely overcrowded which results in commercial losses due to delays and damages.
- Transient float systems for vessels ranging from 90 feet (ft) to 150 ft in length are particularly overcrowded.
- There are no permanent stalls for vessels over 75 ft in length. However, to meet the demand from large vessels, the harbor leases moorage to vessels with overall lengths of up to 85 ft to dock in the 75-foot stalls. This leads to vessels that would normally moor in the 75-foot stalls to be assigned to smaller stalls.
- The depths associated with the transient float systems for these larger vessels are inadequate.
- Due to an extreme tidal range of 28.4 ft (extreme high water +22.9 ft and extreme low water -5.5 ft), strong currents and shallow depths in the entrance channel can significantly delay larger vessels from entering the harbor at lower tides and/or result in these vessels using transient float systems until conditions improve.

The following opportunities are identified under the proposed alternative considered:

- Improve access for commercial and subsistence vessels
- Reduce transportation costs related to vessels required to travel to other ports
- Increase moorage facilities for large vessels
- Reduce damages to floats and docks
- Reduce vessel damages due to collisions and congestion in the small boat harbor
- Increase regional economic activities
- Improved access for recreational activities

1.7 Key Socioeconomic Components

Key socioeconomic characteristics associated with the Homer area include the significant presence of marine activities, commercial and recreational fishers, aquaculture farmers, and subsistence users. The robust marine services industry provides an array of services from boat building and repair to boat hauling and storage facilities. Local businesses form the Homer Marine Trades Association. Some members of this association informed the Project Delivery Team (PDT) about the incorporation of a marine trades program into high school and vocational training institutions in Homer. The goal of this program is to build local skills applicable to the marine trades and services in the study area. These key socioeconomic characteristics play a role in the local employment and income in Homer, and are dependent on a functional harbor with adequate moorage facilities for both small and large vessels that need repair services. Improved navigational infrastructure associated with the proposed Large Vessel Harbor Expansion Project translates to improved opportunities for local marine trades services.

2. ECONOMIC ANALYSIS

2.1 Overview

The economic analysis presented below re-assesses the benefit categories evaluated in the 2008 USACE study based upon new information available, conducts a high-level update to the benefit categories, and describes potential new benefits. The sponsor-proposed plan has the key goals of accommodating large vessels and reducing damages and delays currently experienced in the existing harbor.

2.2 Key Updates and Changes

Primary updates to the 2008 USACE study include price level and discount rate updates to the benefits considered in the previous analysis as well as updates to specific benefit categories relating to float and dock repairs, transportation cost savings for the commercial fleet, opportunities for increased subsistence harvests, and the removal of derelict vessels from the existing harbor.

2.2.1 Derelict Vessels

Lost revenue from and maintenance costs for derelict vessels were previously recognized as part of harbor operations damages. These derelict vessels have since been removed by harbor staff and are therefore eliminated from the analysis because the problem has been alleviated.

2.2.2 Avoided Travel for Commercial Fishing Fleet

Avoided travel refers to additional vessel operating costs (VOC) incurred by vessel operators when they are required to travel to another port foregoing the preferred and optimal port. These travel expenses represent a transportation cost inefficiency that could be avoided if Homer had adequate navigation facilities. A survey of harbor users was conducted in June 2007 by the USACE and the City. The Homer Small Boat Harbor Vessel Survey was mailed out to more than 1,100 users of the harbor at the time. More information on the survey can be found in the Homer Small Boat Harbor Vessel Survey Results Summary (USACE 2008b). Two survey respondents homeporting in Kodiak revealed they were seeking permanent moorage at Homer. The 2008 USACE study assumed that with permanent moorage, these vessels would forego at least one roundtrip annually to Kodiak.

The 2008 USACE study and other small boat harbor studies by the USACE Alaska District provide the basis for methodology and assumptions used to develop VOC estimates upon which avoided travel is quantified. This approach considers VOC by vessel and crew size. For this PAS study, data on permanent and transient moorage lease was cross-referenced with data from the Alaska Commercial Fisheries Entry Commission (CFEC) for commercial fishing vessels for 2018 (CFEC 2018). The underlying assumption for this analysis is that commercial fishing vessels that lease permanent and transient moorage in Homer, but are registered to homeport elsewhere, are required to make one roundtrip per year to the homeport. This assumption is comparable to that used in the previous 2008 USACE study regarding avoided travel for fishing

vessels. Transient moorage is leased on an annual, semi-annual, monthly and daily basis. This analysis considers fishing vessels with monthly transient subscription and permanent moorage subscriptions. Table 1 summarizes the homeport for the fishing vessels, the distances traveled roundtrip and vessel overall lengths. It is important to note that this analysis should be explored in more detail in the future.

Table 1. Avoided Travel for Fishing Vessels in Alaska, 2018

Homeport	Number of fishers	Vessel Length Overall Range (ft)	Nautical miles Round Trip
Kodiak	1	>75	252
Kodiak	2	51-75	252
Kodiak	3	41-50	252
Kodiak	2	33-40	252
Seldovia	1	>75	32
Seward	1	41-50	316
Port Lions	1	33-40	348
Valdez	2	41-50	534
Cordova	3	41-50	540
Cordova	2	33-40	540
Cordova	2	25-32	540
Chignik	2	51-75	626
Chignik	2	41-50	626
False Pass	2	41-50	1042
Juneau	1	>75	753
Juneau	3	51-75	753
Juneau	5	33-40	753
Total number of Fishing Vessels with avoided travel in 2018	**35**		

2.2.3 Avoided Travel for Commercial Vessels

Commercial vessels in Homer participate in a range of activities including fishing, freight/cargo transport, and northern operations and explorations support as tow and/or tug vessels. In the 2008 USACE study, avoided travel benefits were captured for 11 tenders. These benefits were measured as transportation cost savings for boats greater than 85 ft in length that were not able to obtain permanent moorage at the harbor but were assumed to moor there if adequate moorage were available. The number of large commercial vessels (excluding commercial fishing) increased from 11 to 20 in 2018. The largest vessel measuring 190 ft in length overall (LOA) uses transient moorage at the current harbor. As such, these large commercial vessels may be incurring additional VOC. Assessing these potential transportation cost savings would require a more detailed investigation.

2.2.4 Subsistence Harvest

The analysis of potential subsistence benefits for this PAS study follows the approach used in the 2008 USACE study with two notable updates. First, a price level update was conducted so all prices relating to subsistence resources are now reported in current dollars. Second, the method used to estimate the value of subsistence resources was updated to incorporate production cost values in addition to the replacement cost values used in the 2008 USACE study. Together, these changes resulted in an increase in the average value of subsistence resources from $5.11 to $12.54 per pound. This methodology for valuing subsistence harvest is also used in other recent and ongoing USACE Alaska District studies and is further discussed below. Other assumptions used in this analysis are consistent with the 2008 USACE study and are also described below.

The subsistence harvest analysis in the 2008 USACE study considered a total of 93.8 pounds per capita subsistence harvest for Homer per Alaska Department of Fish and Game (ADF&G). It assumed that subsistence activity would increase harvest by 15 percent as a result of improved harbor conditions. It also assumed population increase by projections by Alaska Department of Labor (ADOL) for the Gulf Coast Region Population. As noted above, the subsistence harvest value was based on replacement cost analysis, which relied on information collected from full-line grocery stores in Homer by averaging prices of meats and related products. The valuation of subsistence harvests is now based on assumed replacement values and production cost values for these resources.

A study conducted by the ADF&G Division of Subsistence found that the replacement value of subsistence resources ranged from $4.00 to $8.00 in 2012, or $4.25 to $8.50 in current dollars. A study conducted for the Alaska District about subsistence harvest values on Little Diomede found maximum harvest values of $24.86 per pound, updated to current dollars. These values were updated to current dollars using the Anchorage Consumer Price Index from the State of Alaska Department of Labor and Workforce Development. The values from the Little Diomede study are higher than those reported by ADF&G as they represent the total production costs of acquiring subsistence resources rather than a replacement value. Replacement values only consider the cost of purchasing proteins whereas the production cost method used for Little Diomede considers all of the resources utilized to harvest subsistence resources. The intent of this method is to better quantify the value of subsistence beyond a simple replacement value of protein.

The values calculated for Little Diomede are specific to that community and do not necessarily represent the costs to harvest subsistence resources in Homer. However, including this cost on the distribution of possible subsistence valuations is appropriate for this analysis to address the range of methodologies for valuing subsistence. The method used for the Little Diomede feasibility study is a production cost method which considers that subsistence resources are worth at least as much as the harvesters invest in them through expenditures of cash and labor. This is thought to be a more comprehensive approach than simply considering the grocery store (or equivalent) replacement value of these resources.

The subsistence data presented in the Little Diomede feasibility study is based on comprehensive surveys to estimate subsistence production time and costs. The level of data needed to conduct a detailed update of this method is not available for Homer. As such, updating the value from the Little Diomede study using an economic index is an appropriate method to utilize this data for Homer. This value is used as one point on the distribution of subsistence values to represent the uncertainty in quantifying these resources.

2.3 Existing Conditions

The following sections describe current conditions at the Port of Homer.

2.3.1 Marine Facilities

Cook Inlet is broken into two fisheries management areas: Upper Cook Inlet (UCI) and Lower Cook Inlet (LCI). UCI and LCI are further divided into districts and subdistricts (see Figure 5). As a major port for commercial fishing in the southern region of Cook Inlet Fisheries Management Area, the Port of Homer consists of the facilities for harvest deliveries as well as a modern fish dock with public access cranes and ice facilities. Figure 5 shows the facilities available at the Port and Harbor of Homer.

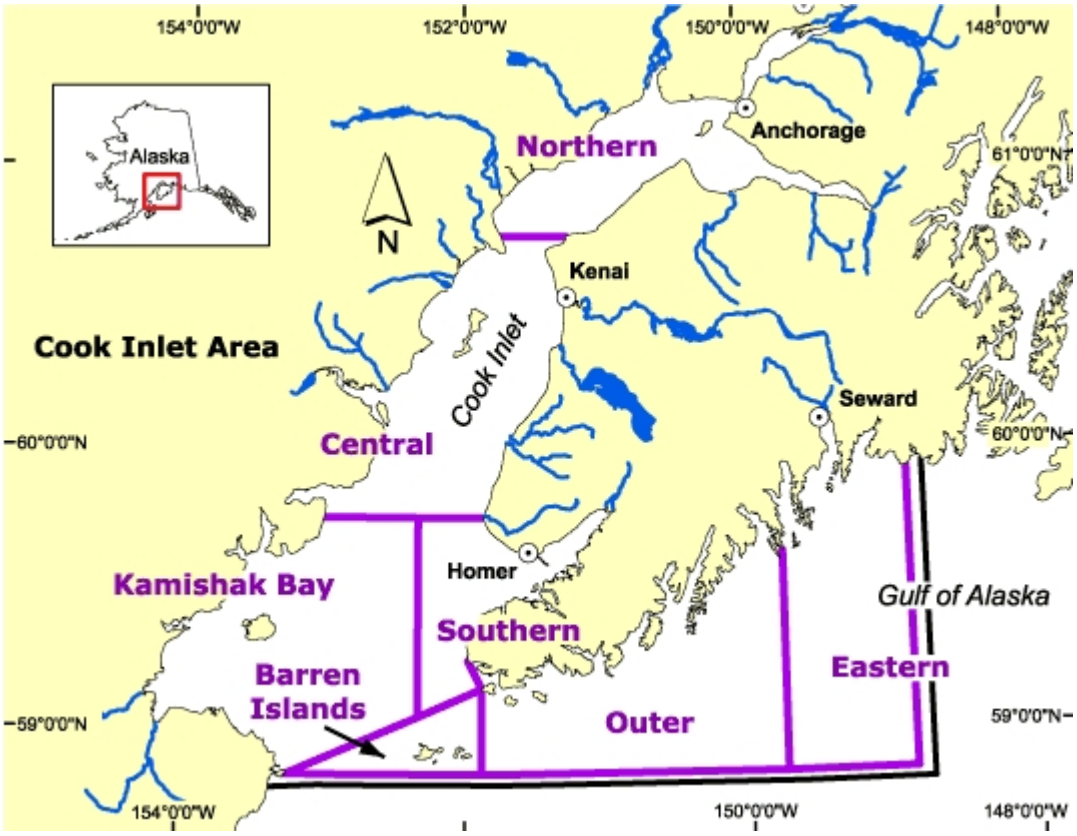

Figure 4. Cook Inlet Fisheries Management Districts & Subdistricts.
Source: State of Alaska 2019b

A. Deep Water Dock

The Deep Water dock northeast of the existing harbor is a secure facility, gated with heated guard station and restrooms, allowing for the transfer of both regulated and unregulated cargo. It allows berthing for ships up to 820 ft LOA and 65,000 displacement tons at -40 ft Mean Lower Low Water (MLLW). There is a 5-acre cargo laydown area directly adjacent to the Deep Water dock that is fenced, gated, and lighted, with monitored security cameras that allows for regulated and unregulated cargo staging and storage.

B. Pioneer Dock

The Pioneer Dock, located to the east of the existing harbor, is a U-shaped structure with two trestles and an outer berthing face of 469 ft and with a combination of breasting/mooring dolphins provides for docking of ships up to 750 ft LOA. Currently this dock has a -40 ft MLLW moorage depth, and it is used for preferential berthing of the AMHS ferries and as a USCG berth (on the northwest trestle).

C. Large Vessel Haul Out Repair Facility

Homer has a large vessel haul out and repair facility located in between Nick Dudiak Fishing Lagoon (also known as the Fishing Hole) and the Freight Dock Road west of the harbor. This facility is marked in the darker blue in Figure 5. The haul out facility is currently used as a repair site option for select large vessel owners. The large vessel haul out repair facility is a key project for the City in its Capital Improvements Plan (CIP) for 2019 to 2024. The City plans to improve the facility to enable barges to complete required annual maintenance at the uplands repair facility while wintering over.

Figure 5. Port of Homer Facilities

2.3.2 Homer Boat Harbor

The existing harbor is a key infrastructure facility in the City's robust port. The harbor has a five boat lane load and launch ramp. An inner and outer barge ramp facilitates loading and unloading of cargo. The harbor has 900 stalls ranging from 20 to 75 ft long for moorage. The harbor allows the longest stalls (75 ft) to accommodate vessels of overall lengths up to 85 ft. Permanent moorage is leased on an annual basis from 01 October to 30 September the following year. Currently the permanent stalls are at maximum capacity for stall lengths ranging from 24 to 75 ft. Close to 60 vacant 20-foot stalls are offered for seasonal lease from April to September for smaller boats.

Vessels with overall lengths exceeding 85 ft are tied to transient rafts and are offered transient moorage lease. The harbor has 6,000 linear ft of transient moorage leased on an annual, semi-annual, monthly, and daily basis. Figure 6 shows the stall sizes and transient moorage in the existing harbor. The harbor as shown on the map, also assigns the space at the endcaps of each 'branch' (also referred to as stall fingers) as a stall for either permanent or transient moorage. When the harbor is at maximum capacity, boats moored in these spaces constrict passage and reduce maneuverability.

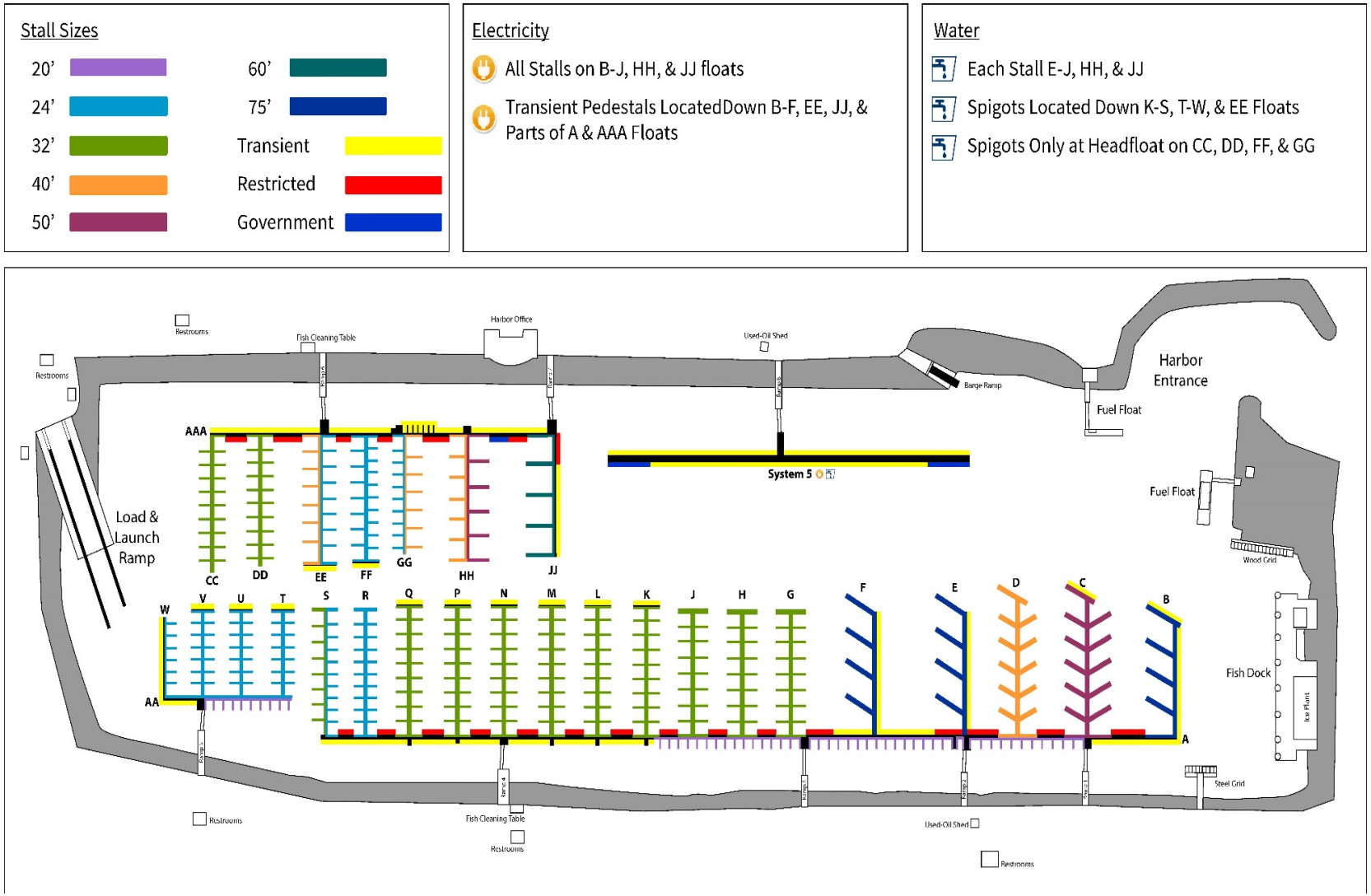

Figure 6. Homer Harbor Moorage Map

A majority of the harbor stalls are 32 ft, 24 ft and 20 ft long (Table 2). System 5 and the highlighted sections of the harbor are designated for transient moorage (see Figure 6) are not included in the number of stalls presented in Table 2.

Table 2. Number of Stalls at Homer Harbor

Stall Size (ft)	Number of Stalls	Percent of Stalls	Location in Harbor/Label
20	103	12%	AA, A
24	230	26%	EE,FF,GG,W,V,U,T,S,R
32	423	48%	CC,DD,S,Q,P,N,M,L,J,K,H,G
40	65	7%	EE,GG,HH,D
50	34	4%	HH, C
60	9	1%	JJ
75	24	3%	F,E,B
Total	**888**	**100%**	

2.3.1 Fleet Composition

This section discusses characteristics of the fleet in the study area. Homer's location as a regional transportation hub in the central gulf and the marine resources in the surrounding area attract numerous user groups to the harbor including commercial fishing, charter, recreation, commercial freight, tourist transportation, research, and the USCG. The data presented here are sourced from the harbor office and the CFEC.

Table 3 shows the vessels lengths overall that lease permanent or transient moorage at the Homer Port for the period of 2017 to 2018. As shown, more than 1400 boats and vessels moor at the harbor. Close to 40 large vessels with overall lengths exceeding 85 ft are rafted to transient floats for moorage. This still leaves 1,400 boats and vessels that are assigned to 888 stalls.

Table 3. Homer Fleet Characteristics 2017-2018

Length Overall (ft)	<15	15-24	25-34	35-44	45-54	55-64	65-74	75-84	85-94	95-104	105-114	>115	Total
Permanent	0	97	399	150	27	24	11	3	4	0	0	0	715
Transient	2	212	274	110	58	29	10	13	7	13	8	10	746
Total	**2**	**309**	**673**	**260**	**85**	**53**	**21**	**16**	**11**	**13**	**8**	**10**	**1461**

A key issue according to the City is that fleet composition has evolved and this change was not adequately assessed in the 2008 USACE study. During data collection for this PAS study, the harbor was transitioning to a new database system during data collection, which imposed constraints on capturing the multi-year trend of the fleet composition using the existing harbor. Nevertheless, Table 3 above is a snapshot that shows the prevalence of congestion problems that are further explained in the Moorage Demand Analysis section.

The primary purpose of the vessel is an important component to analyzing project benefits. Examples of vessel purposes include commercial fishing, subsistence, recreation, freight transport, and support for exploration or resource development in Cook Inlet. However, an accurate representation of vessel purpose is not adequately captured for 2017 to 2018 and is documented as a data gap.

2.3.1.1 Commercial Fishing Fleet

The rich marine resources surrounding Homer generate activities from numerous user groups including commercial and recreational fishers, aquaculture farmers, and subsistence users. Homer is the largest port in the southern region of the Cook Inlet fisheries management area and often accepts harvest deliveries from surrounding districts such as the adjacent Kamishak Bay, Barren Island, and Central Districts.

Homer's fishing fleet grew by 42 percent between 2008 and 2018. This is based on the fishing vessels that register Homer as their homeport on the CFEC database. The CFEC issues permits and vessel licenses for fishing in the State. Overall lengths of fishing vessel that have used Homer as a homeport in the last decade are shown in Table 4. The vessel dimensions are summarized into two categories: vessels with overall lengths less than 75 ft, and greater than 75 ft. Vessels with overall lengths exceeding the largest available stall size in Homer doubled between 2008 and 2018. This trend reflects an overall increase in the number and sizes of fishing vessels that homeport or seek moorage in Homer.

Table 4. Fishing Vessels Homeport in Homer

Length Overall (ft)	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
<75	426	443	484	536	548	569	589	589	582	601	600
>75	7	11	9	9	9	11	12	12	16	15	14
Total	**433**	**454**	**493**	**545**	**557**	**580**	**601**	**601**	**598**	**616**	**614**

It is important to note that the CFEC issues fishing permits and licenses. Vessel operators may participate in both commercial and subsistence fishing. Some of these operators are charters. These specific details require further investigation and a larger data collection effort that is outside the scope of this PAS study.

2.3.1.2 Commercial Vessels

Commercial vessels range in use from freight cargo and oil tenders to tow and tug support for northern explorations. In the 2008 USACE study, there were more than 200 commercial vessels using the harbor. According to the City, commercial vessels have increased in size over time and the fleet characteristics captured in the 2008 USACE study are no longer representative of current conditions. Two commercial freight vessels with LOAs of 200 ft and 260 ft used Homer's large vessel haul out facility for repairs and requested moorage but were turned away

because the harbor cannot accommodate them. This may indicate that commercial vessels that would rather moor in Homer have to travel elsewhere and incur costs that would be avoided if there was a large vessel harbor in Homer. Assessing these potential benefits are constrained by limited data and requires more investigation. As such, this PAS study notes the new anecdotal information presented but for NED evaluation assumes that the fleet composition for commercial vessels remains the same since 2008.

2.3.2 Moorage Demand Analysis

The number of boats and vessels that moor in the existing harbor exceed the number of stalls available. Table 5 shows the number of vessels for each vessel length range compared to the number of available stalls for the period of 2017 to 2018. The fleet shows a considerable wide range in overall lengths (from 15 to 177 ft) that use the harbor. For each vessel class there is an excess demand for moorage, with the exception of the smallest boats (lengths 15 to 24 ft). Moreover, it is typical that the stalls are assigned to vessels that are longer than the stalls. This is reflected in the column of available stalls assigned to each vessel group. In 2018, 6 vessels with overall lengths from 80 to 95 ft were assigned moorage in 75 ft stalls which were too small for these vessel sizes. These vessels draft between 3 and 8 ft. This has a cascade effect; boats in Homer are generally in stalls that are too small which adds stress to floats and harbor infrastructure, reducing maneuverability and imposing safety risks.

Table 5. Moorage Demand Analysis at Homer 2017-2018

Vessel Length Range (LOA in ft)	Number of Vessels	Available Stalls
15-24	311	333
25-34	673	423
35-44	260	65
45-54	85	34
55-64	53	9
65-74	21	24
75-84	16	
85-94	11	Rafted to transient floats
95-104	13	Rafted to transient floats
105-114	8	Rafted to transient floats
>115	10	Rafted to transient floats
Total	**1461**	**888**

As previously mentioned, vessels longer than 85 ft are tied to transient floats and often rafted 2 to 3 abreast. This condition adds to the issue of constricting travel between the docks, and

increases damages and delays. In 2018, close to 40 vessels over 85 ft in length used transient moorage and more than 270 small to large vessels were on the waitlist for moorage.

It is important to note that this is a high-level assessment of moorage demand that captures a one-year period based on readily available data. There are seasonal factors that impact moorage demand which are not specifically considered. These factors would require further investigation.

2.4 Without-Project Conditions

In the absence of Federal investment in navigation improvements for a large vessel harbor expansion project, the current navigation facilities are expected to remain heavily congested and lack moorage capabilities to meet demand, resulting in:

- Inefficiencies to harbor operations and all harbor users
- Transportation delays for vessels
- Damages to vessels and harbor infrastructure
- Lost opportunities for commercial vessels, subsistence, and recreational activities.

Over the 50 year period of analysis, the adverse impacts incurred as a result of current and future harbor conditions have a present value of $93 million and an average annual value of $3.5 million. These are preliminary values evaluated within the limited scope of this PAS study.

The categories of damages presented in Table 6 were developed and evaluated in the previous 2008 USACE study. The development of the without-project conditions analysis relied in part on a results of the 2007 mail-out survey previously discussed (Homer Small Boat Harbor Vessel Survey). This analysis provides a high-level re-evaluation of these categories. Specific updates to each category are subsequently discussed. Detailed descriptions for each category can be found in the 2008 USACE study economics appendix.

Table 6. Damages and Inefficiencies under Without Project Conditions

Categories	Present Value (FY19 dollars)	Average Annual Value	Percentage of Total
Harbor Operations			
Harbor personnel time	373,000	13,700	2%
Float and dock repairs	1,885,000	71,500	
Vessel Damages			
Commercial fleet	4,649,300	171,500	17%
Charter fleet	1,271,400	46,900	
Recreation boats	10,551,000	389,200	
Commercial Vessels			
Avoided travel	13,993,900	516,200	19%
Vessel delays	726,500	26,800	
Opportunity Cost of Time	3,464,600	127,800	
Tender Vessels			
Avoided travel	9,564,200	352,800	10%
Vessel delays	32,500	1,200	
Opportunity Cost of Time	149,100	5,500	
Charter Vessels			
Avoided travel	-	-	1%
Vessel delays	203,300	7,500	
Opportunity Cost of Time	463,600	17,100	
Recreation Vessels			
Recreation experience	12,165,000	461,600	13%
Subsistence Fleet			
Increased harvest	28,306,000	1,074,200	31%
Dredging by U.S. Coast Guard			
Avoided dredging	5,283,000	195,000	6%
Harbor of Refuge			
Avoided damages	33,000	600	<1%
Total Damages	**93,114,400**	**3,479,100**	

2.5 With-Project Conditions

The following section describes anticipated conditions at Homer assuming that a project has been constructed. The anticipated changes in the operating procedures at the harbor are the basis for the economic analysis.

2.5.1 Assumptions

The period of analysis is 50 years, beginning with the base year of 2022, the project effective date, to 2073. The FY19 Federal discount rate of 2.875 percent is used to discount benefits and costs. The report uses methodology for small boat harbor navigation analysis described in the

USACE Planning Guidance Notebook (ER 1105-2-100), with specific guidance found in the appendices on economic and social considerations and the USACE Civil Works program.

2.5.2 Project Alternative

One alternative was evaluated along with the future without-project conditions (No Action). The No Action alternative serves as a baseline for comparison to the proposed large vessel harbor alternative.

1. **No Action**. The harbor will remain the same absent Federal action. No large vessel harbor and no additional float system would be constructed. If no action is taken, congestion and overcrowded conditions will continue to cause transportation delays and limit access for commercial fishing and subsistence activities, creating economic inefficiencies to the region and Nation. No project benefits or opportunities would be realized.

2. **Large Vessel Harbor**. The large vessel harbor would be constructed north of the harbor. This is expected to relieve congestion and transportation inefficiencies in the current harbor. Potential project benefits and opportunities identified in earlier sections of this report may be realized.

2.5.3 Summary of Future With-Project Conditions

Preliminary benefits that are expected to be realized with construction the large vessel harbor are presented in Table 7.

Table 7. Preliminary Benefits: Large Vessel Harbor

Benefit Categories	Present Value of Benefit (FY19 dollars)	Average Annual Benefits	Percentage of Total
Harbor Operations			25%
Harbor personnel time	263,993	9,760	
Float and dock repairs	17,399,019	622,728	
Vessel Damages			15%
Commercial Fleet	3,293,842	121,522	
Charter Fleet	756,629	27,970	
Recreational Fleet	6,279,058	231,619	
Commercial Vessels			15%
Avoided Travel	7,410,491	365,758	
Vessel delays	514,774	19,044	
Opportunity Cost of Time	2,454,611	90,576	
Tender Vessels			7%
Avoided Travel	5,064,547	249,948	
Vessel delays	23,090	833	
Opportunity Cost of Time	105,692	3,928	
Charter Vessels			0.6%
Avoided Travel	-	-	
Vessel delays	121,046	4,523	
Opportunity Cost of Time	275,895	10,236	
Recreational Vessels			10%
Recreational experience	7,239,574	274,700	
Subsistence Vessels			18%
Increased Harvest	12,531,574	475,500	
Dredging by US Coast Guard			9%
Avoided Dredging	6,287,985	231,976	
Harbor of Refuge			0.03%
Avoided Damages	19,639	714	
Total Benefits With-Project	**70,041,460**	**2,741,336**	**100%**

2.5.4 Project Costs

As previously mentioned, the scope of this PAS study was to consider one alternative, the conceptual design of a large vessel harbor that was provided by the local sponsor. The PDT agreed that for this high-level study, the analysis would evaluate the alternative from the 2008 USACE study, for which rough order of magnitude (ROM) costs are available, that is most similar to conceptual design by the City. ROM cost estimates for the alternative considered were developed by USACE Alaska District cost engineers. Cost risk contingencies were included for each item to account for uncertainty.

2.5.5 Key Updates to Project Costs

The project costs developed in the 2008 USACE study are escalated by 20 percent to account for increased prices. The 20 percent escalation is separate from the 20 percent contingency to account for cost uncertainties. Recalling key considerations raised by the City regarding a potential decrease in costs of rock and dredge material management, these form the basis for two scenarios reflected in the preliminary project costs. The first scenario assumes that rock prices and costs of dredge material management will not decrease. This is reflected by contingencies of 20 percent applied on each item cost. The second scenario assumes that costs will decrease and is reflected by removing contingencies from costs associated with rock production and dredging. Contingencies remain for other items.

As with benefit cash flows, costs are discounted to a base year and amortized for comparison against the average annual benefits. Costs used for the benefit-cost analysis include the project first cost, interest during construction (IDC), and operation, maintenance, replacement and rehabilitation (OMR&R) costs greater than the without-project condition. IDC represents the opportunity cost of capital incurred during the construction period. The OMR&R is assumed at $35,000 annually, amounting to a present value of $922,000 over the 50-year period of analysis.

The combination of project first costs, IDC, and OMR&R costs form the total investment cost, which was used to determine the average annual equivalent cost for each scenario. Average annual costs were developed by combining the initial construction costs with annual operations and maintenance costs for the alternative under both scenarios using FY19 Federal discount rate of 2.875 percent along with a period of analysis of 50 years. All costs are in 2019 dollars. Table 8 presents the ROM costs for each scenario.

Table 8. Rough Order of Magnitude Costs by Scenario

Cost Description	Scenario A	Scenario B (without contingency for rock prices and dredging)
Land, Easements, Rights-of-Way, and Relocations (LERR)	20,000	20,000
Mobilization and Demobilization	4,279,343	4,279,343
Preparatory Work	113,820	113,820
Breakwater and Seawalls	43,502,887	38,047,640
Dredging and Disposal	14,824,568	12,536,826
Navigation Aids and Markers	119,417	119,417
Inner Harbor Facilities	11,844,004	11,844,004
Pre-Engineering and Design (PED)	2,987,362	2,987,362
Project First Cost	**77,691,400**	**69,638,692**
Interest During Construction (IDC)	2,208,243	1,979,358
Operations, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R)	922,313	922,313
Total Investment Cost	**80,821,956**	**72,540,362**
Average Annual Cost	**3,067,000**	**2,753,000**

2.5.6 Preliminary Net Benefits and Benefit-Cost Ratio

Net benefits and the BCR are determined using the average annual benefits and average annual costs for each scenario. Net benefits are determined by subtracting the average annual equivalent costs from the average annual benefits for each alternative; the BCR is determined by dividing average annual benefits by average annual costs (Table 9).

Table 9. Summary of Project Costs and Benefits

Alternative Scenario	Present Value Benefits	AAEQ Benefits	Present Value Costs	AAEQ Costs	Net Annual Benefits	BCR
Scenario A	70,041,460	2,741,336	80,821,956	3,067,000	-325,664	0.89
Scenario B	70,041,460	2,741,336	72,540,362	2,753,000	-11,664	1.00

Note: Scenario B reports a minimal negative net annual benefits of -$11,600. This amount is less than 1% of present value cost for this scenario and the values are rounded, resulting in a preliminary BCR of 1.00.

2.6 Data Gaps and Limitations

While considerable effort was taken to gather sufficient data comparable to the analysis in the 2008 USACE study, data gaps remain as a constraint in this analysis. It is beyond the scope of this study to produce analyses that are closely comparable to the details in the 2008 USACE study. However, it provides an opportunity for documenting specific data needs for further

investigation. Table 10 shows the major benefit categories, the portion of total benefits each of these categories comprises, and descriptions of data needs.

Table 10. Benefit Data Gaps

Benefit Categories	Percent of Total Updated Benefits (PAS 2018)	Data Need Description
Float and Dock Repairs	25%	Analysis assumes 15 to 25 percent of accelerated dock repairs on replacement schedule. Costs on repair and replacement work done since 2008 will inform updated accelerated dock repairs
Vessel Damages -Commercial Fleet -Charter Fleet -Recreational Fleet	15%	Adequate details of vessel dimensions and purpose inform fleet composition. This information by vessel type factors into quantifying vessel damages
Avoided Travel -Commercial Fleet -Tender Vessels	22%	Capturing the types of commercial vessels and documented cases of avoided travel including ports the vessels travel to will improve this analysis
Recreational Experience	10%	Adequate representation of recreational vessels in the existing harbor inform this analysis
Subsistence Vessels	18%	Adequate data on vessels for subsistence purposes in the existing harbor inform this analysis

2.6.1 Assumptions

The USACE assumes that the adverse impacts summarized (see Table 6) would persist in the future while also acknowledging a need for additional data gathering that is beyond the scope of this PAS study. This would allow a more adequate evaluation of the future without-project and with-project conditions. Assumptions noted in the previous study are maintained in this analysis unless stated otherwise.

There are pending initiatives and events that may occur in the future regardless of whether there is Federal investment in navigation improvements. These events may influence the demand and conditions at the existing small boat harbor. For example, an improved barge mooring and large vessel haul out repair facility may lead to more large vessels seeking permanent moorage in the existing harbor. The degree to which these different events may influence benefits and costs is beyond the scope of this PAS and warrants further investigation.

The City's Capital Improvement Plan (CIP) for 2019 to 2024 describes and provides justification and ranking for projects submitted for state funding. The following are pending projects that are

to take place in the study area vicinity. These are a mix of infrastructure improvements and technical plans for management of infrastructure.

- Barge Mooring and Large Vessel Haul Out Repair Facility
- Storm Water Master Plan
- Main Street Sidewalk Facility: Pioneer Avenue North
- Fire Department Fleet Management

The Cook Inlet Oil and Gas industry is potentially building a liquefied natural gas (LNG) export plant in Nikiski on the Kenai Peninsula. This project will move natural gas from the North Slope to Cook Inlet through a large diameter pipeline to a liquefaction plant in Nikiski. Construction of a plant of such magnitude may attract more barge services and potentially influence large vessel moorage demand at the Homer harbor.

3. CONCLUSION

This preliminary assessment of costs and benefits of implementing navigation improvements in Homer identified a BCR range of 0.89 to 1.00. This analysis meets the study objective discussed to provide planning/technical assistance to the local sponsor by developing a preliminary assessment of the cost and benefits of implementing navigation improvements to build a large vessel harbor to the north of Homer's existing small boat harbor.

It is important to note that this BCR range is based on project cost assumptions, not a range of benefit values. This BCR range may potentially change with more available data about benefit categories and project costs. The benefit evaluation presented in this report included price level and discount rate updates to the benefits considered in the 2008 USACE study as well as updates to specific categories when information existed to inform such updates. This included updating assumptions and benefit values relating to float and dock repairs, transportation cost savings for the commercial fleet, subsistence harvesting opportunities, and the removal of derelict vessels from the existing harbor.

While considerable effort was taken to gather sufficient data comparable to the 2008 USACE study, data gaps remain as a constraint to this analysis. While it is beyond the scope of this PAS effort to produce detailed analyses similar to what occurred in 2008, this study provides an opportunity for documenting specific data needs for further investigation (see Table 10). The benefit categories presented in Table 10 comprise approximately 90 percent of total benefits considered in this analysis. With additional data on these items, it is possible that the BCR could increase beyond the range estimated in this PAS report.

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