



**US Army Corps  
of Engineers®**  
Alaska District

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# DRAFT Feasibility Report and Environmental Assessment

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## **Homer Navigation Improvements Homer, Alaska Appendix M: Eelgrass Mitigation Assessment**



**May 2026**

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## **ACRONYMS AND ABBREVIATIONS**

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CY	Cubic Yards
FWOP	Future Without Project
FWP	Future With Project
HSI	Habitat Suitability Index
HU	Habitat Units
IFR/EA	Integrated Feasibility Report and Environmental Assessment
KBRR	Kachemak Bay National Estuarine Research Reserve
MLLW	Mean Lower Low Water
NCCOS	National Centers for Coastal Ocean Science
NFS	Non-Federal Sponsor
NTU	Nephelometric Turbidity Units
PED	Preliminary Engineering and Design
SAV	Submerged Aquatic Vegetation
USACE	U.S. Army Corps of Engineers
USCG	United States Coast Guard

## APPENDIX M - EELGRASS MITIGATION ASSESSMENT

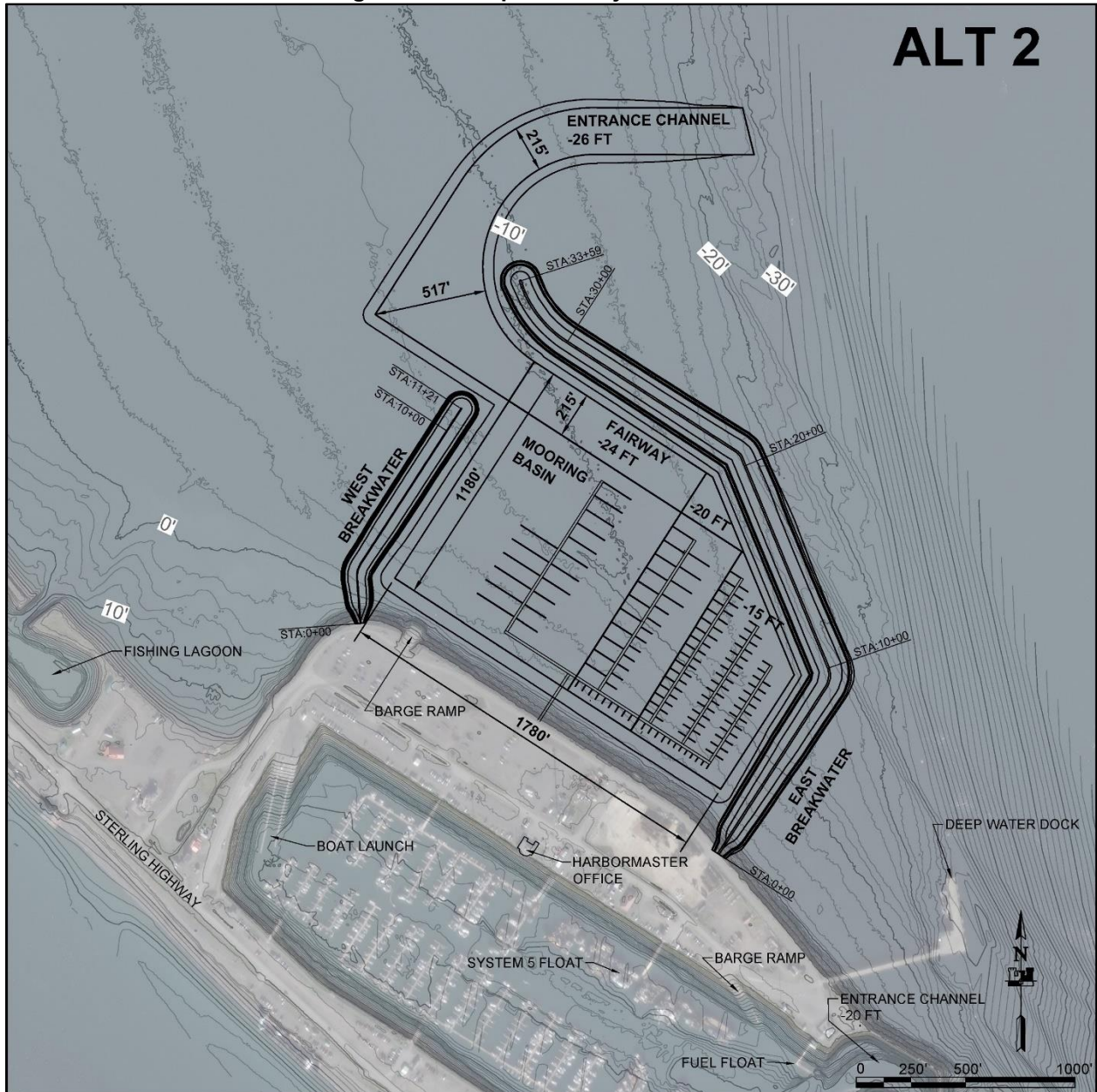
### M.1 Introduction

U.S. Army Corps of Engineers (USACE) operates under specific statutory and regulatory requirements when evaluating and implementing Civil Works water resource development projects. As amended by Section 2036(a) of the Water Resources Development Act of 2007, the primary directive for fish and wildlife mitigation is outlined in 33 United States Code (U.S.C.) § 2283. This statute mandates that any project report submitted for Congressional authorization must include a specific plan to mitigate fish and wildlife losses, unless the Secretary of the Army determines that the adverse impacts to fish and wildlife resources from the project would be negligible. The execution of this statutory requirement is governed by the USACE 2009 Implementation Guidance for Section 2036(a) of the Water Resources Development Act of 2007. This guidance establishes the procedural framework for determining whether project impacts necessitate a comprehensive mitigation plan or if they qualify for a negligible impact exemption. For projects where impacts are determined to be more than negligible, the final mitigation plan must establish explicit ecological success criteria, include a monitoring and contingency plan, and ensure that mitigation activities are undertaken prior to, or concurrently with, project construction.

The USACE Alaska District's Feasibility Study, *Homer Navigation Improvements Study, AK*, evaluated alternatives to address the need for navigation improvements at Homer, Alaska. Eelgrass (*Zostera marina*), a highly productive habitat critical to local fish and wildlife and special aquatic site under the Clean Water Act, is present within the footprints of all practicable alternatives considered in the study, and there is no practicable alternative that completely avoids it. Because complete avoidance is not practicable, and recognizing both the ecological significance of the resource and associated public concerns, this Eelgrass Mitigation Assessment was developed to evaluate the scope of impacts and determine required mitigation. It is important to note that this document is an assessment, not a mitigation plan.

USACE has developed a Draft Integrated Feasibility Report and Environmental Assessment (IFR/EA) for its Feasibility Study. The focus of this evaluation is the Tentatively Selected Plan, Alternative 2 (Transient and Waitlisted Vessels Harbor), of the study referred to herein as the proposed project (Figure M-1).

Figure M-1. Proposed Project Features.



## M.2 Purpose

During field surveys for the proposed project, USACE Alaska District biologists identified eelgrass within the project footprint. Additionally, members of the feasibility study's Environmental Stakeholder Working Group expressed concerns regarding potential direct and indirect impacts to this resource.

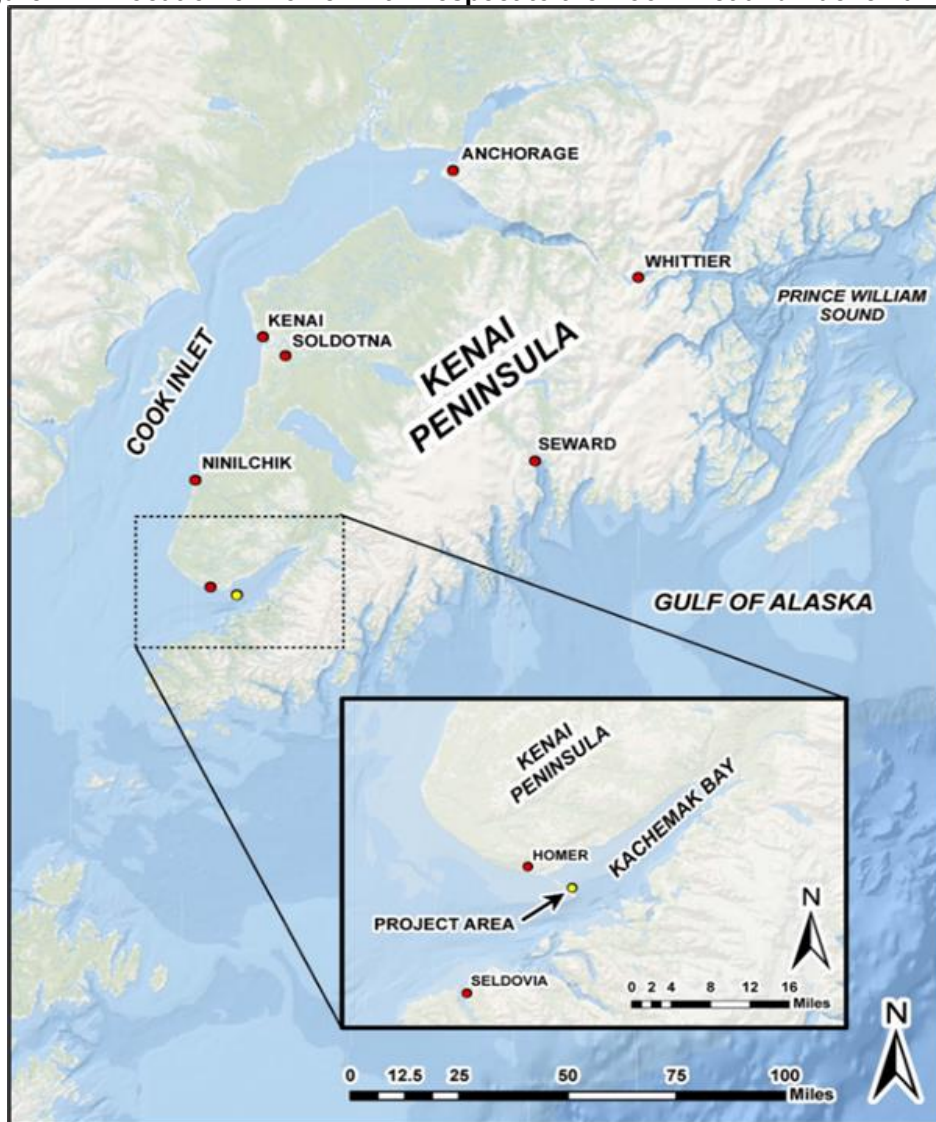
The purpose of this Eelgrass Mitigation Assessment is to analyze the extent of these potential impacts and evaluate them against the statutory "negligible" threshold established in 33 U.S.C. § 2283. The findings of this assessment will directly support the environmental impact determinations within the Draft Integrated Feasibility Report

and Environmental Assessment (IFR/EA). Ultimately, should the impacts be determined to be more than negligible, this assessment will serve as the technical foundation to structure the formal, comprehensive mitigation plan mandated under the statute. For the purposes of this assessment, the 'negligible threshold' would be considered exceeded if pre-construction survey data based on the final design indicates the net loss of eelgrass habitat greater than 0.4 acre-Habitat Units (acre-HUs; see Section 4.3.3.). If this specific threshold is met, USACE would develop and implement the Adaptive Management and Mitigation Plan.

### **M.3 Proposed Project**

The City of Homer is located in the Kenai Peninsula Borough of Southcentral Alaska, 227 road miles and 118 air miles southwest of Anchorage. It is the southernmost town on Alaska's contiguous highway system and part of the Alaska Marine Highway, a ferry service that operates along the southcentral coast of Alaska. The Homer Port and Harbor (herein Homer Harbor) is located in Homer, Alaska at the end of the Homer Spit (herein Spit; Figure M-2). The Spit is a 4.5-mile-long natural sand spit that extends southeast from the City of Homer out into Kachemak Bay. Kachemak Bay is located on the southern tip of the Kenai Peninsula and drains into the Gulf of Alaska by way of Cook Inlet.

**Figure M-2. Location of Homer with Respect to the Cook Inlet and Kachemak Bay.**



Construction of the original Homer Harbor began in the early 1960s. Through a partnership with USACE, the harbor was reconstructed as a 16-acre basin after being damaged by the 1964 Good Friday Earthquake. The harbor fleet exceeded the harbor's capacity, and a harbor expansion project was initiated in 1984 and completed over the next 3 years before resulting in a 50-acre basin, its current size to this day. During this expansion, the existing breakwaters were not altered, but the entrance channel was modified and additional moorage areas were created. Mooring facilities developed incrementally over several years following the expansion, and the dredged material disposal area has since been converted into usable uplands.

The current 50-acre harbor hosts 876 reserve slips and approximately 6,000 feet of transient moorage space, a 5-lane boat launch and barge loading ramp, two tidal repair grids and haul out repair facility, a Deep Water Dock, United States Coast Guard

(USCG) Dock, a ferry terminal located at the Pioneer Dock, two fuel floats, and a fish dock with cranes (Figure M-3).

**Figure M-3. Existing Homer Harbor Facilities Layout.**



The harbor also serves as a critical supply hub for surrounding villages and many nonroad-connected communities. Vessels from the harbor serve over 100 communities, and 50 communities not connected to the road system rely on Homer as a regional hub port. These communities are located in Kachemak Bay, Cook Inlet, Lake Iliamna and Clark, Williamsport, Kodiak Island, along the Alaska Peninsula, the Aleutian Island chain, and Western Alaska. As a regional port, it also serves the needs of vessels operating across southcentral and western Alaska in the commercial fishing, marine transportation, and maritime industries.

The proposed project would develop expand the existing harbor by constructing a new harbor basin encapsulated by a rubble-mound breakwater. It is designed to accommodate the current moorage waitlist and entire transient fleet for vessels up to 225-feet in length. Moorage provided under this proposed project would be sufficient for approximately 304 vessels. The features of the project would include:

- Rubble-mound Breakwater: Construction of a 4,500 linear feet rubble-mound breakwater with crest height of +30 feet mean lower low water (MLLW)
- Harbor Basin and Entrance Channel: Newly dredged 68-acre area consisting of a fairway and mooring basin to -24 feet MLLW and 90-foot-wide entrance channel to -26 feet MLLW
- Float System 5: Replacement of this float system in the existing Homer Harbor with moorage for 40 vessels at 24 feet in length and 132 vessels at 32 feet in length
- New Harbor Float System and Fuel Dock: Installation of a float system as described above and new fuel dock by the non-Federal sponsor (NFS)
- Navigation Aids (not depicted in Figure M-1): Installation by the USCG consisting of an M-1142 Tower and lights on the end of each breakwater demarking the entrance channel and likely three 2976 5-Pile Dolphin Towers (herein Dolphin Towers) to mark the entrance channel. Two Dolphin Towers would be installed near the end of the entrance channel as a “gated pair,” and one would be installed to mark the Northeast corner of the dredged channel just outside of the breakwaters.

In-water rock placement, dredging, and pile driving operations are the primary construction activities that would be required to construct the proposed project. Rock placement operations are anticipated to require an estimated 500,400 cubic yards (CY) of rock (123,100 CY Armor Rock, 66,500 CY B Rock, and 310,800 CY C Rock) for constructing the rubble-mound breakwater. Dredging operations would include new work dredging (i.e., removal of native sediment) of an estimated 1,311,800 CY of predominately fine-grained material (“very soft to soft silt and clay” and “loose to medium dense sand”), and maintenance dredging (i.e., removal of accumulated sediment) of approximately 17,000 CY annually of “very soft silts and clays, and loose sands.”

The method of new work and maintenance dredging to take place under the proposed project is subject to change; however, the Alaska District typically elects mechanical dredging of new work to lower the risk of delays due to potential variance from geotechnical analyses. Maintenance dredging of the new harbor basin is likely to remain consistent with current maintenance dredging operations of the existing harbor that use a hydraulic cutterhead suction dredge. In-water discharge of dredged material at a deep-water site within the boundaries of the area excluded from the Kachemak Bay Critical Habitat Area is proposed under the study while maintenance dredged material is anticipated to be piped to an upland dewatering location for beneficial use (e.g., placement on the western shoreline of the Homer Spit to combat erosion).

Pile-driving operations would be necessary for the NFS installed float systems and USCG installed navigation aids for the proposed project.

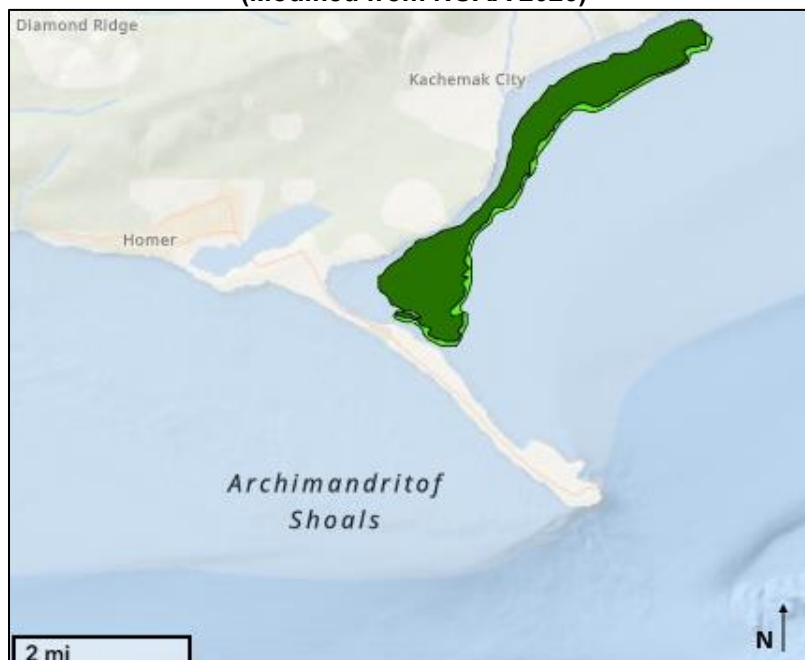
## M.4 Impact Assessment

This section reviews the eelgrass conditions under the Future Without Project (FWOP) and Future With Project (FWP), the methodology used to assess potential impacts to eelgrass, and the estimated extent of those impacts based on the best available information.

### M.4.1 Future Without Project

The eelgrass within the proposed project footprint and its immediate vicinity is subject to concentrated marine activity from existing infrastructure at the end of the Homer Spit. In contrast, a large, high-quality eelgrass meadow extends eastward from the Spit along the shoreline. The extent of this larger meadow is documented in the Kachemak Bay BIOMapper, which relies on aerial photo interpretation ground-truthed with underwater video data (Figure M-4; Field et al., 2005; NOAA, 2026).

**Figure M-4. Dense Eelgrass Meadow (Dark Green).  
(Modified from NOAA 2026)**



It is important to note that this existing distribution is influenced by significant natural variability inherent to subarctic coastal environments. Eelgrass in Alaskan waters undergoes natural seasonal diebacks in the fall, while being constantly subjected to the erosive forces of severe winter storms and extreme tidal flushing (ADF&G 2006). Furthermore, peer-reviewed literature confirms that winter ice scouring serves as a primary, natural source of eelgrass mortality and habitat shifting in Alaska's coastal margins, forcing a higher rate of annual habitat contraction and expansion (Phillips et al. 1983).

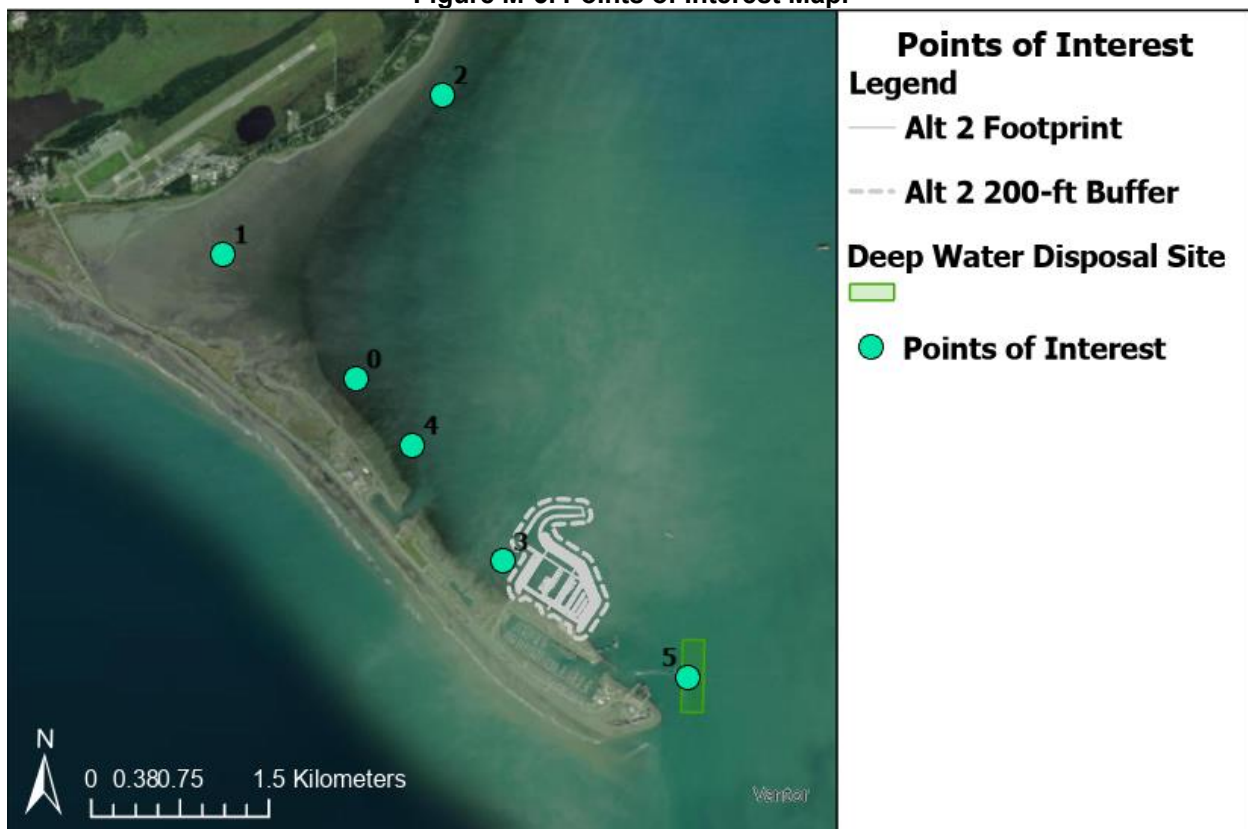
More current eelgrass mapping and ground verification efforts are underway by the National Centers for Coastal Ocean Science (NCCOS) Kasitsna Laboratory (as of

January 2024). This forthcoming data will further inform the understanding of eelgrass presence and its natural dynamics in Kachemak Bay once published.

### M.4.2 Future With Project

The Draft IFR/EA for this project discusses the FWOP and FWP conditions. In general, future conditions in the proposed project area would be affected by regional and national environmental trends. Sea level is predicted to change between -2.23 and 0.73 feet over a 50-year period (2034 to 2084) and water temperatures are projected to increase over time. Sediment circulation changes and the dredged prism of the new harbor may also impact the general seabed depth in Kachemak Bay. HDR modeling (See the HDR Metocean Baseline Conditions Report in the Draft IFR/EA Appendix A) consisting of hydrodynamic and wave, sediment transport, and wind-wave interaction modeling supports highly localized adverse impacts to the immediate proposed project area that are expected to adapt and stabilize appropriately 1 year post-construction. HDR outputs from the sediment transportation modeling for points of interest (Figure M-5) are provided in Table M-1. The scouring and accretion of sediment due to current speeds around the proposed project footprint may increase or decrease, respectively, the existing seabed until conditions stabilize. The sediment transport model predicts that while seabed depths would change in the immediate vicinity of the new breakwater and harbor, any changes in distant areas are likely attributable to existing natural sedimentation, as the project's influence becomes negligible with distance.

Figure M-5. Points of Interest Map.



**Table M-1. Seabed Change based on HDR Sediment Transport Modeling.**

<b>Points of Interest</b>	<b>Point 0</b> (151°27'16"W 59°37'32"N)	<b>Point 1</b> (151°28'30"W 59°38'5"N)	<b>Point 2</b> (151°26'33"W 59°38'50"N)	<b>Point 3</b> (151°25'55"W 59°36'43"N)	<b>Point 4</b> (151°26'45"W 59°37'14"N)	<b>Point 5</b> (151°24'14"W 59°36'13"N)
<b>Seabed Change Output (Meter)</b>	-0.0069	-0.0097	-0.0007	0.0221	0.0073	-0.0005
<b>Seabed Change Across 1 Year (52 Weeks)</b>	-0.3578	-0.5054	-0.0365	1.1471	0.3791	-0.0276

**Source:** See HDR Metocean Baseline Conditions Report in Draft IFR/EA Appendix A.

**Note:** “Seabed Change Output” data represents HDR sediment transport modeling outputs reflecting the change in the seabed depth across 14 tide cycles or a week-long storm event. Year 0 was multiplied by 52 to calculate the Year 1 outputs (52 weeks in 1 year). It is important to note that the system is anticipated to stabilize prior to 1 year post-construction and the change in seabed depth is biased high.

The presence of Eelgrass in Alaska is dependent on various characteristics of a habitat. Within Kachemak Bay, with an ideal depth range (HSI value of 1) being between -1 and +2 meters MLLW (this is consistent with the ecological model developed for the study; see Draft IFR/EA Appendix O). Eelgrass prefers cooler waters, generally 10°C/50°F and 20°C/68°F (Nejrup and Pedersen 2008) compared to tropical seagrass species. Aforementioned environmental trends and project-caused changes on sediment circulation in Kachemak Bay would put stress on eelgrass in the area. Eelgrass within and immediately adjacent to the proposed project are anticipated to be adversely impacted due to project-caused direct loss and disturbance from construction and installation of project features and indirect loss and disturbance from seabed change.

The installation of Float System 5, installation of navigation aids, and new work and maintenance dredged material discharge would not be incorporated into the eelgrass impact assessment. The anticipated eelgrass impacts from these activities are considered, at most, negligible. Float System 5 is within the existing Homer Harbor and consistent with ongoing baseline activities. Navigations aid installation impacts would be encompassed with the impacts captured under other activities carried forward in this assessment. Dredged material management is not included because eelgrass does not occur on the western side of the Homer Spit, and the deep-water disposal site's depth already precludes its viability under existing conditions. Furthermore, the dredged disposal and placement sites are sufficiently geographically separate from potential eelgrass to prevent long-term shoaling or turbidity levels capable of affecting eelgrass.

#### **M.4.3 Assessment Method**

An Ecological Modeling Workshop was held April 11–12, 2024, to develop a conceptual model that would be refined through an iterative process into a final ecological model for the Feasibility Study. The intent was to develop an ecological model with environmental stakeholders that would inform ecological impacts from a constructed alternative to environmental resources of concern. The environmental stakeholder participants were individuals who had environmental expertise and/or local knowledge and experience with the environmental resources in Kachemak Bay.

The refinement of the conceptual models resulted in a Submerged Aquatic Vegetation (SAV) Habitat Suitability Index (HSI) Spreadsheet Model (USACE Model) for the feasibility study (see Draft IFR/EA Appendix O for further details). Dr. Ross Whippo, National Oceanic and Atmospheric Administration's NCCOS Kasitsna Bay Laboratory, has developed a draft ecological model (herein called the NCCOS Model; Whippo 2026) and was consulted with to inform the development of the USACE Model.

The USACE Model and NCCOS Model scopes include all of Kachemak Bay and outputs are derived from three HSI Submodels: (1) Canopy Kelp, (2) Understory Kelp, and (3) Seagrass. The Seagrass HSI Submodel was based on factors specific to viability of eelgrass, and the results of this Submodel would be used to inform this mitigation assessment by providing eelgrass habitat suitability data within Kachemak Bay.

NCCOS is conducting surveys to inform the intertidal and subtidal habitats in Kachemak Bay. These surveys may be used to improve the NCCOS Seagrass HSI Submodel and resulting outputs. The NCCOS Seagrass HSI Submodel (Whippo 2026) has been used to inform the potential loss of eelgrass habitat, i.e., the model would account for the "loss of opportunity" of eelgrass growth in Kachemak Bay in the Feasibility Phase. Actual loss would be determined through on-the-ground pre- and post-construction surveys and monitoring.

#### **M.4.3.1 Seagrass Habitat Suitability Index Submodel**

The NCCOS Seagrass HSI Submodel assigns a value from zero to one to indicate the quality of a 50-square-meter area for supporting eelgrass propagation. A value of one represents optimal habitat with all necessary environmental factors for eelgrass viability, while a value of zero indicates the habitat is completely unsuitable. Therefore, a higher HSI value, such as 0.7, signifies a more suitable habitat for eelgrass than an area with a lower value, like 0.1.

The HSI value for a 50-square-meter area was calculated using four key variables:

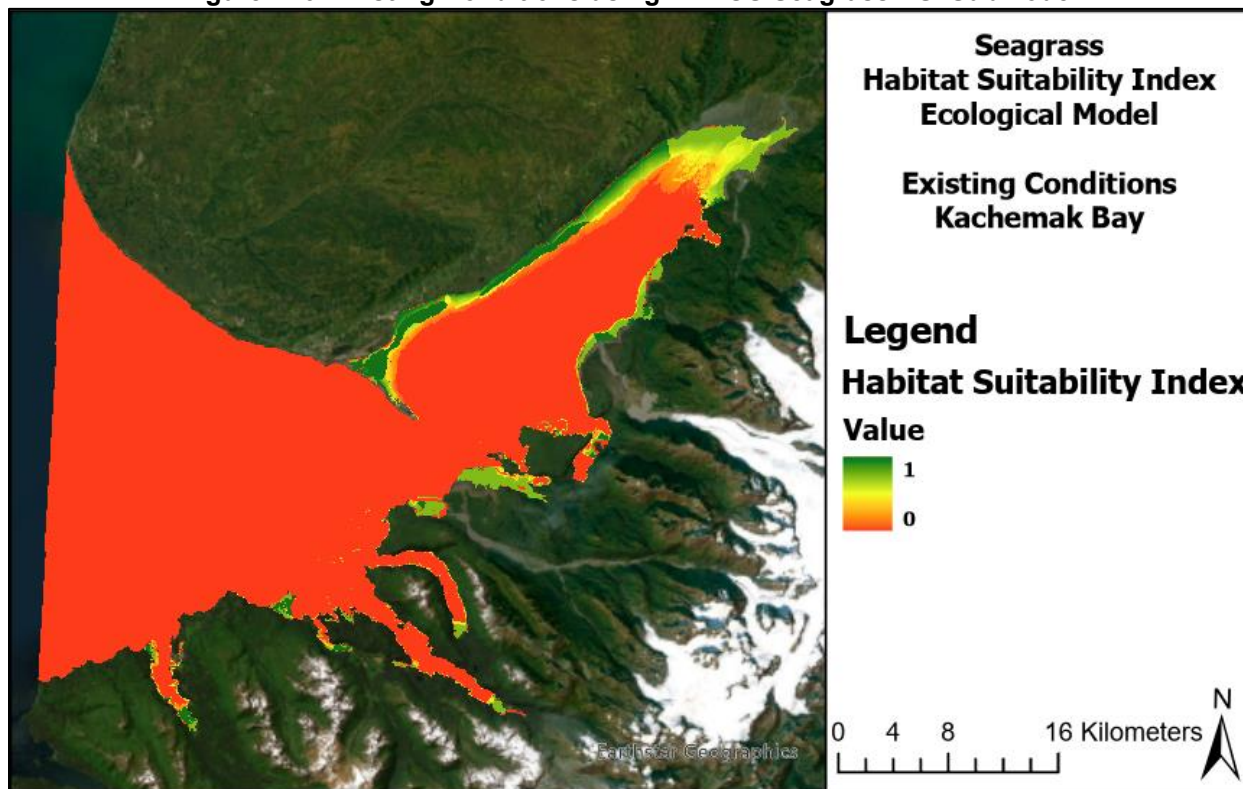
- Depth: bathymetry of the area.
- Fetch: distance over which wind blows in a constant direction, generating waves.
- Substrate: type of sediment in the area.
- Presence: known occurrence of eelgrass in the area.

For further details about these variables and how they were used in the ecological model results to determine eelgrass suitability, see Draft IFR/EA Appendix O.

In order to determine the estimated eelgrass impact; the FWOP seagrass conditions were based on the NCCOS Seagrass HSI Submodel, and the FWP conditions would be informed by the USACE Seagrass HSI Submodel. It is important to note that this would

result in the FWOP being represented as the same as existing conditions (Figure M-6; Whippo 2026). However, changing water temperature and bathymetry resulting from natural changes in the seabed and sea level have potential to benefit or adversely impact eelgrass habitat equality and eelgrass viability in Kachemak Bay.

**Figure M-6. Existing Conditions using NCCOS Seagrass HSI Submodel**



Under existing/FWOP conditions, there is cumulative HSI value of 31,343.6 in Kachemak Bay. HUs, representing the total habitat value were calculated by multiplying the quality [cumulative HSI value] by the quantity [total area] of eelgrass habitat. The HSI unit outputs of the NCCOS Seagrass HSI Submodel are based on a 50 square meter cell. Thus, the cumulative HSI value was multiplied by 50 square meters to calculate the HUs, resulting in 1,567,180 square meter-HUs (387.24 acre-HUs) for eelgrass in Kachemak Bay.

#### **M.4.3.2 Pre- and Post-Construction Surveys and Monitoring**

USACE would perform pre-construction eelgrass surveys during the eelgrass growing season in Kachemak Bay. The surveys would serve as a baseline condition for a final assessment of project impacts to eelgrass beds in the proposed project area. The eelgrass survey area would include monitoring sites in areas with potential for impacts from the proposed project and a series of reference sites to facilitate future assessments of natural variation within the system. Reference sites would be located outside the project's potential impact area for eelgrass but within the same system, i.e., Kachemak Bay. The identification and selection of monitoring and reference sites would

be developed in the Pre-construction Engineering and Design (PED) Phase. The intent of USACE is to inform the development of an Ecological Survey and Monitoring Plan through a workshop with environmental stakeholders at Homer in the PED Phase.

The pre-construction survey data would be used to (1) validate the impact determinations made during the Feasibility Phase or (2) identify if impacts are expected to exceed the negligible threshold based on the final design. If impacts exceed the negligible threshold, the data would be used to develop a ground-truthed functional multiplier for calculating the debits that would be incurred by construction and operation of the proposed project.

Post-construction monitoring would be conducted to quantify the project's impact on eelgrass habitat. Following the completion of construction, surveys identical to the pre-construction baseline would be performed during the growing season in years 0 (within 3 months), 1, 3, and 5. In accordance with the Ecological Survey and Monitoring Plan, these surveys would compare the spatial extent of eelgrass before and after construction to measure direct and indirect impacts, such as habitat loss or degradation, and to track any potential recovery while providing data from reference sites to account for natural eelgrass variability.

#### **M.4.3.3 *Negligible Threshold***

The negligible threshold for this project has been quantitatively established at 0.4 acre-Habitat Units (HUs) of net eelgrass habitat loss. This threshold provides a quantitative basis for triggering the Adaptive Management and Mitigation Plan and is justified by three primary factors unique to the Alaskan coastal environment:

First, regarding Ecosystem Scale, a threshold of 0.4 acre-HUs represents approximately 0.1% of the total regional resource and would ensure that the overall ecological function of the bay remains unimpaired (see Section 4.4.1. for baseline HU calculations).

Second, the threshold accounts for Natural Subarctic Variability, including the annual natural expansion and contraction of eelgrass beds due to ice scour, severe winter storms, and dynamic sedimentation. Setting the limit at 0.4 acre-HUs ensures that minor, naturally occurring seasonal die-backs are not falsely attributed to project impacts.

Finally, regarding Statistical Detectability, there are inherent challenges and standard margins of error associated with surveying submerged aquatic vegetation in highly turbid, macro-tidal waters. The 0.4 acre-HU threshold represents a statistically measurable and verifiable deviation rather than standard background survey variance.

#### **M.4.3.4 *Report***

USACE would develop an Ecological Monitoring Report detailing modeling, survey, and monitoring results to inform the follow-on impact assessment for eelgrass. This report would be shared with environmental stakeholders for the proposed project.

#### **M.4.4 Impact Estimates**

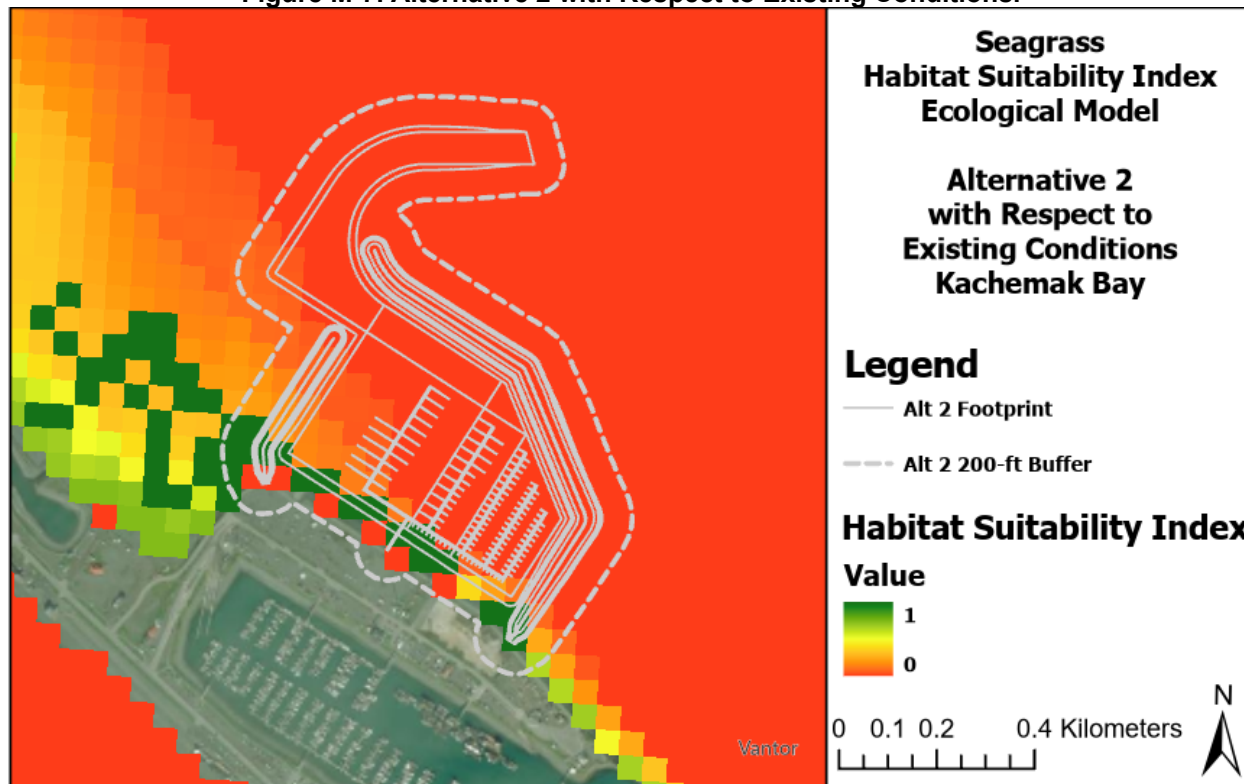
This section describes how permanent impacts from construction of project features and temporal (i.e., temporary) impacts from construction activities (e.g., turbidity plumes from dredging operations) to eelgrass were estimated. These estimates do not account for potential vessel or dredged material discharge impacts to eelgrass, which are not easily forecasted or quantified. The pre-construction and post-construction 0-, 1-, 3-, and 5-year surveys would be used to inform such potential impacts. Prior to construction, pre-construction surveys would confirm the findings of this assessment. Should these surveys identify unanticipated eelgrass loss, a formal Adaptive Management and Mitigation Plan would be developed to address it.

The proposed project would implement several mitigation measures and best management practices to minimize impacts on environmental resources such as eelgrass. The USACE Seagrass HSI Submodel would be utilized during the PED Phase to inform design decisions for avoiding or minimizing impacts to eelgrass, wherein practicable. Additional best management practices to reduce loss and disturbance during construction would include the use of silt screens during dredging and the use of chemically inert rock (pH 7.5-8.4) if practicable. All proposed measures are described in further detail in the Draft IFR/EA.

##### **M.4.4.1 *Permanent Impacts***

Permanent impacts to eelgrass were unavoidable and were based on the direct loss of eelgrass habitat anticipated from construction of the proposed project features. These impacts were estimated based on eelgrass habitat (weighted by its quality) that would be lost as a direct result of proposed project feature construction. Under the proposed project, this area was determined to be the footprint of the dredged prism and rubble-mound breakwater. A 200-foot buffer was added to the proposed project features when calculating potential eelgrass habitat loss to provide a conservative estimate of potential eelgrass loss adjacent to the project features based on the NCCOS Seagrass HSI Submodel (Figure M-7; Whippo 2026).

**Figure M-7. Alternative 2 with Respect to Existing Conditions.**



Based on the Seagrass HSI Submodel, the cumulative HSI value within the 200-foot buffered proposed project footprint is 12.2. This metric accounts for the potential of eelgrass growth throughout the area rather than relying solely on current presence; thus, the submodel accounts for the maximum extent of eelgrass potential for the impacted footprint. Using the prior equation for calculating HUs, the Alternative 2 buffered footprint encompasses 0.15 acre-HUs out of the 387.24 acre-HUs in Kachemak Bay (i.e., 0.0387% loss).

The spatial extent of direct impacts was calculated from the construction footprint, which includes the permanent habitat loss from the rubble-mound breakwater, the dredge prism, and the parking uplands. The float system is accounted for within the dredge prism area.

Indirect impacts from sedimentation are also anticipated. While sedimentation is expected to stabilize within 1 year post-construction, HDR modeling shows a potential for temporary impacts to adjacent eelgrass. Conversely, these same areas may support new growth of eelgrass or other SAV, potentially offsetting the initial loss. The proposed Ecological Survey and Monitoring Plan is designed to quantify these net impacts and validate these predictions.

**M.4.4.2 Temporary Impacts**

Temporary impacts would be indirect effects to eelgrass caused by turbidity plumes generated from dredging operations-. Dredging operations have potential to increase

the silt load in the water and result in turbidity plumes that increase the attenuation of light. The greater Nephelometric Turbidity Units (NTU) and duration of the plume experienced by eelgrass, the more likely the turbidity plume would adversely impact the survival and growth of eelgrass.

Kachemak Bay turbidity is a particularly dynamic feature, creating a distinct gradient from the turbid inner bay to the clearer outer bay (KBRR 2017; Doroff and Holderied 2018). During the summer melt season (May–September), plumes from major rivers cause turbidity to exceed 50 NTUs, while winter levels are often below 1 NTU (KBRR 2017). The eelgrass observed within the proposed project footprint in 2024 and 2025 underwater surveys (Appendix P) showed evidence of extension silt load under natural conditions as well (Figure M-8 and Figure M-9).

**Figure M-8. Eelgrass observed within Proposed Project Footprint June 6, 2024.**



**Figure M-9. Eelgrass observed within Proposed Project Footprint April 10, 2025.**



With the (1) implementation of best management practices to control and minimize silt plumes during construction activities, (2) anticipated temporary, localized increased of turbidity under the proposed project, and (3) existing natural turbidity and high silt load conditions within Kachemak Bay in and around the areas wherein dredging would take place, the impacts to eelgrass beyond the proposed project feature footprint with 200-foot buffer would be minimal, and predominately associated with the sedimentation anticipated on the outside of the northern rubble-mound breakwater based on HDR sediment transport modeling outputs.

## **M.5 Determination**

During the development of the Draft IFR/EA, it was determined that the loss of eelgrass and associated habitat resulting from the construction of the proposed project would be unavoidable. Acknowledging both the ecological value of the resource and voiced public concerns, USACE has minimized these impacts to the maximum extent practicable through informed, intentional design, an effort that would continue to be refined during the PED Phase. Additionally, strict best management practices would be implemented during construction to further reduce overall impacts to eelgrass and other aquatic resources.

The anticipated loss of 0.15 acre-HUs of eelgrass, located in an existing area of heightened anthropogenic activity, represents a functionally insignificant impact. This loss equates to just 0.0387% of the total eelgrass HUs within the Kachemak Bay and does not impair the overall ecological capacity or resilience of the vast and highly protected Kachemak Bay Critical Habitat Area. This is under the negligible threshold defined in Section M.4.3.3. Consequently, pursuant to 33 U.S.C. § 2283(d)(1)(B), USACE has determined that the proposed project would have a negligible adverse impact on fish and wildlife resources; therefore, a formal compensatory mitigation plan is not required.

To provide certainty and validate this determination, USACE would conduct pre- and post-construction eelgrass surveys to confirm that the actual construction impacts remain consistent with this assessment. In the unlikely event that post-construction surveys indicate impacts have exceeded the negligible threshold, USACE would develop an Adaptive Management and Mitigation Plan detailing specific protocols and corrective actions to address the unanticipated eelgrass loss.

## M.6 References

- Alaska Department of Fish and Game (ADF&G). 2006. Our wealth maintained: a strategy for conserving Alaska's diverse wildlife and fish resources. Appendix 5.4: Marine and Coastal Habitats. Juneau, AK: Alaska Department of Fish and Game.
- Doroff, A., and K. Holderied. 2018. "Long-term monitoring of oceanographic conditions in Cook Inlet/Kachemak Bay to understand recovery and restoration of injured near-shore species." Exxon Valdez Oil Spill Long-term Monitoring Program (Gulf Watch Alaska) Final Report. Anchorage, AK: Exxon Valdez Oil Spill Trustee Council.
- Field, D., A. Malhotra, and K. Buja. 2005. "Seagrass." In *Benthic Mapping Kachemak Bay*. National Centers for Coastal Ocean Science.  
[https://gis.ngdc.noaa.gov/arcgis/rest/services/nccos/BenthicMapping\\_Kachemak\\_Bay/MapServer](https://gis.ngdc.noaa.gov/arcgis/rest/services/nccos/BenthicMapping_Kachemak_Bay/MapServer)
- Kachemak Bay National Estuarine Research Reserve (KBRR). 2017. *Kachemak Bay Kelp Forests*. Homer, AK: Kachemak Bay National Estuarine Research Reserve.
- National Oceanic and Atmospheric Administration (NOAA). 2026. "NOAA Benthic Data Hub: Kachemak Bay, AK (2017) Benthic Map." Accessed April 8, 2026.  
<https://experience.arcgis.com/experience/03e8aba9bd5b4bbca69d1ec242c44c9e/page/Kachemak-Bay,-AK/>
- Phillips, R. C., McMillan, C., & Bridges, K. W. 1983. Reproductive strategies of eelgrass (*Zostera marina* L.). *Aquatic Botany*, 16(1), 1-20.
- Whippo, R. 2026. *NCCOS Mapping: Submerged Aquatic Vegetation surveys in Kachemak Bay, Lower Cook Inlet, AK* [Unpublished dataset]. NOAA National Centers for Environmental Information. Dataset. Retrieved April 17, 2026. DOI PENDING.