

San Francisco Bay Conservation and Development Commission

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March 30, 2023

Staff Recommendation

Strategic Aquatic Sediment Placement Pilot Project

(For Commission consideration on April 6, 2023)

Consistency Determination

Number: C2022.011.00

Applicant: US Army Corps of Engineers

Project Description: Place up to 100,000 cy of sediment dredged from the Redwood City Federal Navigation Channel in a 138-acre subtidal area to test whether the tides and currents would transport the sediment into Whale’s Tail Marsh and intertidal mudflats, and potentially portions of Eden Landing Ecological Preserve, thus augmenting the natural sediment supply to the tidal marsh.

Location: Within the San Francisco Bay Coastal Zone, in subtidal and intertidal areas of the Bay, adjacent to and within Whale’s Tail Marsh and Eden Landing Ecological Reserve in the City of Hayward, Alameda County.

Application Filed Complete: February 20, 2023

Deadline for Commission Action: May 5, 2023

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Staff Recommendation: APPROVAL WITH CONDITIONS

Basis for Staff Recommendation

The staff recommends conditional concurrence with the US Army Corps of Engineers’ Strategic Aquatic Sediment Placement Pilot Project, as conditioned in the recommended resolution, below. The project will consist of aquatic placement of 100,000 cy of dredged sediment from Redwood City Federal Navigation Channel in 9-12 feet of subtidal waters adjacent to Whale’s Tail Marsh and adjacent mudflats with the expressed purpose of testing the efficacy of the tides, wind waves and currents to move sediment onto the mudflat and marshes. The project is located in the City of Hayward, Alameda County. The proposed use is not in conflict with any Priority Use Areas established by the San Francisco Bay Plan. Among other things, the recommended resolution includes special conditions to:

- Limit the timing of placement to reduce impacts.
- Monitor the placement and target site pre and post placement.
- Provide the Commission with Monitoring and Pilot Project Assessment Reports

The Pilot Project would increase the region’s understanding of whether this sediment placement technique could increase natural sedimentation at targeted marshes and mudflats that may need augmentation to adapt to rapidly increasing sea level rise.

Recommended Conditional Concurrence and Findings

The staff recommends the Commission conditionally concur with the USACE that the Strategic Aquatic Sediment Placement Pilot Project, as described and conditioned below is consistent to the maximum extent practical with the San Francisco Bay Coastal Zone Management Program, as follows:

I. Conditional Concurrence

The San Francisco Bay Conservation and Development Commission concurs with the determination of the US Army Corps of Engineers (USACE) that, as conditioned, the Strategic Aquatic Sediment Placement Pilot Project is consistent to the maximum extent practical with the Commission’s Amended San Francisco Bay Coastal Zone Management Program, for the San Francisco Bay segment of the California coastal zone, subject to the USACE’s acceptance of the conditions contained in Section II and IV below and the incorporation of those conditions into the project. If the USACE, fails to agree to the conditions and fails to incorporate the conditions into the project, the USACE should treat this conditional concurrence as an objection and should notify the Commission immediately. If this conditional concurrence is converted into an objection, the provisions of Title 15 Code of Federal Regulations Sections 930.43, 930.44, and 930.45 shall apply.

A. Authorized Project

Subject to the conditions stated below, the USACE is authorized to conduct the Strategic Aquatic Sediment Placement Pilot Project (Pilot Project) within the San Francisco Bay Coastal Zone, in subtidal and intertidal waters approximately 2 miles offshore, adjacent to Whale’s Tail Marsh in the City of Hayward, Alameda County, as shown more specifically in Exhibits A and B of this conditional concurrence.

1. Within the San Francisco Bay Coastal Zone

- a. Place up to 100,000 cy (cy) of clean dredged sediment from the Redwood City Federal Navigation Channel at a 138-acre subtidal location in approximately 9-12 feet deep (absolute depth) Bay tidal waters adjacent to Whale’s Tail Marsh via bottom dump scow over a three- to four-month period as shown in Exhibit B.
- b. As part of the Pilot Project tracer monitoring, (1) disperse approximately 2,200 pounds (1000 kilograms) of sediment tracer medium (dyed and magnetically coated fine sediment) as part of sediment placement; and (2) place up to 40

magnetized sediment monitors (small cylinders approximately 12" height x 6" diameter, 0.2 cubic feet each), approximately 20 each in subtidal and intertidal areas, anchored in place by a small frame and a weighted subsurface buoy to study sediment transport mechanisms and pathways.

B. Consistency Determination Concurrence Request

The Commission concurrence and Letter of Agreement is generally pursuant to and limited by the consistency determination concurrence request dated January 20, 2023, including all accompanying and subsequently submitted correspondence and exhibits, subject to the modifications required by conditions hereto.

C. Deadlines for Commencing and Completing Authorized Work

Work authorized herein must commence prior to October 1, 2023, or this Letter of Agreement will lapse and become null and void. All sediment placement authorized herein must be completed by November 30, 2023, unless an extension of time is granted by amendment of the Letter of Agreement.

D. Project Summary

The USACE proposes to test a novel approach to increasing sedimentation at Whale's Tail Marsh and adjacent mudflats. The overarching goal is to determine if this technique would support the adaptation of marshes and mudflats to rising seas in the future. While Whale's Tail Marsh is not currently drowning due to rising sea level,, understanding the efficacy, barriers, and benefits of this technique is needed to assess how it may aid in adaptative management of marshes in the face of rising seas in the future.

This pilot project approach includes placement of up to 100,000 cy of sediment dredged from the Redwood City Federal Navigation Channel at an approximately 138-acre subtidal area located adjacent to and approximately two miles from Whale's Tail Marsh. The goal is to use the local tidal hydrology (e.g., tides and wind driven waves, and currents) to transport the dredged sediment onto Whale's Tail Marsh and adjacent intertidal mudflats to augment the natural sediment supply to the marsh. The pilot project includes pre-, concurrent, and post-placement monitoring of the subtidal placement site, adjacent mudflats, fringing tidal marsh, and specific areas within the Eden Landing Ecological Reserve connected to the Bay via tidal channels.

The proposed project would result in approximately 100,000 cy of Bay fill over 138 acres of subtidal habitat. Because the fill is sediment dredged from the Redwood City federal navigation channel, the project results in no net fill. Whale's Tail Marsh, the target of

sediment deposition for the pilot is defined in Map 6 of the San Francisco Bay Plan (Bay Plan) as a Wildlife Refuge priority use area. Augmentation of sediment supply to the marsh and mudflats is consistent with the Wildlife Refuge priority use area.

II. Special Conditions

If the USACE does not agree to comply with the following conditions or fails to incorporate them into the Pilot Project, the USACE shall notify the Commission immediately of its refusal to agree or to incorporate any of the conditions into the Pilot Project, and this conditional concurrence shall be treated as an objection to the USACE's determination that the Program is consistent to the maximum extent practicable with the enforceable Bay Plan policies applicable to such conditions. The USACE shall also immediately notify the Commission if the USACE determines that it will go forward with the Pilot Project despite the Commission's objection. The authorization made herein shall be subject to the following special conditions, in addition to the standard conditions in Section IV:

A. Plan Review

1. Placement Plan Review and Approval

No work whatsoever shall commence pursuant to this permit until final construction documents regarding authorized activities are approved in writing by or on behalf of the Commission. All construction plans shall be submitted to allow for a 30-day review period. The Commission staff will review and provide comments within 30 days of receipt. To save time, preliminary documents may be submitted prior to the submittal of final documents. If the final construction document review is not completed by or on behalf of the Commission within the 30-day period, the USACE may carry out the Pilot Project authorized herein in a manner substantially consistent with Exhibit B.

- a. Construction documents shall be labeled, as appropriate, with the Mean High Water line or the upland extent of marsh vegetation no higher than 5 feet above Mean Sea Level and the tidal datum reference (Mean Lower Low Water (MLLW)); placement site and surrounding area bathymetry; and the location of sediment placement and dimensions of placement cells. No substantial changes shall be made to these documents without prior review and written approval by or on behalf of the Commission through plan review or amendment to the Letter of Agreement.
- b. In case of a discrepancy between final approved documents and the special conditions of this permit or legal instruments, the special condition shall prevail.

B. Use of Clean Dredged Sediment

The USACE shall place only clean dredged sediment from the Redwood City Federal Navigation Channel in the subtidal placement site as determined by the interagency Dredged Material Management Office (DMMO). Should an insufficient volume of clean

dredged sediment be available from this project, upon the recommendation of the DMMO, clean dredged sediment of appropriate grain size from another federal channel may be substituted for the Pilot Project.

C. Seasonal Limitations

To minimize impacts to native, state, and federally listed species, the placement of dredged sediment shall be limited to June 1, 2023, through November 30, 2023.

D. Eelgrass Protection

Due to the presence of eelgrass in the vicinity of the dredged sediment placement site, and consistent with NOAA's National Marine Fisheries Service (NMFS) California Eelgrass Mitigation Policy dated October 2014, the USACE shall perform pre-placement surveys of the project footprint and adjacent eelgrass areas between May and September 2023. If eelgrass is found in the placement site and/or adjacent areas, the USACE shall perform post placement completion surveys six months post placement.

The pre-placement survey shall be completed prior to the anticipated start of in-water placement and will be valid for either 60 days or until the next active growth period if placement of dredged sediment occurs after the end of the active growth period.

The results of the pre-placement eelgrass survey shall be submitted to Commission prior to commencement of placement activities. If the results of the pre-construction survey indicate that eelgrass beds are located in the placement footprint, the USACE shall either avoid those areas or prepare and submit to the Commission a mitigation and monitoring plan that will be implemented to compensate for impacts to eelgrass beds and include post-surveys of project area.

Furthermore, if required, placement of sediment shall not commence until the USACE receives written approval of the mitigation and monitoring plan from the Commission's Executive Director.

E. Monitoring

In order to inform and assess the efficacy, potential impacts, and benefits of the Pilot Project, the USACE shall conduct pre-, during, and post-placement monitoring of the reference sites, placement site, Whale's Tail Marsh and adjacent mudflats, and select areas of Eden Landing Ecological Reserve, generally in accord with the Draft Monitoring Plan entitled "Evaluating the benefits and impacts in shallows and marshes of a pilot strategic sediment placement project in San Francisco Bay," and consistent with the final Commission approved monitoring plan. The USACE shall provide a final monitoring plan by August 1, 2023, for review by Commission staff. Commission staff will provide review and comment within 30 days of receipt of final monitoring plan. The USACE will implement the final approved monitoring plan in accord with this Letter of Agreement.

1. Monitoring Components

- a. The monitoring plan shall include relevant reference sites for all monitoring tasks described in Special Condition II – E.1.b.
- b. The final monitoring plan shall include site specific monitoring information regarding:
 - i. Bathymetric surveys to determine the initial condition and impact on the Bay floor, and to understand depth, distribution, and dispersal of the placed sediment. These surveys will be conducted immediately before and after placement in quick succession. Two additional surveys will be conducted on an adaptive management basis to track the sediment dispersed from the placement site.
 - ii. Oceanographic conditions shall be monitored a minimum of 1 month prior to placement, during the anticipated placement period (2 months), and six months post-placement to understand the drivers of sediment transport.
 - iii. To better understand the erodibility and any grain size changes at the placement site, shallow cores shall be taken pre- and post-placement and be analyzed for sediment grain size and bulk density. The post-placement cores will target areas of sediment placement based on post placement bathymetric survey results.
 - iv. A sediment tracer study shall be conducted to track the fine grain sediment transport, with the tracer sediment being deployed onto placed dredged sediment to track its transport and fate pathways. The tracer study will include deposition of coated fine grain sediment at the placement site, deployment of strong magnets in the water column and in the intertidal zone to capture tracer particles. The tracer study shall last a period of one year from deployment of the coated sediment.
 - v. Marsh, mudflat, and Eden Landing Ecological Reserve sediment deposition monitoring shall be conducted and include appropriately placed transects. These transects shall include placement of glass filter pads, feldspar plots, and cores adjacent to sediment traps. Analysis will include bulk density, mineral and organic material mass. These samples will be collected pre- and post-placement monthly for six months.
 - vi. Benthic community impacts shall be monitored using the before, after, control, and impact (BACI) methodology, and shall include benthic coring parallel to the placement site and along transects in all directions from the placement zone. Further, a Benthic Resource Assessment Technique (BRAT) will be used to assess the functional impact on feeding resources for bottom feeding fish.

- vii. Eelgrass surveys will be conducted prior the placement, in the placement footprint and adjacent areas. If eelgrass is found in the footprint and nearby vicinity, post placement surveys will take place six months post placement as described in Special Condition II-D.

F. Placed Sediment Removal

In accordance with Bay Plan Dredging Policy Eleven, if the dredged sediment placed does not disperse as expected, and monitoring has determined that it has caused substantial harmful effects to Bay natural resources, the USACE shall remove the dredged sediment, unless doing so would cause more damage than leaving it in place as determined by the Executive Director.

G. Reporting

Within six months of the project completion, the USACE will provide an initial report on the overall outcomes of the project, including cost analysis and project challenges. Within nine months of completion of the monitoring program, the USACE shall provide a draft monitoring report for review and comment. Within 3 months of comments received, the USACE shall provide a final monitoring report. Within six months of the final monitoring report, the USACE shall provide for review a draft pilot project report, which shall include details regarding the outcomes of the project, specifically including benefits and challenges relating to contracting, total project cost, monitoring techniques, sediment transport and deposition in target areas, as well as sediment loss to other areas of the Bay, and overall successes and challenges of the Pilot Project.

III. Findings

A. Letter of Agreement

On January 20, 2023, the USACE submitted a description of the project and requested that the Commission concur that the project is consistent to the maximum extent practicable with its Amended Coastal Zone Management Program for San Francisco Bay. Based on the information contained in those materials, and the information provided subsequently, the Pilot Project was found to be consistent as conditioned herein with the provisions of the Coastal Zone Management Program for San Francisco Bay to the maximum extent practicable, which includes the McAteer-Petris Act and applicable and enforceable policies of the Bay Plan.

1. Authorized Fill

The Pilot Project involves placing 100,000 cy of new Bay fill through the depositing sediment within a 138-acre subtidal area, and up to 40 magnetic sediment monitors totaling approximately 8 cubic feet (0.3 cy), and approximately 1.5 cy (2,200 lbs) of dyed and magnetically coated fine grain sediment. Because the sediment is being dredged from Redwood City Federal Navigation Channel, the net fill in the Bay is less than 2 cy. After the monitoring is complete, the 40 magnetic sediment monitors

would be removed, such that the remaining net fill would be the approximately 1.5 of dyed and magnetically coated fine grain sediment, including 2,200 pounds of sediment tracer medium, used to track the sediment transport.

In reviewing the McAteer-Petris Act in consideration of this project, the Commission must find that further filling of San Francisco Bay ... specified in Section 66610 should be authorized only when public benefits from fill clearly exceed public detriment ... and should be limited to water-oriented uses..., when no alternative upland location is available for such purpose; ...should be the minimum necessary to achieve the purpose of the fill; that it will minimize harmful effects to the Bay Area, such as, the ...water quality, fertility of marshes or fish or wildlife resources, or other conditions impacting the environment...; that fill be constructed in accordance with sound safety standards ...; and when the applicant has such valid title to the properties ... for the uses to be approved.

While the Pilot Project would result in minimal net fill, the work is being conducted next to a Wildlife Refuge Priority Use Area where ecological restoration of tidal marshes is occurring and is intended to test whether augmenting the adjacent subtidal sediment supply would in turn augment sediment supply to the Whale's Tail Marsh and adjacent mudflats. Because it tests the ability for tidal hydrodynamic forces to move sediment to the marsh, there is no upland alternative. The USACE worked with Anchor QEA's modeling experts, modeling different sediment volumes and the potential to detect sediment at the target site. These modeling scenarios assisted the USACE and the project team in determining that 100,000 cy of sediment was the minimum necessary for the project. Less sediment placement would likely result in the inability for it to be detected in the target areas. By minimizing the sediment placement, impacts to the water column, Bay bottom and intertidal habitat are minimized, but not eliminated. Further discussion of the potential ecological impacts is detailed below in the Natural Resource Policies section. The sediment placement will be via bottom discharge dredge scows, and is not an engineered fill. Further, the public would not interact with this site, so sound safety standards for fill is not applicable for this project. Lastly, the USACE has claimed Navigational Servitude for this project as an aquatic placement site for a federal navigation project, and therefore has valid title to the property.

Therefore, in consideration of each of the McAteer-Petris Act fill requirements, the Commission has determined that the Pilot Project is consistent with legal requirements for the placement of fill in San Francisco Bay.

B. Natural Resources Policies

1. Protect and Conserve Habitat and Species

The Bay Plan has several policies regarding protection of the natural resources of the Bay, including Fish, Other Aquatic Organisms and Wildlife (Fish and Wildlife); Water Quality; Tidal Marshes and Tidal Flats (Tidal Marshes and Flats); and Subtidal Areas. These policies guide the Commission's review of projects and the ecological response to impacts to natural resources.

Considered together Fish and Wildlife, Subtidal Areas, and Tidal Marshes and Flats Policies One and Two seek to conserve and restore these habitats and their inhabitants; and to avoid harmful effects of dredging or filling associated with them. They seek to protect and support the increase of native species and those listed by NOAA's National Marine Fisheries Service (NMFS), US Fish and Wildlife Service (USFWS), and California Department of Fish and Wildlife (CDFW) as threatened, endangered, or special status, and their habitats. Subtidal Areas Policy Two limits fill in the Bay to projects that have no feasible alternative and have substantial public benefit.

Bay Plan Fish and Wildlife and Subtidal Areas policies consider, and in some instances support the placement of fill to support species, their habitat, and to enhance the Bay's ecological function in the near-term, as well as to ensure native species habitat persist into the future with rising seas. Fish and Wildlife Policy Seven prioritizes sediment placement in subsided diked baylands, tidal marshes, and tidal flats, due to their vulnerability to degradation due to sea level rise and lack of necessary sediment supply. Secondly it supports fill placement in shallow subtidal areas that support tidal marshes and tidal flats. Subtidal Areas Policy Eight allows for fill for habitat enhancement in subtidal areas with appropriate ecological analysis and in consultation with the relevant federal and state resource agencies if no other method is feasible.

In order to understand the potential impacts to fish and wildlife, as well as their habitat, it's important to understand the existing conditions at the placement site and the target sediment deposition site. The subtidal area, adjacent to Whale's Tail Marsh is located on the eastern shore of South San Francisco Bay. The South Bay is a large, shallow basin, with a relatively deep main channel (between 33 and– 66 feet deep) surrounded by broad shoals and mudflats. Within the South Bay, river flow does not contribute to turbidity as much as sediment resuspension associated with spring-neap tides (Schoellhamer 1996). The shallower shoal and mudflat areas (12 feet in depth or less), where the dredged sediment would be placed, are more prone to wind-generated waves and sediment resuspension than deeper areas of the Bay and have high suspended sediment concentrations in comparison to the deep water channel (Brand et. al. 2010, Lacey et. al. 2014).

The benthic habitat located on the Bay bottom is dominated by mud with occasional areas of sand, shell hash, and other coarse grain sediment. The 138-acres placement site is largely a mud floor, but also includes oyster shell “hash” (S. De La Cruz, USGS, personal communication, June 28, 2022), and bryozoan reefs (small encrusting colonial invertebrates) (Zabin et al. 2010). The subtidal area has an intact community of bottom dwelling invertebrates and fish, and an associated assemblage of fish that feed on the invertebrates, smaller fish, and organisms living in the water column. In addition, waterfowl, such as brown pelicans, a state fully protected species, surf scoters, scaup, and other diving birds feed on the invertebrates and fish living in the area. State and/or federally listed and special status species associated with this critical habitat include Chinook salmon, steelhead, longfin smelt, and green and white sturgeon. The placement site is also considered Essential Fish Habitat under the Magnuson Stevenson Fisheries Management and Conservation Act for salmonids, pelagic, and ground fish.

The target sediment deposition site is Whale’s Tail Marsh and adjacent mudflats. Whale’s Tail Marsh is not currently drowning due to rising seas. It is inundated only by the highest tides due to its high elevation. The bay-marsh edge features an approximately 4-foot high (1.2 meter) scarp produced by wind-wave erosion, and the marsh edge continues to retreat laterally. A broad mudflat, nearly 2 miles in width extends immediately bayward from the marsh edge. The marsh and associated mudflats are foraging grounds for marsh and shore birds, feeding on the invertebrates and insects living there, along with small fish in the marsh channels. The marsh also is home to State and federally listed salt marsh harvest mice and Ridgeway’s rail, and state listed black rail.

The USACE describes the Pilot Project’s consistency with the Bay Plan policies on natural resources, in summary as follows. Shallow-water placement would include depositing dredged sediment onto subtidal surfaces, with the potential for direct effects on the subtidal benthic community via burial of organisms living on and within sediments. The deposition in the subtidal placement site will likely be between 4-12 inches (10–30 cm) in the middle of the placement area, reducing to 0.04 inches (0.1 cm) in the surrounding area. Each placement cell is approximately 5 acres in size.

Bottom dwelling plants and animals buried under the placement mound would likely not survive. The recovery mechanism for this community would be recolonization from surrounding areas, which would take between a few months and a few years for full community recovery. Generally, the effects of burial on bottom dwelling plants, algae and animals are mortality or reduction in growth (e.g., Wilber et al. 2007, Kemp et al. 2011). In addition, if the sediment deposited is different from native sediments, or if different after waves work the sediment, the bottom dwelling

community could shift in species abundance and composition (Bishop et al. 2006). Reduction in subtidal benthic primary producers and consumers has the potential to indirectly affect higher levels of foragers in the estuarine food web.

Native species also could be buried or indirectly impacted via increase in turbidity include: microphytobenthos (e.g., diatoms, cyanobacteria, dinoflagellates), macroalgae (e.g., seaweeds like *Ulva*), submerged vegetation (e.g., eelgrass), benthic macrofauna (e.g., polychaete worms, amphipods), oysters and bivalves (e.g., *Ostrea lurida*), Dungeness crab, deeper-water ground fishes (e.g., green sturgeon, and shallow subtidal fishes (e.g., leopard shark juveniles).

While the USACE asserts that adult demersal fishes and crabs would be expected to avoid burial by sediment-placement actions, these organisms often hunker down or burrow into the substrate to avoid predation and may do the same during sediment placement. Juveniles may be unable to move away from the impacted area, depending upon species and timing of the sediment placement action. Example species indirectly affected by reductions in food availability include invertebrates, and fish such as green sturgeon, halibut, and leopard shark; and water-column species that rely on similar food production, such as zooplankton, fishes, and diving ducks. Piscivorous birds may suffer from reduced food resources if their fish prey is less abundant or harder to hunt due to changes in turbidity. The spawning habitat of pelagic fishes, such as Pacific herring, may be altered by the burial or coating of eelgrasses and other surfaces by sediments.

Due to the potential impacts to native and listed species, the USACE consulted with NMFS to ensure that any potential effects to special-status species and habitats will be minimized and to ensure protection measures are in place. NMFS responded in a letter stating that the project is not likely to adversely affect federally listed steelhead and green sturgeon. CFDW provided a comment letter responding to the San Francisco Bay Regional Water Quality Control Board's (Water Board) California Environmental Quality Act (CEQA) mitigated negative declaration, noted the state listed and species of special and commercial concern, and request compliance with minimization measures listed in the CEQA document. USFWS coordinated with the USACE through the Fish and Wildlife Coordination Act (FWCA) and includes the Planning Aid Letter. NMFS requested that the USACE conduct fish surveys to assess changes in forage patterns and composition, but the USACE has not included the requested fish surveys in the monitoring plan but instead include analysis of forage species impacts.

The USACE described the result of sediment placement and transport modeling, undertaken by Anchor QEA predicting that 20–41% of the dredged sediment may still be present in the placement footprint 2 months after the placement ceases, but did not model further into the future. The US Geological Survey (USGS) expects the placement area to be physically indistinguishable from the surrounding area within 9 months of placement based on best professional judgement and will conduct monitoring for that period. The USACE stated that “If there is still a significant amount of material in the placement area, monitoring of the mound could be extended, and potential remediation would be considered.”

In addition to direct impacts from sediment placement, an indirect impact includes short-term changes to suspended-sediment concentrations, as much as 500 milligrams per liter in the water column that will spread out and travel from the source in a sediment plume, locally increasing SSC and turbidity. The larger and heavier particles quickly settle to the bottom near the source, but fine sediment and organic material may remain suspended for some time (usually hours) and travel some distance before settling. Cohen (2010) identifies several potential direct and indirect impacts on organisms from large increases in SSC in the water column. These include clogging the gills of fish and invertebrates reducing oxygen uptake; damage to skin and tissue; changing the behavior of adult fish, providing cover for prey species, and reducing predation; and reducing light penetration, photosynthesis and the productivity and growth of eelgrass, seaweeds, and phytoplankton.

The above-described potential changes in habitat would occur within the water column and on the Bay bottom in and adjacent to the placement site. The adjacent marsh and mudflat areas targeted by this project is anticipated to have an additional 1-2 millimeters of sediment deposited, much like the current deposition rate. Because this rate and thickness is similar to existing conditions, the marsh and mudflat vegetation, algae, and animals should be able to continue normal activities of feeding, sheltering, and reproduction during and after the placement has completed.

To reduce potential adverse impacts of the placement project to the subtidal habitat, flora, and fauna, special conditions were included in this Letter of Agreement. They include Special Condition II-C, limiting the placement period to the environmental work windows established by the Long Term Management Strategy for the Placement of Dredged Sediment in the Bay Region (LTMS) of June 1 to November 30, a period when fewer listed and species of special concern are present

or spawning. Special Condition II-D requires pre- and post-placement eelgrass monitoring to ensure that the project does not directly impact eelgrass. In the event that pre-placement eelgrass surveys reveal eelgrass in the placement footprint, avoidance measures or mitigation would be required.

2. **Monitoring**

Subtidal Areas Policy Nine encourages pilot projects that address sea level rise adaptation of Bay habitats. This policy, along with Subtidal Areas Policies One, Three, and Tidal Marshes and Flats Policies Two and Six, and Dredging Policy Eleven require clear and specific long-term and short-term biological and physical goals, success criteria, a monitoring program, thorough evaluation of potential impacts on the Bay ecology and physical processes, and minimization of harmful effects. Together they require appropriately detailed experimental design and monitoring to inform initial and future work. Project progress and outcomes should be analyzed and reported expeditiously. The size, design, and management of pilot projects should minimize the project's potential to negatively impact Bay habitats and species.

The USACE Project Team has carefully designed the project, using criteria developed such that (1) sediment from a federal navigation project could be used; (2) the proper physical conditions are present to support the transport of sediment towards the marsh; and (3) scows that are appropriate for federal dredging projects could be used. Because the Pilot Project is tied to a federal navigation project, the scow draft (depth in water) limits their use to get into very shallow water, but the modeling undertaken by Anchor QEA supports the assertion that sediment placed at the selected placement grids in deeper water would transport towards shore during high tides, when the tides are flooding. The USACE describes its goal as "to use the local tidal hydrology, i.e., tides and wind driven currents, to transport the dredged sediment onto Whale's Tail Marsh and adjacent mudflats to augment the natural sediment supply to the marsh. The purpose of testing this technique is to determine whether in-water aquatic placement of sediment is a cost-effective measure that would assist marshes and mudflats in adapting to rapidly rising seas."

In developing the Pilot Project, the USACE has enlisted the USGS in monitoring the project outcomes. The USGS team includes experts from multiple disciplines with experience monitoring at this and other marshes in the region. The USGS team has provided a draft monitoring plan, with multiple elements that would assist in evaluating the Pilot Project's outcomes and impacts on Bay Resources. Commission staff notes that the monitoring techniques are also a pilot project in the sense that

they are the best methodology for measuring the outcome of the sediment placement and transport, but due to the limitation of equipment and the likely thickness of the sediment deposited, there is a question regarding the measurability and certainty of the predicted outcomes.

Special Condition II- E requires the monitoring elements, and well as final, more detailed monitoring plan meeting the requirements of the Bay Plan policies on monitoring and evaluation. Further, Special Condition II-G requires that the USACE provide a preliminary and final reports evaluating the project against its goals, as well as a monitoring report, detailing the findings of the USGS monitoring program. The completed reports are due within a year and a half of project completion, providing time for the data collected to be analyzed and findings made. These reports will assist the Commission in determining the success of this Pilot Project and the potential efficacy of others like it.

This Pilot Project exchanges impacts on 138 acres of subtidal habitat and the associated fish and wildlife for gaining an understanding of how the region might augment sediment supply to marshes and mudflats as sea level rises more rapidly in the future. While the impacts to the localized area may be significant, the surrounding area is likely able to support the displaced wildlife while the experiment and recovery of the placement site is underway. As designed, there is no alternative way to assess the efficacy of this technique, and the outcomes will inform future actions, and are a benefit regionally.

The Commission finds that the Pilot Project, as conditioned, is consistent with Bay Plan policies on Fish, Other Aquatic Organisms and Wildlife; Tidal Marshes and Tidal Flats; and Subtidal Areas.

C. Dredging and Water Quality

1. Beneficial Use of Dredged Sediment

The Bay Plan policies regarding dredging and water quality guide the Commission's decision on projects using dredged sediment for beneficial reuse project and those that may have impacts on water quality. Dredging Policy One ensures that dredging and dredged material disposal be conducted in an environmentally and economically sound manner. Dredging Policies Three, Five, and Six encourage beneficial reuse of dredged sediment while seeking protection of Bay resources through review of sediment quality, consistency with the Water Board's decisions and timing the aquatic placement of dredged sediment consistent with the advice of the resource agencies. Dredging Policy Five supports enhancing and restoring tidal and managed wetlands through use of dredged sediment. Policy Six and Eleven seek to manage dredged sediment placement in a way that minimizes adverse impacts to Bay hydrology and natural resources.

As discussed above, the resource agencies have been consulted regarding this project and none have objected. All have provided comments that have largely been incorporated into the project by the USACE. The Water Board issued a water quality certification for the project on January 31, 2023, which included specific conditions to reduce impacts from the project and adopted the USACE Environmental Assessment and its mitigated negative declaration in compliance with the California Environmental Quality Act (CEQA).

The sediment proposed for use in this Pilot Project would be dredged from Redwood City Harbor. The sediment has undergone testing through the DMMO protocols, and the final report is pending. The Commission staff, along with the DMMO will review the final results and select only sediment that is suitable for aquatic placement and does not have significantly elevated levels of acutely toxic or bio-accumulative chemicals in it. Some areas of this channel have contained elevated levels of PCB and dieldrin, and some heavy metals, but these areas will not be used for Pilot Project, per Special Condition II-B. In the unlikely event that sufficient clean sediment cannot be dredged from Redwood City federal navigation channel, Special Condition II-B allows sediment to be sourced from another federal channel under the advice and recommendations of the DMMO, which includes Water Board staff.

This project is being considered a beneficial reuse project rather than an aquatic disposal project in that its express purpose is to test the ability of the tides and currents to move sediment into Whale's Tail Marsh and adjacent mudflats. Currently authorized aquatic disposal sites in the Bay do not provide sediment to marshes and mudflats through closely coupled physical processes, but rather move sediment directly into deep water channels that move sediment towards the ocean.

2. Enhancing Bay Natural Resources

Dredging Policy Eleven, in summary, directs the Commission to consider the use of dredged sediment for enhancing Bay natural resources if, after review of detailed site-specific studies and project design, it determines all of the following: (a) the project would provide, in relationship to the project size, substantial net improvement in habitat; (b) no feasible alternatives to the fill exist with fewer adverse impacts; (c) the amount of dredged sediment to be used would be the minimum amount necessary to achieve the purpose of the project; (d) beneficial uses and water quality of the Bay would be protected; and (e) there is a high probability that the project would be successful and not result in unmitigated environmental harm.

The USACE has conducted detailed site-specific studies in advance of the Pilot Project. It is the intent of the project to provide a net benefit to the adjacent tidal marsh and mudflat areas by augmenting the natural sediment supply over time with

rising seas. There is no feasible alternative to this Pilot Project that would allow the efficacy of the technique to be tested. Alternative thin layer placement techniques do exist but are not proposed in this Pilot Project. Because the USACE considers cost in its analysis of benefits, this method is being tested not only for its ability to move sediment to marshes, but also to do so at a significantly lower cost than other methods. Direct placement of sediment, while 100 percent effective, may not be the appropriate approach for placing thin layers of sediment on existing marshes without causing significant impacts to the marsh vegetation and wildlife. Because sea level rise is anticipated to take several years to occur, though more rapidly in the future, thin layers of sediment placed on marshes may be effective in creating resilience of this habitat to rising seas.

The USACE modeled different scenarios using various volumes of dredged sediment. The model findings support using 100,000 cy of sediment because this volume appears to be measurable, where lesser volumes may not be. Scenarios using larger amounts of sediment did not appear to provide more certainty in measurability for the Pilot Project, thus the proposed Pilot Project was determined to be the minimum amount of fill necessary for the project purpose. Further, while water quality impacts are likely, specifically increased suspended sediment and turbidity, they are anticipated to dissipate quickly. The beneficial uses of the Bay would be preserved, though reduced in the placement area as described in detailed in the Findings, Section III-B.1. above. Over time, the beneficial uses in the placement area should recover, and recovery will be monitored as part of the project so the Commission can be informed of the tradeoffs of projects like this one.

Dredging Policy Eleven also states that the Commission should encourage well-designed pilot projects to evaluate appropriate biological, hydrological, and physical characteristics of locations that use dredged sediment in habitat enhancement; the potential for direct, indirect, and cumulative impacts of projects; and the feasibility and effectiveness of dredged sediment placement strategies for habitat enhancement, and creation.

Commission staff have worked with the USACE Project Team, the Coastal Conservancy, and the Water Board to ensure the project was designed properly. This process included extensive modeling by Anchor QEA that determined the siting and design of the placement site, given the limitation of sediment delivery through bottom dump scows in an area with broad mudflats. The USACE has sought to reduce potential harm from direct and indirect impacts, but the type of placement used in this Pilot Project will likely result in impacts to native and potentially listed species. Harm will be minimized to some degree by limiting the timing of sediment placement and the area in which it is placed. It is the feasibility and the effectiveness of the technique that is being tested by the Pilot Project.

Dredging Policy Eleven also directs the Commission regarding how it should consider monitoring results and actions to be taken if the project is not successful, or monitoring reveals substantial harmful effects. If the project has not met its goals, and substantial harm has been identified, then Special Condition II-F requires that the dredged sediment would be removed, unless it is demonstrated by competent environmental studies that removing it would cause greater adverse effects on the Bay than allowing it to remain.

The USACE anticipates that the dredged sediment would disperse, and the Bay floor to recover from the placement, and the habitat enhancement proposed is at adjacent mudflats and an existing marsh rather than a subtidal restoration project. Thorough monitoring of the Pilot Project is proposed and discussed above, and required by Special Condition II-E, and should the monitoring reveal the persistence of the placed sediment in the subtidal area, it will be addressed by Special Condition II-F.

Finally, Bay Plan Dredging Policy Eleven limits the volume of dredged sediment to a minor amount for projects that are similar to the Oakland Middle Harbor Enhancement Area project in characteristics including, but not limited to, scale, bathymetric modification, and type of habitat creation, until The Oakland Middle Harbor Enhancement Area project is completed successfully.

While the Pilot Project includes placement of more than a minor amount of fill, it is the minimum necessary for measurability for the Pilot Project. It is not similar to the Oakland Middle Harbor Project in that it places 100,000 cy of dredged sediment in a subtidal area of the Bay with the express purpose of transporting it to an adjacent marsh, while the Oakland Middle Harbor Enhancement Project used nearly 6 million cy of sediment to raise a previously dredged area to shallow water habitat. It was associated specifically with the Oakland Deepening Project to allow for cost effective beneficial reuse and prevention of ocean disposal.

The Commission finds, based on the above analysis that the Pilot Project is consistent with the Commission's applicable policies on dredging and water quality.

D. Environmental Justice and Social Equity

Bay Plan policies on Environmental Justice and Social Equity state, in part: "Equitable, culturally-relevant community outreach and engagement should be conducted by local governments and project applicants to meaningfully involve potentially impacted communities for major projects in underrepresented, vulnerable, and/or disadvantaged communities, and such outreach and engagement should continue throughout the Commission review and permitting processes and potential disproportionate impacts should be identified and mitigated for adverse project impacts on the communities in which the project is proposed."

The Pilot Project would place sediment approximately two miles offshore, and approximately five and a half to six miles from any residential community. While there are vulnerable and disadvantaged communities within Union City and Hayward, they are separated from the Bay by the Eden Landing Ecological Reserve and the Eden Landing Phase II restoration project. Therefore the Pilot Project is not anticipated to directly affect these communities. There is a potential impact to recreational and subsistence fishing that may occur over two months in the area due to the increase in turbidity (increase in sediment in the water column) that may cause some fish to leave the area. This impact would be temporary in nature and fish are expected to return to the area after the placement has ceased.

The USACE project team presented an early stage of the project to the Oakland Shoreline Leadership Academy, which trains local change-makers of all ages from communities living on or near the Oakland shoreline. They also met with the East Bay Dischargers Authority, the City of Hayward, the Alameda Flood Control and Water Sanitation District, and Union City. The team conducted a site visit with the Confederated *Villages of Lisjan*, a local Ohlone tribe, and shared the project with the public via tabling at the Hayward Street Fair. The majority of the outreach was conducted CEQA and the National Environmental Policy Act (NEPA) processes, including scoping and public review of the Environmental Assessment and Mitigated Negative Declaration, NEPA and CEQA documents respectively. According to the USACE, the comments overall were positive, particularly regarding the potential to address future rising seas.

The Commission finds the public engagement undertaken for the proposed Pilot Project to be consistent with the Bay Plan policies on Environmental Justice and Social Equity.

E. Climate Change

The Bay Plan Climate Change policies seek to support early and innovative sea level rise adaptation strategies. Climate Change Policy Seven states, in part: until a regional sea level rise adaptation strategy can be completed, the Commission should evaluate proposed projects on a case-by-case basis to determine the public benefits and capacity to adapt to climate change impacts. It lists and encourages project types that may have regional benefits and advance regional goals. This policy includes natural resource restoration and environmental enhancement projects.

As described above, this Pilot Project seeks to enhance the natural sediment supply to Whale's Tail Marsh and adjacent mudflats specifically to assess the ability to increase marsh and mudflat resiliency to rising seas.

The Commission finds the proposed Pilot Project to be consistent with the Bay Plan policies on Climate Change.

F. Public Trust Uses

The submerged tidelands where the sediment placement would take place is held in public trust by the State of California. The project is consistent with public trust needs for the area, as it tests the potential for the Bay's tides, wind waves, and current's ability to direct sediment to tidal marshes. Tidal marshes and tidal flats support fish and wildlife as discussed above, which is a Public Trust use and need for submerged tidelands of the State. Further, as designed, the project would not likely impede recreational uses of the area due to the limited thickness of sediment placed at the site.

G. Review Boards

Neither the Design nor the Engineering Criteria Review Board reviewed this project.

H. Environmental Review

Pursuant to the NEPA, a draft Environmental Assessment was completed by the USACE, and expected to be finalized once the project authorizations are completed. Further, pursuant to the CEQA, the Water Board completed a mitigated negative declaration for the project and certified it in January 2023.

I. Commission's Amended Coastal Zone Management Program

The Commission, pursuant to the Coastal Zone Management Act of 1972, as amended (16 USC Section 1451), and the implementing Federal Regulations in 15 CFR Part 930, is required to review Federal projects within San Francisco Bay and agree, conditionally agree, or disagree with the Federal agency's determination that the project is consistent with the Commission's Amended Coastal Zone Management Program for the San Francisco Bay segment of the California coastal zone . This letter constitutes such review and concurrence.

IV. Standard Conditions

A. Letter of Agreement Execution

This Letter of Agreement shall not take effect unless the USACE executes the original of this Letter of Agreement and return it to the Commission within ten days after the date of the issuance. No placement work shall be done until the acknowledgment is duly executed and returned to the Commission.

B. Notice of Completion

The attached Notice of Completion and Declaration of Compliance form shall be returned to the Commission within 30 days following completion of the work.

C. Built Project must be Consistent with Letter of Agreement

Work must be performed in the precise manner and at the precise locations indicated in your consistency determination, as such may have been modified by the conditions of the Letter of Agreement and any plans approved in writing by or on behalf of the Commission. Any work that deviates from that specified in the Letter of Agreement will warrant an amended Letter of Agreement.

D. Life of Authorization

Unless otherwise provided in this Letter of Agreement, all the terms and conditions of this Letter of Agreement shall remain effective for so long as the Letter of Agreement remains in effect or for so long as any use or construction authorized by this Letter of Agreement exists, whichever is longer.