Coastal Conservancy

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Offloader Procurement Strategy

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Glossary

avg.	Average
BAAQMD	Bay Area Air Quality Management District
BCDC	San Francisco Bay Conservation and Development Commission
BMK	Bel Marin Keys Unit V Restoration Project
CA	California
CDFW	California Department of Fish and Wildlife
CEDEP	Corps of Engineers Dredge Estimating Program
CEQA	California Environmental Quality Act
CEQ	California Department of Environmental Quality
CFR	Code of Federal Regulations
CY	Cubic Yard
DMMO	Dredged Material Management Office
EA	Each
EIR	Environmental Impact Report
ELER	Eden Landing Ecological Reserve
EL-R	Effects Range Low
ER-M	Effects Range Median
ft.	Feet
gpm	Gallons per Minute
HDPE	High-Density Polyethylene
HWRP	Hamilton Wetland Restoration Project
hp	Horsepower
IS/MND	Initial Study / Mitigated Negative Declaration
kcmil	Thousands of circular mils
kcy	Thousand cubic yards
kV	Kilovolts
LF	Linear Feet
LS	Lump Sum
LTMS	San Francisco Bay Long Term Management Strategy
MCY	Million Cubic Yards

MHHW	Mean Higher High Water
MHW	Mean High Water
MLLW	Mean Lower Low Water
MLW	Mean Low Water
MSL	Mean Sea Level
MTL	Mean Tide Level
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
No.	Number
PEL	Predicted Effect Level
PG&E	Pacific Gas & Electric Company
RFP	Request for Proposal
SBSP	South Bay Salt Pond Restoration Project
SCADA	Supervisory Control and Data Acquisition
SCC	California State Coastal Conservancy
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SFDODS	San Francisco Deep Ocean Disposal Site
SLR	Sea Level Rise
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
UTZ	Upland Transition Zone

1 Executive Summary

1.1 Introduction

As the largest tidal wetland restoration project on the West Coast, the South Bay Salt Pond (SBSP) Restoration Project provides an opportunity to beneficially reuse millions of cubic yards of dredged material generated in the San Francisco Bay area because of subsidence within the ponds and need for flood risk management to adjacent communities. Based on historical records approximately 2.6 MCY of dredged material is generated every year in the SF Bay Area. Given the annual dredging volumes the SBSP Restoration Project has the capacity to be a significant beneficial reuse site and in turn provide the Bay Area with an effective means to achieve its Long Term Management Strategy (LTMS) beneficial reuse goals.

This study was funded by a state grant with emphasis on the Southern Eden Landing Ponds and material dredged from the Redwood City Harbor federal maintenance channel. Since beneficial reuse depends on economies of scale to enhance financial feasibility, the study also considered other large maintenance dredging projects as potential sources of material. The goal of the study is to investigate potential implementation costs for beneficial reuse and identify a procurement strategy that would allow for placement of material dredged from navigation channels into the Eden Landing Complex that would also serve as a template for other potential reuse sites. Specific items addressed in this study include:

- Identifying material sources, volumes, and delivery schedules including, in particular, maintenance dredging of the Redwood City Harbor Channel because of the source of funding for this study.
- Developing schematic layouts of necessary onsite and offsite improvements, and any other required features, to transport material from an offshore location and to place it in the ponds.
- Estimating construction costs for the improvements as well as pumping/placement operations.
- Developing contract procurement strategies to implement the project.
- Conducting outreach with regulatory agencies, dredging sponsors, and the private dredger community to identify constraints to beneficial reuse.

1.2 Background

The Southern Eden Landing Ponds (Site) is a 2,210-acre subsection of the larger 5,500-acre Eden Landing Complex. The former salt production ponds are currently subsided two to three feet below mean higher high water (MHHW), which is the target elevation for tidal mid-marsh growth. Material dredged from navigation channels in SF Bay presents an opportunity for subsidence reversal and flood management such that it would help meet the project's restoration and flood protection goals.

Ponds E1, E2, E4 and E7, also called the Bay Ponds, are the four largest, western-most ponds in the Eden Landing Complex. This report focuses on dredged material placement in the Bay Ponds to raise pond bottom elevations to accelerate the project goal of restoring the bayfront ponds to tidal marsh habitat.

1.2.1 Pond Sizes and Capacities

The Bay Ponds consist of four large ponds with relatively flat bottoms due to their former use as salt ponds. The ponds are separated by internal levees constructed of material excavated from borrow ditches adjacent to the levee. The borrow ditches have been used over time to construct and maintain the levees. Dredged material would be placed into the Bay Ponds as part of the tidal marsh habitat restoration process, to raise pond bottom elevations to help target the MHHW elevation necessary for tidal marsh habitat development, and for the construction of habitat transition zones. Existing pond sizes, bottom elevations, and capacities are detailed in Table ES- 1. If existing levees are utilized as-is, approximately 3.3 MCY of dredged material

may be imported and placed in the Bay Ponds to raise the bottom elevations to an average 6.0 feet NAVD88. If portions of existing levees are improved to a minimum of 10 feet NAVD88, the Bay Pond bottoms may be raised to the target elevation of MHW (6.5 feet NAVD88) with the placement of 4.7 MCY.

Table ES- 1 Bay Ponds – Pond Sizes

Pond	Perimeter (ft.)	Area (Acre)	Avg. Pond Bottom Elev. (ft. NAVD88)	Placement Volume (CY)	
				Existing Levees	Improved Levees
E1	15,801	297	4.8	477,000	1,052,000
E2	22,485	692	4.8	2,003,000	2,449,000
E4	14,261	202	5.6	371,000	501,000
E7	12,709	217	4.9	443,000	723,000
Totals	**-**	**1408**	**-**	**3,294,000**	**4,725,000**

Source: Final Environmental Impact Report, Appendix E Preliminary Design Memorandum of Dredged Material Placement at Southern Eden Landing (AECOM, 2019b)

In addition to using dredged material to raise the pond bottom elevations, dredged material may be utilized to construct habitat transition zones. The volume required for construction of habitat transition zones and levee features for the Bay Ponds is estimated to require an additional 46,000 CY of dry fill that could be sourced from dredged material (AECOM, 2019b).

1.3 Physical Conditions

South San Francisco Bay is a large basin with a deep channel surrounded by broad shallow areas, mudflats and fringing tidal marsh. In the Bay south of Dumbarton Bridge, the average depth is only three feet and 75 percent of the surface area consists of mudflats. This implies that typical scows bringing in dredged material from the dredging project sites would be restricted to the deep channel.

The predominant west winds and resultant waves at the site also requires that the offloader be anchored by a pretty robust system of anchor piles.

1.4 Dredged Material Sources and Material Suitability

1.4.1 Dredging Projects Included in Analysis

Material generated from federal and non-federal navigation dredging projects in San Francisco Bay total to about 2.6 MCY (annualized volume), with 1.7 MCY from federal projects and 0.9 MCY from non-federal projects. The average annual volume per year of dredged material being beneficially reused was 890,000 CY per year. The amount of beneficial reuse has been increasing, likely due to LTMS policies where in-bay disposal volumes have been reducing each year. For beneficial reuse at Eden Landing to be successful, it will need to be cost-competitive with the other active beneficial reuse sites which includes the Montezuma and Cullinan projects. Since it is a new site with a long pump from the offloader to the shoreline, the Eden Landing operator will need to provide a high degree of confidence to the dredging community that dredging project schedules will not be impacted.

The criteria to identify projects that were potentially "suitable" for beneficial reuse material at Eden Landing, projects were:

- *Size*: Projects that had a history of at least 75,000 CY per year (annualized average) of dredging
- *Distance*: Projects that were located closer to Eden Landing than other beneficial reuse sites
- *Equipment*: Projects that were performed with clamshell dredged and dump scows

Based on the above, the projects that were identified as suitable for placement at Eden Landing are shown on Table ES- 2.

Table ES- 2 Dredging Projects Considered Suitable for Beneficial Reuse at Eden Landing

Projects	Potential Annual Volume (CY)	Historical Disposal Site(s)	Distance to Eden Landing (Miles)
FEDERAL			
Oakland Inner & Outer Harbor	429,304	SF-11, Montezuma, Winter Island, Hamilton	23.7
Redwood City Harbor	231,524	SF-10, SF-11, Hamilton, Bair Island, Montezuma	3.4
Richmond Inner & Outer Harbor	286,299	SF-10, SF-11, Hamilton, Cullinan, Montezuma	35.3
Subtotal	861,266		
MID-SIZED NON-FEDERAL			
Chevron	114,400	SF-10, SF-11, Hamilton, Montezuma	32.2
Port of Oakland (Berths)	76,288	SF-11, Hamilton, Montezuma	25.4
Subtotal	190,688		
Total Annual Maintenance Dredging	**1,051,954**		

1.4.2 Sediment Suitability

The San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) had issued a *Draft* Sediment Screening Criteria Staff Report in 2000, which establishes screening values that is used by staff when evaluating the suitability of dredged material for beneficial reuse projects. The *Draft* Staff Report also provides guidance to project proponents on appropriate sediment testing to support suitability determinations.

There are two basic levels of screening guidelines for beneficial reuse of dredged material described in the report: screening guidelines for wetland surface material, and screening guidelines for wetland foundation material. The sediment source analysis assumes that all dredged material delivered to the offloader for placement at Eden Landing will either be suitable for wetland surface material based on the results of each individual project's sediment sampling and analysis program, or suitable for in-bay disposal at SF-11 or SF-10. Based on the analysis of the DMMO dredging records this allows for an annual average maintenance dredging volume of over 1 million CY per year for all five projects being considered. It is further assumed that all material delivered to the offloader is primarily silts and clays, as is typical of most maintenance dredging projects in the Bay Area. Silts and clays will stay in suspension with the slurry as it spreads over the pond bottoms.

1.4.3 Dredged Material Placement Volumes

Cost estimates were prepared based on three different dredging project scenarios to determine the material delivery schedules to Eden Landing, as described below.

- *Scenario 1*: This assumes that only the *Oakland and Redwood City* federal channel maintenance projects deliver dredged material to the Eden Landing offloader. The estimate assumes that the two

federal dredging projects will be dredged and delivered to the offloader during typical LTMS environmental windows for the Oakland project (August 1 through November 30).

- *Scenario 2*: This assumes that the *Oakland, Richmond, and Redwood City* federal channel maintenance projects deliver dredged material to the Eden Landing offloader. This estimate also assumes that these three federal dredging projects will be dredged and delivered to the offloader during the August 1 to November 30 timeframe.
- *Scenario 3:* This assumes that the Oakland, Richmond, and Redwood City federal channel maintenance projects, along with the non-federal dredging projects at Chevron and the Port of Oakland berths, deliver dredged material to the Eden Landing offloader. This estimate also assumes that these five dredging projects will be dredged and delivered to the offloader during the August 1 to November 30 timeframe.

The actual placement volumes for each scenario are shown on Table ES- 3 The placement site capacities were based on information contained in the Eden Landing Phase 2 EIR. To account for bulking of the sediments as they are slurried in the scow and pumped ashore to Eden Landing, the annual dredged material quantities are increased by 10 percent. Two sets of volumes are included in the table to address the pond capacities: 1) Existing Levees (assuming no improvements are made to levees) and 2) Improved Levees Around Ponds

Table ES- 3 Dredged Material Placement Volumes

DELIVERY SCENARIO	Annual Quantity Dredged (CY)	Annual Quantity Placed (CY)*	Annual Duration (Months)	Project Duration (Years)
No Improvements to Existing Levees Around Ponds				
Scenario 1: Oakland + Redwood City Federal	660,800	726,880	1.74	5
Scenario 2: Oakland + Redwood City + Richmond Federal	947,100	1,041,810	2.83	4
Scenario 3: Oakland + Redwood City + Richmond Federal + Chevron + Port of Oakland Berths	1,137,800	1,251,580	3.62	3
Improved Levees Around Ponds				
Scenario 1: Oakland + Redwood City Federal	660,800	726,880	1.74	7
Scenario 2: Oakland + Redwood City + Richmond Federal	947,000	1,041,810	2.83	5
Scenario 3: Oakland + Redwood City + Richmond Federal + Chevron + Port of Oakland Berths	1,137,800	1,251,580	3.62	4

*Annual Quantity placed includes a 10% bulking factor

1.5 Required Site Improvements

1.5.1 Onsite Improvements

Onsite improvements would be required to allow for placement of dredged material in the Bay Ponds at Eden Landing. Power requirements constitute the most significant costs of onsite improvements and are discussed separately. The onsite improvements required will consist of the following:

Levee Repairs

The internal levee separating Pond E2 and E4 has two large breaches, one at each end of a severely deteriorated levee, while the remaining ponds are entirely separated by internal levees and water control

structures. While placing sediment, the levee breaches between Ponds E2 and E4 will need to be repaired or Pond E4 and E2 will act as one large pond. The levee will need to be reconstructed and widened to allow for truck traffic and slurry pipeline to be placed alongside the levee.

The internal levee separating Pond E2 and E1 is also deteriorated, likely due to the wave fetch across Pond E1, and will need to be repaired to allow for access by trucks and other construction equipment to set the dredged material slurry pipeline if needed.

While the remaining levees appear to be in good condition, they will also need repair and widening to allow for access by trucks and other construction equipment to set the dredged material slurry pipeline and install any additional water control structures needed for dredged materials placement.

If the perimeter levees are improved to an elevation of 10 feet NAVD88, the Bay Pond bottoms can be raised to the MHW elevation, allowing for the placement of an additional 1.43 MCY of dredged material (effectively implementing the *Improved Levee* assumption of the EIR). Only about 5,600 CY of material would be needed to raise the levees, which can be sourced from existing levees that are currently above the target elevation of 10 feet (AECOM, 2019b). Material to raise the levees could also be sourced from offsite fill sources trucked to the site.

Water Control Structures

Existing water control structures are in place to intake and/or discharge water from the Bay, Old Alameda Creek, and the Alameda Creek Flood Control Channel. Additional water control structures exist at the internal levees to allow for management of water levels and circulation in all the ponds in the Complex. However, the system was never intended to move a significant amount of water quickly between the ponds, which could be the case for decant water movement during placement operations. Temporary weir structures may need to be added at certain locations to increase residence time in the Bay Ponds and allow more of the solids to settle out of the slurry before moving the water through the other Bay and Inland Ponds.

Excess water from pumping the slurry into the Bay Ponds may also need to decant back to the Bay, which could be accomplished via temporary weirs in Ponds E7 or E6 to decant water into Old Alameda Creek. Given that Pond E1 and E2 have the lowest pond bottom elevations of the four Bay Ponds and require the most fill, a longer flow path to a discharge point to the Bay is ideal. These ponds are also the closest ponds to the offloader location, thereby requiring the least amount of slurry pipeline to get material into the Ponds.

1.5.2 Offsite Improvements

To transport dredged material to the Bay Ponds, an offloader will be required along with additional support infrastructure to pump dredged material to Eden Landing. The offloading facility will consist of an offloader with a feed water pump that will be moored with temporary mooring dolphins (piles), floating and submerged pipelines, booster pump(s), and support equipment.

Dump scows or hopper scows delivering dredged material to the offloading facility will range in capacity from 1,450 to 6,000 CY and will draft up to 18 feet when fully loaded. Given the shallow mudflats in the South Bay and the required water depth for the dredged material delivery scows and tugboats, the offloading facility would be positioned near the San Bruno Shoal Ship Channel, approximately three (3) miles offshore of Pond E2 at the Eden Landing site.

Dredged material will be offloaded from the dump scows or hopper scows, mixed with water from the Bay, and the resulting slurry pumped from the offloading facility to the Bay Ponds at Eden Landing.

Offloader

An offloader consists of a moored barge, a dredge pump with a snorkel that is mounted on a gantry crane, a feedwater system to slurry the material in the scows, and additional in-line pumps to transport the material. The feedwater pumps for the offloader would be screened to reduce velocity at the intake to prevent

entrainment of fish. It is assumed that the screening criteria would be similar to the National Marine Fisheries Service (NMFS) recommendation from the Hamilton Wetland Restoration Project (HWRP) which was a 3/32-inch screen mesh and a 0.33 feet per second or less approach velocity.

The offloader could be a custom offloader like the *Liberty* that is currently in use at the Montezuma Wetlands Restoration Project, or a submersible dredge pump that is suspended with a crane or excavator, similar to the offloader in use at the Cullinan Ranch Restoration Project.

There are currently at least four custom hydraulic offloaders in the U.S. fleet, one on the West Coast (Liberty) and three located on the East Coast that typically work on East Coast and Gulf Coast projects. In order to transit to the West Coast, these offloaders would need to be loaded on a submersible barge and towed to the West Coast at a significant mobilization cost.

An offloading facility similar to the *Liberty* was used as a model for the cost estimating work performed for this study. Portable systems such as the one used at Cullinan Ranch were also considered but they would limit the offloading production rate and result in significantly higher costs due to wait times for the scows.

Pipeline

A pipeline will be required to transport the dredged material slurry from the offloader to the placement locations within the Bay Ponds. The pipeline will extend from the offloader location near the ship channel to the landward extent of the Bay Ponds at Eden Landing, spanning 3.5 to 7 miles. The floating and submerged pipeline would likely be a steel line due to the pumping pressures from the offloader and booster pump(s). The shore pipeline would likely be HDPE or a combination of steel and HDPE depending on the discharge pond location.

Booster Pump(s)

Considering the distance from the offloading facility location, approximately three miles offshore of Eden Landing to the point of discharge at the Bay Ponds, one or more in-line booster pumps would be required. Booster pump(s) located within the Bay will be mounted on a barge, that will be moored by piles. The booster pump could also be located onshore if the offloading facility has enough capacity, such as the *Liberty*, to pump the material to the shoreline and beyond. Similar to the offloader, any feedwater pumps at the booster would be screened according to the NMFS recommended criteria.

Offloader Support Plant

Depending on the selected equipment, an offloading facility will require additional support equipment along with the offloader, such as a reel barge to holds the submersible power cable, mooring barges for the dump scow and tugboats to moor to, a work boat to assist the tugboat with the scows, and a crew boat to shuttle crew between the shoreline and the offloader and booster pump barge(s).

1.6 Power Requirements for Dredged Material Placement

1.6.1 Electrical Power Option

Significant electrical infrastructure will need to be constructed to supply power to the project; potential elements will include a substation, an overhead pole line from the substation to the bay edge, and a submarine power cable from there to the offloader.

The closest high voltage transmission power line is located immediately east of the Bay Ponds. Electrical infrastructure at the Port of Redwood City was also explored to determine the feasibility of running power out to the offloader facility and booster pumps via a submersible power cable.

1.6.2 Diesel Power Option

In lieu of using electricity to power the offloader and booster pump(s), they could also be powered by a large diesel generator or two separate generators, depending on the location of the equipment. The generator could be located on the deck of a support barge at the offloading facility and used to power the offloader and support equipment. A separate generator could be placed on the deck of the booster pump barge or a submersible power cable could be run from the generator at the offloading facility to the booster pump barge.

1.6.3 Air Quality Analysis

An air quality analysis was performed to compare the total emissions for the offloading facility powered by electricity and powered by diesel. Depending on the type and size of offloader used combined with the quantity of material received, the emissions should be under the General Conformity de minimis annual threshold but will exceed the daily thresholds of significance for construction-related activities developed by the Bay Area Air Quality Management District (BAAQMD). The CEQA process may be considered complete based on the review completed in association with the beneficial use site for the SBSP, Eden Landing Phase 2 project, which includes a Final EIR and associated environmental studies completed to support the Final EIR. The Final EIR includes dredged material placement for beneficial reuse under the alternatives considered (AECOM, 2019a).

1.7 Contracting Alternatives

Two potential contracting strategies were evaluated – a *Concession Model* and the *USACE Model*.

1.7.1 Concession Model

The concession model is based on execution of three separate contracts for the work as described below:

- *Contract 1 – Site Development*, which would include preparation of the site to receive dredged material including site water control features, electrical power infrastructure, dredged material pipeline, and offloading facility support piling. Procurement for this is relatively straightforward and would involve design of onsite and offsite improvements, regulatory approvals and permits, and issuing a Request for Bids for implementing the improvements. The upfront costs for Onsite and Offsite Improvements (Contract 1) would be about $21 million for the electrical power option or about $9 million for the diesel option.
- *Contract 2 – Offloader Operations*, which would include the annual mobilization of an offloader to the site, transporting dredged material from scows/barges that would be brought in by the dredging contractor, and managing the decant water at the site. This is likely to be one of the dredge contractors that routinely bids and performs work in the SF Bay Area market and this contract would be competitively bid out. The total costs for mobilizing, demobilizing, and operating the offloader through the end of the placement period, assuming the diesel power option is about $46 million.
- *Contract 3 – Site Management*, which would include maintenance of the site over the period required for placing dredged material at the site (power poles and lines, flood control and decant weirs, monitoring, etc.), ensuring that offloading operations are in compliance with project permits, and executing final closure of the dredged material placement at the site prior to handing it over to the Restoration Contractor for the ultimate pre-breaching and breaching operations at the site. The total cost for site management, assuming the improved levee condition is about $4.3 million.

<u>Procurement Strategy for Concession Model</u>

The assumption for this study is that the SBSP Project would bear the costs for all 3 Contracts described above and attempt to recover all or a portion of the costs by charging a Tipping Fee to the dredging projects

similar to the Montezuma Beneficial Reuse Site. Contract 1 and Contract 2 could each be a separate contracting entity, or both contracts could be let out to a single entity.

One option for the beneficial reuse is that the SBSP project operate and manage the offloading operations and bear the risks associated with the project after implementing the Contract 1 activities. It would contract with an offloading entity that would provide the offloading and placement services similar to the Montezuma model, and the SBSP Project would then charge a tipping fee to the dredging project.

The other option is that the SBSP project award a multi-year, turnkey contract to an entity for Contract 2, who then operates the offloader until site capacity is reached. The site would essentially be "leased" to the contractor who would bear the costs for mobilizing and placing material in the ponds and would have the ability to charge a tipping fee to the dredge contractor.

There are several areas of concern regarding either option described above. If dredge projects cannot commit to a certain amount of volume each year, or the annual volumes fall short of projections, the operating entity will need some manner of recouping costs. If a guaranteed minimum amount of material does not come to the site and costs are high, the operating entity runs the risk of the site not being cost competitive with the Federal Standard or more expensive than other established beneficial reuse sites. If that occurred, the SBSP Project would incur additional costs through the offloader contract or lease agreement and would have to reimburse the entity for time and costs spent to date. Even if dredged material comes as planned and at the assumed delivery rate, the costs exceed that of the Federal Standard and the SBSP Project may have to cover the additional costs for beneficial reuse. This will need to be included as part of the contract or lease agreement, that some guaranteed annual cost will be met.

Summary of Costs for Concession Model

A summary of unit costs for the Concession Model, Scenario 1 only which includes offloading for the Oakland and Redwood City federal projects, is presented in Table ES- 4.

Table ES- 4 Concession Model Cost Summary (2020$)

ESTIMATE DESCRIPTION	Total Project Cost ($M) / Unit Cost (per CY) Placed at Eden Landing						
	Site Improvements	Mob/Demob	Dredging & Transport	Offloading	Remaining Dredging	Site Management	Total*
Scenario 1 (Oakland/Redwood City) – Existing Levees	$8.6	$3.7 / $1.12/CY	N/A	$27.8 / $8.44/CY	N/A	$3.2 / $0.96/CY	$43.2 / $13.13/CY
Scenario 1 (Oakland/Redwood City) – Improved Levees	$9.0	$5.1 / $1.09/CY	N/A	$41.2 / $8.71/CY	N/A	$4.2 / $0.89/CY	$59.5 / $12.60/CY

* For Existing and Improved Levees with Diesel Option only

The remaining dredging costs presented in the table are included to represent the material from the federal dredging projects that was not placed at Eden Landing and had to be placed at another disposal location. Under the Concession Model the offloader would act as a separate entity from the dredging contractor so no costs for dredging & transport or remaining dredging would be incurred as part of the Concession Model. Based on the unit costs presented in Table ES- 4, the tipping fee to recover all of the upfront site preparation and offloading costs would be $13.13/CY and $12.60/CY for the existing and improved levee conditions, respectively. As a comparison, current tipping fees for wetland cover are $12.00-$14.00/CY at Montezuma and $3.00-$4.00/CY at Cullinan. The dredge contractor must provide their own offloader to place material at Cullinan.

1.7.2 USACE Dredging Project Model

The USACE dredging project model is based on the beneficial reuse model that the SF District currently uses for the Federal Channel Maintenance dredging projects. Some projects have a base bid that includes the Government furnished disposal site (Federal Standard) and includes an alternative bid for a contractor furnished disposal site. For the alternative bid the contractor is required to take the dredged material to a permitted beneficial reuse upland site. Other methods have included a base bid where the dredging bid items are a mix of beneficial reuse and the Federal Standard disposal site. Most recently, the SF District bid the Redwood City project as a base bid to the Federal Standard disposal site (SF-11) with an optional bid for an additional cost to take some of the base bid material to a beneficial use site. The SCC supplemented the SF District budget for the project with an additional $2M to allow for the beneficial reuse optional bid to be included.

Providing for an Alternative Bid would allow the contractors to bid on using Eden Landing as the beneficial reuse site, much like Cullinan and Montezuma currently are used. For Eden Landing to be considered as an alternative bid option in the contractors bid, the site would need to be permitted for placement of dredged material. The SBSP project would complete a minimal amount of site improvements (levee repairs and water control features), such that the site is ready to accept dredged material. The remaining work would be included as part of the contractors alternative bid and would include the pipeline, offloader, booster pump(s), support pilings, power requirements, and shore operations to place the dredged material, similar to Contract 1 and Contract 2 of the Concession Model. This type of arrangement is similar to offloading at Cullinan. It allows the dredge contractors to use their competitive advantage in setting up the offloader system to place material at the site.

Procurement Strategy for USACE Model

The procurement strategy for the USACE model would be twofold. The first part of the procurement strategy is to bundle two or more of the Federal Channel Maintenance Dredging projects to provide the maximum amount of dredged material possible being placed at Eden Landing. By maximizing the amount of material placed, the contractor will be able to spread the mobilization costs for the offloader at Eden Landing over a larger quantity of material. The second part of the strategy is to bid the project as an alternate bid; the dredging contractor would thus supply the offloader, booster pump(s), pipeline, mooring piles, and support equipment to place the material at Eden Landing. The dredging contractor would also be responsible for placement of the material at Eden Landing per the required permit conditions.

The potential for bundling two or more Federal Channel Maintenance projects needs to be further developed with the SF District. One of the issues with bundling either the Redwood City Harbor or the Richmond Harbor projects is that these are typically used by the SF District as small business set aside projects. Whether the SF District can re-program those two projects and still meet their small business requirements is unknown. Another potential issue with an alternative bid scenario on the Federal projects is the competition from the existing beneficial reuse sites and the limited amount of federal maintenance dredging projects in the SF Bay.

Summary of Costs for USACE Dredging Model

The cost estimate for the USACE model assumes a bundled project with the Oakland and Redwood City Harbor dredging being combined as one project. The cost estimate was developed based on an alternate bid scenario to take material to Eden Landing and assumes the contractor provides the offloader, booster pump(s), and pipeline, and is also responsible for placing the material at the site. A summary of the costs for the USACE Model for the existing and improved levee conditions are shown in Table ES- 5. Costs for an unbundled scenario would be higher due to multiple project mobilizations.

Table ES- 5 USACE Model Cost Summary (2020$)

ESTIMATE DESCRIPTION	Total Project Cost ($M) / Unit Cost (per CY) Placed at Eden Landing						
	Site Improvements	Mob/Demob	Dredging & Transport	Offloading	Remaining Dredging	Site Management	Total*
Oakland/Redwood City (Bundled) – Existing Levees	$4.7	$31.9 / $9.68/CY	$51.5 / $15.62/CY	$28.8 / $8.73/CY	$63.2 / $27.71/CY	$4.2 / $1.27/CY	$184.1 / $55.90/CY
Oakland/Redwood City (Bundled) – Improved Levees	$5.1	$46.0 / $9.73/CY	$75.9 / $16.06/CY	$42.5 / $8.99/CY	$88.4 / $18.70/CY	$5.9 / $1.25/CY	$263.7 / $55.81/CY

* For Existing and Improved Levees with Diesel Option only

Comparison to Current Dredging Practices

The total spending costs for the Oakland and Redwood City projects over the seven-year period that material would be placed at Eden Landing is compared to the total cost for the USACE model alternate project costs for a bundled project. The comparison costs are shown in Table ES- 6. The difference between the USACE model, which assumes a bundled Oakland and Redwood City project placing material at Eden Landing, and the current spending over a 7-year period for the Oakland and Redwood City projects is approximately $33.1M, or an average annual cost of approximately $6.6M over annual spending.

Table ES- 6 USACE Model Comparison to Oakland / Redwood City Dredging Costs

ESTIMATE DESCRIPTION	Total Project Cost ($M)							
	Site Improvements	Mob/Demob	Dredging & Transport	Offloading	Remaining Dredging	Site Management	Total*	Difference
Current Oakland / Redwood City Costs (over 7-Years)	N/A	$16.5	$195.4	N/A	N/A	N/A	$212.0	-
USACE Model (Oakland/Redwood City Bundled)	$5.1	$46.0	$75.9	$42.5	$88.4	$5.9	$263.7	+ $51.7
Funding Responsibility	SCC	USACE	USACE	USACE	USACE	SCC		SCC

* For Improved Levees with Diesel Option only

1.7.3 Comparison of Concession Model to USACE Dredging Project Model

The costs for the Concession model (Scenario 1 only) were compared to the USACE model for the diesel option, assuming an improved levee condition. The dredging project costs were added to the Concession model including mob/demob of the clamshell dredges, dredging and transport, and remaining dredging, to reflect a total project cost for comparison to the USACE model. Table ES- 7 shows that the Concession model is less expensive simply due to spreading the mobilization and site improvement costs over the seven-year life of the project rather than a single contract bid each year.

The comparison costs presented for either model is based on the maximum site capacity at Eden Landing being mobilized so site improvement costs are spread over the largest volume possible. As the amount of beneficial reuse material delivered on an annual basis decreases, the cost and duration of the placement increases. Using either cost model to beneficially reuse material at Eden Landing may have impacts on the overall Eden Landing restoration project. Certain construction elements of the restoration project will likely be delayed until all the dredged material is placed in the Bay Ponds. Delays to construction of the overall restoration project may have cost and potential funding implications that are not included as part the costs presented in this report.

Table ES- 7 Comparison of Concession Model Costs to USACE Model Costs

ESTIMATE DESCRIPTION	Total Project Cost ($M)							
	Site Improvements	Mob/Demob	Dredging & Transport	Offloading	Remaining Dredging	Site Management	Total*	Difference
USACE Model (Oakland/Redwood City Bundled)	$5.1	$46.0	$75.9	$42.5	$88.4	$5.9	$263.7	+ $30.2
Concession Model	$9.0	$14.9	$75.9	$41.2	$88.4	$4.2	$233.5	

* For Improved Levees with Diesel Option only

1.8 Environmental Documentation and Outreach

The assumption for the beneficial reuse project is that separate environmental review clearances and dredging permits will be obtained prior to offloading by the proponent of any dredging projects utilizing the Project's facilities (e.g. Port of Redwood City dredging, etc.) and that beneficial reuse/placement permits will be obtained by others. There is the potential to use existing environmental studies and documentation previously completed for the South Bay Salt Pond Restoration Project (SBSP), Eden Landing Phase 2 project, including the project Final Environmental Impact Report (EIR), to support and streamline the Project's environmental compliance with the California Environmental Quality Act (CEQA), National Environmental Policy Act (NEPA) and regulatory agency permitting and coordination.

Environmental review completed in association with the beneficial use site for the SBSP, Eden Landing Phase 2 project includes a Final EIR and associated environmental studies completed to support the Final EIR. The Final EIR includes dredged material placement for beneficial reuse under the alternatives considered (AECOM, 2019a). The proposed Project will require environmental review and permits for installation of the offloader facility including pumps, submerged pipeline and potential electrical supply and for operations of the offloader facility including water handling and management. The offloader will draw seawater through piping outfitted with conical fish screens to minimize and avoid fish entrapment, as required by NMFS for other similar projects.

1.8.1 Regulatory Permit Requirements

The offloader project at the Eden Landing Complex will be regulated under Federal, State, and local environmental regulations. An up to date Section 106 Cultural Resources review or survey(s) are assumed to be potentially required given the presence of known shipwrecks in the project vicinity and the potential for such features in or near the project area. Completion of a Biological Assessment (BA) will be used to identify potential impacts and appropriate avoidance, minimization, and mitigation measures. Potential benthic, overwater, and noise impacts will also need to be evaluated to identify appropriate avoidance, minimization, and mitigation measures. It is expected that regulatory agency review and approval of the permit applications could take 12 to 18 months from the date of the application submittal.

The following is a summary of the permits/approvals that will likely be required for the project.

- Federal:
    - Individual Section 10 Rivers and Harbors Act (RHA)- US Army Corps of Engineers (USACE)
    - Section 404 Clean Water Act (CWA) – USACE/San Francisco Bay-California Regional Water Quality Control Board (SF RWQCB)
    - Section 14 RHA, Section 408 – USACE
    - National Environmental Protection Act (NEPA) – USACE

  - Section 7 Endangered Species Act (ESA) Consultation/Biological Opinion (BO) – USACE/US Fish and Wildlife Service (USFWS)/National Oceanic and Atmospheric Administration (NOAA) Fisheries
  - Marine Mammal Protection Act (MMPA) Incidental Harassment Authorization (IHA)/Incidental Take Authorization (ITA) – National Marine Fisheries Service (NMFS) Protected Resources Division

- State
  - California Environmental Quality Act (CEQA) Initial Study (IS)/Mitigated Negative Declaration (MND) or SEIR to SBSP Final EIR – *The CEQA process may be considered complete based on the review completed in association with the beneficial use site for the SBSP, Eden Landing Phase 2 project, which includes a Final EIR and associated environmental studies completed to support the Final EIR. The Final EIR includes dredged material placement for beneficial reuse under the alternatives considered (AECOM, 2019a).*
  - Section 401 CWA Water Quality Certification (WQC) and Region Waste Discharge Requirements - SF RWQCB
  - California Endangered Species Act (CESA) Safe Harbor Agreement (SHA) – California Department of Fish and Wildlife (CDFW)
  - Incidental Take Permit for state-listed species such as longfin smelt- CDFW
  - Consistency Determination (CD) – CESA concurrence with NMFS/NOAA ITA
  - California State Lands Lease – California State Lands Commission (SLC)
  - National Pollution Discharge Elimination System (NPDES) permit for construction and operation – SF RWQCB
  - San Francisco Bay Conservation and Development Commission Management Program (BCDC) and Coastal Zone Management (CZM) CD – BCDC
  - Bay Fill Permit - BCDC
- Local
  - Authority to Construct – Bay Area Air Quality Management District (BAAQMD)

1.8.2 Outreach with Regulatory Agencies

Primarily informal discussions have been held with members of the regulatory agencies. The offloader study was presented at an LTMS Managers Meeting on December 6. The LTMS Managers provided comments on the Draft EIR SBSP, Eden Landing Phase 2 project including comments regarding the offloader portion of the project. The Conservancy has recently presented the overall Restoration Project to Bay Restoration Regulatory Integration Team (BRRIT) pursuant to the project's permitting as a whole. Dredged material resource was discussed as part of that presentation. More formal discussions need to be held, specifically with the SFBRWQCB to determine the potential for material that is suitable for in-bay disposal at Alcatraz can be placed at Eden Landing as beneficial reuse. That would open the pool of dredging projects available to take material to Eden Landing, allowing the regulatory agencies to be more selective in the alternatives analysis to include Eden Landing as an option over in-bay or ocean disposal. This would have the potential to speed up the time required to fill the ponds with dredge material.

1.8.4 Outreach with Dredging Sponsors

Informal discussions have been held with USACE members, however more formal discussions need to be held to determine if bundling of projects is an acceptable option or whether an alternate type bid arrangement on a single project is the only option. No discussions have been held to date with any of the Port facilities or other dredging sponsors to discuss non-federal maintenance dredging projects placing material at Eden Landing.

1.8.5 Outreach with Dredging Contractors

Meetings have been held with two dredging contractors (Dutra Group and Manson Construction Co.), to discuss the possibility of placing an offloader at Eden Landing and what the appropriate contract vehicle is for achieving an operating offloader. The responses varied from a potential lease agreement over a five-year period to spread the capital costs out, to using an alternative bid approach on a bundled federal project. Both dredge contactors have access to offloaders and have been involved in offloading dredged material at beneficial reuse sites over the last twenty plus years.

1.9 CEQA/NEPA Strategy

The CEQA/NEPA process can be a challenge for projects with a broad range of considerations as included in this Project. However, the CEQA consultation likely will be considered complete based on the environmental review completed in association with the beneficial use site for the SBSP, Eden Landing Phase 2 project. The studies to complete the associated Final EIR for the SBSP project will likely support the NEPA evaluation for this project. The Final EIR includes dredged material placement for beneficial reuse under the alternatives considered (AECOM, 2019a).

The Project description should emphasize proposed Onsite and Offsite Improvements, and the Offloading Operations. Measures to avoid and minimize impacts from the operation of the offloader should be identified early to ensure a smooth permit application submittal process and address potential agency concerns raised on similar past projects in the area.

1.10 Conclusions and Recommendations

- *Site Capacity:* The Bay Ponds of the Eden Landing Complex represent an opportunity to restore about 1400 acres of salt ponds to tidal wetlands, using dredged material. Given the condition of the interior levees and berms, improvements would be required to these elements that would allow about 4.7 million CY of dredged material to be placed within the ponds; this would effectively mitigate some of the flooding concerns for the local communities and accelerate the process of establishing tidal wetland habitat in the Bay Ponds.
- *Sources for Dredged Material:* Material generated from federal and non-federal navigation dredging projects in San Francisco Bay total about 2.6 MCY annually, with about 1.7 MCY from federal projects and 0.9 MCY from non-federal projects. Dredging projects identified as “feasible” for this analysis include the Oakland Inner and Outer Harbor (federal), Redwood City Harbor (federal), Richmond Inner and Outer Harbor (federal), Chevron Richmond Terminal, and Port of Oakland Berths. These projects would generate about 1 million CY on an annual basis. Almost all of the material dredged from these projects is expected to be suitable for beneficial reuse because it has historically gone to In-Bay, DODS or other beneficial reuse sites.
- *Site Improvements:* The required site improvements would need to include levee repairs, water control structures, an electric power source along with transmission lines from the source to the offloader or a diesel power source, a pipeline from the offloader to the Bay Ponds, and an offloading facility about 3 miles offshore of the Bay Pond levee. The offloading facility would consist of a commercial offloader,

similar to the *Liberty* at the Montezuma site, and booster pumps for transport of material from scows to the site.

- *Feasibility for Beneficial Reuse:* The overall objective of the study was to identify a practical dredged material delivery model that would help provide the Bay Area with an effective means to beneficially reuse dredged material and improve wetlands and water quality in the Bay. The study shows that although this is feasible, there is a significant upfront cost associated with site improvements and offloading infrastructure that would need to be expended by a non-federal partner to compete with the Federal Standard for dredging.
- *Beneficial Reuse Associated Costs:* The detailed cost estimates prepared for this study show that, using current dredging and disposal practices, the USACE would spend about $212 million over a 7-year period to dredge the Oakland and Redwood City Harbor projects. If the Concession Model were to be implemented, the costs for the same two projects would be about $234 million, but the SBSP project would have to upfront about $60 million and recoup a significant portion of this cost via a tipping fee charged to the dredging projects. If the USACE Model were to be implemented, the costs would increase to about $264 million, even after bundling the two dredging costs.
- *Partnering with Dredging Sponsors:* In order for beneficial reuse at the Eden Landing Complex to be successful, costs would have to competitive with the Federal Standard for maintenance dredging projects in the San Francisco Bay Area. This requires, in addition to the beneficial reuse associated costs, a long-term commitment (in the form of a MOU) between the USACE and the restoration community such that material will be beneficially used, rather than disposed of offshore. Dredge contractors will begin to change their operations to fit a new beneficial reuse practice only if they see that a long-term commitment is being made. The USACE must also consider changing their contracting strategy to fit with beneficial reuse in the San Francisco Bay Area. Any MOU between SCC, USACE, DMMO and others should include the non-federal dredge project participants and dredging contractors. As Federal budgets continue to shrink, buy-in from non-Federal dredging sources and dredging contractors will be critical to the success of the project.
- *Competition with Other Reuse Sites:* Other potential beneficial reuse sites (Montezuma, BMKV, and Cullinan) must also be included in the overall beneficial reuse plan so all projects can be a success and not be viewed as competitors for the dredge material.
- *Environmental Review:* Environmental review completed in association with the beneficial use site for the SBSP, Eden Landing Phase 2 project includes a Final EIR and associated environmental studies completed to support the Final EIR. The Final EIR includes dredged material placement for beneficial reuse under the alternatives considered (AECOM, 2019a). The proposed Project will require environmental review and permits for installation of the offloader facility including pumps, submerged pipeline and potential electrical supply and for operations of the offloader facility including water handling and management. The CEQA consultation likely will be considered complete based on the environmental review completed in association with the beneficial use site for the SBSP. The studies to complete the associated Final EIR for the SBSP project will likely support the NEPA evaluation for this project.
- *Stakeholder Outreach:* Primarily informal discussions have been held with members of the regulatory agencies. More formal discussions need to be held, especially with BCDC and the SFBRWQCB to determine the potential for material that is suitable for in-bay disposal at Alcatraz to be placed at Eden Landing for beneficial reuse.

  Also, only informal discussions have been held with USACE members; more formal discussions need to be held to determine if bundling of projects is an acceptable option or whether an alternate type bid arrangement on a single project is the only option.

Lastly, for beneficial reuse to succeed at the scale of projects being envisioned in the SF Bay Area (multi-million cubic yards at each site), partnering with the private dredging community is critical so that their experience from around the country and the diversity of their equipment inventory can be leveraged.

2 Introduction

2.1 Purpose and Need

The South Bay Salt Ponds were acquired from Cargill in 2003 using a combination of State, Federal and Private funds. The U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW) currently manage the ponds and, in concert with the California State Coastal Conservancy (SCC), initiated the South Bay Salt Ponds Restoration Project (SBSP), the largest wetlands restoration project on the West Coast. A public process to design and implement the SBSP is being led by the SCC. The Eden Landing Complex near Hayward is one of the three primary areas comprising the SBSP Restoration Project and the focus of its Phase 2 operations.

The Southern Eden Landing Ponds (Site) is a 2,210-acre subsection of the greater 5,500-acre Eden Landing Complex. The former salt production ponds are currently subsided two to three feet below mean higher high water (MHHW), which is the target elevation for tidal mid-marsh growth. Material dredged from navigation channels in SF Bay presents an opportunity for subsidence reversal and flood management such that it would help meet the project's restoration and flood protection goals.

Federal and private navigation projects annually maintenance dredge approximately 2.6 million cubic yards (MCY) from San Francisco Bay. The San Francisco Bay Long Term Management Strategy (LTMS) goal is to beneficially reuse at least 40 percent of all regionally generated dredged material. Dredged material could be placed throughout the Eden Landing ponds to raise bottom elevations to near MHHW, restoring tidal habitat. Additional dredged material could be utilized to produce habitat islands or upland transition zones (UTZs) within ponds although this material would require additional drying time and grading rework, adding time to the overall restoration project duration. Levees within and bordering the ponds could be raised to create unique habitats, establish recreational trails, and provide equal or better flood risk management than exists today. This would also require additional drying time and grading rework.

Despite the annual availability of over 1 million cubic yards of material suitable for restoration, the Bay Area's experience is that there are significant constraints for reusing dredged material. The two biggest ones are the location of potential reuse site (fronted by mudflats that do not provide navigation depths for conventional barges/scows that transport material dredged from channels) and the high initial costs to mobilize the equipment for material delivery and placement (offloader, power needs, and pipeline). These constraints result in beneficial reuse costs being typically higher than what the Army Corps presently incurs for maintaining the federal navigation channels, and the cost differential has to be funded in some other manner (restoration agencies for example).

The purpose of this study is to investigate itemized costs for beneficial reuse and identify a procurement strategy that would allow for placement of material dredged from navigation channels into the Eden Landing Complex as well as serve as a template for other potential reuse sites.

2.2 Scope of Work

The overall goals of this work are to analyze potential construction costs for beneficial reuse of dredged material at the Eden Landing Complex for a prescribed duration, and to prepare a procurement strategy for implementing construction of the beneficial reuse.

Specific objectives and scope of work are:

1. Identify material sources, volumes, and delivery schedules including, in particular, maintenance dredging of the Redwood City Harbor Channel because of the source of funding for this study.
2. Develop schematic layouts of onsite and offsite conceptual improvements and construction features. Onsite improvements include placement locations, containment dike locations, decant

water handling features, and water management needs such as settling basins. Offsite improvements include offloader location, offloader system requirements, offloader support plant, pipeline details, and booster pumps.

3. Analyse power needs and potential associated air quality concerns to compare diesel and electric power supply options. Analysis includes power supply schematics.
4. Develop contracting alternative strategies and compare potential cost implications.
5. Identify regulatory permit needs, specifically any additional analyses beyond the Phase 2 South Bay Salt Pond Restoration Project EIR needed to address construction specific activities (pile driving, fish screening, pipeline installation, air quality impacts, etc.).
6. Coordinate with Agencies, Dredging Sponsors, and Contractors to pursue continuance of beneficial reuse at the Eden Landing Complex beyond 2021 and/or extension of a similar strategy to other SBSP sites. Includes presentations at LTMS meetings and facilitation of an Industry Outreach Workshop.
7. Produce Offloader Procurement Strategy Report to present results of the preceding tasks.

3 Background

The SBSP Restoration Project is a multi-agency effort to restore tidal marsh habitat, reconfigure managed pond habitat, maintain or improve flood risk management, and provide recreation opportunities and public access in 15,100 acres of former salt evaporation ponds purchased from and donated by Cargill in 2003 (AECOM, 2019a). Planning and design for the SBSP Restoration Project Phase 2 projects started in 2010. The Salt Ponds are comprised of the Alviso Complex (8,000 acres), the Eden Landing Complex (5,500 acres), and the Ravenswood Complex (1,600 acres). A public process to design and implement the restoration project is being led by the California State Coastal Conservancy (SCC), the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW). The Final EIR/S was adopted in late 2007 and the first phase of restoration started in 2008.

Phase 2 of the SBSP Restoration Project at Eden Landing is intended to address tidal marsh restoration and long-term tidal flood risk management needs. In April of 2019 the Final Environmental Impact Report (EIR) for the Phase 2 Project at the Eden Landing Complex was completed. The EIR evaluated the potential environmental impacts for the proposed Phase 2 project alternatives which included various habitat restoration, flood risk management, and public access improvements. The Phase 2 project area includes the eleven (11) ponds located in the southern portion of the Complex which includes the Bay Ponds (Ponds E1, E2, E4, and E7). The Phase 2 Project area is outlined in Figure 3-1.

3.1 Southern Eden Landing Ponds

The Eden Landing Complex is approximately 5,500 acres of restored former salt ponds and adjacent marshes that are currently managed for resident and migratory shorebirds and tidal marsh habitat. The Complex is located south of State Route 92 near the eastern end of the San Mateo Bridge. It is currently managed by the CDFW through the control of tidal flow through the existing ponds. Under the Phase 1 work at the Eden Landing Complex, the ponds to the north of Old Alameda Creek were restored. The Phase 1 restoration work commenced in 2009 and was completed in 2014, with the opening of public access trails and recreation features in May 2016.

The Southern Eden Landing Ponds (Site) is a 2,210-acre subsection of the greater 5,500-acre Eden Landing Complex. The former salt production ponds are currently subsided two to three feet below mean higher high water (MHHW), which is the target elevation for tidal mid-marsh growth.

3.2 Restoration Plans

The EIR preferred alternative proposes to restore the Bay Ponds to tidal marsh habitat along with an adaptive management phased restoration of the remaining ponds to potentially include either further tidal restoration or enhanced management of water circulation, pond depth, and salinity regimes for migratory shorebirds and waterfowl. The Phase 2 actions also proposed the creation of habitat transition zones from the pond or marsh bottom to the adjacent upland areas. As part of the tidal marsh habitat restoration process, the EIR discusses the potential for the beneficial reuse of dredged material to raise pond bottom elevations to help target the MHHW elevation necessary for tidal marsh habitat development and for the construction of habitat transition zones. As part of the preferred alternative, up to six (6) million cubic yards of dredge materials could be placed in the Bay and Inland Ponds.

The Bay Ponds are the four largest, western-most ponds in the Eden Landing Complex. This report focuses on dredged material placement in the Bay Ponds only, for the purpose of raising pond bottom elevations to more quickly develop the EIR goals of restoring the various pond complexes to a mixture of tidal habitat and managed ponds.

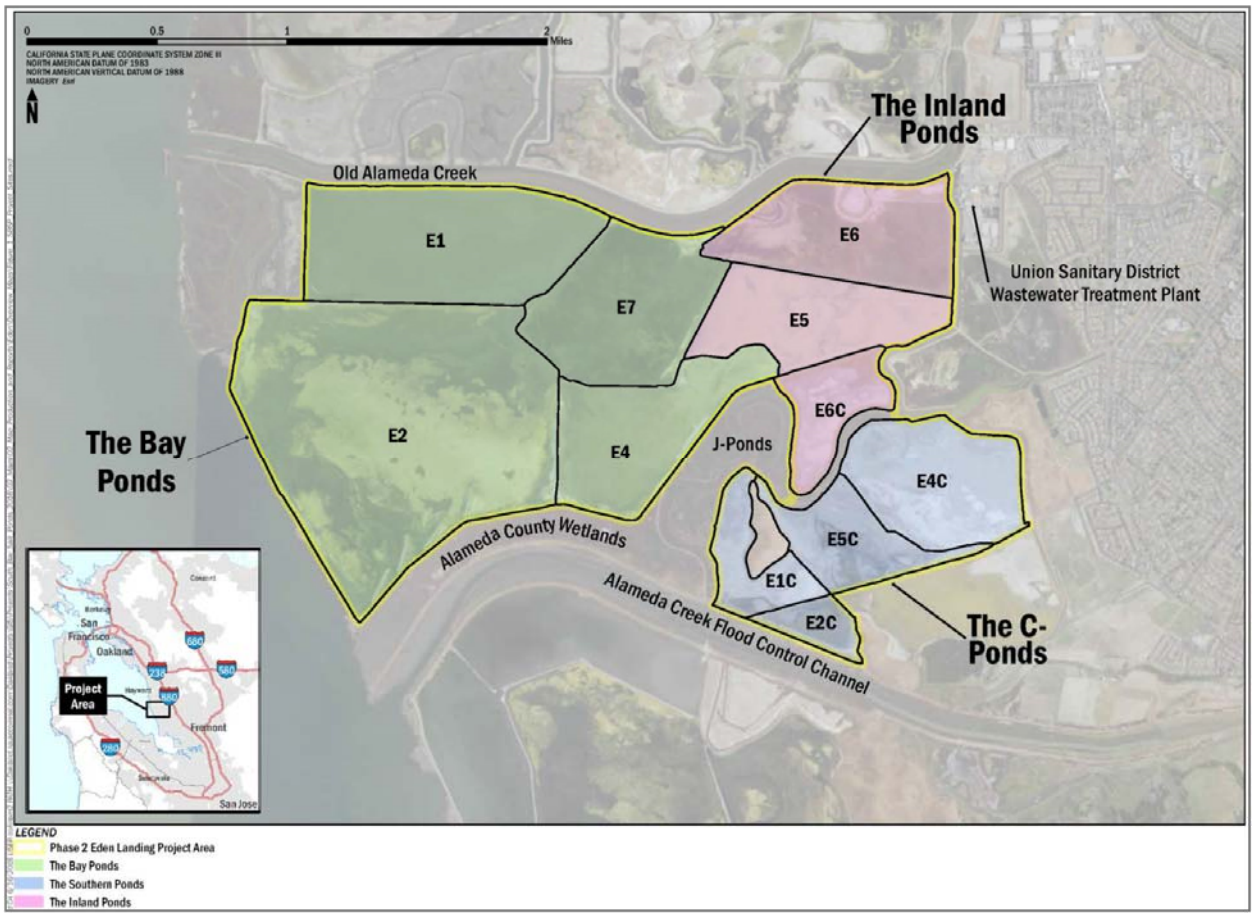


Figure 3-1 Phase 2 Project Area

Source: Final Environmental Impact Report, Appendix E Preliminary Design Memorandum of Dredged Material Placement at Southern Eden Landing ((AECOM, 2019b)

3.3 Pond Sizes and Capacities

The Bay Ponds consist of four large ponds with relatively flat bottoms due to their former use as salt ponds. The ponds are separated by internal levees constructed of material excavated from borrow ditches adjacent to the levee. The borrow ditches have been used over time to construct and maintain the levees. The existing pond sizes and bottom elevations are detailed in Table 1.

Table 1 Bay Ponds – Pond Sizes

Pond	Perimeter (ft.)	Area (Acre)	Avg. Pond Bottom Elev. (ft. NAVD88)	Min. External Existing Levee Crest Elev. (ft. NAVD88)
E1	15,801	297	4.8	8.5
E2	22,485	692	4.8	9.5
E4	14,261	202	5.6	9.5
E7	12,709	217	4.9	9.0

Source: Final Environmental Impact Report, Appendix E Preliminary Design Memorandum of Dredged Material Placement at Southern Eden Landing (AECOM, 2019b)

Dredged material would be placed into the Bay Ponds as part of the tidal marsh habitat restoration process, to raise pond bottom elevations to help target the MHHW elevation necessary for tidal marsh habitat development, and for the construction of habitat transition zones. The Bay Ponds are the four large ponds located nearest to the Bay.

Total dredged material placement volume estimates are summarized in Table 2. If existing levees are utilized as-is, approximately 3.3 MCY of dredged material may be imported and placed in the Bay Ponds to raise the bottom elevations to an average 6.0 feet NAVD88. This assumes a 2-foot freeboard between the maximum slurry elevation and levee crest, a minimum of half a foot of slurry depth near the end of material placement, and about half a foot to one foot of dredged material consolidation settlement (of the dredged material itself and of the young bay mud beneath the one to two feet of placed material, (AECOM, 2019b).

If portions of existing levees are improved to a minimum of 10 feet NAVD88, the Bay Pond bottoms may be raised to the target elevation of MHW (6.5 feet NAVD88) with the placement of 4.7 MCY. Similar assumptions as stated above were assumed. Approximately 5,600 CY would be needed from onsite upland areas to improve levees to 10 feet NAVD88 (AECOM, 2019b).

Table 2 Bay Ponds Dredged Material Placement Volumes

Pond	Placement Volume (CY) for *Existing Levees* (fill to avg. 6.0 ft. NAVD)		Placement Volume (CY) for *Improved Levees* (fill to avg. 6.5 ft. NAVD)		Volume (CY) to Improve Perimeter Levees to 10 ft. NAVD	
E1	477,000 CY	**3,294,000 CY**	1,052,000 CY	**4,725,000 CY**	800 CY	**5,600 CY**
E2	2,003,000 CY		2,449,000 CY		0	
E4	371,000 CY		501,000 CY		1,900 CY	
E7	443,000 CY		723,000 CY		2,900 CY	

Source: Final Environmental Impact Report, Appendix E Preliminary Design Memorandum of Dredged Material Placement at Southern Eden Landing (AECOM, 2019a)

These volumes are based on the average pond bottom estimates and minimum existing levee crest elevations as listed in Table 1. The two feet of freeboard between the maximum slurry elevation and levee crest is included to provide allowances for wind waves generated within the ponds and to provide for capture and release of precipitation (AECOM, 2019b).

In addition to using dredged material to raise the pond bottom elevations, dredged material may be utilized to construct habitat transition zones. The volume required for construction of habitat transition zones and levee features for the Bay Ponds is estimated to require an additional 46,000 CY of dry fill that could be sourced from dredged material (AECOM, 2019b).

4 Physical Conditions

To identify an appropriate location for an offloading facility in the South Bay, it is necessary to identify physical conditions of the Bay, including depths, wave exposure and tidal currents. This section describes conditions in the South Bay offshore of the Eden Landing ponds.

4.1.1 Tides

Mixed semi-diurnal tides enter the Bay through the Golden Gate and are reflected and amplified in the South Bay. The tidal range increases from the Golden Gate going towards the South Bay (Table 3).

Table 3 Tidal Statistics for San Francisco Bay (feet, NAVD datum)

Tidal Plane	Presidio	Alameda	San Mateo Bridge, West	Dumbarton Bridge	`Coyote Creek
MHHW	5.90	6.36	6.97	7.27	7.48
MHW	5.29	5.74	6.33	6.64	6.90
MTL	3.24	3.32	3.38	3.30	3.31
MSL	3.18	3.22	3.36	3.33	3.40
MLW	1.19	0.90	0.43	-0.04	-0.28
NAVD88	0.00	0.00	0.00	0.00	0.00
MLLW	0.06	-0.23	-0.75	-1.24	-1.52

Source: (Moffatt & Nichol, 2015)

4.1.2 Bathymetry

South San Francisco Bay is a large basin with a deep channel surrounded by broad shallow areas, mudflats and fringing tidal marsh. Deep draft ships are restricted to the federal navigation channel which has depths ranging from 38 to 55 feet. Deep draft vessels are unable to navigate the South Bay's surrounding shallows which have less than 13 feet average depth. In the Bay south of Dumbarton Bridge, the average depth is only three feet and 75 percent of the surface area consists of mudflats. This implies that typical scows bringing in dredged material from the dredging project sites would be restricted to the deep channel.

4.1.3 Wind

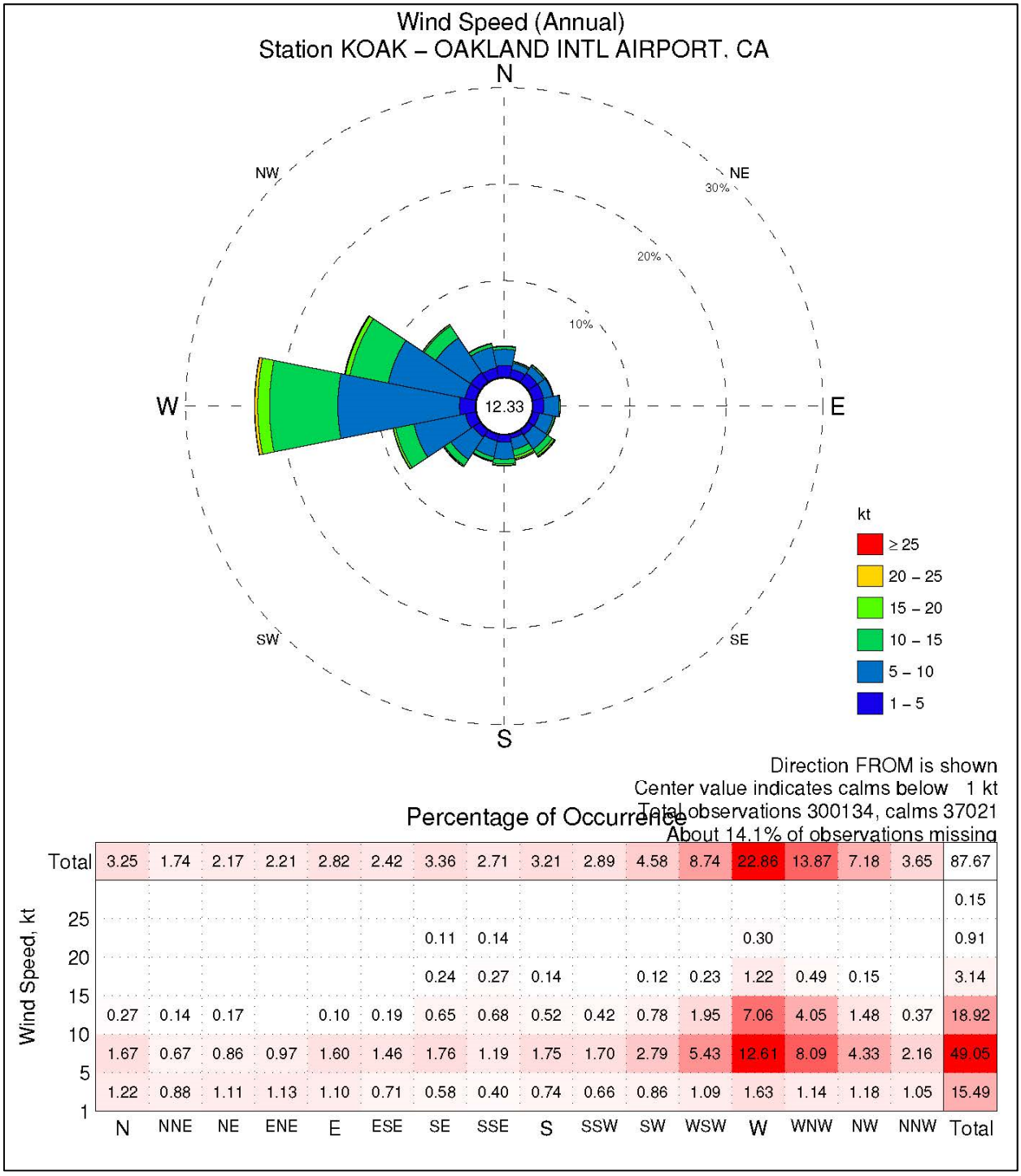
Wind data recorded at Oakland International Airport (KOAK) is representative of wind conditions at the project area. Figure 4-1 and Figure 4-2 show the annual and seasonal wind roses based on wind data from 1979 to 2019. Predominant winds are generally from westerly directions. During the winter months strong winds can blow from the south and southeast. The mostly common wind speeds range from 5 to 10 knots (49% of the time), while wind speeds exceeding 15 knots occur approximately 4% of the time.

Wind speed extremes were estimated following the methodology by Goda (Goda, 2010) using the *Peak-Over-Threshold* method. Figure 4-3 indicates a wind speed of 36 knots for the 100-year return period (equivalent to a 1% annual chance of occurrence).

4.1.4 Waves

Wind-generated waves in San Francisco Bay were calculated using the Automated Coastal Engineering System (ACES) program (Veri-Tech Inc., 2013). The longest over-water fetch is from the northwest. Because the mudflats play a significant role in reducing incident wave heights as they induce depth-limited

wave breaking, the significant wave height is estimated to about 2 feet for the 100-year return period wind speed. The corresponding peak wave period is on the order of 4.5 seconds.



Wind Speed, kt	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
Total	3.25	1.74	2.17	2.21	2.82	2.42	3.36	2.71	3.21	2.89	4.58	8.74	22.86	13.87	7.18	3.65	87.67
25																	0.15
20							0.11	0.14					0.30				0.91
15							0.24	0.27	0.14		0.12	0.23	1.22	0.49	0.15		3.14
10	0.27	0.14	0.17		0.10	0.19	0.65	0.68	0.52	0.42	0.78	1.95	7.06	4.05	1.48	0.37	18.92
5	1.67	0.67	0.86	0.97	1.60	1.46	1.76	1.19	1.75	1.70	2.79	5.43	12.61	8.09	4.33	2.16	49.05
1	1.22	0.88	1.11	1.13	1.10	0.71	0.58	0.40	0.74	0.66	0.86	1.09	1.63	1.14	1.18	1.05	15.49
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total

Figure 4-1 Annual Wind Rose for Oakland International Airport

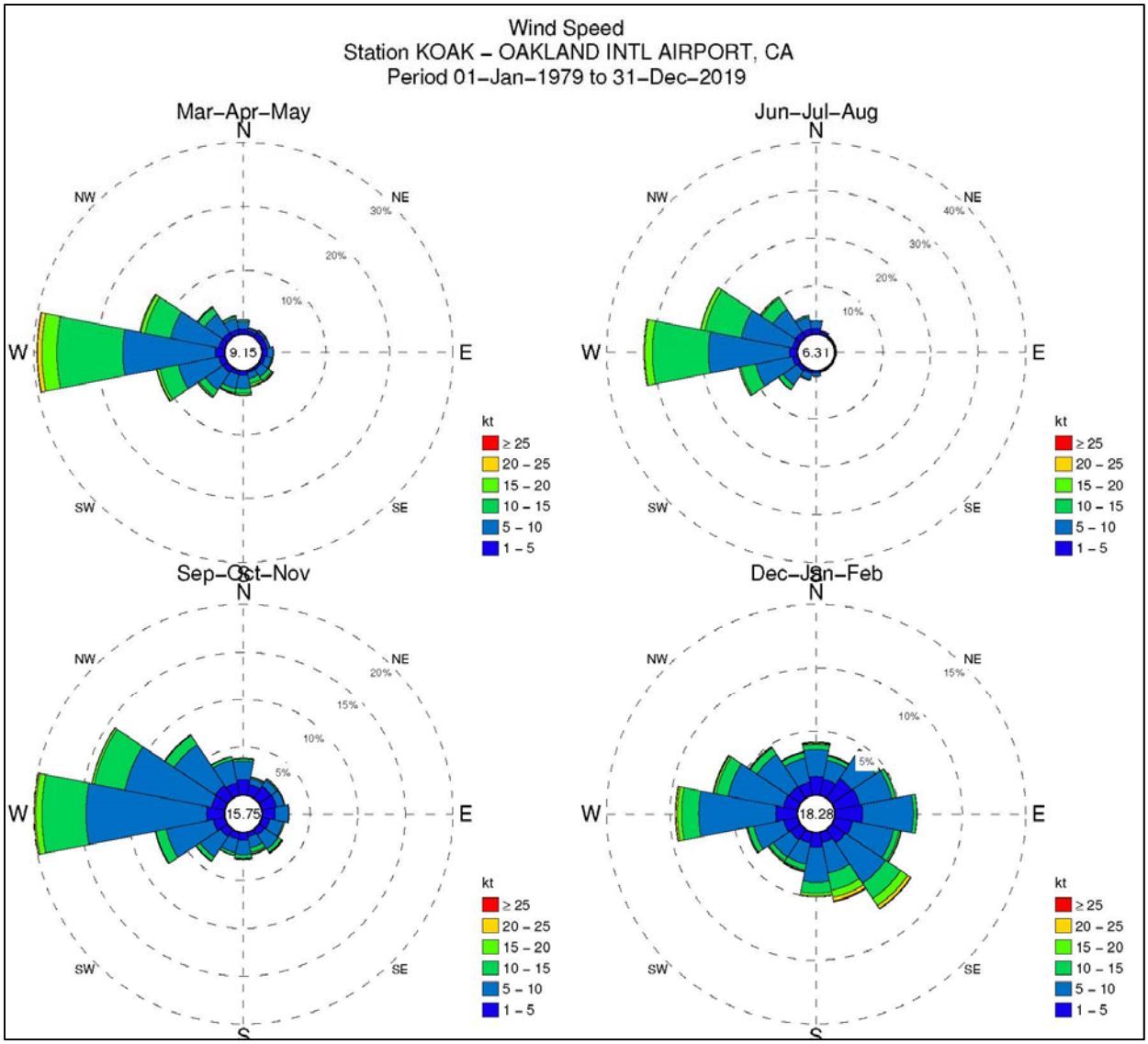


Figure 4-2 Seasonal Wind Roses for Oakland International Airport

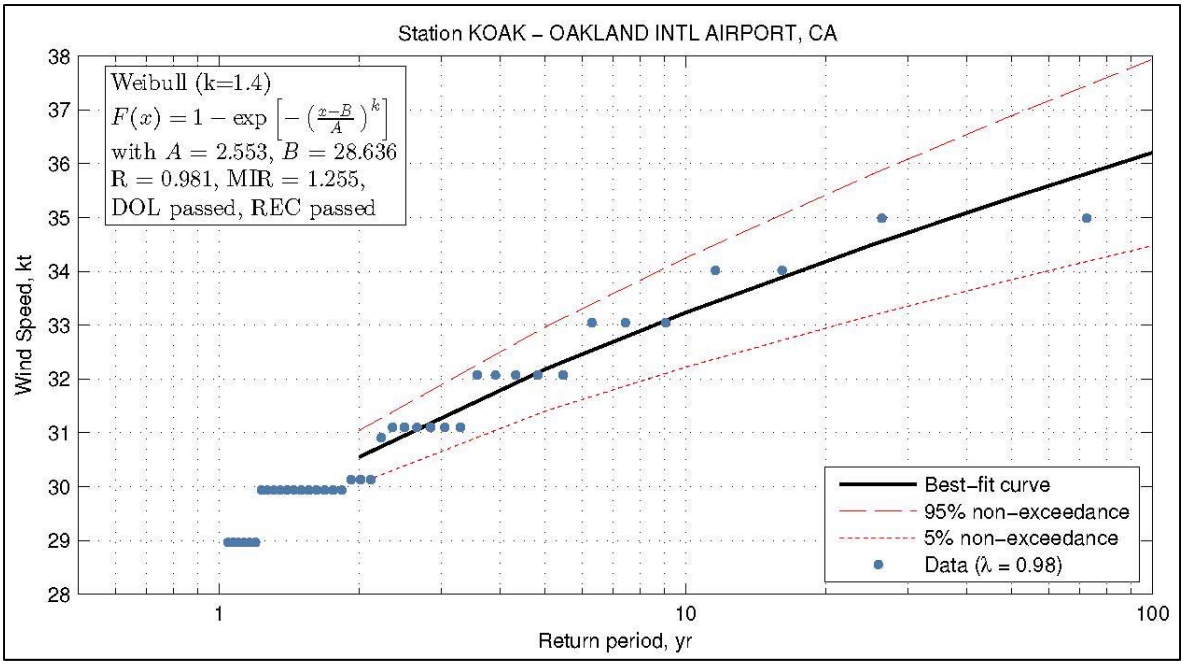


Figure 4-3 Estimates of Extreme Wind Speeds

4.1.5 Currents

NOAA provides tidal current predictions near Little Coyote Point (PCT0506: 37.598°N, 122.2055°W), which is approximately 4 miles northwest of the project area. The predictions for the maximum flood and ebb currents are 0.8 and 0.9 knots, and the average flood and ebb currents are 0.5 and 0.6 knots, respectively. However, because the project area is located by shallower mudflats, the tidal currents are expected to be lower than the predictions at Little Coyote Point.

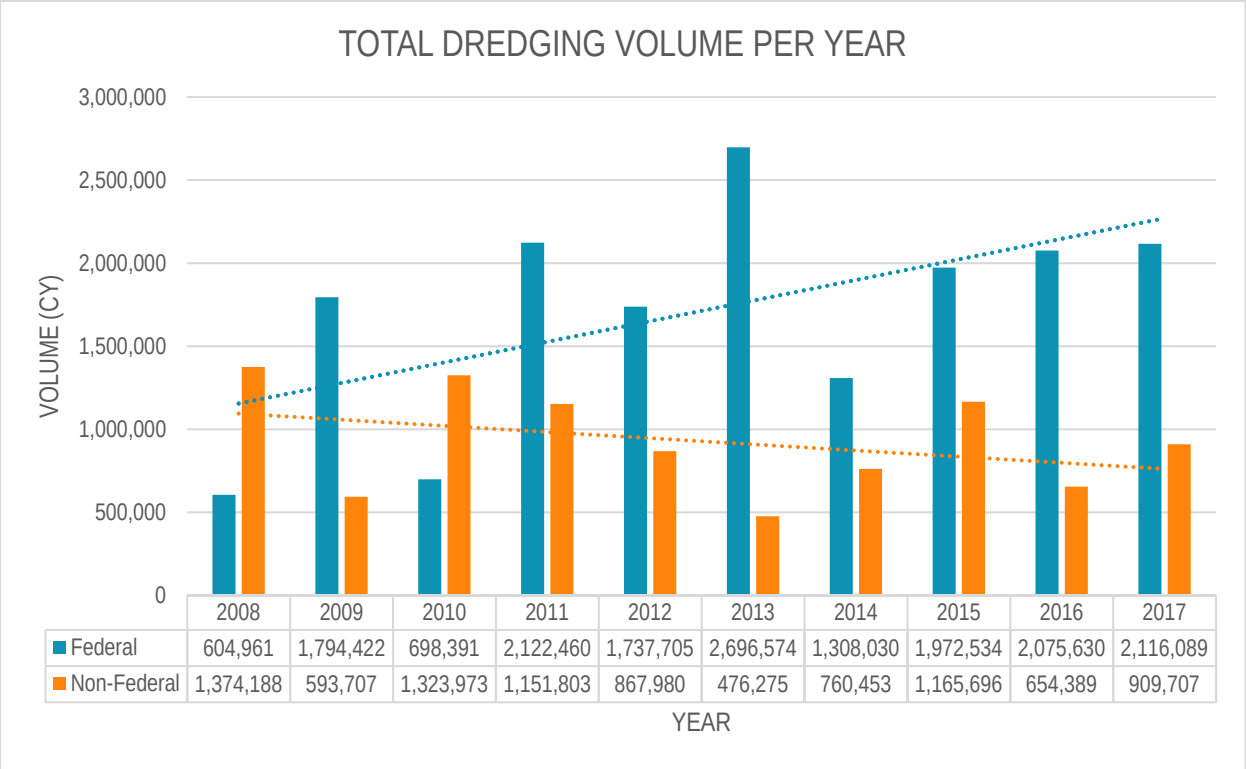
5 Dredged Material Sources

This section describes potential sources of sediment from maintenance dredging projects that are likely to become available within the next five to ten years, the suitability of the sediment for placement at Eden Landing, the most likely projects for delivering dredged material, the annual volume available, and projected placement duration.

5.1 Sediment Sources

A review of the most recent Dredged Material Management Office (DMMO) annual dredging reports from the past ten years (2008-2017) shows that material generated from federal and non-federal navigation dredging projects in San Francisco Bay total to about 2.6 MCY (annualized volume), with 1.7 MCY from federal projects and 0.9 MCY from non-federal projects. A breakdown by annual volume is shown in Figure 5-1.

For beneficial reuse at Eden Landing to be successful, it will need to be cost-competitive with the other active beneficial reuse sites; both the Montezuma Wetlands Project and Cullinan Wetlands Restoration Project are still accepting material, and the next wetland restoration project anticipated to use significant quantities of dredged material is Bel Marin Keys Unit V Restoration Project (BMK; also owned by SCC). The construction contract for the flood control levee at BMK has been awarded and is scheduled to begin in spring 2020.



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Federal	604,961	1,794,422	698,391	2,122,460	1,737,705	2,696,574	1,308,030	1,972,534	2,075,630	2,116,089
Non-Federal	1,374,188	593,707	1,323,973	1,151,803	867,980	476,275	760,453	1,165,696	654,389	909,707

Figure 5-1 Annual Dredging Volume 2008-2017

The DMMO annual dredging reports were also analysed to determine how much material was taken to beneficial reuse sites per year. The average annual volume per year of dredged material being beneficially reused was 0.888 MCY per year. The annual average excludes the Oakland Deepening project volumes

from 2008 and 2009 and the SF Main Ship Channel volumes every year. A breakdown by annual volume and year is shown in Figure 5-1. As can be seen from the trendline in Figure 5-1, the amount of beneficial reuse has been increasing. This increase is likely due to LTMS policies where in-bay disposal volumes have been reducing each year, resulting in an increase in dredging projects that have turned to beneficial reuse.

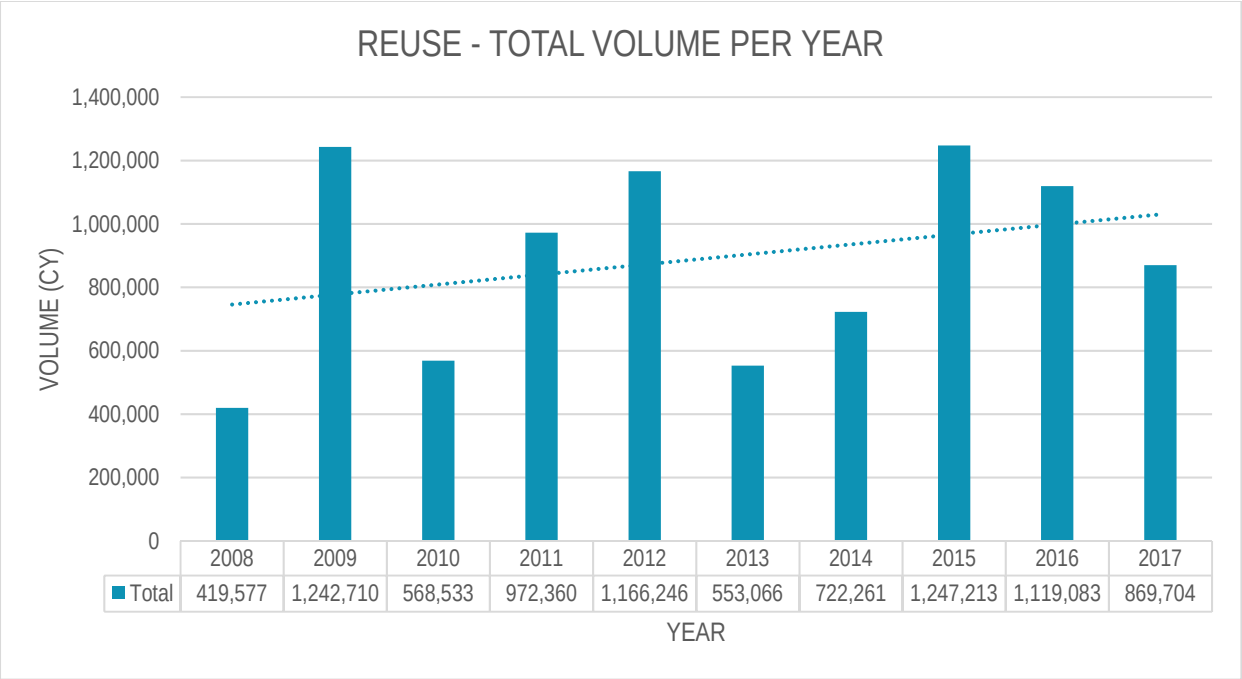


Figure 5-2 Annual Beneficial Reuse Volume 2008-2017

When reviewing the DMMO annual dredging reports to determine the most suitable projects to beneficially reuse material at Eden Landing, the following considerations were used:

- Mid-sized (>75,000 CY average annual volume) non-federal maintenance dredging projects that had recent records of five years or more of beneficial reuse and/or in-bay disposal at SF-11, or SF-10
- Federal channel maintenance dredging projects with a history of beneficial reuse, higher annual volumes than other federal projects, and could be more easily bundled by the U.S. Army Corps of Engineers (USACE) into one bid
- Federal and non-federal maintenance dredging projects located closer to Eden Landing than other beneficial reuse sites
- Projects that were already performed with clamshell dredges and dump scows

Previously there was some concern that private dredging projects may have considerations other than cost that limit their interest in beneficial reuse sites, such as liability concerns when disposing of material at a mixed-material beneficial reuse site. Since most of the mid-sized and many smaller maintenance dredging projects have placed material at the existing beneficial reuse sites over the last ten years that concern seems to have been alleviated.

Some of the mid-sized projects also require shallow draft scows which have less capacity than typical scows or they are dredged less frequently than others. Transporting shallow draft scows to Eden Landing is not economically attractive unless the project is already located in the South Bay. In addition, the frequency of dredging of these smaller, non-federal projects is much less than the Federal maintenance projects. These projects were not included as sediment sources in this analysis.

Additional project types that were not included as sediment sources were projects that are typically performed with hopper dredges and projects that use smaller, pocket scows instead of larger dump scows or hopper scows. The smaller pocket scows require the offloader to move the snorkel from pocket to pocket which is inefficient and may damage the snorkel if the pockets are too small. Hopper dredge projects have been excluded since the majority of the hopper dredging work in the SF Bay Area is performed using the USACE hopper dredges which do not have pump-off capabilities.

Table 4 details the maintenance dredging projects considered for placing material at Eden Landing. The table also includes the frequency of dredging, average annual volumes for each project, the historical disposal site(s), dredging windows, and distance from the project site to the Eden Landing offloader. Figure 5-3 shows the approximate location of the in-water disposal sites and beneficial reuse sites that the projects have historically used since 2008.

Table 4 Maintenance Dredging Projects Considered for Beneficial Reuse

Maintenance Projects Considered	Frequency (Years)	Potential Annual Volume (CY)	Historical Disposal Site(s)	Windows	Distance to Eden Landing (Miles)
FEDERAL					
Oakland Inner & Outer Harbor	1	429,304	SF-11, Montezuma, Winter Island, Hamilton	Aug. 1 – Nov. 30	23.7
Redwood City Harbor	1.4	231,524	SF-10, SF-11, Hamilton, Bair Island, Montezuma	Jun. 1 – Nov. 30	3.4
Richmond Inner & Outer Harbor	1	286,299	SF-10, SF-11, Hamilton, Cullinan, Montezuma	Jun. 1 – Nov. 30	35.3
	Subtotal	861,266			
MID-SIZED NON-FEDERAL					
Chevron	1	114,400	SF-10, SF-11, Hamilton, Montezuma	Jun. 1 – Nov. 30	32.2
Port of Oakland (Berths)	1	76,288	SF-11, Hamilton, Montezuma	Aug. 1 – Nov. 30	25.4
	Subtotal	190,688			
Total Annual Maintenance Dredging		**1,051,954**			

Attachment A contains the sediment source analysis for the projects considered for placement at Eden Landing. The analysis for each site includes the annual quantities dredged from 2008-2017, disposal and/or beneficial reuse location, and the average quantity dredged per month for each disposal or placement location, gathered from DMMO dredging records.

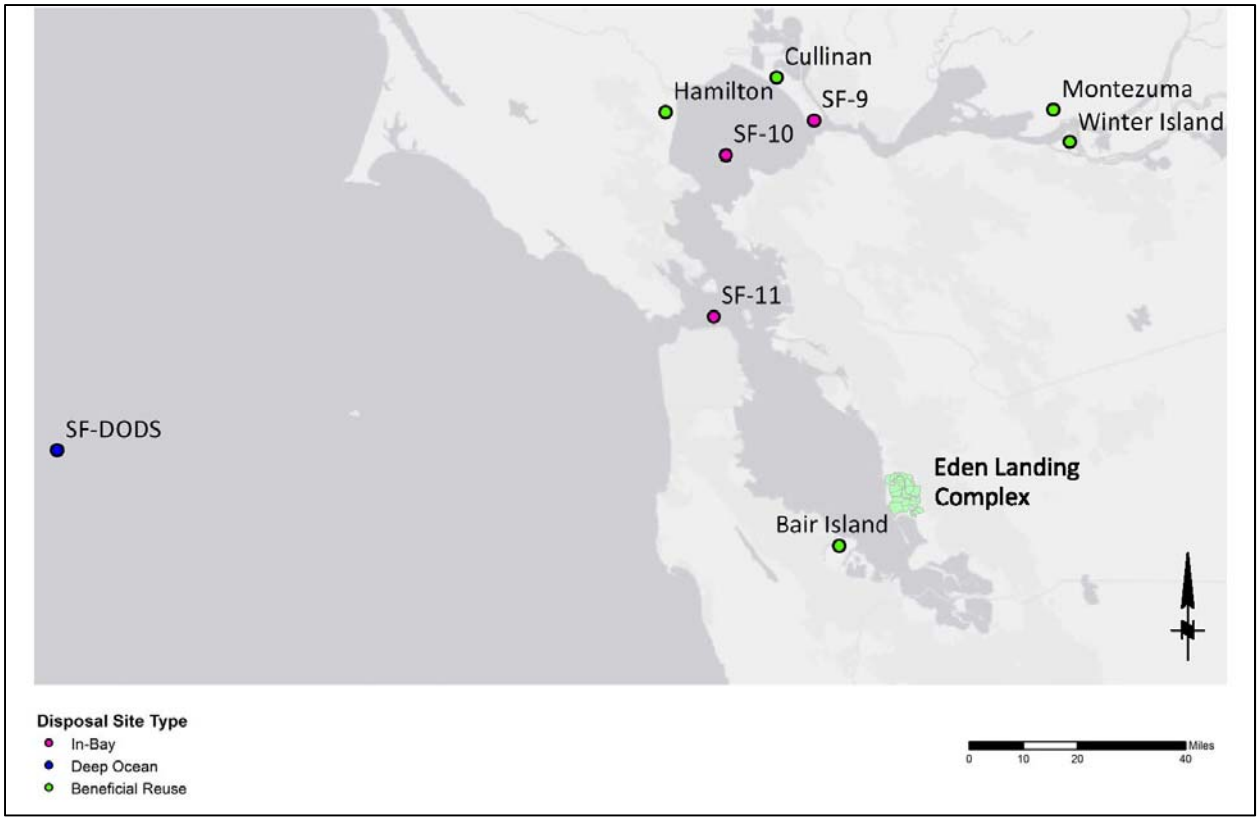


Figure 5-3 Disposal Sites

5.2 Sediment Suitability

The San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) had issued a *Draft* Sediment Screening Criteria Staff Report in 2000, which establishes screening values that is used by staff when evaluating the suitability of dredged material for beneficial reuse projects. The *Draft* Staff Report also provides guidance to project proponents on appropriate sediment testing to support suitability determinations.

There are two basic levels of screening guidelines for beneficial reuse of dredged material described in the report: screening guidelines for wetland surface material, and screening guidelines for wetland foundation material.

For wetland surface material, screening values for sediment chemistry are based primarily on ambient sediment chemistry levels (SFBRWQCB, 1998) for San Francisco Bay. The ambient values are chosen for the upper screening value for Wetland Surface Reuse for two reasons. First, ambient values for San Francisco Bay are generally less than Effects Range Low (ER-L[1]) values and so are unlikely to cause adverse biological effects. Where San Francisco Bay ambient values exceed ER-Ls (for nickel and chromium) these values have not been found to be associated with adverse biological effects during local testing of dredged sediments. Second, since any restored tidal wetland will eventually take on the

[1] ER-L indicates the concentration below which toxic effects are scarcely observed or predicted

characteristics of the ambient sediments in nearby areas of the open bay, efforts to restore the wetland with sediments that are "cleaner" than ambient conditions, may be a waste of resources (SFRWQCB, 2019)

For wetland foundation material, screening values for sediment chemistry are based on levels of chemicals that are believed to be protective of biological receptors. The values where biological effects are likely are the upper screening levels for Wetland Foundation Reuse, with the Effects Range Medians (ER-M[2] where available) taking precedence over the Predicted Effects Levels (PELs), since the ER-M values were derived using data from the San Francisco Bay area. The sediment screening values for Wetland Foundation Reuse are based on ER-Ms in most cases, except that PEL values are used for chemicals with no published ER-M value. Sediments with these chemical characteristics would be unlikely to adversely impact organisms of San Francisco Bay, if the foundation material were inadvertently uncovered (SFRWQCB, 2019).

The sediment source analysis assumes that all dredged material delivered to the offloader for placement at Eden Landing will either be suitable for wetland surface material based on the results of each individual project's sediment sampling and analysis program, or suitable for in-bay disposal at SF-11 or SF-10. Based on the analysis of the DMMO dredging records this allows for an annual average maintenance dredging volume of over 1 million CY per year for all five projects being considered. If only dredged material that has been historically beneficially reused is considered, the average annualized volume for the five projects decreases to 687,000 CY per year (see Attachment A). The available sediment testing data from South Bay dredging projects should be compared to the in-bay testing requirements to determine if sediment that is approved for disposal at SF-11 or SF-10 is cleaner than ambient conditions and therefore should be acceptable for placement at Eden Landing.

It is further assumed that all material delivered to the offloader is comprised of primarily mud and silt, as is typical of most maintenance dredging projects in the Bay Area. Silts and clays will stay in suspension with the slurry as it spreads over the pond bottoms. Sand and silty sand tend to fall out of suspension quickly close to the end of the discharge pipe and will need to be spread across the site using low ground pressure tracked equipment or by relocating the discharge pipe periodically.

5.3 Dredged Material Delivery

Cost estimates were prepared based on three different dredging project scenarios to determine the material delivery schedules to Eden Landing.

> *Scenario 1:* This assumes that only the Oakland and Redwood City federal channel maintenance projects deliver dredged material to the Eden Landing offloader. This estimate assumes that the two federal dredging projects will be dredged and delivered to the offloader during typical LTMS environmental windows for the Oakland project (August 1 through November 30). The Oakland project has routinely worked outside the LTMS window over the past ten years when taking material to beneficial reuse sites. The estimated monthly productions for each project were calculated using a modified version of the USACE Corps of Engineers Dredge Estimating Program (CEDEP). The dredging production for the two federal projects are based on utilizing a large clamshell dredge with a 26-cy bucket and two 4,000 CY dump scows to deliver dredged material to the Eden Landing offloader. Additional production inputs such as bank height, dredge cycle time, effective working time, transport distances, towing cycle time, and number of pieces of equipment were used to estimate the monthly dredging production. The offload times at Eden Landing are based on average production rates provided by dredging contractors based on experience at the Hamilton and Montezuma projects. The monthly dredging production for the

[2] ER-M indicates the concentration above which effects are generally or always observed.

Oakland and Redwood City federal channel maintenance projects were estimated at 178,400 cy/month and 226,600 cy/month, respectively. The estimated monthly productions were then compared to the annual volume of dredging for each project, detailed in Table 4, to determine the number of months required to dredge each project. The production estimates and associated inputs for each project are included in Attachment B.

Scenario 2: This assumes that the Oakland, Richmond, and Redwood City federal channel maintenance projects deliver dredged material to the Eden Landing offloader. This estimate also assumes that these three federal dredging projects will be dredged and delivered to the offloader during the August 1 to November 30 timeframe. The dredging productions for these three federal projects also assumes using a large clamshell dredge and two 4,000 CY dump scows to deliver material to the Eden Landing offloader. The production inputs to CEDEP for the Richmond federal channel maintenance project were similar to the inputs used for the Oakland and Redwood City projects in Scenario 1. Based on the equipment spread, dredging productions, and offloading productions, the monthly dredging production for the Richmond federal channel maintenance project was estimated at 132,600 cy/month.

Scenario 3: This assumes that the Oakland, Richmond, and Redwood City federal channel maintenance projects, along with the non-federal dredging projects at Chevron and the Port of Oakland berths, deliver dredged material to the Eden Landing offloader. This estimate also assumes that these five dredging projects will be dredged and delivered to the offloader during the August 1 to November 30 timeframe. Using similar production inputs as the previous scenarios along the transport distance to Eden Landing, the dredging production for the Chevron Long Wharf and Port of Oakland Berths was estimated at 123,500 cy/month for both projects.

Table 5 details the estimated monthly dredging productions for the individual projects included in the three scenarios detailed above, along with the annual volumes and dredging durations for each of the individual dredging projects. The production estimates and associated inputs for each project are included in Attachment B.

Table 5 Monthly Dredging Productions

Project	Estimated Monthly Production (CY/month)	Annual Volume Available (CY)	Dredging Duration (Months)	Dredging Duration (Days)
FEDERAL CHANNEL MAINTENANCE PROJECTS				
Port of Oakland Inner/Outer Harbor	178,400	429,300	2.41	74
Port of Richmond Inner/Outer Harbor	132,600	286,300	2.16	66
Port of Redwood City	226,600	231,500	1.02	32
NON-FEDERAL MAINTENANCE PROJECTS				
Chevron Long Wharf	123,500	114,400	0.93	29
Port of Oakland Berths	123,500	76,300	0.62	19

5.4 Dredged Material Placement

Based on the sediment sources considered and the estimated monthly productions, a dredged material delivery schedule was generated for the three different project scenarios delivering material to the Eden Landing offloader. The placement site capacities detailed in Table 2 were used along with dredged material delivery schedule to determine the overall project durations for the three different material delivery

scenarios detailed in Table 6. The annual material delivery scenarios and overall project durations were then used in the cost estimate to determine project costs for each scenario.

The schedule assumes that the dredging occurs during the August 1 to November 30 timeframe each year until the placement site capacity is reached. The material delivery durations for each scenario were based on the estimated monthly productions calculated for each dredging project as indicated in Table 5. The dredging productions for each of the projects were assumed using a large clamshell dredge and two 4,000 CY dump scows to deliver material to the Eden Landing offloader. The dredging productions for each project scenario were optimized to be completed as quickly as possible within the operating window assuming one dredge and two dump scows were working at the two project locations concurrently. The durations for the three placement scenarios were determined from the placement capacity, dredging project production, offloading production, and the defined annual dredging and offloading quantity.

Scenario 1 assumes the Oakland and Redwood City federal projects deliver dredged material to the Eden Landing offloader. From Table 5 the annual dredging volume available for the Oakland and Redwood City federal projects is 429,300 cy and 231,500 cy respectively. The total annual dredging volume available for Scenario 1 is then 660,800 cy. The dredging duration for the Oakland and Redwood City federal projects is 74 days and 32 days respectively. Assuming two clamshell dredges and four dump scows are operating simultaneously, the dredging duration for Scenario 1 is then half of the total dredging duration of 106 days or 53 days. Scenarios 2 and 3 follow the same reasoning as Scenario 1 to calculate the total annual dredging volume available and the total dredging duration. The dredged material delivery schedules are summarized in Table 6.

Table 6 Dredged Material Delivery Assumptions

DELIVERY SCENARIO	Annual Quantity Dredged (CY)	Annual Quantity Placed (CY)*	Annual Duration (Months)	Project Duration (Years)
No Improvements to Existing Levees Around Ponds				
Scenario 1: Oakland / Redwood City Federal	660,800	726,880	1.74	5
Scenario 2: Oakland / Redwood City / Richmond Federal	947,100	1,041,810	2.83	4
Scenario 3: Oakland / Redwood City / Richmond Federal + Chevron / Port of Oakland Berths	1,137,800	1,251,580	3.62	3
Improved Levees Around Ponds				
Scenario 1: Oakland / Redwood City Federal	660,800	726,880	1.74	7
Scenario 2: Oakland / Redwood City / Richmond Federal	947,000	1,041,810	2.83	5
Scenario 3: Oakland / Redwood City / Richmond Federal + Chevron / Port of Oakland Berths	1,137,800	1,251,580	3.62	4

*Annual Quantity placed includes a 10% bulking factor

The placement site capacities were based on information contained in the Eden Landing Phase 2 EIR and discussed further in Section 5.1.1. Annual dredged material delivery schedules were generated for *Existing Levee* conditions (no improvements to levees) and *Improved Levee* (raise low points of perimeter levees to increase the amount of material that can be placed in the ponds) conditions. To account for bulking of the sediments as they are slurried in the scow and pumped ashore to Eden Landing, the annual dredged material quantities are increased by 10 percent. This assumes that the dredged material placed at Eden Landing never consolidates to the original in-situ dredged volume. The 10 percent bulking factor is based on conversations with a dredge contractor and their experience with placing silty sediments at the Hamilton and Montezuma beneficial use sites. Typical bulking factors for maintenance dredge sediments, silts and soft clays, can

approach 25 to 30 percent during initial placement. After the material is allowed to settle and consolidate over time, the bulking factor is closer to 10 percent. Softer silts can take up two years to fully settle if the water level is maintained above the sediment level (Dutra Group, personal communication, March 11, 2020). The annual dredged material placement quantities are included in Table 6. Detailed breakdowns of each delivery scenario are included in Attachment C.

6 Conceptual Improvements

6.1 Onsite Improvements for Receiving Dredged Material

Onsite improvements would be required to allow for placement of dredged material in the Bay Ponds at Eden Landing. The following sections discuss the potential onsite improvements including existing levees and water control structures. Power requirements constitute the most significant costs of onsite improvements and are discussed in the next section (Section 7).

6.1.1 Placement Locations Within Eden Landing

6.1.2 Levee Repairs

The internal pond levees are lower in elevation than the surrounding perimeter levees. The internal levee separating Pond E2 and E4 has two large breaches, one at each end of a severely deteriorated levee, while the remaining ponds are entirely separated by internal levees and water control structures. While placing sediment, the levee breaches between Ponds E2 and E4 will need to be repaired or Pond E4 and E2 will act as one large pond. Restoring the hydraulic separation between Ponds E2 and E4 may be advantageous if water needs to discharge to the Bay during dredged material placement operations. The levee section between Pond E2 and E4 will need to be reconstructed and widened to allow for truck traffic and slurry pipeline to be placed alongside the levee. If no fill is required in Pond E4, then repair of this internal levee could be avoided.

The internal levee separating Pond E2 and E1 is also deteriorated, likely due to the wave fetch across Pond E1. This levee currently has steep side slopes on the north side and can no longer be accessed by pickup truck.

Figure 6-1 shows a picture of the E2/E1 internal levee from a site visit on June 14, 2019. The levee between Pond E2 and E1 will need to be repaired to allow for access by trucks and other construction equipment to set the dredged material slurry pipeline if needed.

The remaining interior levees within the Bay Ponds, except for the internal levee between Ponds E2 and E4, were traversed with a pickup truck during the June 2019 site visit. While these levees appeared in good condition, they will also need repair and widening to allow for access by trucks and other construction equipment to set the dredged material slurry pipeline and install any additional water control structures needed for dredged materials placement.

It is assumed that the E2/E1 and E2/E4 levee repairs would be performed with a long reach excavator borrowing material from the interior of the ponds, adjacent to the existing levees. The existing E2/E1 levee is approximately 4,500 feet long and averages ten feet in width. Allowing for a twenty-foot-wide levee section and 2:1 side slopes, the E1/E2 levee will require approximately 45,000 cy of borrow material to repair and widen the levee, or approximately ten (10) cy/foot. Similarly, the E2/E4 levee is approximately 2,600 feet long and averages five feet in width. Allowing for a twenty-foot-wide levee section and 2:1 side slopes, the E2/E4 levee will require approximately 28,800 cy of borrow material to repair and widen the levee, or approximately eleven (11) cy/foot. The internal levee repairs could also be performed by importing material from offsite fill sources. There is a substantial cost associated with offsite fill unless a similar arrangement as the Bair Island model could be developed for receiving fill material.

If the perimeter levees are improved to an elevation of 10 feet NAVD88, the Bay Pond bottoms can be raised to the MHW elevation, allowing for the placement of an additional 1.43 MCY of dredged material. Approximately 5,600 CY of material would be needed to raise the levees (AECOM, 2019b). The material can be sourced from existing levees that are currently above the target elevation of 10 feet or from offsite fill sources trucked to the site.

A conceptual schedule has been prepared detailing the proposed levee repairs along with the other site preparation work including the substation and other electrical infrastructure, onshore and offshore pipeline installation, and offloader support structure. The estimated duration for the levee repairs and weir upgrades is seven months. The levee repairs would need to be completed in advance of any dredge material being placed in the ponds. The remaining onsite and offsite improvements can be completed within the seven-month timeframe of the levee repairs. The duration for removing the electrical infrastructure, pipeline, and offloader support structure after completion of the project is estimated at three months. The conceptual schedule for the onsite and offsite improvements is included in Attachment D.

Figure 6-1 Pond E2/E1 Internal Levee (Looking West)

6.1.3 Water Control Structures

Existing water control structures are in place to intake and/or discharge water from the Bay, Old Alameda Creek, and the Alameda Creek Flood Control Channel. Additional water control structures exist at the internal levees to allow for management of water levels and circulation in all the ponds in the Complex. Most of the water control structures consist of single or double 48-inch culverts with some smaller culverts at the internal levees. The water control structures feature combination gates or slide gates. In addition to the existing culverts, there are also three pumps used for intake or discharge of water; however, only the #1 Baumberg Intake pump (10,000 gpm) is operating.

Prior to placing dredged material in the Bay Ponds, the existing water control structures will need to be evaluated to determine if the invert elevations are high enough to continue water transfer between the ponds during dredged material placement. The existing water control structures area a series of pipes and valves designed to move water from one pond to the next. The system was never intended to move a significant amount of water quickly between the ponds, which could be the case for decant water movement during placement operations. The existing water control structures would be used where possible to manage the slurry placed within the ponds. Temporary weir structures may be added at certain locations to increase residence time in the Bay Ponds and allow more of the solids to settle out of the slurry before moving the water through the other Bay and Inland Ponds. Costs for installation of additional weir structures has been included in the site improvement costs.

Depending on the amount of dredged material placed at Eden Landing in any given year, excess water from pumping the slurry into the Bay Ponds may need to decant back to the Bay. The Bay and Inland Ponds have the capacity to receive the 0.9 to 1.8 MCY of dredged sediment slurry in one (1) year without discharging decant water back to the Bay (AECOM, 2019b). If excess water does need to be discharged back to the Bay, temporary weirs could be constructed in Ponds E7 or E6 to decant water into Old Alameda Creek. Another option for decanting water would be to construct a temporary weir structure around the discharge pipes in Pond E2 at the Bay-front levee. Some type of water control system would be needed prior to the existing discharge structure in Pond E2 to ensure that water quality discharge requirements were being met. During the summer months when water is being circulated through the Bay Ponds to control salinity, the boards at the weir structures could be lowered to allow for additional flow through the ponds as long as the dredged material is not mobilized and causes an impact to water quality. After completion of the placement of dredged material at Eden Landing, all the temporary weir structures installed for controlling the dredge slurry would be removed from the project site.

6.1.4 Water Management Requirements

The Bay Ponds are currently operated as circulation ponds during the summer months, receiving water into Pond E1 through the intake structure at Old Alameda Creek, circulating the water through Ponds E1 and E2 and discharging to the Bay through the water control structure at Pond E2. Water can also be transferred from Pond E1 through Pond E7 to the Inland Ponds as needed, and eventually discharged to the Bay at Pond E2.

During the winter months water is circulated from Pond E1 through the Inland Ponds, to the discharge at Pond E2. Using the existing operating flow regime in place at the Eden Landing ponds, the dredged material slurry could be placed in the Bay Ponds and flow through the existing water control structures to the other Bay Ponds. Water could also be directed to the Inland Ponds if necessary, to prevent discharging any water back to the Bay. Temporary weir structures would be constructed as necessary to allow the solids to settle out of the slurry and to control water quality between the ponds as the dredged material slurry is being pumped in. If necessary, temporary decant weirs to Old Alameda Creek could be constructed at Ponds E7 or E6. Given that Pond E2 and E1 have the lowest pond bottom elevations of the four Bay Ponds and require the most fill, a longer flow path to a discharge point to the Bay is ideal. Ponds E2 and E1 are also the closest

ponds to the offloader location, thereby requiring the least amount of slurry pipeline to get material into the Ponds.

6.2 Offsite Improvements for Transporting Dredged Material

As part of dredged material placement options, an offloading facility will be required along with additional support infrastructure to pump the dredged material to Eden Landing. Dredged material will be offloaded from dump scows or hopper scows, mixed with water from the Bay, and the resulting slurry pumped from the offloading facility to the Bay Ponds at Eden Landing.

Dump scows or hopper scows delivering dredged material to the offloading facility will range in capacity from 1,450 to 6,000 CY and will draft up to 18 feet when fully loaded. Given the shallow mudflats fronting the site and the required water depth for the delivery scows and tugboats, the offloading facility would be positioned near the San Bruno Shoal Ship Channel where water depths of approximately -20 to -25 feet NAVD88 exist, approximately three (3) miles offshore of Pond E2 at the Eden Landing site. Figure 6-2 shows the approximate location of the offloading facility near the ship channel along with the proposed pipeline route to Eden Landing.

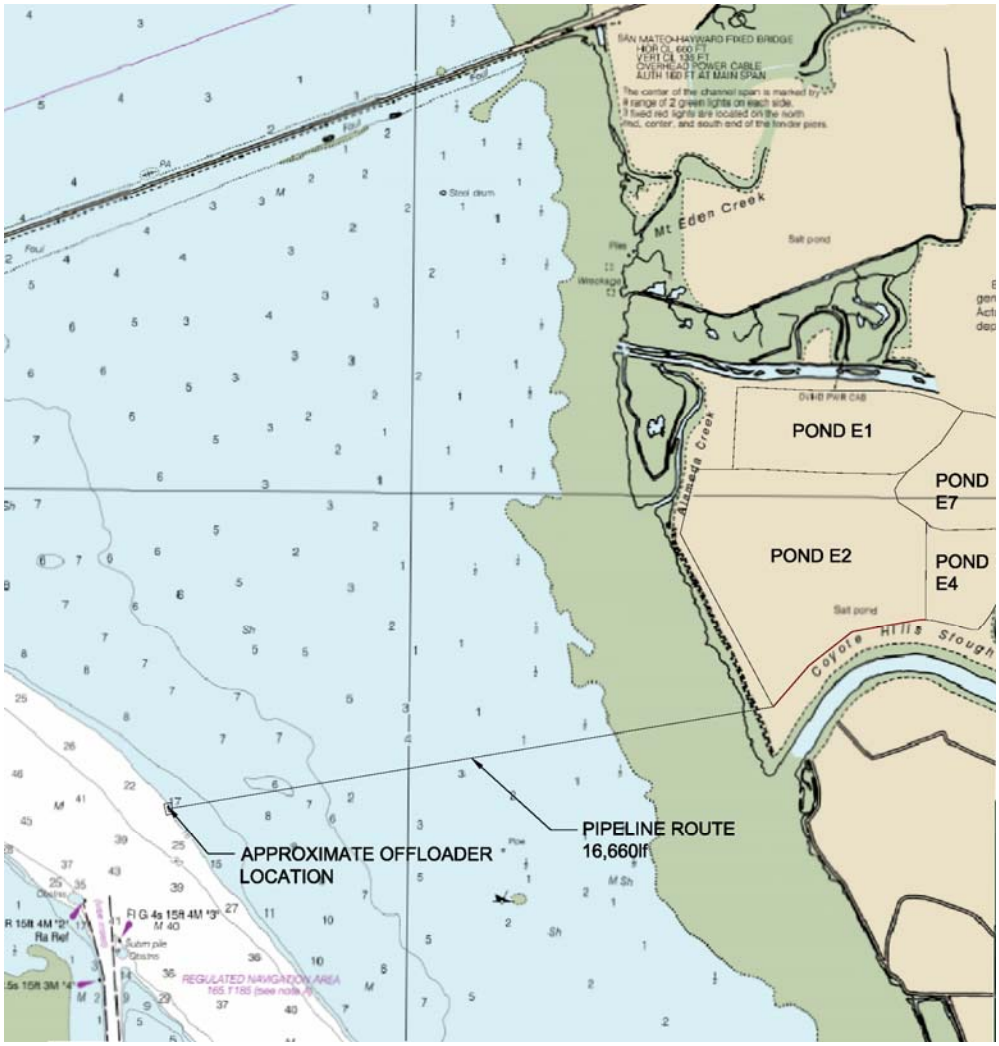


Figure 6-2 Approximate Offloading Facility Location

Source: NOAA Nautical Chart 18651 San Francisco Bay Southern Part

The offloading facility will consist of an offloader, temporary mooring dolphins / piles, mooring barges, a feed water pump, floating and submerged pipelines, booster pump(s), and other support equipment. All boats, barges, piling, pipeline, and booster pump barges will be required to be lighted in accordance with U.S. Coast Guard requirements. In addition, a Notice-to-Mariners will be posted notifying commercial and private boating traffic of the location of the offloader facility, the tugboat(s) call sign(s), what radio channels they will be monitoring, what barges will be using the facility, what hours the facility will be operating each day, and what time period (months) the facility will be in use.

6.2.1 Offloader

The offloader could be a custom offloader like the *Liberty* that is currently in use at the Montezuma Wetlands Restoration Project, or a submersible dredge pump that is suspended with a crane or excavator, similar to the offloader in use at the Cullinan Ranch Restoration Project.

There are currently at least four custom hydraulic offloaders in the U.S. fleet; the *Liberty* (Montezuma LLC; 24-inch discharge, 4,700 horsepower (HP)); the *Vicksburg* (Norfolk Dredging Co.; 30-inch discharge, 2,950 HP); the *#320 Unloader* (Weeks Marine, Inc.; 24-inch discharge, 5,500 HP); and the *Unloader No. 2* (Great Lakes Dredge & Dock Co., Inc.; 24-inch discharge, 6,800 HP). Of the four custom offloaders, only the *Liberty* is located on the West Coast. The other offloaders are located on the East Coast and typically work on East Coast and Gulf Coast projects. In order to transit to the West Coast, these offloaders would need to be loaded on a submersible barge and towed to the West Coast.

An offloading facility similar to the *Liberty* was used as a model for the cost estimating work performed for this study. The *Liberty* currently sits on a barge that is 113 feet long by 40 feet wide by 8 feet deep. The *Liberty* is configured with a 24-inch Mobile Pulley Pump with 4,700 hp and can pump maintenance dredged material (silts) up to 20,000 feet without a booster pump. Figure 6-3 shows the *Liberty* offloader and mooring barges offloading a dump scow. Figure 6-4 shows the snorkel lowered into a dump scow with fire water monitors pumping water into the scow to re-slurry the dredged materials. Due to the operating conditions of the existing offloader only larger open dump scows or hopper scows will work for pumping out dredged material.

The actual setup of the Offloader and support barges would be specific to the contractor working at the site and their planned equipment and dredged material placement production. The EIR included a description for the offloading facility (AECOM, 2019b) as less than 30,000 square feet in size, with approximately 30 temporary mooring piles driven to secure the offloader (18 to 36 inch in diameter). It also described the need for mooring barges, tugboats, scows, and supporting equipment. It is likely that fewer piles could be used as some contractors have spud barges which would negate the need for so many piles, however, it is recommended that the pile count used for the project permits and CEQA be presented on the higher end of this estimated number to provide a conservative estimate of associated impacts.

A feed water system that consists of an intake pump to pump water from the Bay will be needed to slurry the material in the scows. Feed water would be sourced from a screened intake located at the offloader near the ship channel; fish screens will need to comply with NMFS and CDFW permit requirements to reduce flows at the intake. The feedwater pump uses high-pressure water jets mounted on the snorkel to slurry the dredged material in the dump scow or hopper scow. High-pressure monitors may also be mounted on the offloader barge to direct the spray towards the snorkel. The offloader lowers the dredge pump, which is mounted on a gantry operated snorkel, into the scow to re-slurry the dredged material and pump it through the pipeline to shore. The slurry would contain approximately 10 percent to 20 percent solids by volume. Due to the long pumping distances, a booster pump will be placed in-line to assist in pumping the dredged material slurry to shore.

Figure 6-3 Liberty Offloader Pumping Dredged Material from a Scow

Source: Dutra Group, 2001

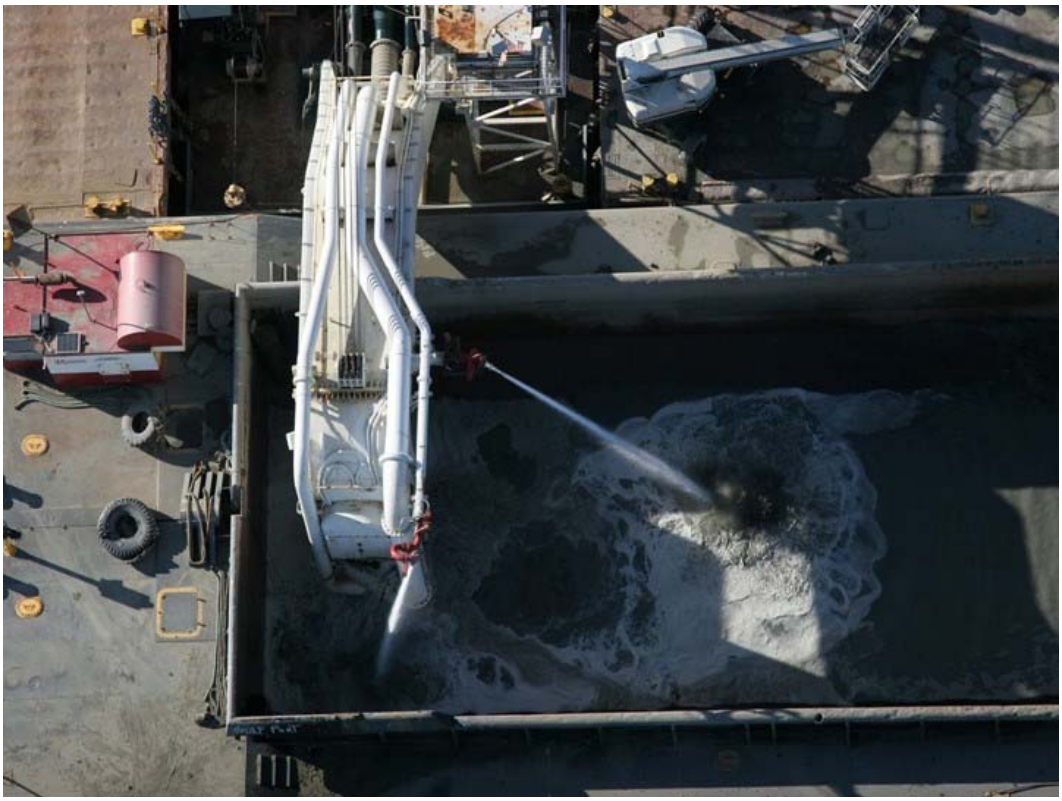


Figure 6-4 Liberty Offloader Snorkel and Feedwater System Lowered into Scow

Source: Dutra Group, 2019

Several other dredging contractors have configured portable submersible dredge pumps mounted on excavators or on a derrick barge to work as an offloader, with Damen being one of the larger portable dredge pumps. The submersible dredge pumps are hydraulically powered with a separate hydraulic power unit to run the pump. The submersible pumps can be mounted on an excavator or lifted with a crane and set into the dump scow to pump the dredged material. The submersible dredge pumps vary in size from 8-inch to 18-inch discharge pipelines and are relatively simple to set up and transport on trucks. Figure 6-5 shows a submersible pump being used with an excavator to dredge a lake.

However, submersible dredge pumps typically have less power than the purpose-built offloaders and typically achieve productions of only around 100-150 CY per hour. Although in-line booster pumps can be added to give the portable submersible pump offloading systems more power to pump longer distances, the pumping distance for this project, which ranges from 18,000 feet to 37,000 feet to reach all four of the Bay Ponds, would make the use of portable systems infeasible.

Figure 6-5 Submersible Pump Mounted on an Excavator

Source: Moffatt & Nichol, 2011

6.2.2 Pipeline

A pipeline will be required to transport the dredged material slurry from the offloader to the placement locations within the Bay Ponds. The pipeline will extend from the offloader location near the ship channel to the furthest extent of the Bay Ponds at Eden Landing, spanning 18,000 feet to 37,000 feet. The pipeline will consist of the following elements:

- Approximately 500 feet of floating pipeline directly behind the offloader
- Approximately 16,000 feet of submerged pipeline from near the offloader location up to the shoreline at Eden Landing (see Figure 6-2)
- Approximately 20,000 feet of shore pipeline (see Figure 6-6)

Final pipeline sizes and routing will be determined by the successful contractor or entity providing the offloading services. Given that Pond E2 would accept approximately 60 percent of the dredged material being placed, the shore pipeline will likely average between 8,000 feet to 13,000 feet. Figure 6-6 shows the distances along the different levees that the shore pipeline will potentially be placed.

Figure 6-6 Potential Shore Pipeline Distances

The pipeline sections will range in size from 16 to 24 inches in diameter depending on the selected offloading equipment. The floating and submerged pipeline would likely be a steel line due to the pumping pressures from the offloader and booster pump(s). The shore pipeline would likely be HDPE or a combination of steel and HDPE. The final pipeline type will be determined based on the material types being dredged, offloaded and pumped to the site. The floating and submerged pipeline will need to be marked according to US Coast Guard regulations. The submerged pipeline will set on the bay bottom and will only leave the bay floor if necessary, to transition to a floating booster pump barge. The submerged pipeline would transition to shore pipeline at the outboard levee. The shore pipeline will be placed alongside the levees onshore to the allow for material to be pumped into the Bay Ponds. Wye valves will be used to place the shore pipeline to several different locations within the Bay Ponds so discharge locations can be

moved if material starts to build up too high at one location. The shore pipeline would be moved as necessary to fill the ponds in a manner supporting the restoration goals. Moving of the shore pipeline and management of the discharge will be controlled by the offloading contractor or entity.

6.2.3 Booster Pump(s)

Considering the distance from the offloading facility location, approximately three miles offshore of Eden Landing to the point of discharge at the Bay Ponds, one or more in-line booster pumps would be required. The size and number of booster pumps will depend on the material being pumped to the site and the offloading equipment selected. The booster pump(s) will be located along the discharge line to effectively maintain the slurry velocity in the pipeline to keep offload production levels high. This allows the offloader dredge pump to operate more efficiently and more importantly, holds the material in suspension thereby reducing the risk of pipeline plugging. Where the booster pump(s) are ultimately placed will depend on the pumping capacity of the selected offloader, the discharge location within the Bay Ponds, and the booster pump equipment the contractor has available. If a smaller submersible dredge pump is used, the booster pump(s) could be located much closer to the offloading facility, within several thousand feet. If the larger, custom offloader is used, the booster pump could potentially be located at the Eden Landing shoreline.

Booster pump(s) located within the Bay will be mounted on a flat deck barge or a sectional barge arrangement. Flat deck barges can be held in place utilizing spuds, which are typically two to three piles ranging in size from 24-inch to 36-inch diameter depending on the size of the barge. A four-point anchoring system controlled by onboard winches can also be used to secure the barge on location. A sectional barge arrangement would also be held on location with the use of spuds and could be placed closer to the shoreline due to their low draft requirements (<3 feet). Any booster pump arrangement that is located within the Bay will need to have enough water depth to allow for flotation of the barge and for crew boat access to the barge.

The booster pump could also be located onshore if the offloading facility has enough capacity to pump the material to the shoreline and beyond. A shore-based booster pump station would be approximately 5,400 square feet in size and would require a temporary gravel or concrete platform to support the equipment. The shore booster will require a source of water for priming the pump at start-up.

The best location for a shore-based booster pump would be at the southwest corner of Pond E2 where the submerged pipeline will make landfall. Figure 6-7 shows the onshore booster pump station from the Hamilton Wetlands Restoration Project (HWRP). The booster pump(s) can be electrically powered, or diesel powered.

6.2.4 Offloader Support Plant

Depending on the selected equipment, an offloading facility will require additional support equipment along with the offloader. The offloading facility will include a reel barge which holds the submersible power cable, mooring barges for the dump scow or hopper scow and tugboat to moor to, a work boat to assist the tugboat with the scows, and a crew boat to shuttle crew between the shoreline and the offloader and booster pump barge(s). A small service crane may also be included on the deck of the reel barge or one of the mooring barges to assist the offloader with any required lifts for supplies or maintenance work.

Figure 6-7 Onshore Booster Pump at HWRP

7 Equipment Power Requirements

Typically, two options for power feed are possible for an offloader – electric or diesel. Both options are described in the text below.

7.1 Electrical Power Option

Significant electrical infrastructure will need to be constructed to supply power to the project. The 115kV Grant-Newark overhead double circuit transmission line is located immediately east of the project as shown in Figure 7-1 and is the closest high voltage power line. To transmit electrical power from the high voltage power line to offloading facility and booster pumps, a substation, overhead pole line, and submarine power cable will need to be installed. The existing line rating, spare capacity, and any necessary upgrades required to interconnect to the PG&E system are unknown at this time. A detailed electric load study will be required to estimate the total project connected and operating load based on the Contractor's selected equipment.

Existing electrical infrastructure at the Port of Redwood City was also explored to determine feasibility of running power out to the offloading facility and booster pumps from the Port. Electrical power would be supplied from the Port via a submersible power cable. A substation may need to be constructed to transform the voltage down to 12kV before it connects to the submersible power cable.

Figure 7-1 Existing Transmission Lines And Substations

Source: California Energy Commission 2015

Four (4) options have been identified for relaying power to the offloader barge. They are shown in Figure 7-2. These options will utilize a submersible power cable, overhead conductor line, substation, existing high voltage power lines, or some combination of the four. Three of the four options presented in Figure 7-2 would involve relaying power from the Grant-Newark high voltage transmission line on the East side of the Channel. The other option would involve relaying power from the Port of Redwood City on the West side of the Channel. The submersible cable would be located such that it would not be at risk of being cut by passing vessels.

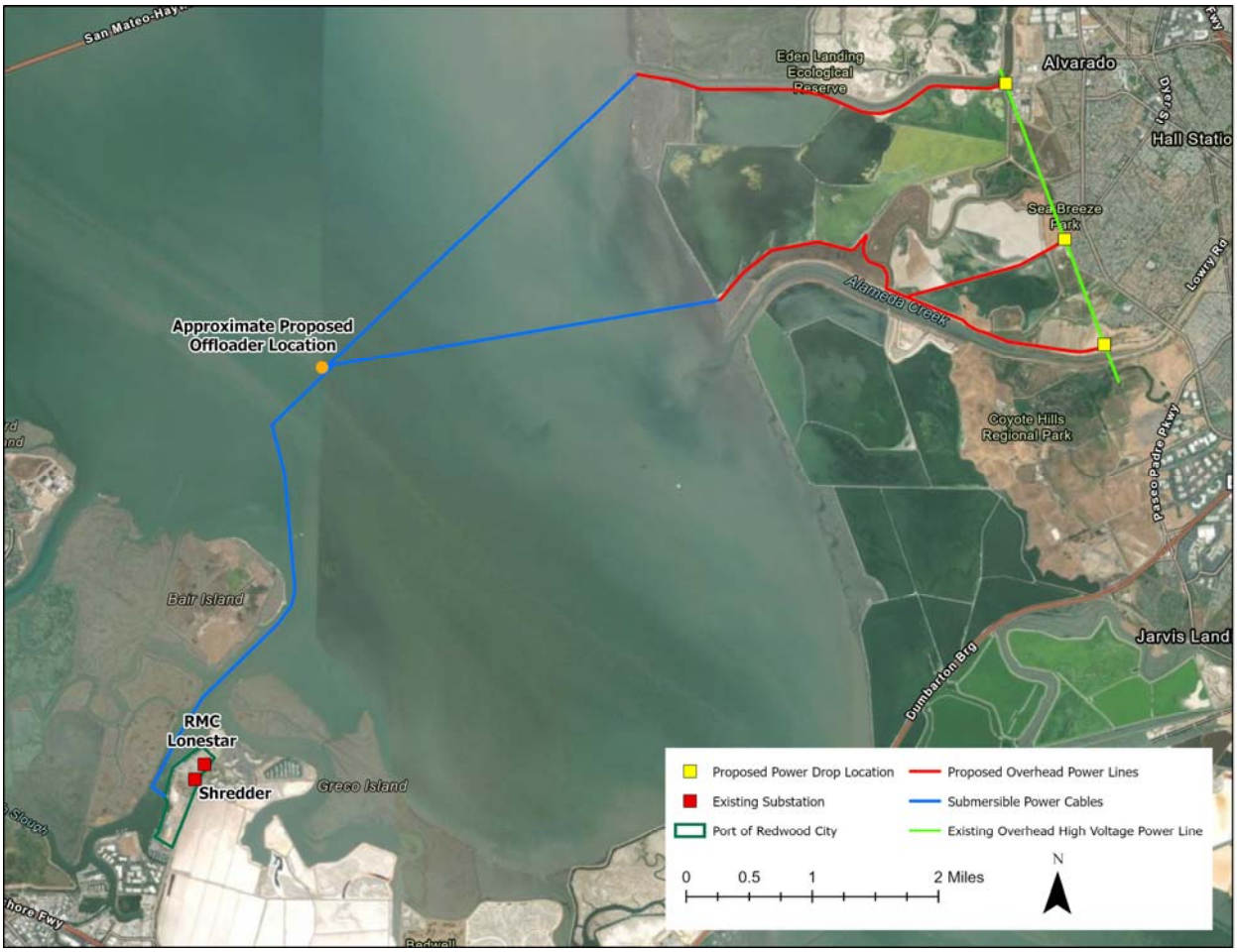


Figure 7-2 Proposed Electrical Power Relay Options

7.1.1 Overhead Transmission Line Power Drop

A substation brings in power from the termination of high voltage utility transmission lines and, depending on the function of the substation, transforms, distributes, and converts power as well as improves the overall power quality. Medium and low voltage lines then distribute the stepped-down, cleaned-up power out to users. Equipment found in high voltage substations include power transformers, switchgear, and auxiliary switching circuitry, interconnected with protective equipment and control options such as protective relaying, power electronics, voltage regulators, harmonic filtering devices and Supervisory Control and Data Acquisition (SCADA) systems. Substations can be publicly or privately owned.

Equipment and installations must meet specific local requirements, but in general, all substations must have the following or account for: safe access, adequate ventilation, proper signage, infiltration of water or

flooding, low frequency magnetic fields, and lighting. Walls, floors and ceilings installed must comply with appropriate standards.

For a publicly owned substation, the utility provider must coordinate placement of the substation and operating transmission voltage, as well as provide specifications for the high voltage transformer bringing power to the substation.

A typical substation layout is provided in Figure 7-3 Substation Layout for reference.

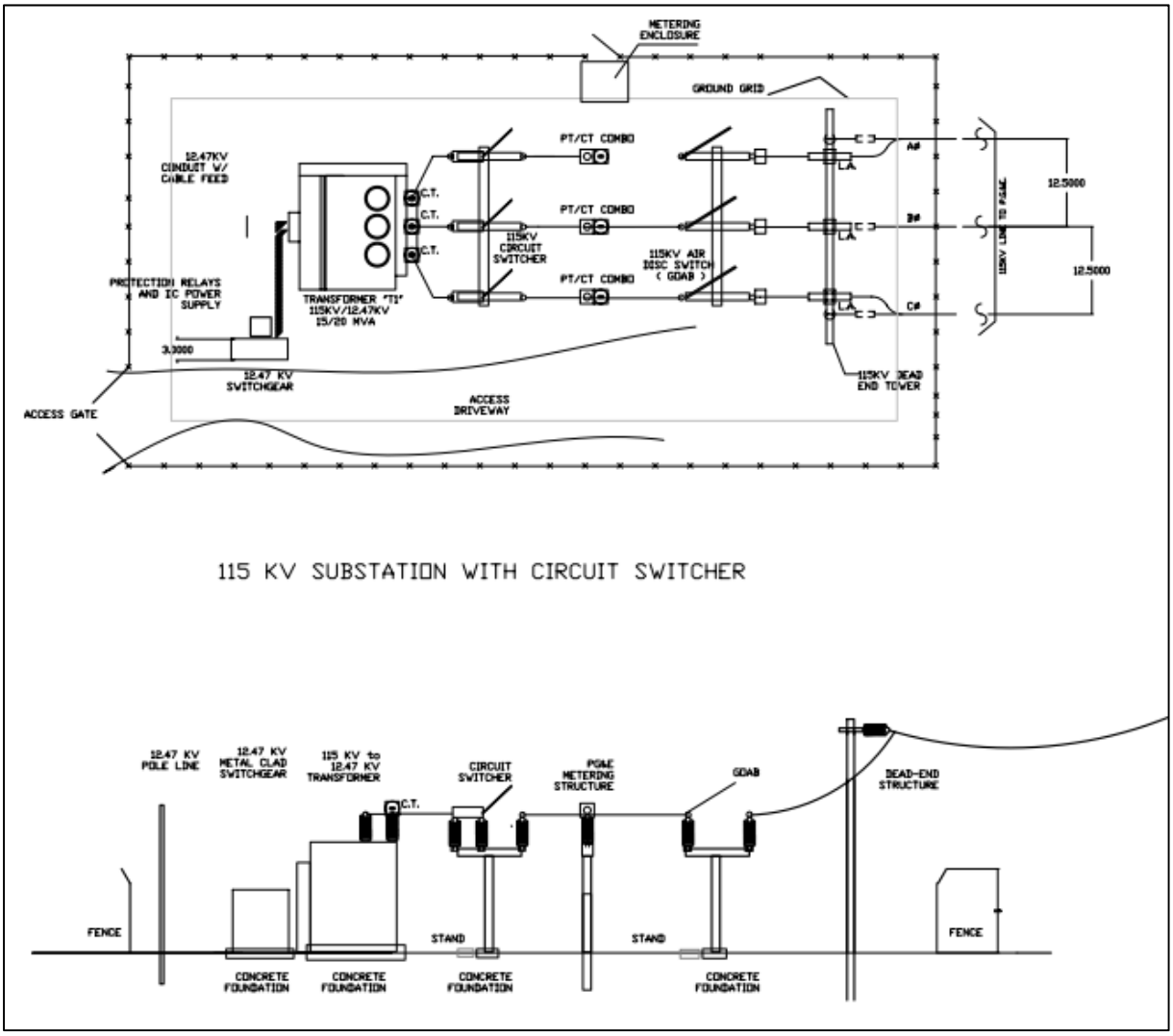


Figure 7-3 Substation Layout

For the four proposed electrical relay options shown in Figure 7-2 there are four corresponding potential power drop locations from the overhead transmission lines to step down transformer. These locations are identified in Figure 7-4.

If the power drop is to be made from the existing Grant-Newark overhead double circuit line, the location of the drop is dictated mostly by the condition of the levees. The selected levee must be capable of supporting equipment required for pole line installation and maintenance. This typically includes a crane, boom truck, and backhoe.

The alternative is to have the power drop at the Port of Redwood City. If the substation is located on the West side of the channel, this may alleviate the need for laying the temporary submersible power cable across the broad expanse of mudflats fronting the Eden Landing shoreline which presents a significant challenge due to draft restrictions of equipment along with wind and wave impacts. This option is still being explored to determine if an existing substation at the Port of Redwood city can be made available for this project, or if one can be more easily installed on the west side of the shipping channel.

Figure 7-4 Potential Substation Locations

The proposed substation would likely weigh 7.5-10 tons and would have a footprint of at least 500 square feet. The structure will sit on a concrete foundation. Based on the proposed power drop locations, it is assumed that the soils will be good enough that pile supports are not required. Additional analysis needs to be performed to determine if there is an available substation at the Port of Redwood City or if one could be constructed in the Port to accommodate this project.

7.1.2 Temporary Pole Line

A temporary pole line will need to be constructed to transmit power from the substation to the submersible power cable if the submersible power cable cannot reach the substation directly. Construction and maintenance of a temporary pole line typically requires large equipment. Providing adequate access for large equipment access will be a critical component of the pole line construction. Equipment typically required for temporary pole line installation and maintenance includes a crane, boom truck, and backhoe.

The existing levees extending from the Grant-Newark high voltage transmission line to the shoreline are the North Levee and the South Levee. The North Levee is identified as Option A in Figure 7-5. The South Levee forks off as it runs from west to east into the Middle Run and the South Run. The Middle Run is identified as Option B and the South Run is identified as Option C in Figure 7-5 Potential Overhead Pole Line Routes. Based on a site visit conducted on June 14, 2019, the most suitable levee for installation of an overhead transmission line is Option B, the Middle Run. An overhead pole line is already established along a portion of this route to supply power to the pumps at Eden Landing and may be acceptable for supporting the conductor line for the offloading facility. This route also requires less overhead power line than the South Fork of the South Levee. Total proposed temporary pole line for the Middle Run is approximately 18,200 linear feet.

Not shown in Figure 7-5 are the two substations at the Port of Redwood City. A temporary pole may not be required if the substation is positioned close enough to the water such that the submersible power cable can be connected directly to the substation. In fact, many large ports have an electrical substation proximate to the water specifically for dredging projects. If one of the substations identified as “Shredder” or “RMC Lonestar” in Figure 7-4 is suitable for supplying power to the offloader and booster pumps, and it can be made available for use, then temporary pole lines may not be required.

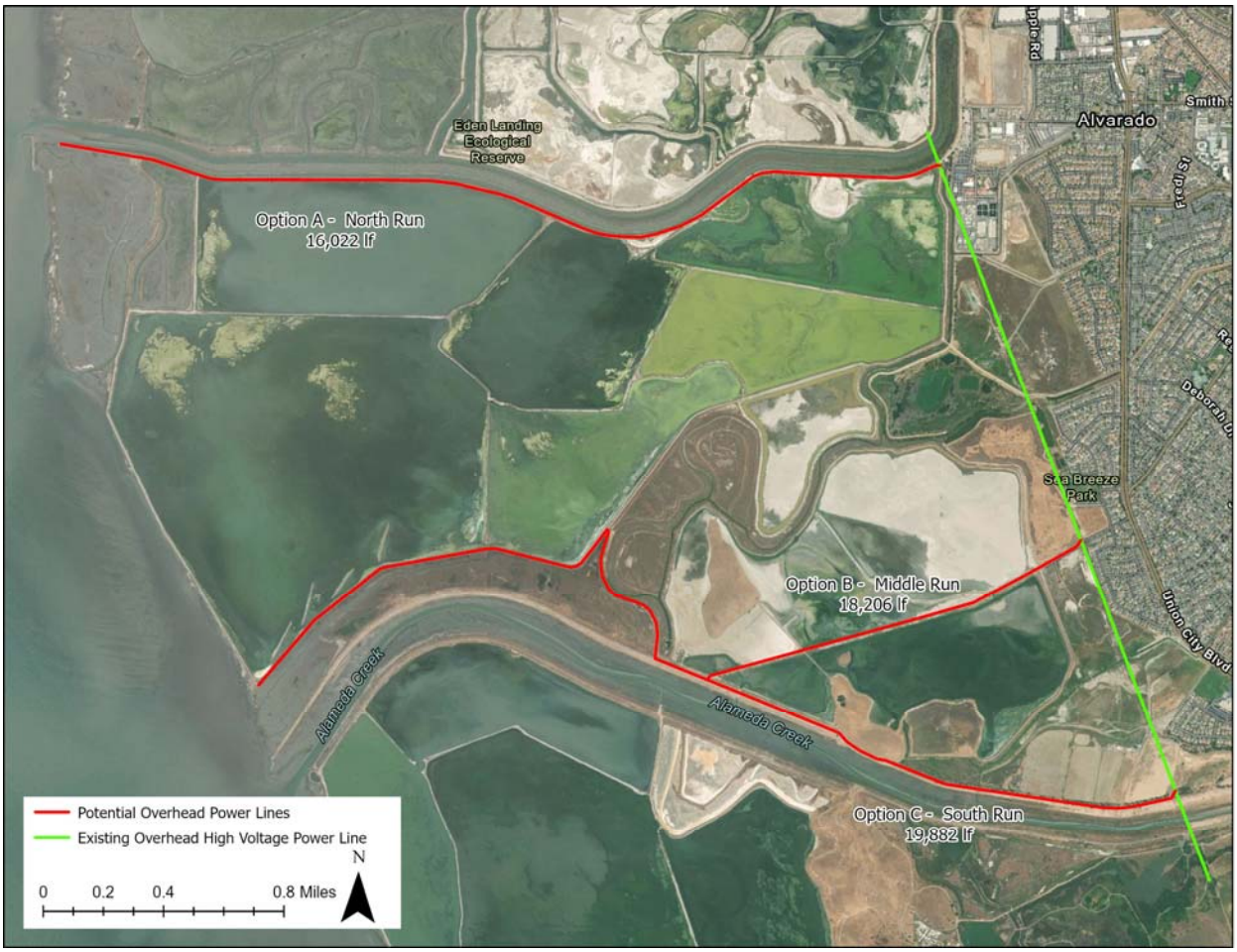


Figure 7-5 Potential Overhead Pole Line Routes

7.1.3 Temporary Submarine Cable

The temporary submarine cable will be installed to transmit electrical power from shore to the booster and hydraulic offloader. A 500kcmil submersible power cable, or similar, would typically be used for a project like this. The cable is approximately three and a half inches in diameter and weighs approximately ten pounds per linear foot. Protecting this cable from wear is critical during the installation process to prevent cracking of the sheath. Sheath cracking can allow saltwater to enter the power cable and corrode the conductors which could ultimately cause a loss of power to the booster and/or offloader.

Three potential submersible power cable routes have been identified. They are shown in Figure 7-6. Two of them extend from the Eden Landing shoreline across the mud flats, while the other one extends out from the Port of Redwood City. The shortest submersible power cable route is Option B/C at approximately 16,700 feet.

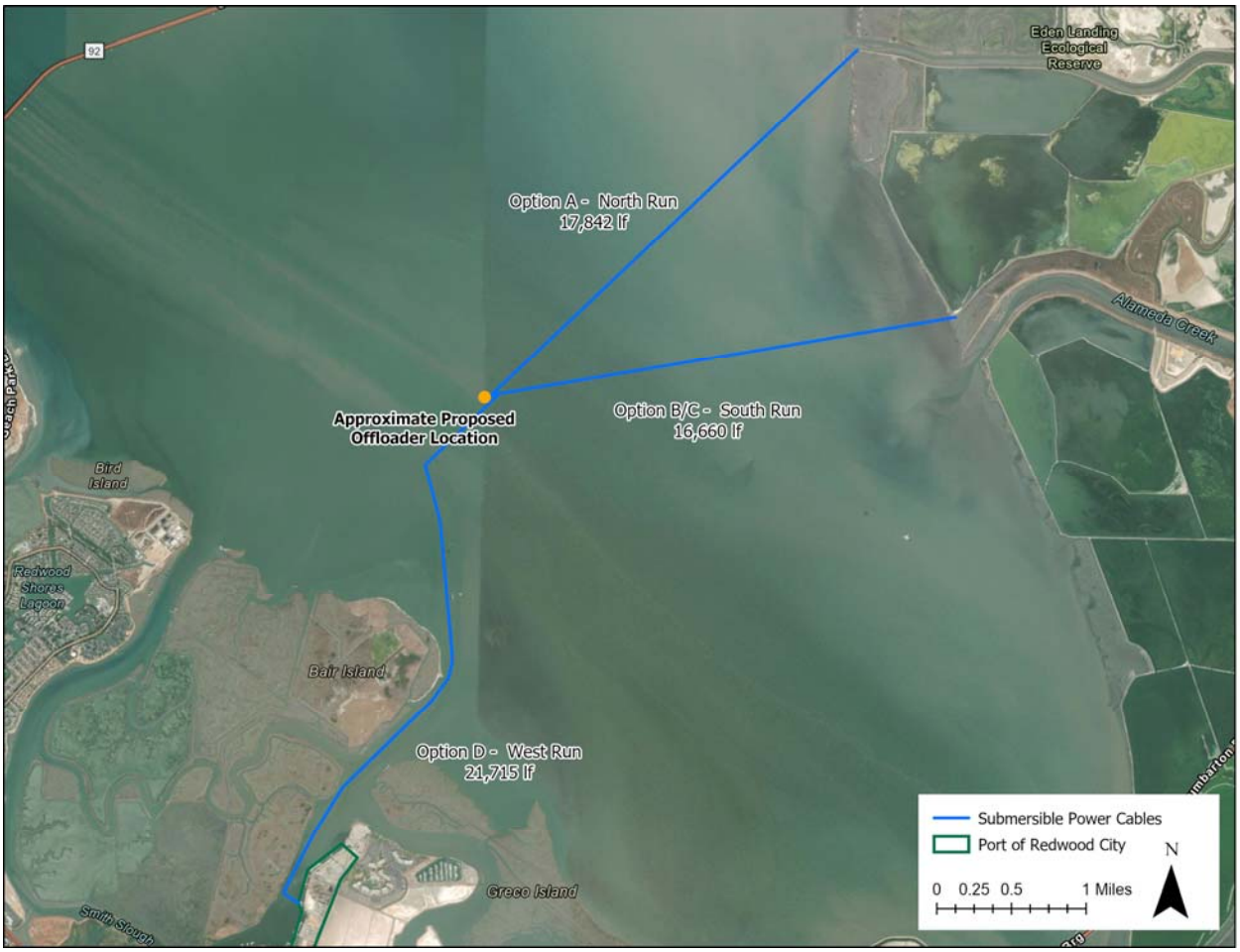


Figure 7-6 Potential Submarine Power Cable Routes

7.2 Diesel Power Option

7.2.1 Diesel Generator

In lieu of using electricity to power the offloader and booster pump(s), they could also be powered by a large diesel generator or two separate generators, depending on the location of the equipment. The generator could be located on the deck of a support barge at the offloading facility and used to power the offloader and support equipment. A separate generator could be placed on the deck of the booster pump barge or a submersible power cable could be run from the generator at the offloading facility to the booster pump barge. Conversely, the generator could be located onshore at Eden Landing with submersible power cables running to the booster pump barge and offloading facility. By locating the generator onshore, refuelling could be performed by a truck rather than supplying a fuel barge and transferring fuel over the water.

Another option for placement of the generator would be at some location within the Port of Redwood City. The submersible power cable would be run along the south side of the channel and out to the offloading facility and booster pump barge. The submersible power cable may need to be weighted down or buried in the sediment to alleviate concerns with vessel traffic.

7.3 Air Quality Analysis

An air quality analysis was performed to compare the total emissions for the offloading facility powered by electricity and powered by diesel. Depending on the type and size of offloader used combined with the quantity of material received, the emissions should be under the General Conformity de minimis annual threshold but will exceed the daily thresholds of significance for construction-related activities developed by the Bay Area Air Quality Management District (BAAQMD).

Emissions were calculated for the offloading facility equipment including the offloader, booster pump, work tug, and crew boat. The equipment information and engine horsepower's are based on equipment specifications provided by dredge contractors. The offloader assumes a "dedicated" offloader such as the Liberty which is used at Montezuma. Both the offloader and booster pump are assumed to be powered by large diesel generators with an assumed Tier 4 engine. The durations and annual operating hours are determined by the material delivery scenarios described in Table 4 3. Emissions calculations were performed for all three scenarios. The total NOx emissions for each scenario are detailed in Table 7.

Table 7 NOx Emissions for Offloading Infrastructure Equipment

Scenario	Total Project NOx Emissions (tons)	Average Annual NOx Emissions (tons)	Average Daily NOx Emissions (lbs)
1	75.4	15.1	628.0
2	74.8	18.7	550.0
3	74.7	24.9	515.1

The NOx emissions, along with VOC and PM2.5, are below the 100-ton per year de minimus levels mandated by the EPA Final Conformity Rule. The NOx emissions and ROG emissions exceed the 54 lbs/day thresholds of significance for construction-related activities established by the Bay Area Air Quality Management District 2011 Guidelines. The summary emissions and additional detail for each scenario are provided in Attachment H.

8 Contracting Alternatives

Two potential contracting strategies are discussed in this section. These are the *Concession Model* and the *USACE Model*. However, before these procurement strategies are discussed, it is important to understand the *Federal Standard* or the *Base Plan* that the USACE uses to assess where dredged material is ultimately placed.

Federal Standard

Well over half of the regular dredging in San Francisco Bay is performed by the USACE under its congressionally authorized Operations and Maintenance (O&M) program. The dredging is conducted based on annual appropriations from Congress. Under the O&M program, USACE regulations require the identification of a Federal Standard, which is defined as the least costly dredged material disposal or placement alternative (or alternatives) that is consistent with sound engineering practices and meets all federal environmental requirements. This standard is often expressed as the "least cost, environmentally acceptable" alternative. Costs associated with placement under the Base Plan are assigned to the navigational purpose of the project. If there is a desire by a local sponsor for the material to be placed elsewhere as a beneficial reuse activity, any incremental costs are shared between the USACE and the non-federal sponsor. The cost sharing for navigation and beneficial reuse projects under the Water Resources Development Act (WRDA) 2014 is as follows:

- Maintenance dredging performed under the O&M program is 100 percent federal funded for channels down to -50 feet MLLW. For deeper channels, the incremental cost is 50 percent federal funded.
- Restoration projects are up to 65 percent federal funded. This would include federal funding for any incremental costs associated with beneficial reuse of dredged material. However, the nonfederal costs include 100 percent of the following items:
- Lands, Easements, Rights-of-way, Relocations, and Dredged or excavated material disposal areas (LERRD); and
- Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) of the restored site.
- The costs of LERRD and OMRR&R may be applied to the 35 percent nonfederal portion of beneficial reuse projects.

In the case of the SBSP beneficial reuse site, the LERRD would include construction and operation of the transfer facility as well as preparation of the receiving site for material placement. (Lands, easements, rights-of-way, and relocations should be minimal.) Even if the overall cost of material disposal at the SBSP beneficial reuse site is less than that of the Base Plan, the nonfederal sponsor would be responsible for 100 percent of the LERRD and OMRR&R costs.

8.1 Cost Estimating Methodology

Cost estimates were developed for the two different contracting alternatives for placement of the dredged material into the Bay Ponds at Eden Landing. Each contracting alternative has multiple cost estimates with similar elements such as site improvements, mobilization/demobilization, dredging & transport, and offloading. The following activities and assumptions were used to develop the cost estimates for the two contracting alternatives.

- Initial Capital Costs: Initial capital costs include the following:
  - Initial one-time mobilization of the offloader, booster pump(s), and barges;
  - Installation and removal of the dredged material slurry pipeline;

  - Installation and removal of the support pilings to moor the offloader and support barges;
  - Installation and removal of the electrical infrastructure to provide power for the offloading facility;
  - Installation and removal of any required water control features
  - Construction of any required levee improvements necessary for placement of dredged material.
- Direct Costs: The cost estimates include direct costs, such as anticipated equipment, labor, and materials necessary to offload and place the dredged material at the site.
- Operational Costs: Operational costs include the following:
  - Rental or ownership costs for an offloader, booster pump(s), barges;
  - Labor and materials required to operate the offloader and booster pumps;
  - Labor and equipment required for the movement and monitoring of the discharge pipe around the Bay Ponds;
  - Annual interim mobilization and demobilization of equipment (offloader, booster pumps, and barges);
  - Labor and equipment for maintenance of the facilities during non-offloading periods;
  - Decant water quality testing services (included in site maintenance costs).
- Offloader Productivity: The offloading equipment operating costs were factored to account for delay between scow deliveries as well as operating inefficiencies due to daily equipment maintenance, re-fueling, continued working hours, and crew changes.
- Project Overhead: The cost estimates include the management, engineering, field, and office support requirements for a general contractor to manage this type of an offloading beneficial reuse project. Additional costs were included to account for safety training and supplies, small tools and supplies, unscheduled overtime, and general liability insurance.
- Profit: The cost estimates include a fifteen (15) percent markup on the total cost to account for contractor profit. The markup cost is based on the contractor's direct labor costs to perform the work, which is typical of projects of this nature.
- Bond: The cost estimates include a 1.5 percent markup for contractor bonds.
- Add-On Fees: Of the total operational costs, a three (3) percent design fee and six (6) percent construction management fee is included in the estimate.
- Contingency: The cost estimates includes a 25 percent contingency factor.
- Escalation: Costs have been escalated from 2020 to reflect the year in which construction is predicted to take place. Escalation is based on the methodology detailed in the USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2 updated 31 March 2019.

The costs do not include any costs for site restoration work including grading for restoration features or material re-handling within the Bay Ponds after completion of dredged material placement. Costs are also not included for any environmental documentation, permitting, mitigation and/or monitoring, or other program management costs.

8.2 Concession Model

The concession model is based on execution of three separate contracts for the work as described below:

- *Contract 1 – Site Development*, which would include preparation of the site to receive dredged material including site water control features, electrical power infrastructure, dredged material pipeline, and offloading facility support piling;
- *Contract 2 – Offloader Operations*, which would include the annual mobilization of an offloader to the site, transporting dredged material from scows/barges that would be brought in by the dredging contractor, and managing the decant water at the site;
- *Contract 3 – Site Management*, which would include maintenance of the site over the period required for placing dredged material at the site (power poles and lines, flood control and decant weirs, monitoring, etc.), ensuring that offloading operations are in compliance with project permits, and executing final closure of the dredged material placement at the site prior to handing it over to the Restoration Contractor for the ultimate pre-breaching and breaching operations at the site.

The assumption for this study is that the SBSP Project would bear the costs for all 3 Contracts described above and attempt to recover all or a portion of the costs by charging a *Tipping Fee* to the dredging projects similar to the Montezuma Beneficial Reuse Site. Contract 1 and Contract 3 could each be a separate contracting entity, or both contracts could be let out to a single entity. Contract 2 is likely to be one of the dredge contractors that routinely bids and performs work in the SF Bay Area market.

The estimates for the Concession model include costs associated with Contract 1 and Contract 2 as described above (site development costs and costs associated with offloading and placing the dredged material in the Bay Ponds). Site Management Costs (Contract 3) are also included in the total cost for each model alternative estimate.

8.2.1 Site Development Costs (Contract 1)

8.2.1.1 Onsite Improvement Costs

Certain improvements will need to be made at the site to allow for the placement of dredged material. The construction of the necessary infrastructure can lead to high front-end costs depending on the power source for the equipment. The onsite improvement costs include the installation of the necessary electrical infrastructure to provide power for the offloading facility including the booster pump(s) and furnishing and installing the shore section of the discharge pipeline. The electrical infrastructure work includes the power drop from PG&E overhead transmission line, substation, and overhead conductor. Additional shoreside work includes water control features, levee repairs, and shore pipeline.

Costs have been developed for a power drop from the existing PG&E overhead transmission line. PG&E will install a dead-end tower consisting of three to four temporary power poles and drop power lines from the transmission line to temporary power poles. The transmission lines will run from the dead-end tower to a second tower structure containing the air-break switch and then to a PG&E metering station. The air-break switch allows for a cut-off in power from the transmission line to the substation. The dead-end tower is the start of the substation platform. Additional equipment within the substation transforms the power from 115 kV to 12.5 kV for distribution out to the offloading facility. Costs have been also been included for a concrete pad, fencing, and lighting for the substation.

The temporary pole line with a 12.5 kV overhead conductor will run from the substation to a shoreline location at Eden Landing. At the shoreline will be a connection point to the submersible power cable(s) that will run to the booster pump and offloading facility. Costs have been included for furnishing and installing the wooden poles and overhead conductor for the temporary pole line. Additional costs have been included for the furnish and installation of the submersible power cable.

The costs for furnishing and installing the shore section of the pipeline to transport the dredged material slurry to the Bay Ponds is also included in the onsite improvement costs. The shore pipeline will be delivered to the site on trucks and welded into position along the levees to the selected discharge locations.

The cost estimate includes 20,000 feet of shore pipe although less could be used if the material is only placed in Ponds E2 and E1. The cost for furnishing the pipe assumes new pipe is purchased and the cost is reduced to a determined rental rate based on the wear of the pipeline over the duration of the project.

A breakdown of the onsite improvement costs is included in Table 8. Additional cost detail is provided in Attachment D.

Table 8 Onsite Improvement Costs (2020$) for Concession Model

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	OPTION
Perimeter Levee Improvements	5,600	CY	$68.93	$386,000	Electric / Diesel
Internal Levee Repairs	19,200	LF	$219.48	$4,214,000	Electric / Diesel
Water Control Structures	5	EA	$91,200	$456,000	Electric / Diesel
Install Substation	1	LS	$6,557,000	$6,557,000	Electric
Install Overhead Pole Line	18,206	LF	$33.51	$610,000	Electric
Furnish Shore Pipeline	20,000	LF	$37.80	$756,000	Electric / Diesel
Install Shore Pipeline	20,000	LF	$35.40	$708,000	Electric / Diesel
Remove Substation	1	LS	$364,000	$364,000	Electric
Remove Overhead Pole Line	18,206	LF	$26.26	$478,000	Electric
Remove Shore Pipeline	20,000	LF	$17.10	$342,000	Electric / Diesel
TOTAL ONSITE IMPROVEMENT COSTS				$14,871,000	**Electric**
				$6,862,000	**Diesel**

Notes: 1.) Costs are rounded to the nearest $1,000
2.) Costs include Design Fee, CM, Contingency and Escalation

8.2.1.2 Offsite Improvement Costs

Along with the onsite improvement costs, additional offsite improvement costs will be required to provide an offloading facility in the Bay, near the ship channel. The offsite improvement costs include the installation of the necessary infrastructure to transfer power to the offloading facility, install the pipeline to pump the dredged material slurry to shore, and the installation of a mooring facility to support the offloader and mooring barges. Costs for mobilizing the offloader annually and operating it every year are separately described in Sections 8.2.2.1 and 8.2.2.2.

Costs have been developed to furnish and install a dredged material slurry pipeline from the offloading facility to the connection point at the shoreline. It is assumed that the offshore section of the dredged material slurry pipeline will be welded into 1,000-foot sections at an offsite location, rafted together and towed to the site. Once at the site, the pipeline sections will be connected from the offloader to the booster pump(s), to the shoreline connection with the onshore section of pipeline. The cost estimate includes 17,000 feet of offshore pipeline and joint connections.

A submersible power cable will also need to be installed to transfer power from the temporary pole line to the offloader and booster pump(s). The cost for furnishing and installing approximately 20,000 feet of

submersible power cable from the connection point at the temporary pole line, offshore to the booster pump(s) and offloading facility are included.

In addition to the pipeline and power cable, a pile-supported mooring system will be required to secure the offloader and mooring barges offshore. The mooring system will consist of a maximum of 30 steel pilings, 24-inch to 36-inch in size, consisting of three pile dolphin assemblies and single piles. The actual number of piles required will be specific to the offloading equipment utilized. The mooring barges will be secured to the piles using steel pile keepers, which are rectangular steel frames surrounding the pile and are welded to the deck of the barge. The offloader and reel barge will sit between the two mooring barges. The cost estimate includes the costs to install the mooring piles and secure the mooring barges to the piles.

A breakdown of the offsite improvement costs is included in Table 9. Additional cost detail is provided in Attachment D.

Table 9 Offsite Improvement Costs (2020$) for Concession Model

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	OPTION
Furnish Offshore Pipeline	17,000	LF	$37.82	$643,000	Electric / Diesel
Install Offshore Pipeline	17,000	LF	$44.24	$752,000	Electric / Diesel
Furnish Submersible Power Cable	20,000	LF	$127.95	$2,559,000	Electric
Install Submersible Power Cable	20,000	LF	$71.45	$1,429,000	Electric
Install Mooring System	1	LS	$326,000	$326,000	Electric / Diesel
Remove Submersible Power Cable	20,000	LF	$12.35	$247,000	Electric
Remove Offshore Pipeline	17,000	LF	$16.88	$287,000	Electric / Diesel
Remove Mooring System	1	LS	$109,000	$109,000	Electric / Diesel
TOTAL OFFSITE IMPROVEMENT COSTS				**$6,352,000**	**Electric**
				$2,117,000	**Diesel**

Notes: 1.) Costs are rounded to the nearest $1,000
2.) Costs include Design Fee, CM, Contingency and Escalation

8.2.2 Offloader Operations Costs (Contract 2)

8.2.2.1 Offloader Mobilization

The offloader mobilization costs will include the initial mobilization of the offloader and booster pump(s) to the project site. Once on site, the offloader and booster pump(s) will be prepared for work including connections to the pipeline and submersible power cable, pre-system check, and start-up of equipment. The offloader mobilization assume the floating plant is mobilized locally, considering the two main large dredging companies maintain a base of operations in the SF Bay Area. Depending on the power scheme selected, the initial offloader and booster pump mobilization ranges from $711,000 to $735,000.

All onsite and offsite improvement costs and offloader mobilization costs assume one mobilization and demobilization of the capital infrastructure (electrical power infrastructure, pipeline, and support pilings). Once the first year of offloading dredged material is completed, the offloader and booster pump(s) will be

removed from the site and all other infrastructure will be left in place. If the offloading facility equipment is being powered by a diesel generator, the generator will also be removed after completion of offloading each year. The costs to partially demobilize the offloader and booster pump(s), and remobilize the following year are included in the cost estimate for each year of the contract. Depending on the power scheme selected, the interim offloader and booster pump mobilization ranges from $196,000 to $202,000.

Additional costs are included to cover the maintenance of the offloading facility outside of the dredged material delivery periods, mainly replacing batteries on the lights marking the support pilings and pipeline. The other features are onshore and will be shut down while not in use. The costs assume that two people will maintain the lights on the support pilings and pipeline twice per month using a small crew boat. The average cost for the bi-monthly maintenance is estimated at $5,500 per month.

Once the Bay Ponds are filled to the desired elevation, all infrastructure (electrical power infrastructure, overhead pole line and support pilings, shore pipeline, etc.) and offloading equipment (offloader, booster pump(s), mooring barges, and removal of support pilings) will be demobilized from the site. No costs have been included in this estimate to perform the site restoration work (e.g. earthwork to shape upland transition zones, levee breaches, or other restoration features).

8.2.2.2 Offloading Operations

Management of the offloader operations, including onshore placement operations, is assumed to be controlled by a third-party entity through a competitive bid or Request for Proposals (RFP) process. The offloader is assumed to accept material on an ad hoc basis (as material arrives by scow from various dredging projects) 24-hours per day, 7-days per week. For the periods when there is an active project but when scows are not actively being unloaded, the offloader will remain onsite on operational standby. Operational standby requires the offloader to be fully crewed and ready to receive dredged material, with the only power consumption being local power for lights, radios, deck equipment, etc. at the offloading facility and booster pump(s). The pump engines are not operating during operational standby. The dredged material is assumed to arrive at the offloading facility in a productive manner allowing the offloader to remain efficient and only be onsite for the minimum amount of time each year. The dredging productions for the selected projects were optimized to be completed as quickly as possible using two clamshell dredges and four scows, assuming dredging occurs concurrently at two of the dredging projects.

Separate cost estimates were developed based on the dredged material sources and delivery scenarios discussed in Sections 5.3 and 5.4. Table 4 through Table 6 include information on the dredging projects elected, annual volumes provided, dredging and offloading productions, number of months the offloader is on site each year, and how many years are required to complete placement of dredged material at the site. The three scenarios are as follows:

- Scenario 1 assumes the offloader only receives dredged material from the Oakland and Redwood City Federal Maintenance dredging projects.
- Scenario 2 assumes the offloader receives dredged material from the Oakland, Redwood City, and Richmond Federal Maintenance dredging projects.
- Scenario 3 assumes the offloader receives dredged material from the Oakland, Redwood City, and Richmond Federal Maintenance dredging projects along with dredged material from two non-federal maintenance dredging projects, Chevron and Port of Oakland berths.

Cost estimates were developed for placement of the dredged material into the Bay Ponds at Eden Landing assuming use of the existing levees. Cost estimates were also developed assuming the levees in and around the Bay Ponds were improved so the site could contain more dredged material. A total of six cost estimates were developed for both an electric power option and a diesel power option.

8.2.2.3 Water Management, Operations and Maintenance

The offloader operations costs also include the equipment, labor, and materials cost for a shore crew to manage the power infrastructure, pipeline, water control features, and maintain the internal levees in working condition. The shore crew costs also account for movement of the pipeline and monitoring of the discharge into the Bay Ponds. Shore crew costs have been included for the entire duration while the offloader is in operation. Costs to perform decant water quality testing have been included in the site maintenance costs.

8.2.3 Summary of Costs for Concession Model

The costs for offloading and management of the site, including profit, bond, add-on fees, escalation, and contingency are summarized below in Table 10. The initial onsite and offsite improvement costs to receive dredged material are included in the totals. Additional detail for the annual cost breakdowns for each cost estimate scenario, for electric and diesel options, are included in Attachment E. The annual offloading quantities and durations along with the total project durations for each scenario are included in Table 6. Table 10 also includes the average unit cost, calculated based on the total project cost and duration (detailed in Table 6).

Table 10 Total Costs for Concession Model (2020$)

Estimate Description			Total Project Cost ($M) / Unit Cost (per CY) Placed at Eden Landing						
			Site Improvements	Mob/Demob	Dredging & Transport*	Offloading	Remaining Dredging	Site Management	Total
Scenario 1	Electric Power	Existing Levees	$20.8	$3.6 / $1.09/CY	N/A	$26.2 / $7.97/CY	N/A	$3.2 / $0.96/CY	$53.8 / $16.35/CY
		Improved Levees	$21.2	$5.0 / $1.06/CY	N/A	$38.9 / $8.23/CY	N/A	$4.2 / $0.89/CY	$69.3 / $14.67/CY
	Diesel Power	Existing Levees	$8.6	$3.7 / $1.12/CY	N/A	$27.8 / $8.44/CY	N/A	$3.2 / $0.96/CY	$43.2 / $13.13/CY
		Improved Levees	$9.0	$5.1 / $1.09/CY	N/A	$41.2 / $8.71/CY	N/A	$4.2 / $0.89/CY	$59.5 / $12.60/CY
Scenario 2	Electric Power	Existing Levees	$20.8	$2.9 / $0.88/CY	N/A	$29.1 / $8.83/CY	N/A	$3.3 / $1.00/CY	$56.1 / $17.04/CY
		Improved Levees	$21.2	$3.6 / $0.76/CY	N/A	$42.6 / $9.02/CY	N/A	$4.4 / $0.93/CY	$71.8 / $15.19/CY
	Diesel Power	Existing Levees	$8.6	$3.0 / $0.90/CY	N/A	$30.9 / $9.39/CY	N/A	$3.4 / $1.02/CY	$45.9 / $13.92/CY
		Improved Levees	$9.0	$3.7 / $0.78/CY	N/A	$45.3 / $9.58/CY	N/A	$4.4 / $0.94/CY	$62.3 / $13.19/CY
Scenario 3	Electric Power	Existing Levees	$20.8	$2.2 / $0.68/CY	N/A	$31.0 / $9.40/CY	N/A	$3.4 / $1.03/CY	$57.4 / $17.43/CY
		Improved Levees	$21.2	$2.9 / $0.61/CY	N/A	$45.1 / $9.54/CY	N/A	$4.5 / $0.95/CY	$73.7 / $15.59/CY
	Diesel Power	Existing Levees	$8.6	$2.3 / $0.70/CY	N/A	$32.9 / $9.98/CY	N/A	$3.5 / $1.05/CY	$47.2 / $14.33/CY
		Improved Levees	$9.0	$3.0 / $0.63/CY	N/A	$47.8 / $10.12/CY	N/A	$4.6 / $0.97/CY	$64.3 / $13.61/CY

* costs for Dredging and Transport to site not included

Under the Concession Model the offloader would act as a separate entity from the dredging contractor so no costs for dredging & transport or remaining dredging would be incurred as part of the Concession Model. Based on the unit costs presented in Table 10 for the three different scenarios, the tipping fee to recover all of the upfront site preparation and offloading costs varies from a high of $17.43/CY to a low of $12.60/CY. The diesel power options are less expensive than the electrical power option with Scenario 1 being the most cost efficient of the three scenarios. As a comparison, current tipping fees for wetland cover are $12.00-$14.00/CY at Montezuma and $3.00-$4.00/CY at Cullinan. The dredge contractor must provide their own offloader to place material at Cullinan.

8.2.4 Procurement Strategy for Concession Model

Contract 1 – Site Development: Procurement for Contract 1 of this model is relatively straightforward and would involve design of onsite and offsite improvements, regulatory approvals and permits, and issuing a Request for Bids for implementing the improvements. The SBSP Project could bid this contract and pay for it as part of restoration related costs. An advantage of the Project bearing these costs for Contract 1 is that the entire onshore infrastructure (electrical substation, temporary pole line, and shore pipeline) and offshore infrastructure (submerged pipeline, power cable, and support pilings) can be readily transferred to another beneficial use site.

Contract 2 – Offloader Operations: Contract 2 for offloader operations, including onshore placement operations, will likely be a dredge contractor that would win it through a competitive bid or RFP process. The RFP process would need to clearly communicate to the potential bidders what infrastructure is being made available, where the offloader can be placed, where any booster pump(s) can be placed, what the pipeline route to the Eden Landing shoreline is, where the dredged material is to be placed and how much, how the equipment can be powered (electric vs. diesel), and what the permit conditions are. The RFP process would also need to clearly delineate which dredging projects will be bringing dredged material to Eden Landing, approximately how much material on an annual basis, and what months the offloader is expected to operate. The bidders will need this information in order to develop their proposal costs.

For a concession model to be implemented at Eden Landing, two options are described below:

> *Option 1* is where the SBSP project operates and manages the offloading operations and bears the risks associated with the project after implementing the Contract 1 activities. It would contract with an offloading entity that would provide the offloading and placement services similar to the Montezuma model, and the SBSP Project would then charge a tipping fee to the dredging project.
>
> The RFP contract would be structured similar to the dredge rental contracts the USACE uses in the New Orleans District, where contract documents include typical specifications for contract clauses, evaluation of bids, conditions of contract award, permit requirements, quality control, etc. along with the technical specifications for the equipment requirements and dredge locations. The bid schedule is then based on a specific size of equipment or a minimum production rate that needs to be achieved. The contractor then bids on a set number of hours for rental of the equipment along with mobilization and demobilization, standby time, towing to other project locations, and any environmental requirements.
>
> The RFP can be structured as a competitive bid for a pre-determined amount of time, such as a single year or multi-year contract, or could also be negotiated as a long-term lease over a five-year period. The longer the terms of the lease, the longer the time period that the operating entity can amortize capital costs. The advantage of a competitively bid contract (similar to a rental contract) or a negotiated lease arrangement, is that it allows the operating entity's competitive advantage to be used. Depending on the selected entity, the site may also offer an advantage bidding on private maintenance dredging contracts that have SFDODS or another upland site as a required disposal location. If the offloader is already operating at Eden Landing, the operating entity can provide additional material to complete the project in a shorter amount of time.

Option 2 is where the SBSP project awards a multi-year, turnkey contract to an entity for Contract 2, who then operates the offloader until site capacity is reached. The site would essentially be "leased" to the contractor who would bear the costs for mobilizing and placing material in the ponds and would have the ability to charge a tipping fee to the dredge contractor. The SBSP Project would hire a separate entity for Contract 3 for Site Management to ensure permit compliance. This would be similar to the Bair Island model.

There are several areas of concern regarding either option described above. If dredge projects cannot commit to a certain amount of volume each year, or the annual volumes fall short of projections, the operating entity will need some manner of recouping costs. If a guaranteed minimum amount of material does not come to the site and costs are high, the operating entity runs the risk of the site not being cost competitive with the Federal Standard or more expensive than other established beneficial reuse sites. If that occurred, the SBSP Project would incur additional costs through the offloader contract or lease agreement and would have to reimburse the entity for time and costs spent to date. Even if dredged material comes as planned and at the assumed delivery rate, the costs exceed that of the Federal Standard and the SBSP Project may have to cover the additional costs for beneficial reuse. This will need to be included as part of the contract or lease agreement, that some guaranteed annual cost will be met.

Another area of concern is what infrastructure should be included as part of the contract and what infrastructure to have the operating entity provide, such as pipeline and support pilings.

Contract 3 – Site Management: This contract would be with an entity that manages the site throughout the beneficial reuse operations and would be similar to a construction management services contract.

8.3 USACE Dredging Project Model

The USACE dredging project model is based on the beneficial reuse model that the SF District currently uses for the Federal Channel Maintenance dredging projects. The SF District has bid the channel maintenance dredging projects in several different manners. Some projects have a base bid that includes the Government furnished disposal site (Federal Standard) and includes an alternative bid for a contractor furnished disposal site. For the alternative bid the contractor is required to take the dredged material to a permitted beneficial reuse upland site. Other methods have included a base bid where the dredging bid items are a mix of beneficial reuse and the Federal Standard disposal site. Most recently, the SF District bid the Redwood City project as a base bid to the Federal Standard disposal site (SF-11) with an optional bid for an additional cost to take some of the base bid material to a beneficial use site. The SCC supplemented the SF District budget for the project with an additional $2M to allow for the beneficial reuse optional bid to be included.

Providing for an Alternative Bid would allow the contractors to bid on using Eden Landing as the beneficial reuse site, much like Cullinan and Montezuma currently are used. The alternative bid requires the contractors to take the material to a permitted beneficial reuse site. Montezuma is set up with an offloader in place, so the contractor pays a tipping fee to Montezuma Wetlands LLC to have the material offloaded and placed at the site. Cullinan has no offloader, so the contractor is required to bring their own offloader to place material at the site.

For Eden Landing to be considered as an alternative bid option in the contractors bid, the site would need to be permitted for placement of dredged material. The SBSP project would complete a minimal amount of site improvements (levee repairs and water control features), such that the site is ready to accept dredged material. The remaining work would be included as part of the contractors alternative bid and would include the pipeline, offloader, booster pump(s), support pilings, power requirements, and shore operations to place the dredged material, similar to Contract 1 and Contract 2 of the Concession Model. This type of arrangement is similar to offloading at Cullinan.

The risk to the project, in the event of the site not being cost competitive with the Federal Standard, is only those costs associated with levee improvements and water features. It allows the dredge contractors to use their competitive advantage in setting up the offloader system to place material at the site. Each dredge contactor would likely have a different offloading system which means different size pipelines, different power requirements, different booster setups, etc.

Cost estimates for this procurement model are based on the SF District issuing Request for Bids with an Alternative Bid for placement at Eden Landing as described above, including all of the offsite improvement costs along with the cost of offloading and placing the dredged material in the Bay Ponds as part of the contractors bid.

8.3.1 Initial Onsite Improvement Costs (by SBSP Project)

Onsite improvement costs under the USACE model will only require minimal improvements at the site to allow for dredged material placement. The onsite improvement costs will only include the installation of water control features and levee repairs to allow for the placement of dredged material. The design and permitting of the material placement into the Bay Ponds would need to be completed prior to allowing the site to be used as a beneficial use site in an alternative bid.

8.3.2 Costs for USACE Model

8.3.2.1 Onsite and Offsite Improvement Costs

Under this procurement model, the option for powering the offloading equipment would be up to the contractor and would have to comply with required permit conditions. The cost estimate performed for this model assumes diesel powered equipment.

Offsite improvement costs would also be included as part of the contractors alternate bid to place dredged material at the site. The contractor is assumed to provide the offloader, booster pump(s), and pipeline to place dredged material at Eden Landing. This cost includes the installation of the offshore and onshore pipeline along with furnishing and installing the support piles to moor the offloader and mooring barges.

8.3.2.2 Dredging and Transport Costs

Dredging and transport costs for three of the Federal Channel Maintenance dredging projects also needed to be developed for a comprehensive estimate for beneficial reuse at Eden Landing. The costs for dredging and transport of the material to Eden Landing for placement in the Bay ponds were developed for Oakland Inner & Outer Harbor, Redwood City Harbor, and Richmond Inner & Outer Harbor. The dredging productions, and subsequent costs, for each of the projects were assumed using a large clamshell dredge and two 4,000 CY dump scows to deliver material to the offloader at Eden Landing. The durations for the three dredging projects were determined from the annual dredging quantities and compared to historical monthly production averages for each project. Table 5 includes the estimated monthly dredging productions for each project. The historical volume breakdown for the three Federal channel projects is included in Attachment A and the cost estimate details for each project are included in Attachment B. Additional detail on recent Federal Channel Maintenance Dredging costs are included in Attachment F.

8.3.3 Summary of Costs for USACE Dredging Project Model

The cost estimate for the USACE model assumes a bundled project with the Oakland and Redwood City Harbor dredging being combined as one project. The cost estimate was developed based on an alternate bid scenario to take material to Eden Landing and assumes the contractor provides the offloader, booster pump(s), and pipeline, and is also responsible for placing the material at the site. The alternate bid costs for mobilization and demobilization of the dredge plant and offloading plant, dredging, transport, offloading, and management of the site, including profit, bond, add-on fees, escalation, and contingency for the USACE

model are summarized below in Table 11. The initial site improvement costs to receive dredged material, including levee repairs and water control structures are included in the total cost.

The total dredge quantities for a combined Oakland / Redwood City project exceed the annual volumes placed at Eden Landing. Based on the DMMO annual dredging reports, the Oakland Inner & Outer Harbor dredges approximately 0.80 MCY annually and the Redwood City Harbor dredges approximately 0.25 MCY annually. The annual volumes dredged for placement at Eden Landing for the USACE model project are estimated at 0.66 MCY, leaving an additional 0.39 MCY to be dredged between the two projects. The cost for the remaining dredging were included in the totals since the USACE will still need to complete the required dredging at each project. An average unit cost based on historical dredging costs for each project was used to determine the remaining dredging costs. Additional detail for the annual cost breakdown is included in Attachment G. The annual offloading quantities and durations along with the total project durations for each scenario were as shown in Table 6.

Table 11 USACE Model Cost Summary (2020$)

ESTIMATE DESCRIPTION	Total Project Cost ($M) / Unit Cost (per CY) Placed at Eden Landing						
	Site Improvements	Mob/Demob	Dredging & Transport	Offloading	Remaining Dredging	Site Management	Total
Oakland/Redwood City (Bundled; Existing Levees)	$4.7	$31.9 / $9.68/CY	$51.5 / $15.62/CY	$28.8 / $8.73/CY	$63.2 / $27.71/CY	$4.2 / $1.27/CY	$184.1 / $55.90/CY
Oakland/Redwood City (Bundled; Improved Levees)	$5.1	$46.0 / $9.73/CY	$75.9 / $16.06/CY	$42.5 / $8.99/CY	$88.4 / $18.70/CY	$5.9 / $1.25/CY	$263.7 / $55.81/CY

8.3.3.1 Comparison to Current Dredging Practice

The USACE model alternate project costs for dredging and offloading at Eden Landing are compared to the average annual spending costs for the Oakland Inner & Outer Harbor Channel and Redwood City Harbor projects over the last five years. Based on DMMO dredging records and published bid costs, the annual dredge quantities and spending costs for both projects were compiled for 2015 through 2019 to determine an average annual volume and average annual cost. The total spending costs for each year were escalated to 2020 dollars for comparison with the estimated costs for USACE model. The annual average dredging volume and spending for the Oakland Inner & Outer Harbor project from 2015-2019 is 792,017 CY and $19.9M. The annual average dredging volume and spending for the Redwood City Harbor project from 2015-2019 is 273,105 CY and $7.0M. The total annual combined spending for the Oakland and Redwood City projects is $26.9M. Additional detail for the annual cost breakdown for the Oakland and Redwood City projects is included in Attachment G.

The total spending costs for the Oakland and Redwood City projects over the five-year period (existing levee condition) and the seven-year period (improved levee condition) that material would be place Eden Landing is compared to the total cost for the USACE model alternate project costs for a bundled project. The comparison costs are shown in Table 12. Additional detail on the USACE Alternate bid cost summary is included in Attachment G. The costs shown in Table 12 for the Oakland and Redwood City dredging costs reflect a recent history of in-bay, offshore, and beneficial reuse costs and are not necessarily the Federal Standard costs.

Table 12 USACE Model Comparison to Oakland / Redwood City Dredging Costs

ESTIMATE DESCRIPTION	Total Project Cost ($M)							
	Site Improvements	Mob/Demob	Dredging & Transport	Offloading	Remaining Dredging	Site Management	Total	Difference
Current Oakland / Redwood City Costs (over 5-Years)*	N/A	$11.5	$135.4	N/A	N/A	N/A	$146.8	-
USACE Model (Oakland/Redwood City Bundled; Existing Levees)	$4.7	$31.9	$51.5	$28.8	$63.2	$4.2	$184.1	+ $37.3
Current Oakland / Redwood City Costs (over 7-Years)*	N/A	$16.5	$195.4	N/A	N/A	N/A	$212.0	_
USACE Model (Oakland/Redwood City Bundled; Improved Levees)	$5.1	$46.0	$75.9	$42.5	$88.4	$5.9	$263.7	+$51.7
Funding Responsibility	SCC	USACE	USACE	USACE	USACE	SCC		SCC

* over 5-Years represents existing levee conditions and over 7-Years represents improved levee conditions

The difference between the USACE model, which assumes a bundled Oakland and Redwood City project placing material at Eden Landing, and the current spending over a 5-year period for the Oakland and Redwood City projects is approximately $37.3M, or an average annual cost of approximately $7.5M over annual spending. The difference between the USACE model, for the improved levee condition, and the current spending over a 7-year period for the Oakland and Redwood City projects is approximately $51.7M, or an average annual cost of approximately $7.4M over annual spending. Additional detail on the USACE model alternate bid cost along with the comparison to the Oakland and Redwood City annual spending summary is included in Attachment G.

The costs presented for both placement models with the improved levee condition assumes the maximum site capacity at Eden Landing being mobilized so site improvement costs are spread over the largest volume possible. As the amount of beneficial reuse material delivered on an annual basis decreases, the unit cost of the placement increases. Using either cost model to beneficially reuse material at Eden Landing may have impacts on the overall Eden Landing restoration project. Certain construction elements of the restoration project will likely be delayed until all the dredged material is placed in the Bay Ponds. Delays to construction of the overall restoration project may have cost and potential funding implications that are not included as part the costs presented in this report.

8.3.4 Procurement Strategy for USACE Model

The procurement strategy for the USACE model would be twofold. The first part of the procurement strategy is to bundle two or more of the Federal Channel Maintenance Dredging projects to provide the maximum amount of dredged material possible being placed at Eden Landing. By maximizing the amount of material placed, the contractor will be able to spread the mobilization costs for the offloader at Eden Landing over a larger quantity of material. With mobilization costs approaching $6.5M to set up an offloader at Eden Landing, it is imperative that these costs are spread over more than one maintenance dredging project. If two or more Federal Channel Maintenance dredging projects can be successfully bundled, the project would then have an alternate bid for dredging and placement at Eden Landing. The second part of the strategy is to bid the project as an alternate bid; the dredging contractor would thus supply the offloader, booster pump(s), pipeline, mooring piles, and support equipment to place the material at Eden

Landing. The dredging contractor would also be responsible for placement of the material at Eden Landing per the required permit conditions.

Additional costs could be realized if the projects are bid so they can work concurrently or simultaneously beyond the environmental window. The regulatory agencies in the past several years have allowed dredging to extend beyond the environmental window of June 1 through November 30 if the material is going to a beneficial reuse site. This could work to the advantage of Eden Landing if certain projects can be bid and dredged later in the year rather than trying to complete every dredging project in the SF Bay Area in a six-month window. By spreading the work out, the dredging contractors would not have such a push to complete projects and could more efficiently plan their equipment needs, hopefully lowering costs to use the beneficial reuse sites.

The potential for bundling two or more Federal Channel Maintenance projects needs to be further developed with the SF District. One of the issues with bundling either the Redwood City Harbor or the Richmond Harbor projects is that these are typically used by the SF District as small business set aside projects. Whether the SF District can re-program those two projects and still meet their small business requirements is unknown. It is also unclear if the offloader could accept dredged material from other projects while it is at Eden Landing working on a Federal project.

Another potential issue with an alternative bid scenario on the Federal projects is the competition from the existing beneficial reuse sites and the limited amount of federal maintenance dredging projects in the SF Bay. The Oakland and Redwood City Harbor projects represent approximately 62 percent of the average annual federal maintenance dredging in the SF Bay Area, excluding the SF Bar Channel dredging.

8.4 Comparison of Concession Model to USACE Dredging Project Model

The costs for the Concession model (Scenario 1 only) were compared to the USACE model for the diesel option. The dredging costs were added to the Concession model including mob/demob of the clamshell dredges, dredging and transport, and remaining dredging, to reflect a total project cost for comparison to the USACE model. Table 13 shows that the Concession model is less expensive simply due to spreading the mobilization and site improvement costs over the five-year or seven-year life of the project rather than a single contract bid each year.

Table 13 Comparison of Concession Model Costs to USACE Model Costs

ESTIMATE DESCRIPTION	Total Project Cost ($M)							
	Site Improvements	Mob/Demob	Dredging & Transport	Offloading	Remaining Dredging	Site Management	Total	Difference
USACE Model (Oakland/Redwood City Bundled; Existing Levees)	$4.7	$31.9	$51.5	$28.8	$63.2	$4.2	$184.1	+ $19.5
Concession Model (Existing Levees)	$8.6	$10.4	$51.5	$27.8	$63.2	$3.2	$164.6	
USACE Model (Oakland/Redwood City Bundled; Improved Levees)	$5.1	$46.0	$75.9	$42.5	$88.4	$5.9	$263.7	+$30.2
Concession Model (Improved Levees)	$9.0	$14.9	$75.9	$41.2	$88.4	$4.2	$233.5	

9 Environmental Documentation and Outreach

The following section summarizes the expected environmental permitting requirements for the proposed Dredged Material Offloader Project (Project) at the Eden Landing Complex. The assumption for the beneficial reuse project is that separate environmental review clearances and dredging permits will be obtained prior to offloading by the proponent of any dredging projects utilizing the Project's facilities (e.g. Port of Redwood City dredging, etc.) and that beneficial reuse/placement permits will be obtained by others. There is the potential to use existing environmental studies and documentation previously completed for the South Bay Salt Pond Restoration Project (SBSP), Eden Landing Phase 2 project, including the project Final Environmental Impact Report (EIR), to support and streamline the Project's environmental compliance with the California Environmental Quality Act (CEQA), National Environmental Policy Act (NEPA) and regulatory agency permitting and coordination.

Environmental review completed in association with the beneficial use site for the SBSP, Eden Landing Phase 2 project includes a Final EIR and associated environmental studies completed to support the Final EIR. The Final EIR was prepared in accordance with the California Department of Environmental Quality (CEQ) regulations for implementing National Environmental Policy Act (NEPA, 40 Code of Federal Regulations [CFR] 1500–1508) (CEQ 2015) and California Environmental Quality Act (CEQA, Public Resources Code Section 21000 et seq.) The California Department of Fish and Wildlife (CDFW) was the lead agency under CEQA; CDFW also prepared additional analysis that meets NEPA requirements for future use by a federal lead agency (e.g., the USACE is expected to issue a Section 404 permit under the Clean Water Act and may undertake the NEPA process as part of that regulatory process) (AECOM, 2019b). The Final EIR includes dredged material placement for beneficial reuse under the alternatives considered. (Final EIR SBSP, Eden Landing Phase 2, 2019).

The proposed Project will require environmental review and permits for installation of the offloader facility including pumps, submerged pipeline and potential electrical supply and for operations of the offloader facility including water handling and management. The offloader will draw seawater through piping outfitted with conical fish screens to minimize and avoid fish entrapment, as required by CDFW for other similar projects.

9.1 Regulatory Permit Requirements

The offloader project at the Eden Landing Complex will be regulated under Federal, State, and local environmental regulations. The assumption is that Section 106 Cultural Resources review or surveys will not be required given the nature and location of the offloader work. It is expected that regulatory agency review and approval of the permit applications could take 12 to 18 months from the date of the application submittal. It should be noted that completion of the CEQA document is a requirement of state agency permit applications. The project is expected to require the approvals/permits listed in Table 14.

Table 14 Project Permits / Review

PERMIT/REVIEW	AGENCY	TRIGGER	FORM/DOCUMENT/STUDY
Federal			
Section 10 Rivers and Harbors Act (individual project permit)	US Army Corps of Engineers (USACE)	Construction in or over navigable US waters.	Joint Aquatic Resource Permit Application (JARPA)
Section 404 Clean Water Act (CWA)	USACE/San Francisco Regional Water Quality Control Board (SF RWQCB)	Placement of fill/dredged material in waters of the U.S.	JARPA
Section 14 Rivers and Harbor Act Section 408 Alterations to Civil Works Evaluation (potential)	USACE	Offloader pipeline placement across navigation channel	Request for Section 408 Consultation Memorandum
NEPA	USACE	The requirement for Federal Permits	USACE will use the information provided in the JARPA and CEQA consultation to inform consultation under NEPA
Section 7 Endangered Species Act (ESA) Consultation and Biological Opinion (BO)	USACE/US Fish and Wildlife Service (USFWS/ National Oceanic and Atmospheric Administration (NOAA) Fisheries	Work in and over marine aquatic habitat	Biological Evaluation (BE). An eelgrass Survey may be required for the areas where the offloader and pipeline will be located. A survey of the offloader area may not be required as it will be located in deep water. There is a higher potential for the presence of eelgrass, and thus the requirement for survey, within the pipeline footprint.
Marine Mammal Protection Act (MMPA) Incidental Harassment Authorization (IHA) /Incidental Take Authorization (ITA)	National Marine Fisheries Service (NMFS) Protected Resources Division	Work in and over marine aquatic habitat	Letter request for IHA/ITA, if needed, based on offloader anchoring, barge traffic, noise from construction and operations.
State			
CEQA Initial Study (IS)/Mitigated Negative Declaration (MND) OR SEIR to SBSP Final EIR	CEQA	Work in and over marine aquatic habitat in California	CEQA Checklist, IS and MND OR SEIR to SBSP Final EIR

Table 14 Project Permits / Review

PERMIT/REVIEW	AGENCY	TRIGGER	FORM/DOCUMENT/STUDY
			The CEQA process may be considered complete based on the review completed in association with the beneficial use site for the SBSP, Eden Landing Phase 2 project, which includes a Final EIR and associated environmental studies completed to support the Final EIR. (AECOM, 2019a).
Region Waste Discharge Requirements and Section 401 CWA Certification	San Francisco Bay Regional Water Quality Control Board (SF RWQCB)	Discharge of offloader water back into the Bay	JARPA and Notice of Intent, a water quality monitoring plan may also be required.
California Endangered Species Act (CESA) Safe Harbor Agreement (SHA) Consistency Determination (CD) or Incidental Take Permit	California Department of Fish and Wildlife	The project may be eligible for CESA SHA CD based on the habitat improvements associated with the beneficial use site and CESA concurrence with NMFS/NOAA Incidental Take decision. May trigger incidental take permit for CESA-listed species	BE, NOAA/NMFS BO and request for consistency review letter.
National Pollution Discharge Elimination System (NPDES) permit for construction and Operation	SF RWQCB	Construction of the facility and discharge of offloader water back into the Bay	JARPA and Notice of Intent, a water quality monitoring plan may also be required.
San Francisco Bay Conservation and Development Commission Management Program for San Francisco Bay (BCDC) and Coastal Zone Management (CZM) CD	BCDC	Work in the San Francisco Bay	Application form and coordination with BCDC.
California State Lands Lease	SLC	Work on state owned lands	Application and coordination with SLC
Bay Fill Permit	BCDC	Placement of fill/dredged material in San Francisco Bay	Application and coordination with BCDC
Local			

Table 14 Project Permits / Review

PERMIT/REVIEW	AGENCY	TRIGGER	FORM/DOCUMENT/STUDY
Authority to Construct	Bay Area Air Quality Management District (BAAQMD)	May be required based on pump and other equipment operations depending upon power source	BAAQMD form, additional information details

9.2 CEQA/NEPA Strategy

The CEQA/NEPA process can be a challenge for projects with a broad range of considerations as included in this Project. However, the CEQA consultation likely will be considered complete based on the environmental review completed in association with the beneficial use site for the SBSP, Eden Landing Phase 2 project. The studies to complete the associated Final EIR for the SBSP project will likely support the NEPA evaluation for this project. The Final EIR includes dredged material placement for beneficial reuse under the alternatives considered (AECOM, 2019a).

The Project description should emphasize proposed Onsite and Offsite Improvements, and the Offloading Operations. Measures to avoid and minimize impacts from the operation of the offloader should be identified early to ensure a smooth permit application submittal process and address potential agency concerns raised on similar past projects in the area. For example, it will be important to focus on prevention of fish entrainment with fish screens as well as to identify mitigation measures to avoid and minimize potential impacts to water quality during construction and operation of the offloader. Completion of a Biological Assessment (BA) will be used to identify potential impacts and appropriate avoidance, minimization, and mitigation measures. Potential benthic, overwater, and noise impacts will also need to be evaluated to identify appropriate avoidance, minimization, and mitigation measures.

9.3 Outreach with Regulatory Agencies

Only informal discussions have been held with members of the regulatory agencies. The offloader study was presented at an LTMS Managers Meeting on December 6. More formal discussions need to be held, especially with BCDC and the SFBRWQCB to determine the potential for material that is suitable for in-bay disposal at Alcatraz to be placed at Eden Landing for beneficial reuse. That would open the pool of dredging projects available to take material to Eden Landing, allowing the regulatory agencies to be more selective in the alternatives analysis to include Eden Landing as an option over in-bay or ocean disposal.

9.4 Outreach with Dredging Sponsors

Informal discussions have been held with USACE members, however more formal discussions need to be held to determine if bundling of projects is an acceptable option or whether an alternate type bid arrangement on a single project is the only option. No discussions have been held to date with any of the Port facilities or other dredging sponsors to discuss non-federal maintenance dredging projects placing material at Eden Landing.

9.5 Outreach with Dredging Contractors

Meetings have been held with two dredging contractors to discuss the possibility of placing an offloader at Eden Landing and what the appropriate contract vehicle is for achieving an operating offloader. The responses varied from a potential lease agreement over a five-year period to spread the capital costs out, to using an alternative bid approach on a bundled federal project. Both dredge contactors have access to offloaders and have been involved in offloading dredged material at beneficial reuse sites over the last twenty plus years.

For beneficial reuse to succeed at the scale of projects being envisioned in the SF Bay Area (multi-million cubic yards at each site), partnering with the private dredging community is critical so that their experience from around the country and the diversity of their equipment inventory can be leveraged.

10 Conclusions and Recommendations

1) *Site Capacity:* The Bay Ponds of the Eden Landing Complex represent an opportunity to restore about 1400 acres of salt ponds to tidal wetlands, using dredged material. Given the condition of the interior levees and berms, improvements would be required to these elements that would allow about 4.7 million CY of dredged material to be placed within the ponds; this would effectively mitigate some of the flooding concerns for the local communities and accelerate the process of establishing tidal wetland habitat in the Bay Ponds.

2) *Sources for Dredged Material:* Material generated from federal and non-federal navigation dredging projects in San Francisco Bay total about 2.6 MCY annually, with about 1.7 MCY from federal projects and 0.9 MCY from non-federal projects. Dredging projects identified as "feasible" for this analysis include the Oakland Inner and Outer Harbor (federal), Redwood City Harbor (federal), Richmond Inner and Outer Harbor (federal), Chevron Richmond Terminal, and Port of Oakland Berths. These projects would generate about 1 million CY on an annual basis. Almost all of the material dredged from these projects is expected to be suitable for beneficial reuse because it has historically gone to In-Bay, DODS or other beneficial reuse sites.

3) *Site Improvements:* The required site improvements would need to include levee repairs, water control structures, an electric power source along with transmission lines from the source to the offloader or a diesel power source, a pipeline from the offloader to the Bay Ponds, and an offloading facility about 3 miles offshore of the Bay Pond levee. The offloading facility would consist of a commercial offloader, similar to the *Liberty* at the Montezuma site, and booster pumps for transport of material from scows to the site.

4) *Feasibility for Beneficial Reuse:* The overall objective of the study was to identify a practical, economically sustainable dredged material delivery model that would help provide the Bay Area with an effective means to beneficially reuse dredged material and improve wetlands and water quality in the Bay. The study shows that although this is feasible, there is a significant upfront cost and risk associated with site improvements and offloading infrastructure that would need to be expended by a non-federal partner to compete with the Federal Standard for dredging.

5) *Beneficial Reuse Associated Costs:* The detailed cost estimates prepared for this study show that, using current dredging and disposal practices, the USACE would spend about $212 million over a 7-year period to dredge the Oakland and Redwood City Harbor projects. If the Concession Model were to be implemented, the costs for the same two projects would be about $234 million, but the SBSP project would have to upfront about $60 million and recoup a significant portion of this cost via a tipping fee charged to the dredging projects. If the USACE Model were to be implemented, the costs would increase to about $264 million, even after bundling the two dredging costs.

6) *Partnering with Dredging Sponsors:* In order for beneficial reuse at the Eden Landing Complex to be successful, costs would have to competitive with the Federal Standard for maintenance dredging projects in the San Francisco Bay Area. This requires, in addition to the beneficial reuse associated costs, a long-term commitment (in the form of a MOU) between the USACE and the restoration community such that material will be beneficially used, rather than disposed of offshore. Dredge contractors will begin to change their operations to fit a new beneficial reuse practice only if they see that a long-term commitment is being made. The USACE must also consider changing their contracting strategy to fit with beneficial reuse in the San Francisco Bay Area. Any MOU between SCC, USACE, DMMO and others should include the non-federal dredge project participants and dredging contractors. As Federal budgets continue to shrink, buy-in from non-Federal dredging sources and dredging contractors will be critical to the success of the project.

7) *Competition with Other Reuse Sites:* Other potential beneficial reuse sites (Montezuma, BMKV, and Cullinan) must also be included in the overall beneficial reuse plan so all projects can be a success and not be viewed as competitors for the dredge material.

8) *Environmental Review:* Environmental review completed in association with the beneficial use site for the SBSP, Eden Landing Phase 2 project includes a Final EIR and associated environmental studies completed to support the Final EIR. The Final EIR includes dredged material placement for beneficial reuse under the alternatives considered (AECOM, 2019a). The proposed Project will require environmental review and permits for installation of the offloader facility including pumps, submerged pipeline and potential electrical supply and for operations of the offloader facility including water handling and management. The CEQA consultation likely will be considered complete based on the environmental review completed in association with the beneficial use site for the SBSP. The studies to complete the associated Final EIR for the SBSP project will likely support the NEPA evaluation for this project.

9) *Stakeholder Outreach:* Primarily informal discussions have been held with members of the regulatory agencies. More formal discussions need to be held, especially with BCDC and the SFBRWQCB to determine the potential for material that is suitable for in-bay disposal at Alcatraz to be placed at Eden Landing for beneficial reuse.

   Also, only informal discussions have been held with USACE members; more formal discussions need to be held to determine if bundling of projects is an acceptable option or whether an alternate type bid arrangement on a single project is the only option.

   Lastly, for beneficial reuse to succeed at the scale of projects being envisioned in the SF Bay Area (multi-million cubic yards at each site), partnering with the private dredging community is critical so that their experience from around the country and the diversity of their equipment inventory can be leveraged.

11 References

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ATTACHMENT A

SEDIMENT SOURCE ANALYSIS

EDEN LANDING PHASE 2 PROJECT
PROJECTED ANNUAL DREDGE MATERIAL DELIVERY

DMMO Annual Report Summary of Dredged Volumes

Maintenance Projects Considered	Frequency (years)	Annual Volume (CY)	Historical & Current Disposal Site(s)	2017 Total	2016 Total	2015 Total	2014 Total	2013 Total	2012 Total	2011 Total	2010 Total	2009 Total	2008 Total	Annualized over 10 years
FEDERAL														
Oakland Inner & Outer Harbor	1	808,628	SF-11, SF-DODS, Montezuma, Winter Is., Hamilton	554,900	1,162,572	304,884	288,420	1,955,997	1,030,222	877,647	294,378	0	0	808,628
Redwood City Harbor	1.4	246,339	SF-10, SF-11, SF-DODS, Hamilton, Bair Island, Montezuma	370,133	288,628	562,102	394,382	0	0	124,670	0	593,612	129,859	246,339
Richmond Inner & Outer Harbor	1	376,926	SF-10, SF-11, SF-DODS, Hamilton, Cullinan, Montezuma	438,479	219,946	925,096	151,102	502,200	236,100	467,099	138,277	388,439	302,519	376,926
	Subtotal	1,270,166		1,363,512	1,671,146	1,792,082	833,904	2,458,197	1,266,322	1,469,416	432,655	982,051	432,378	**1,270,166**
Mid-Sized Non-Federal														
Chevron	1	120,866	SF-10, SF-11, SF-DODS, Hamilton, Montezuma	149,954	38,565	105,735	132,751	148,280	150,132	150,981	105,464	103,034	123,763	120,866
Port of Oakland (Berths)	1	98,994	SF-11, SF-DODS, Hamilton, Montezuma	95,476	98,140	142,277	69,157	121,490	141,759	93,927	97,279	70,583	59,853	98,994
	Subtotal	219,860		245,430	136,705	248,012	201,908	269,770	291,891	244,908	202,743	173,617	183,616	**219,860**
Total Maintenance Dredging		**1,490,026**		1,608,942	1,807,851	2,040,094	1,035,812	2,727,967	1,558,213	1,714,324	635,398	1,155,668	615,994	**1,490,026**

Notes:
1.) Volumes, frequency, and disposal sites based off 2008-2017 DMMO annual dredging reports.
2.) Oakland Inner & Outer Harbor is annualized over 8 years due to the -50 Ft. Deepening work taking place in 2008 and 2009.
3.) Redwood City Harbor annualized amount is 351,912 when annualized over 7 years that dredging occurred.
4.) Redwood City Harbor annualized amount does not include dredging performed by USACE dredge Yaquina in 2010.
5.) Richmond Inner & Outer Harbor annualized amount does not include dredging performed by USACE dredge Essayons.

Maintenance Projects Considered	Frequency (years)	Annual Volume (CY)	Beneficial Use Site(s) Only	2017 Total	2016 Total	2015 Total	2014 Total	2013 Total	2012 Total	2011 Total	2010 Total	2009 Total	2008 Total	Annualized over 10 years
FEDERAL														
Oakland Inner & Outer Harbor	1	384,591	Montezuma, Winter Is., Hamilton	0	565,982	197,491	288,420	358,597	727,722	644,141	294,378	0	0	384,591
Redwood City Harbor	1.4	96,637	Hamilton, Bair Island, Montezuma	0	55,746	290,763	0	0	0	0	0	490,001	129,859	96,637
Richmond Inner & Outer Harbor	1	175,301	Hamilton, Cullinan, Montezuma	438,479	219,946	333,337	39,131	0	0	195,399	138,277	388,439	0	175,301
	Subtotal	579,611		438,479	841,674	821,591	327,551	358,597	727,722	839,540	432,655	878,440	129,859	**579,611**
Mid-Sized Non-Federal														
Chevron	1	67,282	Hamilton, Montezuma	109,272	30,852	89,786	106,079	121,590	142,871	0	23,839	48,530	0	67,282
Port of Oakland (Berths)	1	40,381	Hamilton, Montezuma	0	0	142,277	69,157	0	141,759	0	50,615	0	0	40,381
	Subtotal	107,663		109,272	30,852	232,063	175,236	121,590	284,630	0	74,454	48,530	0	**107,663**
Total Maintenance Dredging		**687,274**		547,751	872,526	1,053,654	502,787	480,187	1,012,352	839,540	507,109	926,970	129,859	**687,274**

Notes:
1.) Volumes, frequency, and beneficial use sites based off 2008-2017 DMMO annual dredging reports
2.) Oakland Inner & Outer Harbor is annualized over 8 years due to the -50 Ft. Deepening work taking place in 2008 and 2009.

EDEN LANDING PHASE 2 PROJECT
PROJECTED ANNUAL DREDGE MATERIAL DELIVERY

DMMO Annual Report Summary of Dredged Volumes

Maintenance Projects Considered	Frequency (years)	Annual Volume (CY)	In-Bay & Beneficial Use Site(s)
FEDERAL			
Oakland Inner & Outer Harbor	1	429,304	SF-11, Montezuma, Winter Is., Hamilton
Redwood City Harbor	1.4	231,524	SF-10, SF-11, Hamilton, Bair Island, Montezuma
Richmond Inner & Outer Harbor	1	286,299	SF-10, SF-11, Hamilton, Cullinan, Montezuma
	Subtotal	947,126	
Mid-Sized Non-Federal			
Chevron	1	114,400	SF-10, SF-11, Hamilton, Montezuma
Port of Oakland (Berths)	1	76,288	SF-11, Hamilton, Montezuma
	Subtotal	190,688	
Total Maintenance Dredging		**1,137,815**	

Notes:
1.) Volumes, frequency, and disposal sites based off 2008-2017 DMMO annual dredging reports.
2.) Oakland Inner & Outer Harbor is annualized over 8 years due to the -50 Ft. Deepening work taking place in 2008 and 2009.
3.) Redwood City Harbor annualized amount does not include dredging performed by USACE dredge Yaquina in 2010.
4.) Richmond Inner & Outer Harbor annualized amount does not include dredging performed by USACE dredge Essayons.

EDEN LANDING PHASE 2 PROJECT
DMMO ANNUAL DREDGING VOLUMES (2008-2017)

TOTALS	16.02	MCY
	10	Years

2008

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
USACE, REDWOOD CITY HARBOR (Hamilton)	0	0	0	0	0	0	0	0	0	0	0	129,859	129,859
USACE, RICHMOND INNER HARBOR (SF11)	0	0	0	0	0	0	10,917	0	0	0	0	0	10,917
USACE, RICHMOND OUTER HARBOR (SF10)	0	0	0	0	0	34,992	20,412	0	0	0	0	0	55,404
USACE, RICHMOND OUTER HARBOR (SF11)	0	0	0	0	0	154,549	81,649	0	0	0	0	0	236,198
FEDERAL TOTAL	**0**	**0**	**0**	**0**	**0**	**189,541**	**112,978**	**0**	**0**	**0**	**0**	**129,859**	**432,378**
NON-FEDERAL													
CHEVRON LONG WHARF (SF11)	0	0	0	0	0	0	0	0	0	0	123,763	0	123,763
PORT OF OAKLAND, BERTH Maintenance (SF11)	0	0	0	0	0	0	0	0	0	45,389	14,464	0	59,853
NON-FEDERAL TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**45,389**	**138,227**	**0**	**183,616**
TOTAL	**0**	**0**	**0**	**0**	**0**	**189,541**	**112,978**	**0**	**0**	**45,389**	**138,227**	**129,859**	**615,994**
CY/day	*0*	*0*	*0*	*0*	*0*	*6,231*	*3,714*	*0*	*0*	*1,492*	*4,544*	*4,269*	*4,050*

2009

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
USACE, REDWOOD CITY HARBOR (SF11)	0	0	0	0	0	0	0	0	0	75,111	28,500	0	103,611
USACE, REDWOOD CITY HARBOR (Bair Island)	99,085	0	0	0	0	0	0	0	7,991	42,616	0	0	149,692
USACE, REDWOOD CITY HARBOR (Hamilton)	0	0	0	0	0	0	0	0	0	64,990	275,319	0	340,309
USACE, RICHMOND INNER HARBOR (Hamilton)	0	0	0	0	0	59,660	107,830	91,261	58,587	65,968	5,133	0	388,439
USACE, RICHMOND OUTER HARBOR (SF10; Essayons)	0	0	0	0	0	11,333	0	0	0	0	0	0	11,333
USACE, RICHMOND OUTER HARBOR (SF11; Essayons)	0	0	0	0	0	216,064	0	0	0	0	0	0	216,064
FEDERAL TOTAL	**99,085**	**0**	**0**	**0**	**0**	**287,057**	**107,830**	**91,261**	**66,578**	**248,685**	**308,952**	**0**	**1,209,448**
NON-FEDERAL													
CHEVRON LONG WHARF (Hamilton)	0	0	0	0	0	0	0	0	0	23,305	25,225	0	48,530
CHEVRON LONG WHARF (SFDODS)	0	0	0	0	0	0	0	0	0	0	54,504	0	54,504
PORT OF OAKLAND, BERTH Maintenance (SF11)	0	0	0	0	0	0	0	37,212	33,208	163	0	0	70,583
NON-FEDERAL TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**37,212**	**33,208**	**23,468**	**79,729**	**0**	**173,617**
TOTAL	**99,085**	**0**	**0**	**0**	**0**	**287,057**	**107,830**	**128,473**	**99,786**	**272,153**	**388,681**	**0**	**1,383,065**
CY/day	*3,258*	*0*	*0*	*0*	*0*	*9,437*	*3,545*	*4,224*	*3,281*	*8,947*	*12,779*	*0*	*6,496*

2010

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
USACE, OAKLAND INNER & OUTER HARBOR (Hamilton)	0	0	0	0	0	0	0	0	0	0	0	290,378	290,378
USACE, OAKLAND INNER TURNING BASIN (Winter Isl); Old Ba	0	0	0	0	4,000	0	0	0	0	0	0	0	4,000
USACE, RICHMOND INNER HARBOR (Hamilton)	0	0	0	0	0	0	0	0	0	0	0	138,277	138,277
FEDERAL TOTAL	**0**	**0**	**0**	**0**	**4,000**	**0**	**0**	**0**	**0**	**0**	**0**	**428,655**	**432,655**
NON-FEDERAL													
CHEVRON RICHMOND LONG WHARF (SF11)	0	0	0	0	0	0	0	0	0	0	81,625	0	81,625
CHEVRON RICHMOND LONG WHARF (Hamilton)	0	0	0	0	0	0	0	0	0	0	0	23,839	23,839
PORT OF OAKLAND, BERTH Maintenance (SF11)	0	0	0	0	0	0	0	0	0	46,664	0	0	46,664
PORT OF OAKLAND, BERTH Maintenance (Hamilton)	0	0	0	0	0	0	0	0	0	0	0	50,615	50,615
PORT OF REDWOOD CITY (SF11)	0	0	0	0	0	0	0	0	0	0	25,021	0	25,021
PORT OF REDWOOD CITY (SFDODS)	0	0	0	0	0	0	0	0	0	0	14,216	0	14,216
NON-FEDERAL TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**46,664**	**120,862**	**74,454**	**241,980**
TOTAL	**0**	**0**	**0**	**0**	**4,000**	**0**	**0**	**0**	**0**	**46,664**	**120,862**	**503,109**	**674,635**
CY/day	*0*	*0*	*0*	*0*	*132*	*0*	*0*	*0*	*0*	*1,534*	*3,974*	*16,541*	*5,545*

EDEN LANDING PHASE 2 PROJECT
DMMO ANNUAL DREDGING VOLUMES (2008-2017)

TOTALS	16.02	MCY
	10	Years

2011

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
USACE, OAKLAND INNER & OUTER HARBOR (SF11)	0	0	0	0	0	0	0	0	0	116,753	116,753	0	233,506
USACE, OAKLAND INNER & OUTER HARBOR (Hamilton)	198,040	198,040	198,040	0	0	0	0	0	0	0	0	0	594,120
USACE, OAKLAND INNER & OUTER HARBOR (Montezuma)	0	0	0	0	0	0	0	0	0	0	0	50,021	50,021
USACE, PORT OF REDWOOD CITY (SF11)	0	0	0	0	0	0	0	0	31,168	31,168	31,167	31,167	124,670
USACE, RICHMOND INNER HARBOR (SFDODS)	0	0	0	0	0	0	0	0	67,925	67,925	67,925	67,925	271,700
USACE, RICHMOND INNER HARBOR (Hamilton)	65,133	65,133	65,133	0	0	0	0	0	0	0	0	0	195,399
USACE, RICHMOND OUTER HARBOR (SF11; Essayons)	0	0	0	0	0	0	95,491	95,491	0	0	0	0	190,982
FEDERAL TOTAL	**263,173**	**263,173**	**263,173**	**0**	**0**	**0**	**95,491**	**95,491**	**99,093**	**215,846**	**215,845**	**149,113**	**1,660,398**
NON-FEDERAL													
CHEVRON RICHMOND LONG WHARF (SF10)	0	0	0	0	0	0	0	0	60,392	0	0	0	60,392
CHEVRON RICHMOND LONG WHARF (SF11)	0	0	0	0	0	0	0	0	90,589	0	0	0	90,589
PORT OF OAKLAND, BERTH Maintenance (SF11)	0	0	0	0	0	0	0	93,927	0	0	0	0	93,927
NON-FEDERAL TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**93,927**	**150,981**	**0**	**0**	**0**	**244,908**
TOTAL	**263,173**	**263,173**	**263,173**	**0**	**0**	**0**	**95,491**	**189,418**	**250,074**	**215,846**	**215,845**	**149,113**	**1,905,306**
CY/day	*8,652*	*8,652*	*8,652*	*0*	*0*	*0*	*3,139*	*6,227*	*8,222*	*7,096*	*7,096*	*4,902*	*6,960*

2012

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
USACE, OAKLAND INNER & OUTER HARBOR (Montezuma)	252,358	266,857	203,458	5,049	0	0	0	0	0	0	0	0	727,722
USACE, OAKLAND INNER & OUTER HARBOR (SFDODS)	0	0	0	0	0	0	0	0	0	18,800	113,700	170,000	302,500
USACE, PORT OF REDWOOD CITY (SF11; Yaquina)	0	0	0	0	0	0	0	10,040	0	0	0	0	10,040
USACE, RICHMOND INNER HARBOR (SFDODS)	0	0	0	0	0	0	0	0	0	0	75,600	160,500	236,100
USACE, RICHMOND OUTER HARBOR (SF10; Essayons)	0	0	0	0	0	0	0	75,551	0	0	0	0	75,551
USACE, RICHMOND OUTER HARBOR (SF11; Essayons)	0	0	0	0	0	0	23,683	91,267	0	0	0	0	114,950
FEDERAL TOTAL	**252,358**	**266,857**	**203,458**	**5,049**	**0**	**0**	**23,683**	**176,858**	**0**	**18,800**	**189,300**	**330,500**	**1,466,863**
NON-FEDERAL													
CHEVRON RICHMOND LONG WHARF (SFDODS)	0	0	0	0	0	0	0	0	0	7,261	0	0	7,261
CHEVRON RICHMOND LONG WHARF (Montezuma)	0	0	0	0	0	0	0	0	0	14,128	128,743	0	142,871
PORT OF OAKLAND, BERTH Maintenance (Montezuma)	0	0	0	0	0	0	0	52,921	47,471	41,367	0	0	141,759
NON-FEDERAL TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**52,921**	**47,471**	**62,756**	**128,743**	**0**	**291,891**
TOTAL	**252,358**	**266,857**	**203,458**	**5,049**	**0**	**0**	**23,683**	**229,779**	**47,471**	**81,556**	**318,043**	**330,500**	**1,758,754**
CY/day	*8,297*	*8,773*	*6,689*	*166*	*0*	*0*	*779*	*7,554*	*1,561*	*2,681*	*10,456*	*10,866*	*5,782*

EDEN LANDING PHASE 2 PROJECT
DMMO ANNUAL DREDGING VOLUMES (2008-2017)

TOTALS	16.02	MCY
	10	Years

2013

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
USACE, OAKLAND INNER & OUTER HARBOR (SF-11)	0	0	0	0	0	0	0	0	0	46,200	78,000	0	124,200
USACE, OAKLAND INNER & OUTER HARBOR (Montezuma)	0	0	0	0	0	0	0	0	0	0	131,800	226,797	358,597
USACE, OAKLAND INNER & OUTER HARBOR (SF-DODS)	221,000	214,400	302,500	161,600	239,000	264,000	0	0	0	44,900	25,800	0	1,473,200
USACE, RICHMOND INNER & OUTER HARBOR (SF-10)	0	0	0	0	0	0	0	94,420	141,630	94,420	0	0	330,470
USACE, RICHMOND INNER & OUTER HARBOR (SF-11)	0	0	0	0	0	0	0	49,065	73,600	49,065	0	0	171,730
FEDERAL TOTAL	**221,000**	**214,400**	**302,500**	**161,600**	**239,000**	**264,000**	**0**	**143,485**	**215,230**	**234,585**	**235,600**	**226,797**	**2,458,197**
NON-FEDERAL													
CHEVRON RICHMOND LONG WHARF (Montezuma)	0	0	0	0	0	0	0	0	0	41,988	79,602	0	121,590
CHEVRON RICHMOND LONG WHARF (SF11)	0	0	0	0	0	0	0	0	0	8,377	18,313	0	26,690
PORT OF OAKLAND, BERTH Maintenance (SDODS)	0	0	0	0	0	0	0	0	0	121,490	0	0	121,490
NON-FEDERAL TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**171,855**	**97,915**	**0**	**269,770**
TOTAL	**221,000**	**214,400**	**302,500**	**161,600**	**239,000**	**264,000**	**0**	**143,485**	**215,230**	**406,440**	**333,515**	**226,797**	**2,727,967**
CY/day	*7,266*	*7,049*	*9,945*	*5,313*	*7,858*	*8,679*	*0*	*4,717*	*7,076*	*13,362*	*10,965*	*7,456*	*8,153*

2014

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
USACE, OAKLAND INNER & OUTER HARBOR (Montezuma)	0	0	0	0	0	0	0	84,930	33,525	17,903	33,824	118,238	288,420
USACE, REDWOOD CITY HARBOR (SF10)	0	0	0	0	0	0	0	0	0	0	67,143	43,529	110,672
USACE, REDWOOD CITY HARBOR (SF11)	0	0	0	0	0	0	0	0	0	30,410	253,300	0	283,710
USACE, RICHMOND OUTER (SF11; Essayons)	0	0	0	0	0	10,449	163,413	0	0	0	0	0	173,862
USACE, RICHMOND OUTER (SF10; Essayons)	0	0	0	0	0	0	4,144	0	0	0	0	0	4,144
USACE, RICHMOND OUTER (SF-10)	0	0	0	0	0	0	0	0	0	0	50,212	22,824	73,036
USACE, RICHMOND INNER (SFDODS)	0	0	0	0	0	0	0	0	0	0	0	38,935	38,935
USACE, RICHMOND INNER (Montezuma)	0	0	0	0	0	0	0	0	0	0	0	39,131	39,131
FEDERAL TOTAL	**0**	**0**	**0**	**0**	**0**	**10,449**	**167,557**	**84,930**	**33,525**	**48,313**	**404,479**	**262,657**	**1,011,910**
NON-FEDERAL													
CHEVRON RICHMOND LONG WHARF (SF11)	0	0	0	0	0	0	0	0	0	26,672	0	0	26,672
CHEVRON RICHMOND LONG WHARF (Montezuma)	0	0	0	0	0	0	0	0	0	86,100	19,979	0	106,079
PORT OF OAKLAND, BERTH Maintenance (Montezuma)	0	0	0	0	0	0	0	0	69,157	0	0	0	69,157
PORT OF REDWOOD CITY, F-DOCK (SFDODS)	0	0	0	0	0	0	0	0	0	0	3,615	0	3,615
NON-FEDERAL TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**69,157**	**112,772**	**23,594**	**0**	**205,523**
TOTAL	**0**	**0**	**0**	**0**	**0**	**10,449**	**167,557**	**84,930**	**102,682**	**161,085**	**428,073**	**262,657**	**1,217,433**
CY/day	*0*	*0*	*0*	*0*	*0*	*344*	*5,509*	*2,792*	*3,376*	*5,296*	*14,074*	*8,635*	*5,718*

EDEN LANDING PHASE 2 PROJECT
DMMO ANNUAL DREDGING VOLUMES (2008-2017)

TOTALS	16.02	MCY
	10	Years

2015

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
USACE, OAKLAND INNER & OUTER HARBOR (Montezuma)	101,474	0	0	0	0	0	0	0	0	0	33,066	62,951	197,491
USACE, OAKLAND INNER & OUTER HARBOR (SFDODS)	0	0	0	0	0	0	0	0	0	56,736	50,657	0	107,393
USACE, REDWOOD CITY HARBOR (SF11)	0	0	0	0	0	191,682	79,657	0	0	0	0	0	271,339
USACE, REDWOOD CITY HARBOR (Montezuma)	0	0	0	0	0	0	0	0	0	0	0	290,763	290,763
USACE, RICHMOND INNER HARBOR (Montezuma)	165,436	0	0	0	0	0	0	0	0	0	97,101	70,800	333,337
USACE, RICHMOND INNER HARBOR (SFDODS)	37,221	85,901	44,665	0	0	0	0	0	0	17,700	174,050	0	359,537
USACE, RICHMOND OUTER HARBOR (SF10)	0	0	0	0	0	0	0	0	0	232,222	0	0	232,222
FEDERAL TOTAL	**304,131**	**85,901**	**44,665**	**0**	**0**	**191,682**	**79,657**	**0**	**0**	**306,658**	**354,874**	**424,514**	**1,792,082**
NON-FEDERAL													
CHEVRON RICHMOND LONG WHARF (SF10)	0	0	0	0	0	0	0	0	13,053	0	0	0	13,053
CHEVRON RICHMOND LONG WHARF (SFDODS)	0	0	0	0	0	0	0	0	0	2,896	0	0	2,896
CHEVRON RICHMOND LONG WHARF (Montezuma)	0	0	0	0	0	0	0	0	70,706	18,573	507	0	89,786
PORT OF OAKLAND, BERTH Maintenance (Montezuma)	0	0	0	0	0	0	0	45,074	0	95,416	1,787	0	142,277
PORT OF REDWOOD CITY, Wharves (SF11)	0	0	0	0	0	0	0	0	0	0	9,498	0	9,498
PORT OF REDWOOD CITY, Wharves (SFDODS)	0	0	0	0	0	0	0	0	0	0	34,705	0	34,705
NON-FEDERAL TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**45,074**	**83,759**	**116,885**	**46,497**	**0**	**292,215**
TOTAL	**304,131**	**85,901**	**44,665**	**0**	**0**	**191,682**	**79,657**	**45,074**	**83,759**	**423,543**	**401,371**	**424,514**	**2,084,297**
CY/day	*9,999*	*2,824*	*1,468*	*0*	*0*	*6,302*	*2,619*	*1,482*	*2,754*	*13,925*	*13,196*	*13,957*	*6,852*

2016

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
USACE, OAKLAND INNER & OUTER HARBOR (Montezuma)	224,507	22,240	85,503	133,359	0	0	0	0	0	0	0	38,214	503,823
USACE, OAKLAND INNER & OUTER HARBOR (SFDODS)	0	46,181	19,624	7,212	86,491	80,676	0	81,400	59,200	94,160	121,646	0	596,590
USACE, OAKLAND INNER & OUTER HARBOR (Winter Island)	0	1,697	60,462	0	0	0	0	0	0	0	0	0	62,159
USACE, REDWOOD CITY HARBOR (SF11)	0	0	0	0	0	0	0	0	0	15,533	147,562	42,261	205,356
USACE, REDWOOD CITY HARBOR (SFDODS)	0	0	0	0	0	0	0	0	0	25,200	2,326	0	27,526
USACE, REDWOOD CITY HARBOR (Montezuma)	0	0	0	0	0	0	0	0	0	0	36,604	19,142	55,746
USACE, RICHMOND INNER HARBOR (Cullinan)	0	0	0	0	0	0	0	0	0	50,511	153,011	16,424	219,946
USACE, RICHMOND OUTER HARBOR (SF11; Essayons)	0	0	0	0	0	156,325	0	0	0	65,878	0	0	222,203
USACE, RICHMOND OUTER HARBOR (SF10; Essayons)	0	0	0	0	0	0	0	0	0	12,291	0	0	12,291
FEDERAL TOTAL	**224,507**	**70,118**	**165,589**	**140,571**	**86,491**	**237,001**	**0**	**81,400**	**59,200**	**263,573**	**461,149**	**116,041**	**1,905,640**
NON-FEDERAL													
CHEVRON RICHMOND LONG WHARF (SF10)	0	0	0	0	0	0	0	0	6,622	0	1,091	0	7,713
CHEVRON RICHMOND LONG WHARF (Montezuma)	0	0	0	0	0	0	0	0	0	0	30,852	0	30,852
PORT OF OAKLAND, BERTH Maintenance (SF11)	0	0	0	0	0	0	0	0	75,745	0	12,301	0	88,046
PORT OF OAKLAND, BERTH Maintenance (SFDODS)	0	0	0	0	0	0	0	0	0	0	10,094	0	10,094
PORT OF REDWOOD CITY, Wharves (Montezuma (the rest of E	810	0	0	0	0	0	0	0	0	0	0	0	810
NON-FEDERAL TOTAL	**810**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**82,367**	**0**	**54,338**	**0**	**137,515**
TOTAL	**225,317**	**70,118**	**165,589**	**140,571**	**86,491**	**237,001**	**0**	**81,400**	**141,567**	**263,573**	**515,487**	**116,041**	**2,043,155**
CY/day	*7,408*	*2,305*	*5,444*	*4,622*	*2,844*	*7,792*	*0*	*2,676*	*4,654*	*8,665*	*16,948*	*3,815*	*6,107*

EDEN LANDING PHASE 2 PROJECT
DMMO ANNUAL DREDGING VOLUMES (2008-2017)

TOTALS	16.02	MCY
	10	Years

2017

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
USACE, OAKLAND INNER AND OUTER HARBOR (SFDODS)	0	0	0	0	0	0	0	68,800	163,000	107,800	119,800	95,500	554,900
USACE, REDWOOD CITY HARBOR (SF11)	0	0	0	0	0	0	0	0	249,507	0	0	0	249,507
USACE, REDWOOD CITY HARBOR (SFDODS)	0	0	0	0	0	0	0	112,099	8,527	0	0	0	120,626
USACE, RICHMOND INNER HARBOR (Cullinan)	0	0	0	0	0	0	0	0	47,738	226,312	164,429	0	438,479
FEDERAL TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**180,899**	**468,772**	**334,112**	**284,229**	**95,500**	**1,363,512**
NON-FEDERAL													
CHEVRON RICHMOND LONG WHARF (SF10)	0	0	0	0	0	12,579	28,103	0	0	0	0	0	40,682
CHEVRON RICHMOND LONG WHARF (Montezuma)	0	0	0	0	0	58,792	50,480	0	0	0	0	0	109,272
PORT OF OAKLAND, Berth Maintenance (SFDODS)	0	0	0	0	0	0	0	25,374	0	58,928	11,174	0	95,476
NON-FEDERAL TOTAL	**0**	**0**	**0**	**0**	**0**	**71,371**	**78,583**	**25,374**	**0**	**58,928**	**11,174**	**0**	**245,430**
TOTAL	**0**	**0**	**0**	**0**	**0**	**71,371**	**78,583**	**206,273**	**468,772**	**393,040**	**295,403**	**95,500**	**1,608,942**
CY/day	*0*	*0*	*0*	*0*	*0*	*2,346*	*2,584*	*6,782*	*15,412*	*12,922*	*9,712*	*3,140*	*7,557*

EDEN LANDING PHASE 2 PROJECT
DMMO ANNUAL DREDGING VOLUMES (2008-2017)

TOTALS	16.02	MCY
	10	Years

Summary

USACE, REDWOOD CITY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
2008 Hamilton	0	0	0	0	0	0	0	0	0	0	0	129,859	129,859
2009 SF-11	0	0	0	0	0	0	0	0		75,111	28,500	0	103,611
2009 Bair Island	99,085	0	0	0	0	0	0	0	7,991	42,616	0	0	149,692
2009 Hamilton	0	0	0	0	0	0	0	0	0	64,990	275,319	0	340,309
2011 SF-11	0	0	0	0	0	0	0	0	31,168	31,168	31,167	31,167	124,670
2012 SF-11 (Yaquina)	0	0	0	0	0	0	0	10,040	0	0	0	0	10,040
2014 SF-10	0	0	0	0	0	0	0	0	0	0	67,143	43,529	110,672
2014 SF-11	0	0	0	0	0	0	0	0	0	30,410	253,300	0	283,710
2015 SF-11	0	0	0	0	0	191,682	79,657	0	0	0	0	0	271,339
2015 Montezuma	0	0	0	0	0	0	0	0	0	0	0	290,763	290,763
2016 SF-11	0	0	0	0	0	0	0	0	0	15,533	147,562	42,261	205,356
2016 SF-DODS	0	0	0	0	0	0	0	0	0	25,200	2,326	0	27,526
2016 Montezuma	0	0	0	0	0	0	0	0	0	0	36,604	19,142	55,746
2017 SF-11	0	0	0	0	0	0	0	0	249,507	0	0	0	249,507
2017 SF-DODS	0	0	0	0	0	0	0	112,099	8,527	0	0	0	120,626
Totals	*99,085*	*0*	*0*	*0*	*0*	*191,682*	*79,657*	*112,099*	*297,193*	*285,028*	*841,921*	*556,721*	*2,463,386*
Avg CY/Mo when dredged	*99,085*	*0*	*0*	*0*	*0*	*191,682*	*79,657*	*112,099*	*99,064*	*57,006*	*210,480*	*92,787*	*117,733*
Avg CY/Day when dredged	*3,258*	*0*	*0*	*0*	*0*	*6,302*	*2,619*	*3,685*	*3,257*	*1,874*	*6,920*	*3,051*	
Beneficial Reuse Avg CY/Mo when dredged	*99,085*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*7,991*	*53,803*	*155,962*	*150,596*	*467,437*
Inbay (SF-10, SF-11) Avg CY/Mo when dredged	*0*	*0*	*0*	*0*	*0*	*191,682*	*79,657*	*0*	*249,507*	*40,351*	*124,126*	*42,895*	*728,219*
SF-DODS CY/Mo when dredged	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*112,099*	*8,527*	*25,200*	*2,326*	*0*	*148,152*
Total	99,085	0	0	0	0	191,682	79,657	112,099	266,025	119,354	282,414	193,491	**1,343,807**

USCAE, OAKLAND INNER & OUTER HARBOR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
2010 Hamilton	0	0	0	0	0	0	0	0	0	0	0	290,378	290,378
2010 Winter Island	0	0	0	0	4,000	0	0	0	0	0	0	0	4,000
2011 SF-11	0	0	0	0	0	0	0	0	0	116,753	116,753	0	233,506
2011 Hamilton	198,040	198,040	198,040	0	0	0	0	0	0	0	0	0	594,120
2011 Montezuma	0	0	0	0	0	0	0	0	0	0	0	50,021	50,021
2012 Montezuma	252,358	266,857	203,458	5,049	0	0	0	0	0	0	0	0	727,722
2012 SF-DODS	0	0	0	0	0	0	0	0	0	18,800	113,700	170,000	302,500
2013 SF-11	0	0	0	0	0	0	0	0	0	46,200	78,000	0	124,200
2013 Montezuma	0	0	0	0	0	0	0	0	0	0	131,800	226,797	358,597
2013 SF-DODS	221,000	214,400	302,500	161,600	239,000	264,000	0	0	0	44,900	25,800	0	1,473,200
2014 Montezuma	0	0	0	0	0	0	0	84,930	33,525	17,903	33,824	118,238	288,420
2015 Montezuma	101,474	0	0	0	0	0	0	0	0	0	33,066	62,951	197,491
2015 SF-DODS	0	0	0	0	0	0	0	0	0	56,736	50,657	0	107,393
2016 Montezuma	224,507	22,240	85,503	133,359	0	0	0	0	0	0	0	38,214	503,823
2016 SF-DODS	0	46,181	19,624	7,212	86,491	80,676	0	81,400	59,200	94,160	121,646	0	596,590
2016 Winter Island	0	1,697	60,462	0	0	0	0	0	0	0	0	0	62,159
2017 SF-DODS	0	0	0	0	0	0	0	68,800	163,000	107,800	119,800	95,500	554,900
Totals	*997,379*	*749,415*	*869,587*	*307,220*	*329,491*	*344,676*	*0*	*235,130*	*255,725*	*503,252*	*825,046*	*1,052,099*	*6,469,020*
Avg CY/Mo when dredged	*199,476*	*187,354*	*217,397*	*102,407*	*164,746*	*172,338*	*0*	*78,377*	*85,242*	*71,893*	*117,864*	*131,512*	*138,964*
Avg CY/Day when dredged	*6,558*	*6,160*	*7,147*	*3,367*	*5,416*	*5,666*	*0*	*2,577*	*2,802*	*2,364*	*3,875*	*4,324*	
Beneficial Reuse Avg CY/Mo when dredged	*194,095*	*122,209*	*136,866*	*69,204*	*4,000*	*0*	*0*	*84,930*	*33,525*	*17,903*	*66,230*	*131,100*	*860,061*
Inbay (SF-10, SF-11) Avg CY/Mo when dredged	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*81,477*	*97,377*	*0*	*178,853*
SF-DODS CY/Mo when dredged	*221,000*	*130,291*	*161,062*	*84,406*	*162,746*	*172,338*	*0*	*75,100*	*111,100*	*64,479*	*86,321*	*132,750*	*1,401,592*
Total	415,095	252,499	297,928	153,610	166,746	172,338	0	160,030	144,625	163,859	249,927	263,850	**2,440,506**

EDEN LANDING PHASE 2 PROJECT
DMMO ANNUAL DREDGING VOLUMES (2008-2017)

TOTALS	16.02	MCY
	10	Years

Summary

USCAE, RICHMOND INNER & OUTER HARBOR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
2008 SF-10	0	0	0	0	0	34,992	20,412	0	0	0	0	0	55,404
2008 SF-11	0	0	0	0	0	154,549	92,566	0	0	0	0	0	247,115
2009 Hamilton	0	0	0	0	0	59,660	107,830	91,261	58,587	65,968	5,133	0	388,439
2009 SF-10 (Essayons)	0	0	0	0	0	11,333	0	0	0	0	0	0	11,333
2009 SF-11 (Essayons)	0	0	0	0	0	216,064	0	0	0	0	0	0	216,064
2010 Hamilton	0	0	0	0	0	0	0	0	0	0	0	138,277	138,277
2011 SF-DODS	0	0	0	0	0	0	0	0	67,925	67,925	67,925	67,925	271,700
2011 Hamilton	65,133	65,133	65,133	0	0	0	0	0	0	0	0	0	195,399
2011 SF-11 (Essayons)	0	0	0	0	0	0	95,491	95,491	0	0	0	0	190,982
2012 SF-DODS	0	0	0	0	0	0	0	0	0	0	75,600	160,500	236,100
2012 SF-10 (Essayons)	0	0	0	0	0	0	0	75,551	0	0	0	0	75,551
2012 SF-11 (Essayons)	0	0	0	0	0	0	23,683	91,267	0	0	0	0	114,950
2013 SF-10	0	0	0	0	0	0	0	94,420	141,630	94,420	0	0	330,470
2013 SF-11	0	0	0	0	0	0	0	49,065	73,600	49,065	0	0	171,730
2014 SF-11 (Essayons)	0	0	0	0	0	10,449	163,413	0	0	0	0	0	173,862
2014 SF-10 (Essayons)	0	0	0	0	0	0	4,144	0	0	0	0	0	4,144
2014 SF-10	0	0	0	0	0	0	0	0	0	0	50,212	22,824	73,036
2014 SF-DODS	0	0	0	0	0	0	0	0	0	0	0	38,935	38,935
2014 Montezuma	0	0	0	0	0	0	0	0	0	0	0	39,131	39,131
2015 Montezuma	165,436	0	0	0	0	0	0	0	0	0	97,101	70,800	333,337
2015 SF-DODS	37,221	85,901	44,665	0	0	0	0	0	0	17,700	174,050	0	359,537
2015 SF-10	0	0	0	0	0	0	0	0	0	232,222	0	0	232,222
2016 Cullinan	0	0	0	0	0	0	0	0	0	50,511	153,011	16,424	219,946
2016 SF-11 (Essayons)	0	0	0	0	0	156,325	0	0	0	65,878	0	0	222,203
2016 SF-10 (Essayons)	0	0	0	0	0	0	0	0	0	12,291	0	0	12,291
2017 Cullinan	0	0	0	0	0	0	0	0	47,738	226,312	164,429	0	438,479
Totals	*267,790*	*151,034*	*109,798*	*0*	*0*	*249,201*	*220,808*	*234,746*	*389,480*	*804,123*	*787,461*	*554,816*	*3,769,257*
Avg CY/Mo when dredged	*133,895*	*75,517*	*54,899*	*0*	*0*	*124,601*	*110,404*	*117,373*	*97,370*	*134,021*	*112,494*	*92,469*	*105,304*
Avg CY/Day when dredged	*4,402*	*2,483*	*1,805*	*0*	*0*	*4,096*	*3,630*	*3,859*	*3,201*	*4,406*	*3,698*	*3,040*	
Beneficial Reuse Avg CY/Mo when dredged	*115,285*	*65,133*	*65,133*	*0*	*0*	*59,660*	*107,830*	*91,261*	*53,163*	*146,140*	*84,781*	*66,158*	*854,543*
Inbay (SF-10, SF-11) Avg CY/Mo when dredged	*0*	*0*	*0*	*0*	*0*	*94,771*	*56,489*	*71,743*	*107,615*	*125,236*	*50,212*	*22,824*	*528,889*
SF-DODS CY/Mo when dredged	*37,221*	*85,901*	*44,665*	*0*	*0*	*0*	*0*	*0*	*67,925*	*42,813*	*105,858*	*89,120*	*473,503*
Total	152,506	151,034	109,798	0	0	154,431	164,319	163,004	228,703	314,188	240,851	178,102	**1,856,935**

EDEN LANDING PHASE 2 PROJECT
DMMO ANNUAL DREDGING VOLUMES (2008-2017)

TOTALS	16.02	MCY
	10	Years

Summary

CHEVRON LONG WHARF	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
2008 SF-11	0	0	0	0	0	0	0	0	0	0	123,763	0	123,763
2009 Hamilton	0	0	0	0	0	0	0	0	0	23,305	25,225	0	48,530
2009 SF-DODS	0	0	0	0	0	0	0	0	0	0	54,504	0	54,504
2010 SF-11	0	0	0	0	0	0	0	0	0	0	81,625	0	81,625
2010 Hamilton	0	0	0	0	0	0	0	0	0	0	0	23,839	23,839
2011 SF-10	0	0	0	0	0	0	0	0	60,392	0	0	0	60,392
2011 SF-11	0	0	0	0	0	0	0	0	90,589	0	0	0	90,589
2012 SF-DODS	0	0	0	0	0	0	0	0	0	7,261	0	0	7,261
2012 Montezuma	0	0	0	0	0	0	0	0	0	14,128	128,743	0	142,871
2013 Montezuma	0	0	0	0	0	0	0	0	0	41,988	79,602	0	121,590
2013 SF-11	0	0	0	0	0	0	0	0	0	8,377	18,313	0	26,690
2014 SF-11	0	0	0	0	0	0	0	0	0	26,672	0	0	26,672
2014 Montezuma	0	0	0	0	0	0	0	0	0	86,100	19,979	0	106,079
2015 SF-10	0	0	0	0	0	0	0	0	13,053	0	0	0	13,053
2015 SF-DODS	0	0	0	0	0	0	0	0	0	2,896	0	0	2,896
2015 Montezuma	0	0	0	0	0	0	0	0	70,706	18,573	507	0	89,786
2016 SF-10	0	0	0	0	0	0	0	0	6,622	0	1,091	0	7,713
2016 Montezuma	0	0	0	0	0	0	0	0	0	0	30,852	0	30,852
2017 SF-10	0	0	0	0	0	12,579	28,103	0	0	0	0	0	40,682
2017 Montezuma	0	0	0	0	0	58,792	50,480	0	0	0	0	0	109,272
Totals	*0*	*0*	*0*	*0*	*0*	*71,371*	*78,583*	*0*	*241,362*	*229,300*	*564,204*	*23,839*	*1,208,659*
Avg CY/Mo when dredged	*0*	*0*	*0*	*0*	*0*	*71,371*	*78,583*	*0*	*80,454*	*45,860*	*70,526*	*23,839*	*61,772*
Avg CY/Day when dredged	*0*	*0*	*0*	*0*	*0*	*2,346*	*2,584*	*0*	*2,645*	*1,508*	*2,319*	*784*	
Beneficial Reuse Avg CY/Mo when dredged	*0*	*0*	*0*	*0*	*0*	*58,792*	*50,480*	*0*	*70,706*	*36,819*	*47,485*	*23,839*	*288,120*
Inbay (SF-10, SF-11) Avg CY/Mo when dredged	*0*	*0*	*0*	*0*	*0*	*12,579*	*28,103*	*0*	*42,664*	*17,525*	*56,198*	*0*	*157,069*
SF-DODS CY/Mo when dredged	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*5,079*	*54,504*	*0*	*59,583*
Total	0	0	0	0	0	71,371	78,583	0	113,370	59,422	158,187	23,839	**504,771**

PORT OF OAKLAND BERTHS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
2008 SF-11	0	0	0	0	0	0	0	0	0	45,389	14,464	0	59,853
2009 SF-11	0	0	0	0	0	0	0	37,212	33,208	163	0	0	70,583
2010 SF-11	0	0	0	0	0	0	0	0	0	46,664	0	0	46,664
2010 Hamilton	0	0	0	0	0	0	0	0	0	0	0	50,615	50,615
2011 SF-11	0	0	0	0	0	0	0	93,927	0	0	0	0	93,927
2012 Montezuma	0	0	0	0	0	0	0	52,921	47,471	41,367	0	0	141,759
2013 SF-DODS	0	0	0	0	0	0	0	0	0	121,490	0	0	121,490
2014 Montezuma	0	0	0	0	0	0	0	0	69,157	0	0	0	69,157
2015 Montezuma	0	0	0	0	0	0	0	45,074	0	95,416	1,787	0	142,277
2016 SF-11	0	0	0	0	0	0	0	0	75,745	0	12,301	0	88,046
2016 SF-DODS	0	0	0	0	0	0	0	0	0	0	10,094	0	10,094
2017 SF-DODS	0	0	0	0	0	0	0	25,374	0	58,928	11,174	0	95,476
Totals	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*254,508*	*225,581*	*409,417*	*49,820*	*50,615*	*989,941*
Avg CY/Mo when dredged	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*75,194*	*81,883*	*6,228*	*50,615*	*53,480*
Avg CY/Day when dredged	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*2,472*	*2,692*	*205*	*1,664*	
Beneficial Reuse Avg CY/Mo when dredged	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*48,998*	*58,314*	*68,392*	*1,787*	*50,615*	*228,105*
Inbay (SF-10, SF-11) Avg CY/Mo when dredged	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*65,570*	*54,477*	*30,739*	*13,383*	*0*	*164,167*
SF-DODS CY/Mo when dredged	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*25,374*	*0*	*90,209*	*10,634*	*0*	*126,217*
Total	0	0	0	0	0	0	0	139,941	112,791	189,339	25,804	50,615	**518,489**

ATTACHMENT B

DREDGING PROJECT PRODUCTION ESTIMATES

MOBIL & DEMOB COST:

Oakland Outer/Inner Harbor - Eden Landing

CHECKLIST FOR INPUT DATA.

BID QUANTITY	429,300	C.Y.
UNIT COST...	$11.98	PER C.Y.
EXCAV. COST.	$5,143,014	
TIME.....	2.41	MONTHS

PG 1 OF 9: PROJECT TITLES

PROJECT -	Oakland Outer/Inner Harbor - Eden La
LOCATION -	Oakland, CA
INVIT # -	Planning Estimate
DATE OF EST. -	September 17, 2019
EST. BY -	J. Fink
MOB. BID ITEM # -	1
EXCAV. BID ITEM # -	2

PG 1a OF 9: LOCAL AREA FACTORS

PRESENT YEAR -	2019	
ECONOMIC INDEX -	9053	
LAF -	1.000	
INTEREST RATE -	2.625%	/yr
TIME PERIOD -	Jul.1 - Dec. 31, 2019	
PIPELINE AVAILABILITY -	n/a	mos/yr
BUCKET AVAILABILITY -	6.16438356	mos/yr
HOPPER AVAILABILITY -	n/a	mos/yr
FUEL PRICE -	$3.66	/gal

PG 2 OF 9: TYPE OF EST & INDIRECT COSTS

TYPE OF EST. -	Planning Estimate
CONTRACTOR'S O.H. -	8.0%
CONTRACTOR'S PROFIT -	10.0%
CONTRACTOR'S BOND -	1.5%

PG 3 OF 9: EXCAVATION QTY'S

DREDGING AREA -	3,863,700	sf
REQ'D EXCAVATION -	429,300	cyds
PAY OVERDEPTH -	0	cyds
CONTRACT AMOUNT -	429,300	cyds
NOT DREDGED -	0	cyds
NET PAY -	429,300	cyds
NONPAY YARDAGE -	0	cyds
GROSS YARDAGE -	429,300	cyds
NONPAY HEIGHT -	0.0	ft overdig
TOTAL BANK HEIGHT -	3.0	ft

PG 4 OF 9: EXCAVATION PRODUCTION WORKSHEET

DREDGE SELECTED -	26 CY CLAMSHELL
TYPE OF MATERIAL -	MUD
BUCKET SIZE -	26
BUCKET FILL FACTOR -	1.00
OPTIMUM BANK -	6
BANK FACTOR -	0.50

PG 5 OF 9: EXCAVATION PRODUCTION WORKSHEET

BUCKET CYCLE TIME -	60	Seconds
OTHER FACTOR -	0.95	Weather
CLEANUP -	20%	More Time
TIME EFFICIENCY -	65.0%	of EWT

PG 6 OF 9: HAULING PRODUCTION WORKSHEET

TUG DESCRIPTION -	4000	HP Diesel--Twin Screw
PREPARE SCOW TOW -	20	min
HAUL DIST -	23.7	mi
SPEED TO D/A -	5	mph
SPEED FROM D/A -	7	mph
DUMP OR PUMPOUT -	178.287928	min
DISENGAGE TOW -	15	min
TOW EFFICIENCY -	95	%
SCOW DESCRIPTION -	4000	CY Split Hull Scow
USEABLE VOLUME -	90	%
% SOLIDS -	83.32	%

PG 7 OF 9: EQUIPMENT MATCHING

# OF PIECES:	Used
DREDGES -	1
SCOWS PER DREDGE -	1
TOWING VESSELS -	1
SCOWS PER TOW -	1
ADDITIONAL SCOWS -	0
TOT SCOWS ON JOB -	2

PG 8 OF 9: SPECIAL LABOR & EQUIPMENT

QUARTERS ON DREDGE? -	NO
SURVEY BOAT? -	YES
CREW BOAT? -	NO

PG 9 OF 9: OTHER ADJUSTMENTS

SPECIAL COST/MO (1ST) -	$0		$0
SP COST/MO (2ND-14TH) -	$0	From Sheet D\4	
SPECIAL COST LS (1ST) -	$0		$0
SP COST LS (2ND-14TH) -	$0	From Sheet E	

PRODUCTION -	615	gross cy per hour
OPERATING TIME -	290	hours per month
GROSS PRODUCTION -	178,358	cy per month
PAY PRODUCTION -	178,133	pay cy per month

MOBIL & DEMOB COST:

Redwood City Harbor - Eden Landing

CHECKLIST FOR INPUT DATA.

BID QUANTITY	231,500	C.Y.
UNIT COST...	$7.53	PER C.Y.
EXCAV. COST.	$1,743,195	
TIME.....	1.02	MONTHS

PG 1 OF 9: PROJECT TITLES

PROJECT -	Redwood City Harbor - Eden Landing
LOCATION -	Redwood City, CA
INVIT # -	Planning Estimate
DATE OF EST. -	September 17, 2019
EST. BY -	J. Fink
MOB. BID ITEM # -	1
EXCAV. BID ITEM # -	2

PG 1a OF 9: LOCAL AREA FACTORS

PRESENT YEAR -	2019	
ECONOMIC INDEX -	8949	
LAF -	1.000	
INTEREST RATE -	2.625%	/yr
TIME PERIOD -	Jul.1 - Dec. 31, 2019	
PIPELINE AVAILABILITY -	n/a	mos/yr
BUCKET AVAILABILITY -	6.16438356	mos/yr
HOPPER AVAILABILITY -	n/a	mos/yr
FUEL PRICE -	$3.66	/gal

PG 2 OF 9: TYPE OF EST & INDIRECT COSTS

TYPE OF EST. -	Planning Estimate
CONTRACTOR'S O.H. -	8.0%
CONTRACTOR'S PROFIT -	10.0%
CONTRACTOR'S BOND -	1.5%

PG 3 OF 9: EXCAVATION QTY'S

DREDGING AREA -	3,125,250	sf
REQ'D EXCAVATION -	231,500	cyds
PAY OVERDEPTH -	0	cyds
CONTRACT AMOUNT -	231,500	cyds
NOT DREDGED -	0	cyds
NET PAY -	231,500	cyds
NONPAY YARDAGE -	0	cyds
GROSS YARDAGE -	231,500	cyds
NONPAY HEIGHT -	0.0	ft overdig
TOTAL BANK HEIGHT -	2.0	ft

PG 4 OF 9: EXCAVATION PRODUCTION WORKSHEET

DREDGE SELECTED -	21 CY CLAMSHELL
TYPE OF MATERIAL -	MUD
BUCKET SIZE -	21
BUCKET FILL FACTOR -	1.00
OPTIMUM BANK -	5
BANK FACTOR -	0.40

PG 5 OF 9: EXCAVATION PRODUCTION WORKSHEET

BUCKET CYCLE TIME -	50	Seconds
OTHER FACTOR -	0.95	Weather
CLEANUP -	20%	More Time
TIME EFFICIENCY -	65.0%	of EWT

PG 6 OF 9: HAULING PRODUCTION WORKSHEET

TUG DESCRIPTION -	3000	HP Diesel--Twin Screw
PREPARE SCOW TOW -	20	min
HAUL DIST -	3.4	mi
SPEED TO D/A -	5	mph
SPEED FROM D/A -	5	mph
DUMP OR PUMPOUT -	178.287928	min
DISENGAGE TOW -	15	min
TOW EFFICIENCY -	95	%
SCOW DESCRIPTION -	4000	CY Split Hull Scow
USEABLE VOLUME -	90	%
% SOLIDS -	83.32	%

PG 7 OF 9: EQUIPMENT MATCHING

# OF PIECES:	Used
DREDGES -	1
SCOWS PER DREDGE -	1
TOWING VESSELS -	1
SCOWS PER TOW -	1
ADDITIONAL SCOWS -	0
TOT SCOWS ON JOB -	2

PG 8 OF 9: SPECIAL LABOR & EQUIPMENT

QUARTERS ON DREDGE? -	NO
SURVEY BOAT? -	YES
CREW BOAT? -	NO

PG 9 OF 9: OTHER ADJUSTMENTS

SPECIAL COST/MO (1ST) -	$0		$0
SP COST/MO (2ND-14TH) -	$0	From Sheet D\4	
SPECIAL COST LS (1ST) -	$0		$0
SP COST LS (2ND-14TH) -	$0	From Sheet E	

PRODUCTION -	477	gross cy per hour
OPERATING TIME -	475	hours per month
GROSS PRODUCTION -	226,575	cy per month
PAY PRODUCTION -	226,575	pay cy per month

MOBIL & DEMOB COST:

Richmond Outer/Inner Harbor - Eden Landing

CHECKLIST FOR INPUT DATA.

BID QUANTITY	286,300	C.Y.
UNIT COST...	$12.54	PER C.Y.
EXCAV. COST.	$3,590,202	
TIME.....	2.16	MONTHS

PG 1 OF 9: PROJECT TITLES

PROJECT -	Richmond Outer/Inner Harbor - Eden L
LOCATION -	Richmond, CA
INVIT # -	Planning Estimate
DATE OF EST. -	September 17, 2019
EST. BY -	J. Fink
MOB. BID ITEM # -	1
EXCAV. BID ITEM # -	2

PG 1a OF 9: LOCAL AREA FACTORS

PRESENT YEAR -	2019	
ECONOMIC INDEX -	8949	
LAF -	1.000	
INTEREST RATE -	2.625%	/yr
TIME PERIOD -	Jul.1 - Dec. 31, 2019	
PIPELINE AVAILABILITY -	n/a	mos/yr
BUCKET AVAILABILITY -	6.16438356	mos/yr
HOPPER AVAILABILITY -	n/a	mos/yr
FUEL PRICE -	$3.66	/gal

PG 2 OF 9: TYPE OF EST & INDIRECT COSTS

TYPE OF EST. -	Planning Estimate
CONTRACTOR'S O.H. -	8.0%
CONTRACTOR'S PROFIT -	10.0%
CONTRACTOR'S BOND -	1.5%

PG 3 OF 9: EXCAVATION QTY'S

DREDGING AREA -	2,576,700	sf
REQ'D EXCAVATION -	286,300	cyds
PAY OVERDEPTH -	0	cyds
CONTRACT AMOUNT -	286,300	cyds
NOT DREDGED -	0	cyds
NET PAY -	286,300	cyds
NONPAY YARDAGE -	0	cyds
GROSS YARDAGE -	286,300	cyds
NONPAY HEIGHT -	0.0	ft overdig
TOTAL BANK HEIGHT -	3.0	ft

PG 4 OF 9: EXCAVATION PRODUCTION WORKSHEET

DREDGE SELECTED -	21 CY CLAMSHELL
TYPE OF MATERIAL -	MUD
BUCKET SIZE -	21
BUCKET FILL FACTOR -	1.00
OPTIMUM BANK -	5
BANK FACTOR -	0.60

PG 5 OF 9: EXCAVATION PRODUCTION WORKSHEET

BUCKET CYCLE TIME -	55	Seconds
OTHER FACTOR -	0.95	Weather
CLEANUP -	20%	More Time
TIME EFFICIENCY -	65.0%	of EWT

PG 6 OF 9: HAULING PRODUCTION WORKSHEET

TUG DESCRIPTION -	3000	HP Diesel--Twin Screw
PREPARE SCOW TOW -	20	min
HAUL DIST -	35.3	mi
SPEED TO D/A -	5	mph
SPEED FROM D/A -	7	mph
DUMP OR PUMPOUT -	178.287928	min
DISENGAGE TOW -	15	min
TOW EFFICIENCY -	95	%
SCOW DESCRIPTION -	4000	CY Split Hull Scow
USEABLE VOLUME -	90	%
% SOLIDS -	83.32	%

PG 7 OF 9: EQUIPMENT MATCHING

# OF PIECES:	Used
DREDGES -	1
SCOWS PER DREDGE -	1
TOWING VESSELS -	1
SCOWS PER TOW -	1
ADDITIONAL SCOWS -	0
TOT SCOWS ON JOB -	2

PG 8 OF 9: SPECIAL LABOR & EQUIPMENT

QUARTERS ON DREDGE? -	NO
SURVEY BOAT? -	YES
CREW BOAT? -	NO

PG 9 OF 9: OTHER ADJUSTMENTS

SPECIAL COST/MO (1ST) -	$0		$0
SP COST/MO (2ND-14TH) -	$0	From Sheet D\4	
SPECIAL COST LS (1ST) -	$0		$0
SP COST LS (2ND-14TH) -	$0	From Sheet E	

PRODUCTION -	650	gross cy per hour
OPERATING TIME -	204	hours per month
GROSS PRODUCTION -	132,554	cy per month
PAY PRODUCTION -	132,546	pay cy per month

MOBIL & DEMOB COST:

Chevron Long Wharf - Eden

CHECKLIST FOR INPUT DATA.

BID QUANTITY	114,400	C.Y.
UNIT COST...	$14.75	PER C.Y.
EXCAV. COST.	$1,687,400	
TIME.....	0.93	MONTHS

PG 1 OF 9: PROJECT TITLES

PROJECT -	Chevron Long Wharf - Eden
LOCATION -	Richmond, CA
INVIT # -	Planning Estimate
DATE OF EST. -	September 17, 2019
EST. BY -	J. Fink
MOB. BID ITEM # -	1
EXCAV. BID ITEM # -	2

PG 1a OF 9: LOCAL AREA FACTORS

PRESENT YEAR -	2019	
ECONOMIC INDEX -	8949	
LAF -	1.000	
INTEREST RATE -	2.625%	/yr
TIME PERIOD -	Jul.1 - Dec. 31, 2019	
PIPELINE AVAILABILITY -	n/a	mos/yr
BUCKET AVAILABILITY -	6.16438356	mos/yr
HOPPER AVAILABILITY -	n/a	mos/yr
FUEL PRICE -	$3.66	/gal

PG 2 OF 9: TYPE OF EST & INDIRECT COSTS

TYPE OF EST. -	Planning Estimate
CONTRACTOR'S O.H. -	8.0%
CONTRACTOR'S PROFIT -	10.0%
CONTRACTOR'S BOND -	1.5%

PG 3 OF 9: EXCAVATION QTY'S

DREDGING AREA -	1,544,400	sf
REQ'D EXCAVATION -	114,400	cyds
PAY OVERDEPTH -	0	cyds
CONTRACT AMOUNT -	114,400	cyds
NOT DREDGED -	0	cyds
NET PAY -	114,400	cyds
NONPAY YARDAGE -	0	cyds
GROSS YARDAGE -	114,400	cyds
NONPAY HEIGHT -	0.0	ft overdig
TOTAL BANK HEIGHT -	2.0	ft

PG 4 OF 9: EXCAVATION PRODUCTION WORKSHEET

DREDGE SELECTED -	21 CY CLAMSHELL
TYPE OF MATERIAL -	MUD
BUCKET SIZE -	14
BUCKET FILL FACTOR -	1.00
OPTIMUM BANK -	5
BANK FACTOR -	0.40

PG 5 OF 9: EXCAVATION PRODUCTION WORKSHEET

BUCKET CYCLE TIME -	61	Seconds
OTHER FACTOR -	0.95	Weather
CLEANUP -	20%	More Time
TIME EFFICIENCY -	65.0%	of EWT

PG 6 OF 9: HAULING PRODUCTION WORKSHEET

TUG DESCRIPTION -	3000	HP Diesel--Twin Screw
PREPARE SCOW TOW -	20	min
HAUL DIST -	32.2	mi
SPEED TO D/A -	5	mph
SPEED FROM D/A -	7	mph
DUMP OR PUMPOUT -	178.287928	min
DISENGAGE TOW -	15	min
TOW EFFICIENCY -	95	%
SCOW DESCRIPTION -	4000	CY Split Hull Scow
USEABLE VOLUME -	90	%
% SOLIDS -	83.32	%

PG 7 OF 9: EQUIPMENT MATCHING

# OF PIECES:	Used
DREDGES -	1
SCOWS PER DREDGE -	1
TOWING VESSELS -	1
SCOWS PER TOW -	1
ADDITIONAL SCOWS -	0
TOT SCOWS ON JOB -	2

PG 8 OF 9: SPECIAL LABOR & EQUIPMENT

QUARTERS ON DREDGE? -	NO
SURVEY BOAT? -	YES
CREW BOAT? -	NO

PG 9 OF 9: OTHER ADJUSTMENTS

SPECIAL COST/MO (1ST) -	$0		$0
SP COST/MO (2ND-14TH) -	$0	From Sheet D\4	
SPECIAL COST LS (1ST) -	$0		$0
SP COST LS (2ND-14TH) -	$0	From Sheet E	

PRODUCTION -	260	gross cy per hour
OPERATING TIME -	475	hours per month
GROSS PRODUCTION -	123,500	cy per month
PAY PRODUCTION -	123,011	pay cy per month

MOBIL & DEMOB COST:

Port of Oakland Berths - Eden Landing

CHECKLIST FOR INPUT DATA.

BID QUANTITY	76,300	C.Y.
UNIT COST...	$14.96	PER C.Y.
EXCAV. COST.	$1,141,448	
TIME.....	0.62	MONTHS

PG 1 OF 9: PROJECT TITLES

PROJECT -	Port of Oakland Berths - Eden Landing
LOCATION -	Oakland, CA
INVIT # -	Planning Estimate
DATE OF EST. -	September 17, 2019
EST. BY -	J. Fink
MOB. BID ITEM # -	1
EXCAV. BID ITEM # -	2

PG 1a OF 9: LOCAL AREA FACTORS

PRESENT YEAR -	2019	
ECONOMIC INDEX -	8949	
LAF -	1.000	
INTEREST RATE -	2.625%	/yr
TIME PERIOD -	Jul.1 - Dec. 31, 2019	
PIPELINE AVAILABILITY -	n/a	mos/yr
BUCKET AVAILABILITY -	6.16438356	mos/yr
HOPPER AVAILABILITY -	n/a	mos/yr
FUEL PRICE -	$3.66	/gal

PG 2 OF 9: TYPE OF EST & INDIRECT COSTS

TYPE OF EST. -	Planning Estimate
CONTRACTOR'S O.H. -	8.0%
CONTRACTOR'S PROFIT -	10.0%
CONTRACTOR'S BOND -	1.5%

PG 3 OF 9: EXCAVATION QTY'S

DREDGING AREA -	1,030,050	sf
REQ'D EXCAVATION -	76,300	cyds
PAY OVERDEPTH -	0	cyds
CONTRACT AMOUNT -	76,300	cyds
NOT DREDGED -	0	cyds
NET PAY -	76,300	cyds
NONPAY YARDAGE -	0	cyds
GROSS YARDAGE -	76,300	cyds
NONPAY HEIGHT -	0.0	ft overdig
TOTAL BANK HEIGHT -	2.0	ft

PG 4 OF 9: EXCAVATION PRODUCTION WORKSHEET

DREDGE SELECTED -	21 CY CLAMSHELL
TYPE OF MATERIAL -	MUD
BUCKET SIZE -	14
BUCKET FILL FACTOR -	1.00
OPTIMUM BANK -	5
BANK FACTOR -	0.40

PG 5 OF 9: EXCAVATION PRODUCTION WORKSHEET

BUCKET CYCLE TIME -	61	Seconds
OTHER FACTOR -	0.95	Weather
CLEANUP -	20%	More Time
TIME EFFICIENCY -	65.0%	of EWT

PG 6 OF 9: HAULING PRODUCTION WORKSHEET

TUG DESCRIPTION -	3000	HP Diesel--Twin Screw
PREPARE SCOW TOW -	20	min
HAUL DIST -	25.4	mi
SPEED TO D/A -	5	mph
SPEED FROM D/A -	7	mph
DUMP OR PUMPOUT -	151.293327	min
DISENGAGE TOW -	15	min
TOW EFFICIENCY -	95	%
SCOW DESCRIPTION -	3000	CY Split Hull Scow
USEABLE VOLUME -	90	%
% SOLIDS -	83.32	%

PG 7 OF 9: EQUIPMENT MATCHING

# OF PIECES:	Used
DREDGES -	1
SCOWS PER DREDGE -	1
TOWING VESSELS -	1
SCOWS PER TOW -	1
ADDITIONAL SCOWS -	0
TOT SCOWS ON JOB -	2

PG 8 OF 9: SPECIAL LABOR & EQUIPMENT

QUARTERS ON DREDGE? -	NO
SURVEY BOAT? -	YES
CREW BOAT? -	NO

PG 9 OF 9: OTHER ADJUSTMENTS

SPECIAL COST/MO (1ST) -	$0		$0
SP COST/MO (2ND-14TH) -	$0	From Sheet D\4	
SPECIAL COST LS (1ST) -	$0		$0
SP COST LS (2ND-14TH) -	$0	From Sheet E	

PRODUCTION -	260	gross cy per hour
OPERATING TIME -	475	hours per month
GROSS PRODUCTION -	123,500	cy per month
PAY PRODUCTION -	123,065	pay cy per month

DISTANCES TO DISPOSAL LOCATIONS - VARIOUS PROJECTS TO EDEN LANDING

Outer Oakland to Eden Landing	Nautical Miles	Miles
Berth 30-32 to Oakland Bar Channel 1 & 2	1.65	1.90
Oakland Bar Channel 1 & 2 to San Mateo Bridge	14.9	17.15
San Mateo Bridge to Eden Landing Transfer Location	3.45	3.97
Oakland Outer Harbor to Eden Landing Transfer Location	20.00	23.02

Inner Oakland to Eden Landing	Nautical Miles	Miles
APL to Oakland Bar Channel 1 & 2	2.75	3.16
Oakland Bar Channel 1 & 2 to San Mateo Bridge	14.9	17.15
San Mateo Bridge to Eden Landing Transfer Location	3.45	3.97
Oakland Outer Harbor to Eden Landing Transfer Location	21.10	24.28
Average of Oakland Inner/Outer Harbor		23.65

Port of Oakland (Berths) to Eden Landing	Nautical Miles	Miles
Howard Terminal to Oakland Bar Channel 1 & 2	3.7	4.26
Oakland Bar Channel 1 & 2 to San Mateo Bridge	14.9	17.15
San Mateo Bridge to Eden Landing Transfer Location	3.45	3.97
Oakland Outer Harbor to Eden Landing Transfer Location	22.05	25.37

Redwood City (and Port) to Eden Landing	Nautical Miles	Miles
Redwood City Harbor to Entrance	2.75	3.16
Redwood City Entrance to Eden Landing Transfer Location	0.24	0.28
Redwood City Harbor to Eden Landing Transfer Location	2.99	3.44

Richmond (and Port) to Eden Landing	Nautical Miles	Miles
Richmond to Blossom Rock	9.85	11.34
Blossom Rock to San Mateo Bridge	17.35	19.97
San Mateo Bridge to Eden Landing Transfer Location	3.45	3.97
	30.65	35.27

Chevron to Eden Landing	Nautical Miles	Miles
Chevron to Blossom Rock	7.2	8.29
Blossom Rock to San Mateo Bridge	17.35	19.97
San Mateo Bridge to Eden Landing Transfer Location	3.45	3.97
	28.00	32.22

ATTACHMENT C

DREDGE MATERIAL DELIVERY SCENARIOS

EDEN LANDING PHASE 2 PROJECT
DREDGE MATERIAL DELIVERY SCENARIOS

From 2010 Offloader Contract:

	1,221,229	cy offloaded	Oakland Federal	866,000	cy
13569.21	90	Operating days	Richmond Federal	267,000	cy
CY/day	2.96	operating months	Oakland Berths	50,000	cy
	13,569	cy/day, avg.	Chevron	38,229	cy
	412,730	cy/mo, avg.		1,221,229	cy
	332	scows ofloaded		92.78%	from Oakland & Richmond Federal projects
	3,678	cy/scow, avg.			

best day was 27,000 cy in 15 hours (1,800 cy/hr)
Liberty - 4,700 hp
Super Booster - 7,000 hp
Land Booster - 3,500 hp

Productions based on CEDEP estimates Federal Channel Monthly Dredging Productions			Annual Volumes	Duration (Days)	Total Annual Volumes	Additional Amount Dredged	Additional Amount Dredged		Additional Amount Dredged	
Port of Oakland Inner/Outer Harbor	178,400 cy/month	5,865 cy/day	429,300	74	808,600	379,300	688,600	Yr 5	709,400	Yr 7
Port of Richmond Inner/Outer Harbor	132,600 cy/month	4,359 cy/day	286,300	66	377,000	90,700				
Port of Redwood City Harbor	226,600 cy/month	7,450 cy/day	231,500	32	246,300	14,800	14,800	Yr 5	14,800	Yr 7
Mid-Sized Projects Monthly Dredging Productions										
Chevron Long Wharf	123,500 cy/month	4,060 cy/day	114,400	29	120,900	6,500				
Port of Oakland Berths	123,500 cy/month	4,060 cy/day	76,300	19	99,000	22,700				

Assuming there are a minimum of four large scows (>3,000 CY) to service two large maintenance dredging projects at one time, total monthly minimum amount of material delivered to Offloader at Eden Landing:	Optimized	Maximum	Non-Optimized		
Oakland & Redwood City	12,468 cy/day	12,468 cy/day	6,234 cy/day	394,100	88 days
Oakland, Richmond & Redwood City	11,013 cy/day	13,569 cy/day	5,506 cy/day	484,800	
All Projects	10,344 cy/day	13,569 cy/day	5,172 cy/day	514,000	

EDEN LANDING PHASE 2 PROJECT
DREDGE MATERIAL DELIVERY SCENARIOS

Federal Projects (Oakland & Redwood City) - Existing Levees (3,294,000 CY Fill)

	Quantity	Quantity	Unloading Scows				Operational Standby		Duration based on Monthly Dredge Productions	
Year	Dredged	Placed*	Days	CY/hr	hrs	hrs/mo	Days	hrs	Days	Months
2021	660,800	726,880	19	1,667	436	250	35	836	53	1.74
2022	660,800	726,880	19	1,667	436	250	35	836	53	1.74
2023	660,800	726,880	19	1,667	436	250	35	836	53	1.74
2024	660,800	726,880	19	1,667	436	250	35	836	53	1.74
2025	351,500	386,650	10	1,667	232	252	19	440	28	0.92
Totals	2,994,700	3,294,170	86	1,667	1,976	1,253	159	3,784	7.89	months total duration
				Average	*395*	*250*	*34.31%*		658,834	cy; Annual avg.
*Quantity Placed includes 10% for long-term bulking									417,490	cy; Monthly avg.

Federal Projects (Oakland & Redwood City) - Improved Levees (4,725,000 CY Fill)

	Quantity	Quantity	loading Scows				Operational Standby		Duration based on Monthly Dredge Productions	
Year	Dredged	Placed*	Days	CY/hr	hrs	hrs/mo	Days	hrs	Days	Months
2021	660,800	726,880	19	1,667	436	250	35	836	53	1.74
2022	660,800	726,880	19	1,667	436	250	35	836	53	1.74
2023	660,800	726,880	19	1,667	436	250	35	836	53	1.74
2024	660,800	726,880	19	1,667	436	250	35	836	53	1.74
2025	660,800	726,880	19	1,667	436	250	35	836	53	1.74
2026	660,800	726,880	19	1,667	436	250	35	836	53	1.74
2027	330,700	363,770	10	1,667	218	246	18	430	27	0.89
Totals	4,295,500	4,725,050	124	1,667	2,834	1,747	228	5,446	11.34	months total duration
				Average	*405*	*250*	*34.23%*		675,007	cy; Annual avg.
*Quantity Placed includes 10% for long-term bulking									416,580	cy; Monthly avg.

EDEN LANDING PHASE 2 PROJECT
DREDGE MATERIAL DELIVERY SCENARIOS

Federal Projects (Oakland, Richmond & Redwood City) - Existing Levees (3,294,000 CY Fill)

Year	Quantity Dredged	Quantity Placed*	Unloading Scows Days	CY/hr	hrs	hrs/mo	Operational Standby Days	hrs	Duration based on Monthly Dredge Productions Days	Months
2021	947,100	1,041,810	27	1,667	625	221	60	1,439	86	2.83
2022	947,100	1,041,810	27	1,667	625	221	60	1,439	86	2.83
2023	947,100	1,041,810	27	1,667	625	221	60	1,439	86	2.83
2024	153,400	168,740	5	1,667	101	220	10	235	14	0.46
Totals	2,994,700	3,294,170	86	1,667	1,976	883	190	4,552		8.94 months total duration
				Average	*494*	*221*	*30.27%*			823,543 cy; Annual avg.
										368,374 cy; Monthly avg.

*Quantity Placed includes 10% for long-term bulking

Federal Projects (Oakland, Richmond & Redwood City) - Improved Levees (4,725,000 CY Fill)

Year	Quantity Dredged	Quantity Placed*	loading Scows Days	CY/hr	hrs	hrs/mo	Operational Standby Days	hrs	Duration based on Monthly Dredge Productions Days	Months
2021	947,100	1,041,810	27	1,667	625	221	60	1,439	86	2.83
2022	947,100	1,041,810	27	1,667	625	221	60	1,439	86	2.83
2023	947,100	1,041,810	27	1,667	625	221	60	1,439	86	2.83
2024	947,100	1,041,810	27	1,667	625	221	60	1,439	86	2.83
2025	507,100	557,810	14	1,667	335	221	33	769	46	1.51
Totals	4,295,500	4,725,050	122	1,667	2,834	1,105	273	6,526		12.82 months total duration
				Average	*567*	*221*	*30.28%*			945,010 cy; Annual avg.
										368,514 cy; Monthly avg.

*Quantity Placed includes 10% for long-term bulking

EDEN LANDING PHASE 2 PROJECT
DREDGE MATERIAL DELIVERY SCENARIOS

Federal & Non-Federal Projects (Oakland, Richmond, Redwood City, Oakland Berths, Chevron)
Existing Levees (3,294,000 CY Fill)

Year	Quantity Dredged	Quantity Placed*	Days	Unloading Scows CY/hr	hrs	hrs/mo	Operational Standby Days	hrs
2021	1,137,800	1,251,580	32	1,667	751	208	79	1,889
2022	1,137,800	1,251,580	32	1,667	751	208	79	1,889
2023	719,000	790,900	20	1,667	474	206	51	1,206
Totals	2,994,600	3,294,060	84	1,667	1,976	621	209	4,984
				Average	*659*	*207*	*28.39%*	

*Quantity Placed includes 10% for long-term bulking

Duration based on Monthly Dredge Productions

Days	Months	
110	3.62	
110	3.62	
70	2.30	
	9.53	months total duration
	1,098,020	cy; Annual avg.
	345,498	cy; Monthly avg.

Federal & Non-Federal Projects (Oakland, Richmond, Redwood City, Oakland Berths, Chevron)
Improved Levees (4,725,000 CY Fill)

Year	Quantity Dredged	Quantity Placed*	loading Scows Days	CY/hr	hrs	hrs/mo	Operational Standby Days	hrs
2021	1,137,800	1,251,580	32	1,667	751	208	79	1,889
2022	1,137,800	1,251,580	32	1,667	751	208	79	1,889
2023	1,137,800	1,251,580	32	1,667	751	208	79	1,889
2024	882,100	970,310	25	1,667	582	208	61	1,458
Totals	4,295,500	4,725,050	121	1,667	2,834	831	298	7,126
				Average	*709*	*208*	*28.46%*	

*Quantity Placed includes 10% for long-term bulking

Duration based on Monthly Dredge Productions

Days	Months	
110	3.62	
110	3.62	
110	3.62	
85	2.79	
	13.64	months total duration
	1,181,263	cy; Annual avg.
	346,314	cy; Monthly avg.

ATTACHMENT D

ONSITE / OFFSITE IMPROVEMENTS COST DETAIL

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
100	MOB/DEMOB		1.000	LS	15,095,591.44	15,095,591.44
			Bid Total	========>		$15,095,591.44

EDEN LANDING PHASE 2 PROJECT
SITE MOB/DEMOB ESTIMATE

Bid Item/ *Activities*	Bid Description	Bid Quantity	Units	Labor + Burden	Permanent Material	Construction Material	Total Equipment	Subs	Direct Total	Indirect Cost	Addon/ Bond Cost	Total Cost	Markup	Bid Total	Bid Total U.P.	Man Hours
100	**MOB/DEMOB**	**1**	**LS**	**$1,609,316**	**$2,711,390**	**$391,583**	**$1,631,308**	**$4,978,472**	**$11,322,069**	**$1,255,734**	**$631,119**	**$13,208,921**	**$1,886,670**	**$15,095,591**	**$15,095,591**	**18,774**
110	POWER CABLE MOB/DEMOB	1	LS	$365,411	$1,955,745	$79,029	$357,714	$4,968,472	$7,726,372	$285,127	$430,686	$8,442,185	$428,387	$8,870,572	$8,870,572	3,964
111	Substation & Electrical Infrastructure Mob/Dem	1	LS	$104,827	$199,745	$0	$29,431	$4,968,472	$5,302,475	$81,796	$295,572	$5,679,843	$122,893	$5,802,736	$5,802,736	1,084
111010	*Install Pole Line*	*18,206*	*LF*	*$0*	*$199,745*	*$0*	*$0*	*$218,472*	*$418,217*	*$0*	*$23,312*	*$441,529*	*$0*	*$441,529*	*$24.25*	*0*
111020	*Install 138kV to 12.5kV Substation*	*1*	*LS*	*$0*	*$0*	*$0*	*$0*	*$3,000,000*	*$3,000,000*	*$0*	*$167,227*	*$3,167,227*	*$0*	*$3,167,227*	*$3,167,227*	*0*
111050	*PG&E Fees*	*1*	*LS*	*$0*	*$0*	*$0*	*$0*	*$1,500,000*	*$1,500,000*	*$0*	*$83,614*	*$1,583,614*	*$0*	*$1,583,614*	*$1,583,614*	*0*
111060	*Remove 12 kV Overhead Conductor*	*18,206*	*LF*	*$71,572*	*$0*	*$0*	*$16,088*	*$0*	*$87,659*	*$55,847*	*$4,886*	*$148,392*	*$83,907*	*$232,299*	*$12.76*	*720*
111070	*Remove Timber Poles*	*91*	*EA*	*$33,255*	*$0*	*$0*	*$13,343*	*$0*	*$46,599*	*$25,949*	*$2,598*	*$75,145*	*$38,987*	*$114,132*	*$1,254*	*364*
111080	*Demob 138kV to 12.5kV Substation*	*1*	*LS*	*$0*	*$0*	*$0*	*$0*	*$250,000*	*$250,000*	*$0*	*$13,936*	*$263,936*	*$0*	*$263,936*	*$263,936*	*0*
112	Waterside Power Cable Mob/Demob	1	LS	$150,764	$1,756,000	$0	$214,414	$0	$2,121,178	$117,640	$118,239	$2,357,057	$176,747	$2,533,804	$2,533,804	1,632
112010	*Procure Sumbersible Power Cable*	*20,000*	*LF*	*$0*	*$1,756,000*	*$0*	*$0*	*$0*	*$1,756,000*	*$0*	*$97,884*	*$1,853,884*	*$0*	*$1,853,884*	*$92.69*	*0*
112020	*Tow Power Barge & Reel Barge*	*2*	*TOW*	*$13,167*	*$0*	*$0*	*$40,234*	*$0*	*$53,401*	*$10,274*	*$2,977*	*$66,651*	*$15,436*	*$82,087*	*$41,043*	*120*
112110	*Prep Workboats for Tow, Load, Unload*	*6*	*SH*	*$38,408*	*$0*	*$0*	*$42,297*	*$0*	*$80,705*	*$29,969*	*$4,499*	*$115,173*	*$45,027*	*$160,200*	*$26,700*	*432*
112120	*Tow Workboats*	*2*	*TOW*	*$13,167*	*$0*	*$0*	*$40,234*	*$0*	*$53,401*	*$10,274*	*$2,977*	*$66,651*	*$15,436*	*$82,087*	*$41,043*	*120*
112130	*Prep Barges for Tow*	*15*	*SH*	*$86,023*	*$0*	*$0*	*$91,649*	*$0*	*$177,672*	*$67,123*	*$9,904*	*$254,698*	*$100,848*	*$355,546*	*$23,703*	*960*
113	Install Submersible Power Cable	1	LS	$72,220	$0	$53,141	$77,067	$0	$202,428	$56,353	$11,284	$270,065	$84,667	$354,732	$354,732	824
113010	*Sub Cable to Booster - Tidal Work*	*9,321*	*LF*	*$22,555*	*$0*	*$0*	*$21,269*	*$0*	*$43,824*	*$17,599*	*$2,443*	*$63,866*	*$26,442*	*$90,308*	*$9.69*	*256*
113020	*Sub Cable to Booster - No Water Access*	*5,062*	*LF*	*$45,898*	*$0*	*$53,141*	*$50,899*	*$0*	*$149,938*	*$35,814*	*$8,358*	*$194,109*	*$53,808*	*$247,918*	*$48.98*	*528*
113030	*Sub Cable to Offloader*	*4,776*	*LF*	*$3,768*	*$0*	*$0*	*$4,899*	*$0*	*$8,667*	*$2,940*	*$483*	*$12,090*	*$4,417*	*$16,507*	*$3.46*	*40*
114	Remove Submersible Power Cable	1	LS	$37,600	$0	$25,889	$36,803	$0	$100,291	$29,339	$5,590	$135,220	$44,080	$179,300	$179,300	424
114010	*Demob-Sub Cable to Booster - Tidal Work*	*9,321*	*LF*	*$22,555*	*$0*	*$0*	*$21,269*	*$0*	*$43,824*	*$17,599*	*$2,443*	*$63,866*	*$26,442*	*$90,308*	*$9.69*	*256*
114020	*Demob-Sub Cable to Booster - No Water Acce*	*5,062*	*LF*	*$11,277*	*$0*	*$25,889*	*$10,634*	*$0*	*$47,800*	*$8,800*	*$2,665*	*$59,265*	*$13,221*	*$72,486*	*$14.32*	*128*
114030	*Demob-Sub Cable to Offloader*	*4,776*	*LF*	*$3,768*	*$0*	*$0*	*$4,899*	*$0*	*$8,667*	*$2,940*	*$483*	*$12,090*	*$4,417*	*$16,507*	*$3.46*	*40*
120	MOB/DEMOB PIPELINE	1	LS	$385,871	$722,720	$310,907	$250,711	$10,000	$1,680,209	$301,091	$93,659	$2,074,959	$452,373	$2,527,331	$2,527,331	4,776
120005	*Procure Pipe*	*37,000*	*LF*	*$0*	*$722,720*	*$236,949*	*$0*	*$0*	*$959,669*	*$0*	*$53,494*	*$1,013,163*	*$0*	*$1,013,163*	*$27.38*	*0*
120010	*Weld Submerged Pipeline*	*20*	*S*	*$100,557*	*$0*	*$17,560*	*$29,260*	*$10,000*	*$157,377*	*$78,463*	*$8,773*	*$244,613*	*$117,887*	*$362,500*	*$18,125*	*1,280*
120015	*Prep Pipeline for Tow*	*1*	*LS*	*$12,803*	*$0*	*$0*	*$11,333*	*$0*	*$24,135*	*$9,990*	*$1,345*	*$35,470*	*$15,009*	*$50,479*	*$50,479*	*144*
120020	*Mob-Tow Pipeline*	*1*	*TOW*	*$6,583*	*$0*	*$0*	*$10,765*	*$0*	*$17,348*	*$5,137*	*$967*	*$23,452*	*$7,718*	*$31,170*	*$31,170*	*60*
120025	*Prep Shore Pipeline for Work*	*41*	*S*	*$127,388*	*$0*	*$35,998*	*$86,672*	*$0*	*$250,058*	*$99,399*	*$13,939*	*$363,396*	*$149,342*	*$512,738*	*$12,506*	*1,640*
120030	*Mob-Unload Pipe & Makeup Pipe*	*4*	*S*	*$25,605*	*$0*	*$0*	*$22,665*	*$0*	*$48,270*	*$19,980*	*$2,691*	*$70,941*	*$30,018*	*$100,959*	*$25,240*	*288*
120035	*Demob Shore Pipe*	*17*	*S*	*$52,819*	*$0*	*$20,400*	*$35,937*	*$0*	*$109,156*	*$41,214*	*$6,085*	*$156,455*	*$61,922*	*$218,378*	*$12,846*	*680*
120040	*Demob-Prep Pipeline for Tow*	*2*	*S*	*$12,803*	*$0*	*$0*	*$11,333*	*$0*	*$24,135*	*$9,990*	*$1,345*	*$35,470*	*$15,009*	*$50,479*	*$25,240*	*144*
120045	*Demob-Tow Pipeline*	*1*	*TOW*	*$6,583*	*$0*	*$0*	*$10,765*	*$0*	*$17,348*	*$5,137*	*$967*	*$23,452*	*$7,718*	*$31,170*	*$31,170*	*60*
120050	*Demob-Unload Pipe & Makeup Pipe*	*5*	*S*	*$32,006*	*$0*	*$0*	*$28,331*	*$0*	*$60,338*	*$24,974*	*$3,363*	*$88,676*	*$37,523*	*$126,198*	*$25,240*	*360*
120055	*Unload-Prep Shore Pipe for Storage*	*3*	*S*	*$8,724*	*$0*	*$0*	*$3,651*	*$0*	*$12,374*	*$6,807*	*$690*	*$19,871*	*$10,227*	*$30,098*	*$10,033*	*120*
130	SETUP UNLD SUPPORT BARGES	1	LS	$72,241	$0	$0	$92,432	$0	$164,672	$56,369	$9,179	$230,220	$84,691	$314,911	$314,911	748
131	Drive Piles for Support Barges	1	LS	$59,432	$0	$0	$82,692	$0	$142,124	$46,374	$7,922	$196,420	$69,675	$266,095	$266,095	616
131010	*Load Piles on Barge*	*1*	*LS*	*$5,403*	*$0*	*$0*	*$7,517*	*$0*	*$12,920*	*$4,216*	*$720*	*$17,856*	*$6,334*	*$24,190*	*$24,190*	*56*
131011	*Fly Leads, Hammer and Power Pack to*	*1*	*LS*	*$5,403*	*$0*	*$0*	*$7,517*	*$0*	*$12,920*	*$4,216*	*$720*	*$17,856*	*$6,334*	*$24,190*	*$24,190*	*56*
131012	*Tow Pile Driving Spread*	*1*	*LS*	*$2,701*	*$0*	*$0*	*$3,759*	*$0*	*$6,460*	*$2,108*	*$360*	*$8,928*	*$3,167*	*$12,095*	*$12,095*	*28*
131013	*Get Into Leads, Prep to Drive Pile*	*1*	*LS*	*$5,403*	*$0*	*$0*	*$7,517*	*$0*	*$12,920*	*$4,216*	*$720*	*$17,856*	*$6,334*	*$24,190*	*$24,190*	*56*
131020	*Drive 24" Steel Pipe Plumb Piles*	*1*	*LS*	*$16,209*	*$0*	*$0*	*$22,552*	*$0*	*$38,761*	*$12,648*	*$2,161*	*$53,569*	*$19,002*	*$72,571*	*$72,571*	*168*
131021	*Drive 24" Steel Pipe Batter Piles*	*1*	*LS*	*$10,806*	*$0*	*$0*	*$15,035*	*$0*	*$25,841*	*$8,432*	*$1,440*	*$35,713*	*$12,668*	*$48,381*	*$48,381*	*112*
131030	*Get out of Leads*	*1*	*LS*	*$5,403*	*$0*	*$0*	*$7,517*	*$0*	*$12,920*	*$4,216*	*$720*	*$17,856*	*$6,334*	*$24,190*	*$24,190*	*56*
131031	*Tow Pile Driving Spread - Demob*	*1*	*LS*	*$2,701*	*$0*	*$0*	*$3,759*	*$0*	*$6,460*	*$2,108*	*$360*	*$8,928*	*$3,167*	*$12,095*	*$12,095*	*28*
131032	*Fly Pile Driving Eq to Shore & Store*	*1*	*LS*	*$5,403*	*$0*	*$0*	*$7,517*	*$0*	*$12,920*	*$4,216*	*$720*	*$17,856*	*$6,334*	*$24,190*	*$24,190*	*56*

EDEN LANDING PHASE 2 PROJECT
SITE MOB/DEMOB ESTIMATE

Bid Item/ *Activities*	Bid Description	Bid Quantity	Units	Labor + Burden	Permanent Material	Construction Material	Total Equipment	Subs	Direct Total	Indirect Cost	Addon/ Bond Cost	Total Cost	Markup	Bid Total	Bid Total U.P.	Man Hours
132	Setup Support Barge(s)	1	LS	$12,809	$0	$0	$9,740	$0	$22,549	$9,994	$1,257	$33,800	$15,016	$48,816	$48,816	132
132010	*Install Pile Keepers*	*4*	*S*	*$7,065*	*$0*	*$0*	*$2,724*	*$0*	*$9,789*	*$5,513*	*$546*	*$15,847*	*$8,283*	*$24,130*	*$6,032*	*72*
132020	*Tow Flat Barges*	*1*	*LS*	*$1,106*	*$0*	*$0*	*$2,827*	*$0*	*$3,933*	*$863*	*$219*	*$5,015*	*$1,296*	*$6,311*	*$6,311*	*12*
132110	*Tow Flat Barges - Demob*	*1*	*TOW*	*$1,106*	*$0*	*$0*	*$2,827*	*$0*	*$3,933*	*$863*	*$219*	*$5,015*	*$1,296*	*$6,311*	*$6,311*	*12*
132120	*Grind/burn off keepers*	*2*	*S*	*$3,532*	*$0*	*$0*	*$1,362*	*$0*	*$4,894*	*$2,756*	*$273*	*$7,924*	*$4,141*	*$12,065*	*$6,032*	*36*
140	LEVEE REPAIRS	19,200	LF	$691,385	$0	$1,646	$920,169	$0	$1,613,199	$539,481	$89,924	$2,242,604	$810,540	$3,053,143	$159	8,036
141	Mob/Demob Equipment	1	LS	$55,262	$0	$1,646	$28,686	$0	$85,594	$43,120	$4,771	$133,486	$64,786	$198,272	$198,272	736
14110	*Load Out Equipment at Yard*	*2*	*SH*	*$8,326*	*$0*	*$0*	*$3,630*	*$0*	*$11,956*	*$6,496*	*$666*	*$19,118*	*$9,760*	*$28,879*	*$14,439*	*112*
14120	*Mobilize Equipment*	*10*	*LDS*	*$5,822*	*$0*	*$0*	*$5,386*	*$0*	*$11,209*	*$4,543*	*$625*	*$16,377*	*$6,826*	*$23,202*	*$2,320*	*80*
14130	*Set Up Site*	*1*	*EA*	*$7,210*	*$0*	*$0*	*$2,934*	*$0*	*$10,143*	*$5,626*	*$565*	*$16,334*	*$8,452*	*$24,786*	*$24,786*	*96*
14140	*Offload Equipment at Site*	*2*	*SH*	*$7,210*	*$0*	*$0*	*$2,934*	*$0*	*$10,143*	*$5,626*	*$565*	*$16,334*	*$8,452*	*$24,786*	*$12,393*	*96*
14150	*Load Out Equipment at Site*	*2*	*SH*	*$7,210*	*$0*	*$0*	*$2,934*	*$0*	*$10,143*	*$5,626*	*$565*	*$16,334*	*$8,452*	*$24,786*	*$12,393*	*96*
14160	*Demobilize Equipment*	*10*	*LDS*	*$5,822*	*$0*	*$0*	*$5,386*	*$0*	*$11,209*	*$4,543*	*$625*	*$16,377*	*$6,826*	*$23,202*	*$2,320*	*80*
14170	*Clean Up Site*	*1*	*LS*	*$9,500*	*$0*	*$1,646*	*$3,667*	*$0*	*$14,814*	*$7,413*	*$826*	*$23,053*	*$11,138*	*$34,190*	*$34,190*	*120*
14180	*Offload Equipment at Yard*	*1*	*SH*	*$4,163*	*$0*	*$0*	*$1,815*	*$0*	*$5,978*	*$3,248*	*$333*	*$9,559*	*$4,880*	*$14,439*	*$14,439*	*56*
142	Repair E2/E1 Levee	4,500	LF	$377,037	$0	$0	$528,392	$0	$905,429	$294,199	$50,471	$1,250,098	$442,017	$1,692,115	$376	4,327
14110	*Repair E2/E1 Levee*	*45,000*	*CY*	*$377,037*	*$0*	*$0*	*$528,392*	*$0*	*$905,429*	*$294,199*	*$50,471*	*$1,250,098*	*$442,017*	*$1,692,115*	*$376*	*4,327*
143	Repair E2/E4 Levee	2,600	LF	$241,513	$0	$0	$338,464	$0	$579,978	$188,451	$32,329	$800,758	$283,136	$1,083,894	$417	2,772
14310	*Repair E2/E1 Levee*	*28,825*	*CY*	*$241,513*	*$0*	*$0*	*$338,464*	*$0*	*$579,978*	*$188,451*	*$32,329*	*$800,758*	*$283,136*	*$1,083,894*	*$417*	*2,772*
144	Repair/Regrade Interior Levees	12,100	LF	$17,572	$0	$0	$24,626	$0	$42,198	$13,711	$2,352	$58,262	$20,601	$78,862	$6.52	202
150	WEIR UPGRADES	5	EA	$94,409	$32,925	$0	$10,282	$0	$137,616	$73,667	$7,671	$218,954	$110,680	$329,634	$65,927	1,250
90000	CONTRACTOR INDIRECTS	1	LS	$731,879	$0	$230,817	$293,038	$0	$1,255,734							1,044
				$1,609,316	**$2,711,390**	**$391,583**	**$1,631,308**	**$4,978,472**	**$11,322,069**	**$1,255,734**	**$631,119**	**$13,208,921**	**$1,886,670**	**$15,095,591**		**18,774**
													Rounded	**$15,095,000**		

Install Substation	$4,751,000
Install Overhead Pole Line	$442,000
Furnish Submersible Power Cable	$1,854,000
Install Power Cable	$1,035,000
Furnish Offshore Pipeline	$466,000
Furnish Shore Pipe	$548,000
Install Offshore Pipeline	$545,000
Install Shore Pipe	$513,000
Install Mooring System	$236,000
Levee Repairs	$3,053,000
Water Control Structures	$330,000
Remove Substation	$264,000
Remove Overhead Pole Line	$346,000
Remove Submersible Power Cable	$179,000
Remove Offshore Pipeline	$208,000
Remove Shore Pipe	$248,000
Remove Mooring System	$79,000
	$15,097,000

Offsite Improvements	$4,602,000
Onsite Improvements	$10,495,000
	$15,097,000

Site Mob Costs - Diesel	$5,911,000	assumes onshore generator & powered w/submersible cable; offshore piling, pipeline costs included
Site Mob Costs - Diesel	$2,843,000	assumes generator is on barge or all equipment is diesel, offshore piling and pipeline costs included
Site Mob Costs - Electric	$9,186,000	assumes electrical infrastructure, power cable, and offshore piling (no pipeline)
Site Mob Costs - Diesel	$315,000	assumes diesel equipment, offshore piling only
Site Mob Costs - Diesel	$3,383,000	assumes onshore generator & powered w/submersible cable, offshore piling included, no pipeline costs
Site Mob Costs - Electric	$3,383,000	assumes levee repairs and water control structures only
Site Mob Costs - Diesel	$3,383,000	assumes levee repairs and water control structures only

$1,514,000	pipeline mob/demob costs less purchase
$3,068,000	submersible cable mob/demob (used for electric or diesel option w/generator onshore)
$1,214,000	submersible cable mob/demob less cable purchase (used for electric or diesel option w/generator onshore)

Offshore Pipe	Shore Pipe	
$466,000	$548,000	Furnish
$545,000	$513,000	Install
$208,000	$248,000	Remove
$1,219,000	$1,309,000	Total

Estimate Summary - Costs and Prices

Direct Biditems

Manhours	Labor	Perm Materials	Const Materials	Equipment	Subs	Direct Total	Indirect Charge	Addon Bond	Total Cost	Balanced Bid (TO)		Bid Prices	
										Markup	Total	Markup	Total
100 - MOB/DEMOB				**1 LS**									
18,774	1,609,316	2,711,390	391,583	1,631,308	4,978,472	11,322,069	1,255,734	631,119	13,208,921	1,886,670	15,095,591.44	1,886,670	15,095,591.44
18,774.23	1,609,316.37	2,711,389.55	391,583.07	1,631,307.53	4,978,472.00	11,322,068.52	1,255,733.90	631,118.65	13,208,921.07	14.28%	15,095,591.44	14.28%	15,095,591.44
110 - POWER CABLE MOB/DEMOB				***1 LS***									
3,964	*365,411*	*1,955,745*	*79,029*	*357,714*	4,968,472	*7,726,372*							
3,964.00	*365,411.36*	*1,955,745.00*	*79,029.45*	*357,714.23*	*4,968,472.00*	7,726,372.04							
111 - Substation & Electrical Infrastructure Mob/Demob				***1 LS***									
1,084	*104,827*	*199,745*		*29,431*	4,968,472	*5,302,475*							
1,084.00	*104,827.12*	*199,745.00*		*29,431.03*	*4,968,472.00*	5,302,475.15							
112 - Waterside Power Cable Mob/Demob				***1 LS***									
1,632	*150,764*	*1,756,000*		*214,414*		*2,121,178*							
1,632.00	*150,763.93*	*1,756,000.00*		*214,413.76*		2,121,177.69							
113 - Install Submersible Power Cable				***1 LS***									
824	*72,220*		*53,141*	*77,067*		*202,428*							
824.00	*72,220.46*		*53,140.95*	*77,066.86*		202,428.27							
114 - Remove Submersible Power Cable				***1 LS***									
424	*37,600*		*25,889*	*36,803*		*100,291*							
424.00	*37,599.85*		*25,888.50*	*36,802.58*		100,290.93							
120 - MOB/DEMOB PIPELINE				***1 LS***									
4,776	*385,871*	*722,720*	*310,907*	*250,711*	10,000	*1,680,209*							
4,776.00	*385,870.62*	*722,719.55*	*310,907.37*	*250,711.12*	*10,000.00*	1,680,208.66							
130 - SETUP UNLD SUPPORT BARGES				***1 LS***									
748	*72,241*			*92,432*		*164,672*							
748.00	*72,240.61*			*92,431.81*		164,672.42							

Manhours	Labor	Perm Materials	Const Materials	Equipment	Subs	Direct Total	Indirect Charge	Addon Bond	Total Cost	Balanced Bid (TO) Markup	Balanced Bid (TO) Total	Bid Prices Markup	Bid Prices Total
131 - DRIVE PILES FOR SUPPORT BARGES				***1 LS***									
616	*59,432*			*82,692*		*142,124*							
616.00	*59,432.08*			*82,691.73*		142,123.81							
132 - SETUP SUPPORT BARGE(S)				***1 LS***									
132	*12,809*			*9,740*		*22,549*							
132.00	*12,808.53*			*9,740.08*		22,548.61							
140 - LEVEE REPAIRS				***19,200 LF***									
8,036	*691,385*		*1,646*	*920,169*		*1,613,199*							
.42	*36.01*		*.09*	*47.93*		84.02							
141 - MOB/DEMOB EQUIPMENT				***1 LS***									
736	*55,262*		*1,646*	*28,686*		*85,594*							
736.00	*55,261.74*		*1,646.25*	*28,686.42*		85,594.41							
142 - REPAIR E2/E1 LEVEE				***4,500 LF***									
4,327	*377,037*			*528,392*		*905,429*							
.96	*83.79*			*117.42*		201.21							
143 - REPAIR E2/E4 LEVEE				***2,600 LF***									
2,772	*241,513*			*338,464*		*579,978*							
1.07	*92.89*			*130.18*		223.07							
144 - REPAIR/REGRADE INTERIOR LEVEES				***12,100 LF***									
202	*17,572*			*24,626*		*42,198*							
.02	*1.45*			*2.04*		3.49							
150 - WEIR UPGRADES				***5 EA***									
1,250	*94,409*	*32,925*		*10,282*		*137,616*							
250.00	*18,881.85*	*6,585.00*		*2,056.35*		27,523.20							
Direct Totals													
50,297	**4,347,669**	**7,378,524**	**863,842**	**4,632,930**	**14,925,416**	**32,148,381**	**1,255,734**	**631,119**	**13,208,921**	**1,886,670**	**15,095,591**	**1,886,670**	**15,095,591**

Indirect Charges

MHs	Labor	Perm Matl	Constr Matl	Equipment	Subcontract	Total

MHs	Labor	Perm Matl	Constr Matl	Equipment	Subcontract	Total
90000 - CONTRACTOR INDIRECTS						
1,044	731,879	-	230,817	293,038	-	1,255,734
Indirect Totals						
1,044	**731,879**	**-**	**230,817**	**293,038**	**-**	**1,255,734**

Addon/Bond

Additional Cost		Addon/Bond Cost
Home office Overhead	4 % of JX	404,685
Bond from Summary Table		226,434
Totals from Addon and Bond		
		631,119

Summary Information

Last Summary: 3/12/2020 5:24:00 PM

Last Spread: 3/12/2020 5:24:00 PM

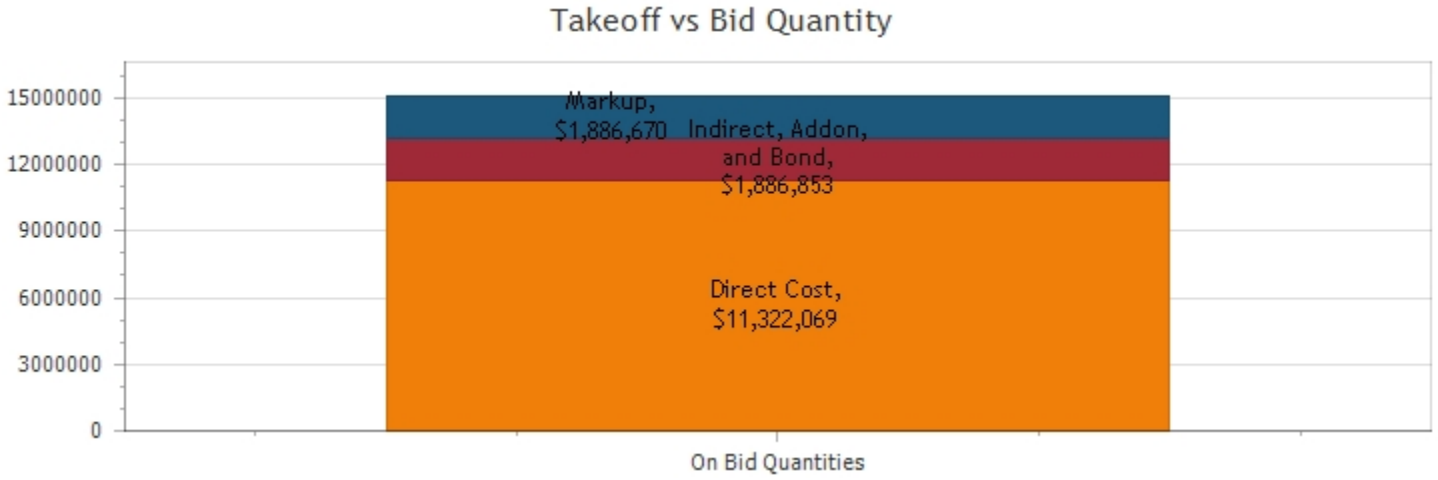
Estimate Recap Report

Project Information

Estimate:	2019-33-02 - SBSPRP - SITE PREPARATION	**Bid Date:**	-
Project:	-	**Review Date:**	-
Estimator In Charge:	MT - Matt Taylor	**Job Duration:**	9 months
Owner:	-	**State:**	CA
Engineer:	-	**Estimate Type:**	Estimate
Related Estimate:	-		

Estimate Summary

	On Bid Quantities	%
Direct Cost	11,322,069	75.00%
Indirect Cost	1,255,734	8.32%
Addons	404,685	2.68%
Bond	226,434	1.50%
Pass Through Cost	0	0.00%
Direct Markup	1,698,310	11.25%
Indirect Markup	188,360	1.25%
Markup Addons	0	0.00%
+ / - Adjustments	0	
Pass Through Adjustment	0	
Unbalancing Difference	0	0.00%
Rounding Difference	0	
Desired Bid	0.00	
Final Bid Total	15,095,591.44	100.00%
Final Markup (% Based on Cost)	1,886,670	14.28%



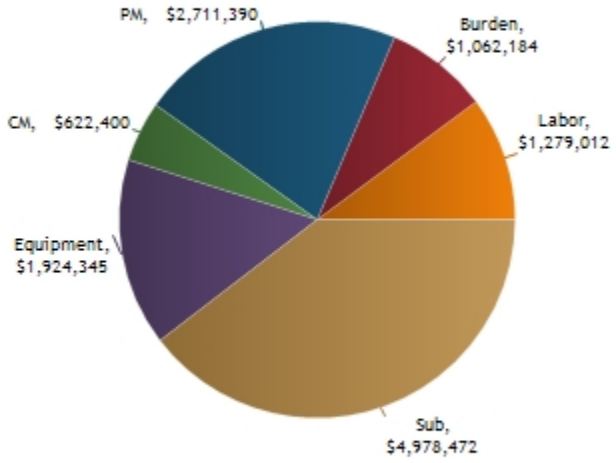
Other Totals

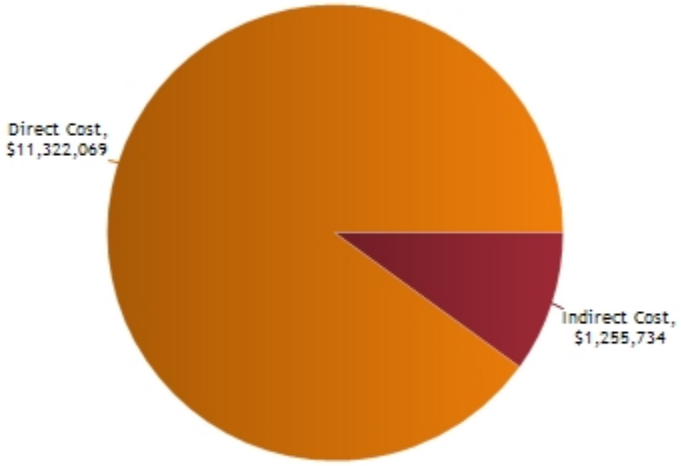
Total Sales Tax	$266,830
Total Escalation	$0
Labor % of Job Cost	17.72 %
Equipment % of Job Cost	14.57 %

Burden % of Direct Labor	51.44 %
Burden % of Indirect Labor	32.02 %
EOE % of Equipment	61.95 %
Current Minority %	0.00 %

Totals by Cost Type - Bid Quantities

	Direct	Indirect	Total	% of Total
Base Labor	781,482	497,529	1,279,012	10.17%
Burden	827,834	234,350	1,062,184	8.44%
Total Labor	**1,609,316**	**731,879**	**2,341,196**	**18.61%**
Inside Equipment	0	0	0	0.00%
Outside Equipment	682,965	49,243	732,208	5.82%
EOE	948,342	243,795	1,192,137	9.48%
Total Equipment	**1,631,308**	**293,038**	**1,924,345**	**15.30%**
Permanent Materials	2,711,390	0	2,711,390	21.56%
Construction Materials	391,583	230,817	622,400	4.95%
Subcontractors	4,978,472	0	4,978,472	39.58%
Misc 1	0	0	0	0.00%
Misc 2	0	0	0	0.00%
Misc 3	0	0	0	0.00%
Totals	**11,322,069**	**1,255,734**	**12,577,802**	**100.00%**





Fuel Summary

Fuel Type	Quantity	Units
Gasoline	52,029	Gal
Diesel	4,885	Gal
Off-Road	147,334	Gal

Sales Tax Summary

	Setup Tax %	Average Tax %	Total Taxes
Permanent Materials	9.75%	9.75%	240,875
Construction Materials	9.75%	4.35%	25,954
Inside Equipment	0.00%	0.00%	0
Outside Equipment	0.00%	0.00%	0
EOE	0.00%	0.00%	0
Subcontractors	0.00%	0.00%	0
Misc 1	0.00%	0.00%	0
Misc 2	0.00%	0.00%	0
Misc 3	0.00%	0.00%	0
Total Tax			266,830

Escalation Summary

	Average Escalation %	Total Escalation
Labor	0.00%	0
Inside Equipment	0.00%	0
Outside Equipment	0.00%	0
EOE	0.00%	0
Permanent Materials	0.00%	0
Construction Materials	0.00%	0
Subcontractors	0.00%	0
Misc 1	0.00%	0
Misc 2	0.00%	0
Misc 3	0.00%	0
Total Escalation		0

Labor Summary

	Direct	Indirect	Total
Hourly Labor (MH, MHS, MHR, MHRS)			
Manhours	18,774	1,044	19,818
Base Labor	739,448	42,282	781,730
Premium (on Base Labor)	42,034	9,061	51,095
Burden (includes Premium)	827,834	51,227	879,061
Total Labor	1,609,316	102,570	1,711,886
Daily Labor (DAY, DAYS, DY, DYS)			
None	0	0	0
Weekly Labor (WK, WKS, WEEK)			
None	0	0	0
Monthly Labor (MO, MON, MNTH, MMO, MMOS)			
Months	0	36	36
Base Labor	0	414,000	414,000
Premium (on Base Labor)	0	0	0
Burden (includes Premium)	0	175,077	175,077
Total Labor	0	589,077	589,077
Other Labor			
Base Labor	0	32,186	32,186
Premium (on Base Labor)	0	0	0
Burden (includes Premium)	0	8,047	8,047
Total Labor	0	40,233	40,233

Summary IS Current Last run 3/12/2020 5:24:00 PM
Spread IS Current Last run 3/12/2020 5:24:00 PM

Balanced Markup Calculation

	Cost	Markup %	Markup $
Labor	1,279,012	15.00%	191,852
Burden	1,062,184	15.00%	159,328
Permanent Materials	2,711,390	15.00%	406,708
Construction Materials	622,400	15.00%	93,360
Inside Equipment	0	15.00%	0
Outside Equipment	732,208	15.00%	109,831
EOE	1,192,137	15.00%	178,821
Subcontractors	4,978,472	15.00%	746,771
Misc 1	0	15.00%	0
Misc 2	0	15.00%	0
Misc 3	0	15.00%	0
Overrides	0	0.00%	0
Total	**12,577,802**	**15.00%**	**1,886,670**

Addons, Bond and Markup Summary Dependent on Bid Summary

	Total	%
Cost Addons		
Home office Overhead	404,685	2.68 %
Bond		
Bond	226,434	1.50 %
Markup		
Resource Markup	1,886,670	12.50 %
Total Markup	1,886,670	12.50 %
Markup, Addons, and Bond Total	**2,517,789**	**16.68 %**

Key Indicators Dependent on Bid Summary

	Result	Formula
Balanced Markup/Total Labor	80.59%	Balanced Markup / Total Labor
Indirect Cost/Direct Cost	11.09%	Indirect Cost / Direct Cost
Total Manhours	19,818.23	Direct Manhours + Indirect Manhours

Estimate Notes

```
Estimate created on: 06/25/2012 by User#: 1 - Jack Fink
Source used: C:\HEAVYBID\HBSAVE\ESTMAST.zip (a backup) from 09/13/2011  4:19:37 PM

************Estimate created on: 07/16/2019 by User#: 4 - Matthew Taylor
Source estimate used: L:\HEAVYBID\EST\ESTMAST

************Estimate created on: 11/10/2019 by User#: 1 - Jack Fink
Source estimate used: L:\HEAVYBID\EST\2019-33
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Cost Report

Biditem - Parent

100

MOB/DEMOB

Takeoff Qty: 1.000 LS

Bid Qty: 1.000 LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	781,482.14	827,834.23	1,609,316.37	1,631,307.53	2,711,389.55	391,583.07	4,978,472.00	11,322,068.52
Total	781,482.14	827,834.23	1,609,316.37	1,631,307.53	2,711,389.55	391,583.07	4,978,472.00	11,322,068.52

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
18,774.2300	0.0001	18,774.2300	603.0643	41.6253	85.7194	0.0000

Biditem - Parent

110

POWER CABLE MOB/DEMOB

Takeoff Qty: 1.000 LS

Bid Qty: 1.000 LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	175,572.28	189,839.08	365,411.36	357,714.23	1,955,745.00	79,029.45	4,968,472.00	7,726,372.04
Total	175,572.28	189,839.08	365,411.36	357,714.23	1,955,745.00	79,029.45	4,968,472.00	7,726,372.04

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
3,964.0000	0.0003	3,964.0000	1,949.1352	44.2917	92.1825	0.0000

Biditem

111

Substation & Electrical Infrastructure Mob/Demob

Takeoff Qty: 1.000 LS

Bid Qty: 1.000 LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	51,640.24	53,186.88	104,827.12	29,431.03	199,745.00	0.00	4,968,472.00	5,302,475.15
Total	51,640.24	53,186.88	104,827.12	29,431.03	199,745.00	0.00	4,968,472.00	5,302,475.15

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
1,084.0000	0.0009	1,084.0000	4,891.5822	47.6386	96.7040	0.0080

Activity: 111010 Install Pole Line Quantity: 1 Unit: LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	0.00	0.00	0.00	0.00	199,745.00	0.00	218,472.00	418,217.00
Total	0.00	0.00	0.00	0.00	199,745.00	0.00	218,472.00	418,217.00

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Notes: Assuming 18,206lf of pole line need to be installed. 25' wood utility poles every 200' @ $2000/ea with 12KV overhead conductors at $12/lf. All costs are installed costs per Tyler Sparks, including material, labor, overhead, and profit. 18206/200=91 poles.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
2L2TTP	Treated Timber Pile	1.00	91.00	EA	2,000.00	109.75	2,195.00	199,745.00
412KVOHL	12KV Overhead Conductor	1.00	18,206.00	LF	12.00	100.00	12.00	218,472.00

Activity: 111020 Install 138kV to 12.5kV Substation Quantity: 1 Unit: LS

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Notes: Includes concrete pad, fencing, switches, 5MVA transformer and switchgear @ installed costs, including material, labor, overhead and profit.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
4SUBST	115KV to 12.5KV Substation	1.00	1.00	LS	3,000,000.00	100.00	3,000,000.00	3,000,000.00

Activity: 111050 PG&E Fees Quantity: 1 Unit: LS

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Notes: Allow cost for PG&E engineering, permitting, and equipment costs for power drop from 138 kV transmission line to 12.5 kV substation. Budgetary estimate from Saylor Consulting was approx. $1.5M.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
4ELEC	Electric - Sub	1.00	1.00	LS	1,500,000.00	100.00	1,500,000.00	1,500,000.00

Activity: 111060 Remove 12 kV Overhead Conductor Quantity: 18206 Unit: LF

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	1.94	1.99	3.93	0.88	0.00	0.00	0.00	4.81
Total	35,284.80	36,286.89	71,571.69	16,087.60	0.00	0.00	0.00	87,659.29

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
4.8149	0.0044	227.5750	1,095.7411	10.0000	1,820.6000	0.0005	8,765.9290

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
720.0000	25.2861	0.0395	99.4051	1.9381

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Crew: 4ELDEM 4-Man Electrical Crew Prod: UH 227.575 Eff: 100.00 Crew Hrs: 80 Labor Pcs: 9.00 Equipment Pcs: 4.00

Notes: Allow for electrical crew to remove 12.5kV overhead conductor from temporary pole line. Remove conductor in 800-1000 ft. sections and wind on reel mounted on flatdeck truck.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
811SGS15000D	15000w Small GenSet	1.00	80.00	HR	16.24	100.00	16.24	1,299.52
812ICSPARBAL	JLG 600A	1.00	80.00	HR	54.47	100.00	54.47	4,357.68
813FLRT08	Forklift Truck RT 8t	1.00	80.00	HR	63.05	100.00	63.05	5,044.00
820OHFT045	On Hwy Flatbed Truck 45K	1.00	80.00	HR	67.33	100.00	67.33	5,386.40
EL01	Electrician Foreman	1.00	80.00	MH	63.03	100.00	122.80	9,823.62
EL02	Electrician	4.00	320.00	MH	61.03	100.00	120.07	38,423.15
LA02	Laborer (CS)	2.00	160.00	MH	31.49	100.00	67.23	10,756.68
OE08	Operator (Gr 7)	1.00	80.00	MH	38.65	100.00	84.32	6,745.97
TE03	Truck Driver (8-25 cy)	1.00	80.00	MH	32.28	100.00	72.78	5,822.27

Activity: 111070 Remove Timber Poles Quantity: 91 Unit: EA

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	179.73	185.71	365.44	146.63	0.00	0.00	0.00	512.08
Total	16,355.44	16,899.99	33,255.43	13,343.43	0.00	0.00	0.00	46,598.86

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
512.0754	0.5000	2.0000	1,024.1508	5.6875	16.0000	0.0625	8,193.2062

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
364.0000	0.2500	4.0000	91.3611	179.7301

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA6003 Pile Driving - Land

Crew: DEMO Demo Crew Prod: UH 2 Eff: 100.00 Crew Hrs: 45.5 Labor Pcs: 8.00 Equipment Pcs: 3.00

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
813RT700E	GROVE RT700E RT Crane 50mt	1.00	45.50	HR	152.12	100.00	152.12	6,921.46
815VHAP50	APE 50 Vibratory Hammer	1.00	45.50	HR	73.81	100.00	73.81	3,358.45
820OHFT045	On Hwy Flatbed Truck 45K	1.00	45.50	HR	67.33	100.00	67.33	3,063.52
OE12	Crane Operator (<100 tn)	1.00	45.50	MH	46.17	100.00	92.22	4,195.91
OE14	Truck Crane Oiler (<100 tn)	1.00	45.50	MH	40.76	100.00	85.13	3,873.27
PD01	Piledriver Foreman	1.00	45.50	MH	49.65	100.00	98.58	4,485.31
PD02	Piledriver	4.00	182.00	MH	47.65	100.00	95.96	17,464.13
TE03	Truck Driver (8-25 cy)	1.00	45.50	MH	32.28	100.00	71.14	3,236.81

Activity: 111080 Demob 138kV to 12.5kV Substation Quantity: 1 Unit: LS

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Notes: Allow costs to remove substation, electrical equipment, concrete pad, fencing, etc. and clean up site.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
4SUBST	115KV to 12.5KV Substation	1.00	1.00	LS	250,000.00	100.00	250,000.00	250,000.00

Biditem

112

Waterside Power Cable Mob/Demob

Takeoff Qty: 1.000 LS

Bid Qty: 1.000 LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	75,368.20	75,395.73	150,763.93	214,413.76	1,756,000.00	0.00	0.00	2,121,177.69
Total	75,368.20	75,395.73	150,763.93	214,413.76	1,756,000.00	0.00	0.00	2,121,177.69

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
1,632.0000	0.0006	1,632.0000	1,299.7412	46.1815	92.3799	0.0038

Activity: 112010 Procure Sumbersible Power Cable Quantity: 20000 Unit: CLF

Calendar: Code not found. Hrs/Shift: 8 WC: Code not found.

Notes: Assume 20,000lf of cable required @ $80/lf. Per Tyler Sparks, costs include material, labor, OH and profit.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
2SPC	500kcmil submersible power cable	1.00	20,000.00	LF	80.00	109.75	87.80	1,756,000.00

Activity: 112020 Tow Power Barge & Reel Barge Quantity: 2 Unit: TOW

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	4,972.45	1,610.91	6,583.36	20,116.90	0.00	0.00	0.00	26,700.26
Total	9,944.90	3,221.82	13,166.72	40,233.79	0.00	0.00	0.00	53,400.51

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
26,700.2550	24.0000	0.0417	1,112.5106	2.0000	1.0000	1.0000	26,700.2550

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
120.0000	0.0167	60.0000	109.7227	4,972.4500

Calendar: S24 24 Hr Shipping Schedule Hrs/Shift: 24 WC: CA3 Dredging

Crew: TOWE (Mod) Tow Electrical Power Barge Prod: HU 24 Eff: 100.00 Crew Hrs: 48 Labor Pcs: 2.50 Equipment Pcs: 1.00

Notes: Assume 100mi(assume local to Bay Area)@ 100mi/day = 1 day; assume one power bargeand one reel barge to house additional cable. Assume tandem tow.
2 TOTAL TOWS (1 MOB, 1 DEMOB)

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
814TB4400	Tow Boat - 4,000hp	1.00	48.00	HR	838.20	100.00	838.20	40,233.79
IB01	Boat Operator	0.50	24.00	MH	61.41	141.67	115.18	2,764.43
IB03	Deckhand Engineer	0.50	24.00	MH	58.81	141.67	110.31	2,647.39
IB04	Deckhand	1.00	48.00	MH	57.48	141.67	107.81	5,175.03
IB05	Mate	0.50	24.00	MH	57.31	141.67	107.49	2,579.87

Activity: 112110 Prep Workboats for Tow, Load, Unload Quantity: 6 Unit: SH

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	2,844.00	3,557.30	6,401.30	7,049.54	0.00	0.00	0.00	13,450.84
Total	17,064.00	21,343.78	38,407.78	42,297.26	0.00	0.00	0.00	80,705.04

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
13,450.8400	8.0000	0.1250	1,681.3550	6.0000	1.0000	1.0000	13,450.8400

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
432.0000	0.0139	72.0000	88.9069	2,844.0000

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: WBMB (Mod) Work Boat Mob Prod: HU 8 Eff: 100.00 Crew Hrs: 48 Labor Pcs: 9.00 Equipment Pcs: 6.00

Notes: MOB: Assume 2 shifts for prepping boats and flat for tow, cribbing, and lashing, 1 shift to fly off and restore barge (3 shifts total).
DEMOB: SAME

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
814CB150	Crane Barge - 150 Ton	1.00	48.00	HR	231.11	100.00	231.11	11,093.28
814DCB0200	Flat Deck Barge 3,102 Ton	1.00	48.00	HR	207.98	100.00	207.98	9,983.18
814HCDWT	Work Tugboat	2.00	96.00	HR	205.12	100.00	205.12	19,691.23
814RUN016	Runabout 16ft	1.00	48.00	HR	22.57	100.00	22.57	1,083.17
818PW350S	Portable Welder Skid 350 amp	1.00	48.00	HR	9.30	100.00	9.30	446.40
OE15	Leverman	1.00	48.00	MH	45.88	100.00	97.58	4,683.80
OE16	HD Repairman/Welder	1.00	48.00	MH	40.92	100.00	90.84	4,360.18
OE17	Engineer	1.00	48.00	MH	39.80	100.00	89.31	4,287.10
OE18	Mate	3.00	144.00	MH	39.80	100.00	89.31	12,861.32
OE19	Deckhand	3.00	144.00	MH	36.50	100.00	84.83	12,215.38

Activity: 112120 Tow Workboats Quantity: 2 Unit: TOW

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	4,972.45	1,610.91	6,583.36	20,116.90	0.00	0.00	0.00	26,700.26
Total	9,944.90	3,221.82	13,166.72	40,233.79	0.00	0.00	0.00	53,400.51

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
26,700.2550	24.0000	0.0417	1,112.5106	2.0000	1.0000	1.0000	26,700.2550

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
120.0000	0.0167	60.0000	109.7227	4,972.4500

Calendar: S24 24 Hr Shipping Schedule Hrs/Shift: 24 WC: CA3 Dredging

Crew: WKBM (Mod) Mob Work Boats Prod: HU 24 Eff: 100.00 Crew Hrs: 48 Labor Pcs: 2.50 Equipment Pcs: 1.00

Notes: Assume 1 ea tow to bring both work boats to the site. Assume 100 miles @ 100mi/day=1day.
2 TOTAL TOWS (1 MOB, 1 DEMOB)

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
814TB4400	Tow Boat - 4,000hp	1.00	48.00	HR	838.20	100.00	838.20	40,233.79
IB01	Boat Operator	0.50	24.00	MH	61.41	141.67	115.18	2,764.43
IB03	Deckhand Engineer	0.50	24.00	MH	58.81	141.67	110.31	2,647.39
IB04	Deckhand	1.00	48.00	MH	57.48	141.67	107.81	5,175.03
IB05	Mate	0.50	24.00	MH	57.31	141.67	107.49	2,579.87

Activity: 112130 Prep Barges for Tow Quantity: 15 Unit: SH

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	2,560.96	3,173.89	5,734.85	6,109.93	0.00	0.00	0.00	11,844.78
Total	38,414.40	47,608.31	86,022.71	91,648.92	0.00	0.00	0.00	177,671.63

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
11,844.7753	8.0000	0.1250	1,480.5969	15.0000	1.0000	1.0000	11,844.7753

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
960.0000	0.0156	64.0000	89.6070	2,560.9600

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: DRKB (Mod) Derrick Barge Crew Prod: HU 8 Eff: 100.00 Crew Hrs: 120 Labor Pcs: 8.00 Equipment Pcs: 6.00

Notes: MOB: Assume 10 shifts for building up reel barge and prepping reel and power barge for tow (1 wk to fly everything over and weld down, 1 week to prep for tow)
DEMOB: 1 wk (5 shifts to take everything apart)

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
814DB300	Derrick Barge - 300 Ton	1.00	120.00	HR	508.16	100.00	508.16	60,978.96
814HCDWT	Work Tugboat	1.00	120.00	HR	205.12	100.00	205.12	24,614.04
814RUN016	Runabout 16ft	1.00	120.00	HR	22.57	100.00	22.57	2,707.92
818PW350S	Portable Welder Skid 350 amp	3.00	360.00	HR	9.30	100.00	9.30	3,348.00
OE15	Leverman	1.00	120.00	MH	45.88	100.00	97.58	11,709.52

OE16	HD Repairman/Welder	2.00	240.00	MH	40.92	100.00	90.84	21,800.92
OE17	Engineer	1.00	120.00	MH	39.80	100.00	89.31	10,717.77
OE18	Mate	2.00	240.00	MH	39.80	100.00	89.31	21,435.53
OE19	Deckhand	2.00	240.00	MH	36.50	100.00	84.83	20,358.97

Biditem

113

Install Submersible Power Cable

Takeoff Qty: 1.000 LS

Bid Qty: 1.000 LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	31,897.36	40,323.10	72,220.46	77,066.86	0.00	53,140.95	0.00	202,428.27
Total	31,897.36	40,323.10	72,220.46	77,066.86	0.00	53,140.95	0.00	202,428.27

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
824.0000	0.0012	824.0000	245.6654	38.7104	87.6462	0.0114

Activity: 113010 Sub Cable to Booster - Tidal Work Quantity: 9321 Unit: LF

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	1.07	1.35	2.42	2.28	0.00	0.00	0.00	4.70
Total	9,960.96	12,593.92	22,554.88	21,268.86	0.00	0.00	0.00	43,823.74

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
4.7016	0.0034	291.2813	1,369.4919	4.0000	2,330.2500	0.0004	10,955.9350

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
256.0000	36.4102	0.0275	88.1050	1.0687

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: WPCL Waterside Power Cable Lay Prod: US 2330.25 Eff: 100.00 Crew Hrs: 32 Labor Pcs: 8.00 Equipment Pcs: 5.00

Notes: 8,105lf of cable is tidal access (assuming 15% add for precision, 9,321).
Tidal Work: Assume can only work 2 hrs/high-tide (2hrs/shift). Inbound(avg 1mi), 2mph, 1mi/2mph=30mins inbound. 90min remaining. Outbound(spooling out cable) 1mph*1.5hrs=1.5miles/shift. 9,321 can be done in approx 2 shifts. Assume 50% weather delays, so 4 shifts total.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
811LGS0400D	400kW Large GenSet	1.00	32.00	HR	199.31	100.00	199.31	6,377.92
814CD26WB	Anchor Scow	1.00	32.00	HR	29.68	100.00	29.68	949.63
814DCB0200	Flat Deck Barge 3,102 Ton	1.00	32.00	HR	207.98	100.00	207.98	6,655.46
814HCDWT	Work Tugboat	1.00	32.00	HR	205.12	100.00	205.12	6,563.74
814RUN016	Runabout 16ft	1.00	32.00	HR	22.57	100.00	22.57	722.11
OE15	Leverman	1.00	32.00	MH	45.88	100.00	97.58	3,122.54
OE18	Mate	3.00	96.00	MH	39.80	100.00	89.31	8,574.22
OE19	Deckhand	4.00	128.00	MH	36.50	100.00	84.83	10,858.12

Activity: 113020 Sub Cable to Booster - No Water Access Quantity: 5062 Unit: LF

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	3.99	5.07	9.07	10.06	0.00	10.50	0.00	29.62
Total	20,211.36	25,686.67	45,898.03	50,898.72	0.00	53,140.95	0.00	149,937.70

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
19.1222	0.0095	105.4583	2,016.5990	6.0000	843.6667	0.0012	24,989.6167

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
528.0000	9.5871	0.1043	86.9281	3.9928

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: WPCW Waterside Power Cable Winch Prod: US 843.6667 Eff: 100.00 Crew Hrs: 48 Labor Pcs: 11.00 Equipment Pcs: 6.00

Notes: 4,402LF of cable has no water access (assuming 15% add for precision - 5062LF of cable).
Waterside power cable install crew + 2ea 100hp tender + spooling truck(assuming Grove Truck Crane 50 is comparable for now), operators, and foreman. Include labor to run out cable and install neptune buoys to cable to float it while it is winched in. Assume 5 mins/buoy to connect to cable - 15hours delay time for installing floats on cable. Assume 1mi/hr winching - 1hr to winch in + 15 hours for buoy delay=16 hours for pulling cable in (2shifts) + 2 hours to shutdown/startup btwn shifts (20 hrs

to winch in). Assume .5 shift to run cable out.
Total of 3 shifts for this operation + 50% weather delays = 6 shifts total.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
5NEPTNB	Neptune Float System	1.00	180.00	EA	269.00	109.75	295.23	53,140.95
811LGS0400D	400kW Large GenSet	1.00	48.00	HR	199.31	100.00	199.31	9,566.88
813HTCTMS700	GROVE TMS700E Truck Crane 50	1.00	48.00	HR	213.19	100.00	213.19	10,232.98
814CD26WB	Anchor Scow	1.00	48.00	HR	29.68	100.00	29.68	1,424.45
814DCB0200	Flat Deck Barge 3,102 Ton	1.00	48.00	HR	207.98	100.00	207.98	9,983.18
814HCDWT	Work Tugboat	2.00	96.00	HR	205.12	100.00	205.12	19,691.23
OE12	Crane Operator (<100 tn)	1.00	48.00	MH	46.17	100.00	94.46	4,534.14
OE18	Mate	3.00	144.00	MH	39.80	100.00	89.31	12,861.32
OE19	Deckhand	7.00	336.00	MH	36.50	100.00	84.83	28,502.57

Activity: 113030 Sub Cable to Offloader Quantity: 4776 Unit: LF

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	0.36	0.43	0.79	1.03	0.00	0.00	0.00	1.81
Total	1,725.04	2,042.51	3,767.55	4,899.28	0.00	0.00	0.00	8,666.83

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
1.8147	0.0017	597.0000	1,083.3538	1.0000	4,776.0000	0.0002	8,666.8300

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
40.0000	119.4000	0.0084	94.1888	0.3612

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: RBHC Reel Barge Handling Crew Prod: US 4776 Eff: 100.00 Crew Hrs: 8 Labor Pcs: 5.00 Equipment Pcs: 3.00

Notes: 41531f neatline (assume 4,7761f for precision). Assume 1 hour in, 1hr out - 2 hours, plus 6 hours to lock out and hook up. 1 total shift. Non-tidal work.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
811LGS0400D	400kW Large GenSet	1.00	8.00	HR	199.31	100.00	199.31	1,594.48
814DCB0200	Flat Deck Barge 3,102 Ton	1.00	8.00	HR	207.98	100.00	207.98	1,663.86
814HCDWT	Work Tugboat	1.00	8.00	HR	205.12	100.00	205.12	1,640.94
EL01	Electrician Foreman	1.00	8.00	MH	63.03	100.00	122.66	981.26
OE18	Mate	2.00	16.00	MH	39.80	100.00	89.31	1,429.03
OE19	Deckhand	2.00	16.00	MH	36.50	100.00	84.83	1,357.26

Biditem 114

Remove Submersible Power Cable

Takeoff Qty: 1.000 LS
Bid Qty: 1.000 LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	16,666.48	20,933.37	37,599.85	36,802.58	0.00	25,888.50	0.00	100,290.93
Total	16,666.48	20,933.37	37,599.85	36,802.58	0.00	25,888.50	0.00	100,290.93

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
424.0000	0.0024	424.0000	236.5352	39.3077	88.6789	0.0179

Activity: 114010 Demob-Sub Cable to Booster - Tidal Work Quantity: 9321 Unit: LF

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	1.07	1.35	2.42	2.28	0.00	0.00	0.00	4.70
Total	9,960.96	12,593.92	22,554.88	21,268.86	0.00	0.00	0.00	43,823.74

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
4.7016	0.0034	291.2813	1,369.4919	4.0000	2,330.2500	0.0004	10,955.9350

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
256.0000	36.4102	0.0275	88.1050	1.0687

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: WPCL Waterside Power Cable Lay Prod: US 2330.25 Eff: 100.00 Crew Hrs: 32 Labor Pcs: 8.00 Equipment Pcs: 5.00

Notes: 8,105lf of cable is tidal access (assuming 15% add for precision, 9,321).
Tidal Work: Assume can only work 2 hrs/high-tide (2hrs/shift). Inbound(avg 1mi), 2mph, 1mi/2mph=30mins inbound. 90min remaining. Outbound(spooling out cable) 1mph*1.5hrs=1.5miles/shift. 9,321 can be done in approx 2 shifts. Assume 50% weather delays, so 4 shifts total.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
811LGS0400D	400kW Large GenSet	1.00	32.00	HR	199.31	100.00	199.31	6,377.92
814CD26WB	Anchor Scow	1.00	32.00	HR	29.68	100.00	29.68	949.63
814DCB0200	Flat Deck Barge 3,102 Ton	1.00	32.00	HR	207.98	100.00	207.98	6,655.46
814HCDWT	Work Tugboat	1.00	32.00	HR	205.12	100.00	205.12	6,563.74
814RUN016	Runabout 16ft	1.00	32.00	HR	22.57	100.00	22.57	722.11
OE15	Leverman	1.00	32.00	MH	45.88	100.00	97.58	3,122.54
OE18	Mate	3.00	96.00	MH	39.80	100.00	89.31	8,574.22
OE19	Deckhand	4.00	128.00	MH	36.50	100.00	84.83	10,858.12

Activity: 114020 Demob-Sub Cable to Booster - No Water Access Quantity: 5062 Unit: LF

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	0.98	1.24	2.23	2.10	0.00	5.11	0.00	9.44
Total	4,980.48	6,296.94	11,277.42	10,634.44	0.00	25,888.50	0.00	47,800.36

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
4.3287	0.0032	316.3750	1,369.4913	2.0000	2,531.0000	0.0004	23,900.1800

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
128.0000	39.5469	0.0253	88.1048	0.9839

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: WPCL Waterside Power Cable Lay Prod: US 2531 Eff: 100.00 Crew Hrs: 16 Labor Pcs: 8.00 Equipment Pcs: 5.00

Notes: 4,402LF of cable has no water access (assuming 15% add for precision - 5062LF of cable).
Waterside power cable install crew
Buoys supply 792lbs of buoyancy force/ea. Cable weighs approx 61,870lb/mi - 59,316lb/5,062lf. 59,316lb/792lb/buoy=75 buoys. Assume 5 mins/buoy to connect to cable - 6.25hours delay time for installing floats on cable. Assume .25mi/hr winching - 4hr to winch in +6.25hours for buoy delay=10.25hour for pulling cable in + 2 hours to anchor btwn shifts (12.25 hrs to winch in). Total of 2 shifts for this operation.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
5NORWG	34in Norwegian Buoy	1.00	75.00	EA	345.18	100.00	345.18	25,888.50
811LGS0400D	400kW Large GenSet	1.00	16.00	HR	199.31	100.00	199.31	3,188.96
814CD26WB	Anchor Scow	1.00	16.00	HR	29.68	100.00	29.68	474.82
814DCB0200	Flat Deck Barge 3,102 Ton	1.00	16.00	HR	207.98	100.00	207.98	3,327.73
814HCDWT	Work Tugboat	1.00	16.00	HR	205.12	100.00	205.12	3,281.87
814RUN016	Runabout 16ft	1.00	16.00	HR	22.57	100.00	22.57	361.06
OE15	Leverman	1.00	16.00	MH	45.88	100.00	97.58	1,561.27
OE18	Mate	3.00	48.00	MH	39.80	100.00	89.31	4,287.10
OE19	Deckhand	4.00	64.00	MH	36.50	100.00	84.83	5,429.05

Activity: 114030 Demob-Sub Cable to Offloader Quantity: 4776 Unit: LF

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	0.36	0.43	0.79	1.03	0.00	0.00	0.00	1.81
Total	1,725.04	2,042.51	3,767.55	4,899.28	0.00	0.00	0.00	8,666.83

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
1.8147	0.0017	597.0000	1,083.3538	1.0000	4,776.0000	0.0002	8,666.8300

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
40.0000	119.4000	0.0084	94.1888	0.3612

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: RBHC Reel Barge Handling Crew Prod: US 4776 Eff: 100.00 Crew Hrs: 8 Labor Pcs: 5.00 Equipment Pcs: 3.00

Notes: 4153lf neatline (assume 4,776lf for precision). Assume 1 hour in, 1hr out - 2 hours, plus 6 hours to lock out and disconnect. 1 total shift. Non-tidal work.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
811LGS0400D	400kW Large GenSet	1.00	8.00	HR	199.31	100.00	199.31	1,594.48
814DCB0200	Flat Deck Barge 3,102 Ton	1.00	8.00	HR	207.98	100.00	207.98	1,663.86
814HCDWT	Work Tugboat	1.00	8.00	HR	205.12	100.00	205.12	1,640.94
EL01	Electrician Foreman	1.00	8.00	MH	63.03	100.00	122.66	981.26
OE18	Mate	2.00	16.00	MH	39.80	100.00	89.31	1,429.03
OE19	Deckhand	2.00	16.00	MH	36.50	100.00	84.83	1,357.26

Biditem

120

MOB/DEMOB PIPELINE

Takeoff Qty: 1.000 LS

Bid Qty: 1.000 LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	183,878.08	201,992.54	385,870.62	250,711.12	722,719.55	310,907.37	10,000.00	1,680,208.66
Total	183,878.08	201,992.54	385,870.62	250,711.12	722,719.55	310,907.37	10,000.00	1,680,208.66

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
4,776.0000	0.0002	4,776.0000	351.8025	38.5004	80.7937	0.0013

Activity: 120005 Procure Pipe — Quantity: 37000 — Unit: LF

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	0.00	0.00	0.00	0.00	19.53	6.40	0.00	25.94
Total	0.00	0.00	0.00	0.00	722,719.55	236,949.37	0.00	959,668.92

Calendar: 724 7 Days x 24 Hrs Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Notes: Allow for furnish of 37,000 LF of pipeline, made up of 500 lf of floating pipe, 16,000 lf submerged pipe and 20,000 lf of shore pipe. Assume first 3,000 lf of pipeline after Offloader and booster pump are steel pipe and remainder is HDPE pipe. Allow for furnish of 6,000 lf of 24" dia. x 0.625" wall pipe, 156.18 lb/ft at $0.96/lb; Allow for 31,000 lf of 28" DR 15.5 PE4710 NSF HDPE Pipe, 28" dia. x 1.806" wall HDPE, 65.563 lb/ft at $88.51/lf. Assume cost includes freight to SF Bay Area. Total cost of pipeline - $3,988,621
Total quantity of material being placed at Eden Landing varies from 3,304,000 with no levee repairs to 4,735,300 with levee repairs. Expected life of pipeline for silty material is 20 MCY. Using the maximum amount of material, the pro-rated cost of the pipeline is 4,735,000 cy/20,000,000 cy = ~24% of the expected pipeline life; $3,988,621*0.24 = $957,269

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
2PRHDPE28	HDPE Pipe, 28" DR 15.5	0.24	7,440.00	LF	88.51	109.75	97.14	722,719.55
3S5P024	Steel Pipe 24" x 0.5"	0.24	1,440.00	LF	149.93	109.75	164.55	236,949.37

Activity: 120010 Weld Submerged Pipeline — Quantity: 20 — Unit: S

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	2,349.04	2,678.80	5,027.84	1,463.02	0.00	878.00	500.00	7,868.86
Total	46,980.80	53,575.96	100,556.76	29,260.40	0.00	17,560.00	10,000.00	157,377.16

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
6,490.8580	8.0000	0.1250	811.3573	20.0000	1.0000	1.0000	7,868.8580

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
1,280.0000	0.0156	64.0000	78.5600	2,349.0400

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Crew: 4WELD (Mod) 4-Man Welding Crew Prod: HU 8 Eff: 100.00 Crew Hrs: 160 Labor Pcs: 8.00 Equipment Pcs: 3.25

Notes: Total 37,0001f of pipe. 5001f of floating pipe (~15 pontoons), 16,0001f submerged pipe, 20,5001f shore pipe. Weld submerged sections into 1,0001f pieces and raft for tow to Eden Landing. Assuming pipe is delivered in 50ft pieces, there will be 320 ea. pices for submerged line. Allow for 6,000 lf steel pipeline and 10,000 lf of HDPE pipeline for submerged line. Steel line will require 120 welds at approx. 6.28 ft. per weld or 2.67 lbs weld/splice. Total length of steel pipe welding is approx. 742 ft. Allow 3 hours per weld - 360 hrs total; allowing for three welding stations - 120 hrs or 15 sh. HDPE line will require 198 welds using fusion machine. Based on fusion cost guidelines assume 10 welds/shift; allowing for one fusion welding station - 198 welds/10 welds/sh = 20 sh. Allow rental cost for shop and fusion welder.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
3WFUSW	Fusion Welder	1.00	160.00	HR	100.00	109.75	109.75	17,560.00
4SHOP	Welding Shop Rental	1.00	20.00	SH	500.00	100.00	500.00	10,000.00
813RT700E	GROVE RT700E RT Crane 50mt	1.00	160.00	HR	152.12	100.00	152.12	24,339.20
818PW500S	Portable Welder Skid 500 amp	2.25	360.00	HR	13.67	100.00	13.67	4,921.20

IW01	Ironworker Foreman	0.75	120.00	MH	42.00	100.00	90.38	10,845.06
IW02	Ironworker	2.25	360.00	MH	40.00	100.00	87.65	31,554.90
LA02	Laborer (CS)	4.00	640.00	MH	31.49	100.00	67.23	43,026.71
OE12	Crane Operator (<100 tn)	1.00	160.00	MH	46.17	100.00	94.56	15,130.09

Activity: 120015 Prep Pipeline for Tow — Quantity: 1 — Unit: LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	5,688.00	7,114.58	12,802.58	11,332.54	0.00	0.00	0.00	24,135.12
Total	5,688.00	7,114.58	12,802.58	11,332.54	0.00	0.00	0.00	24,135.12

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
24,135.1200	16.0000	0.0625	1,508.4450	2.0000	0.5000	2.0000	12,067.5600

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
144.0000	0.0069	144.0000	88.9068	5,688.0000

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: PIPEM Pipeline Mob Prod: S 2 Eff: 100.00 Crew Hrs: 16 Labor Pcs: 9.00 Equipment Pcs: 4.00

Notes: Prep pipeline for tow to Eden Landing. Pull 1,000 ft. sections into water and raft for tow. Load floating line, pontoons, welding machines, rollers, etc. onto deck barge and lash for tow. Allow two shifts to prepare submerged pipeline for tow.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
814DCB0200	Flat Deck Barge 3,102 Ton	1.00	16.00	HR	207.98	100.00	207.98	3,327.73
814HCDDB	Derrick Barge	1.00	16.00	HR	90.07	100.00	90.07	1,441.07
814HCDWT	Work Tugboat	2.00	32.00	HR	205.12	100.00	205.12	6,563.74
OE15	Leverman	1.00	16.00	MH	45.88	100.00	97.58	1,561.27
OE16	HD Repairman/Welder	1.00	16.00	MH	40.92	100.00	90.84	1,453.39
OE17	Engineer	1.00	16.00	MH	39.80	100.00	89.31	1,429.03
OE18	Mate	3.00	48.00	MH	39.80	100.00	89.31	4,287.10
OE19	Deckhand	3.00	48.00	MH	36.50	100.00	84.83	4,071.79

Activity: 120020 Mob-Tow Pipeline — Quantity: 1 — Unit: TOW

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	4,972.44	1,610.91	6,583.35	10,764.55	0.00	0.00	0.00	17,347.90
Total	4,972.44	1,610.91	6,583.35	10,764.55	0.00	0.00	0.00	17,347.90

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
17,347.9000	24.0000	0.0417	722.8292	1.0000	1.0000	1.0000	17,347.9000

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
60.0000	0.0167	60.0000	109.7225	4,972.4400

Calendar: S24 24 Hr Shipping Schedule Hrs/Shift: 24 WC: CA3 Dredging

Crew: PIPET (Mod) Pipeline Tow Prod: HU 24 Eff: 100.00 Crew Hrs: 24 Labor Pcs: 2.50 Equipment Pcs: 1.00

Notes: Allow for 1 tow for pipeline raft and deck barge w/floating pipe. Allow for tow of 100 miles; 1 ea. x 100 miles / 100mi/day = 1 day total.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
814TB4400	Tow Boat - 4,000hp %50	1.00	24.00	HR	838.20	100.00	448.52	10,764.55
IB01	Boat Operator	0.50	12.00	MH	61.41	141.67	115.18	1,382.21
IB03	Deckhand Engineer	0.50	12.00	MH	58.81	141.67	110.31	1,323.69
IB04	Deckhand	1.00	24.00	MH	57.48	141.67	107.81	2,587.52
IB05	Mate	0.50	12.00	MH	57.31	141.67	107.49	1,289.93

Activity: 120025 Prep Shore Pipeline for Work — Quantity: 41 — Unit: S

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	1,480.16	1,626.85	3,107.01	2,113.95	0.00	878.00	0.00	6,098.97
Total	60,686.56	66,700.99	127,387.55	86,672.03	0.00	35,998.00	0.00	250,057.58

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
5,220.9654	8.0000	0.1250	652.6207	41.0000	1.0000	1.0000	6,098.9654

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
1,640.0000	0.0250	40.0000	77.6753	1,480.1600

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Crew: PIPES Shore Pipe Mob Prod: HU 8 Eff: 100.00 Crew Hrs: 328 Labor Pcs: 5.00 Equipment Pcs: 2.00

Notes: Offload from trucks and prepare HDPE shore pipeline for work at Eden Landing site. Assume 20,500 lf of HDPE shore pipe is placed and welded along with wye valves at pump-off locations. Assuming 50' lengths HDPE shore pipe will require 408 welds using fusion machine. Based on fusion cost guidelines assume 10 welds/shift; allowing for one fusion welding station - 408 welds/10 welds/sh = 41 sh. Allow rental cost for fusion welder.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
3WFUSW	Fusion Welder	1.00	328.00	HR	100.00	109.75	109.75	35,998.00
809SCD06T	CAT D6T Dozer	1.00	328.00	HR	134.48	100.00	134.48	44,107.80
813RT600E	GROVE RT640E RT Crane, 36.3	1.00	328.00	HR	129.77	100.00	129.77	42,564.23
LA01	Laborer Foreman	1.00	328.00	MH	33.49	100.00	69.95	22,944.34
LA02	Laborer (CS)	2.00	656.00	MH	31.49	100.00	67.23	44,102.37
OE05	Operator (Gr 4)	1.00	328.00	MH	42.38	100.00	89.40	29,324.17
OE12	Crane Operator (<100 tn)	1.00	328.00	MH	46.17	100.00	94.56	31,016.67

Activity: 120030 Mob-Unload Pipe & Makeup Pipe Quantity: 4 Unit: S

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	2,844.00	3,557.31	6,401.31	5,666.27	0.00	0.00	0.00	12,067.58
Total	11,376.00	14,229.22	25,605.22	22,665.09	0.00	0.00	0.00	48,270.31

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
12,067.5775	8.0000	0.1250	1,508.4472	4.0000	1.0000	1.0000	12,067.5775

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
288.0000	0.0139	72.0000	88.9070	2,844.0000

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: PIPEC Pipeline Mob Prod: HU 8 Eff: 100.00 Crew Hrs: 32 Labor Pcs: 9.00 Equipment Pcs: 4.00

Notes: Assume 4 shifts to unload, connect, place and prepare 16,5001f of pipe from the Offloader to the levee, 500ft floating, 16,000ft submerged.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
814DCB0200	Flat Deck Barge 3,102 Ton	1.00	32.00	HR	207.98	100.00	207.98	6,655.46
814HCDDB	Derrick Barge	1.00	32.00	HR	90.07	100.00	90.07	2,882.14
814HCDWT	Work Tugboat	2.00	64.00	HR	205.12	100.00	205.12	13,127.49
OE15	Leverman	1.00	32.00	MH	45.88	100.00	97.58	3,122.54
OE16	HD Repairman/Welder	1.00	32.00	MH	40.92	100.00	90.84	2,906.79
OE17	Engineer	1.00	32.00	MH	39.80	100.00	89.32	2,858.08
OE18	Mate	3.00	96.00	MH	39.80	100.00	89.31	8,574.22
OE19	Deckhand	3.00	96.00	MH	36.50	100.00	84.83	8,143.59

Activity: 120035 Demob Shore Pipe Quantity: 17 Unit: S

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	1,480.16	1,626.85	3,107.01	2,113.95	0.00	1,200.00	0.00	6,420.96
Total	25,162.72	27,656.50	52,819.22	35,937.18	0.00	20,400.00	0.00	109,156.40

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
5,220.9647	8.0000	0.1250	652.6206	17.0000	1.0000	1.0000	6,420.9647

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
680.0000	0.0250	40.0000	77.6753	1,480.1600

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Crew: PIPES Shore Pipe Mob Prod: HU 8 Eff: 100.00 Crew Hrs: 136 Labor Pcs: 5.00 Equipment Pcs: 2.00

Notes: Cut shore pipe and load onto trucks for transport back to contractors yard for storage. Assume pipe cut into 50 ft. lengths at 1.65 ton/ea.; 20,500 lf/ 50 ft/ea = 410 ea.; 410 ea.*1.65 ton/ea. = 676.5 ton; 676.5 ton/20 ton/truckload = 34 trucks; Allow 34 truck trips, 2 trips/day at $1200/day.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
3HDAY	Hauling - Day Rate	1.00	17.00	SH	1,200.00	100.00	1,200.00	20,400.00
809SCD06T	CAT D6T Dozer	1.00	136.00	HR	134.48	100.00	134.48	18,288.60
813RT600E	GROVE RT640E RT Crane, 36.3	1.00	136.00	HR	129.77	100.00	129.77	17,648.58
LA01	Laborer Foreman	1.00	136.00	MH	33.49	100.00	69.95	9,513.50
LA02	Laborer (CS)	2.00	272.00	MH	31.49	100.00	67.23	18,286.35
OE05	Operator (Gr 4)	1.00	136.00	MH	42.38	100.00	89.40	12,158.80
OE12	Crane Operator (<100 tn)	1.00	136.00	MH	46.17	100.00	94.56	12,860.57

Activity: 120040 Demob-Prep Pipeline for Tow Quantity: 2 Unit: S

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	2,844.00	3,557.29	6,401.29	5,666.27	0.00	0.00	0.00	12,067.56
Total	5,688.00	7,114.58	12,802.58	11,332.54	0.00	0.00	0.00	24,135.12

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
12,067.5600	8.0000	0.1250	1,508.4450	2.0000	1.0000	1.0000	12,067.5600

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
144.0000	0.0139	72.0000	88.9068	2,844.0000

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: PIPEM Pipeline Mob Prod: HU 8 Eff: 100.00 Crew Hrs: 16 Labor Pcs: 9.00 Equipment Pcs: 4.00

Notes: Disconnect and raft pipe into 1,000 ft. lengths for tow back to contractor's yard. Load floating pipeline onto barge and lash for tow. Assume 2 shifts

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
814DCB0200	Flat Deck Barge 3,102 Ton	1.00	16.00	HR	207.98	100.00	207.98	3,327.73
814HCDDB	Derrick Barge	1.00	16.00	HR	90.07	100.00	90.07	1,441.07
814HCDWT	Work Tugboat	2.00	32.00	HR	205.12	100.00	205.12	6,563.74
OE15	Leverman	1.00	16.00	MH	45.88	100.00	97.58	1,561.27
OE16	HD Repairman/Welder	1.00	16.00	MH	40.92	100.00	90.84	1,453.39
OE17	Engineer	1.00	16.00	MH	39.80	100.00	89.31	1,429.03
OE18	Mate	3.00	48.00	MH	39.80	100.00	89.31	4,287.10
OE19	Deckhand	3.00	48.00	MH	36.50	100.00	84.83	4,071.79

Activity: 120045 Demob-Tow Pipeline Quantity: 1 Unit: TOW

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	4,972.44	1,610.91	6,583.35	10,764.55	0.00	0.00	0.00	17,347.90
Total	4,972.44	1,610.91	6,583.35	10,764.55	0.00	0.00	0.00	17,347.90

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
17,347.9000	24.0000	0.0417	722.8292	1.0000	1.0000	1.0000	17,347.9000

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
60.0000	0.0167	60.0000	109.7225	4,972.4400

Calendar: S24 24 Hr Shipping Schedule Hrs/Shift: 24 WC: CA3 Dredging

Crew: PIPET (Mod) Pipeline Tow Prod: HU 24 Eff: 100.00 Crew Hrs: 24 Labor Pcs: 2.50 Equipment Pcs: 1.00

Notes: Allow for 1 tow for pipeline raft and deck barge w/floating pipe. Allow for tow of 100 miles; 1 ea. x 100 miles / 100mi/day = 1 day total.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
814TB4400	Tow Boat - 4,000hp %50	1.00	24.00	HR	838.20	100.00	448.52	10,764.55
IB01	Boat Operator	0.50	12.00	MH	61.41	141.67	115.18	1,382.21
IB03	Deckhand Engineer	0.50	12.00	MH	58.81	141.67	110.31	1,323.69
IB04	Deckhand	1.00	24.00	MH	57.48	141.67	107.81	2,587.52
IB05	Mate	0.50	12.00	MH	57.31	141.67	107.49	1,289.93

Activity: 120050 Demob-Unload Pipe & Makeup Pipe Quantity: 5 Unit: S

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total

U. Cost	2,844.00	3,557.30	6,401.30	5,666.27	0.00	0.00	0.00	12,067.57
Total	14,220.00	17,786.49	32,006.49	28,331.36	0.00	0.00	0.00	60,337.85

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
12,067.5700	8.0000	0.1250	1,508.4463	5.0000	1.0000	1.0000	12,067.5700

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
360.0000	0.0139	72.0000	88.9069	2,844.0000

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: PIPEC Pipeline Mob Prod: HU 8 Eff: 100.00 Crew Hrs: 40 Labor Pcs: 9.00 Equipment Pcs: 4.00

Notes: Assume 5 shifts to unload and prepare for storage 16,500lf of floating and submerged pipe. Pull rafts from water and cut pipe into shorter sections for storage.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
814DCB0200	Flat Deck Barge 3,102 Ton	1.00	40.00	HR	207.98	100.00	207.98	8,319.32
814HCDDB	Derrick Barge	1.00	40.00	HR	90.07	100.00	90.07	3,602.68
814HCDWT	Work Tugboat	2.00	80.00	HR	205.12	100.00	205.12	16,409.36
OE15	Leverman	1.00	40.00	MH	45.88	100.00	97.58	3,903.17
OE16	HD Repairman/Welder	1.00	40.00	MH	40.92	100.00	90.84	3,633.48
OE17	Engineer	1.00	40.00	MH	39.80	100.00	89.31	3,572.59
OE18	Mate	3.00	120.00	MH	39.80	100.00	89.31	10,717.77
OE19	Deckhand	3.00	120.00	MH	36.50	100.00	84.83	10,179.48

Activity: 120055 Unload-Prep Shore Pipe for Storage Quantity: 3 Unit: S

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	1,377.04	1,530.80	2,907.84	1,216.96	0.00	0.00	0.00	4,124.80
Total	4,131.12	4,592.40	8,723.52	3,650.88	0.00	0.00	0.00	12,374.40

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
4,124.8000	8.0000	0.1250	515.6000	3.0000	1.0000	1.0000	4,124.8000

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
120.0000	0.0250	40.0000	72.6960	1,377.0400

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Crew: 4WELD (Mod) 4-Man Welding Crew Prod: HU 8 Eff: 100.00 Crew Hrs: 24 Labor Pcs: 5.00 Equipment Pcs: 1.00

Notes: Unload pipe from trucks and stack for storage. Assume 30 minutes per truckload to offload and stack.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
813RT700E	GROVE RT700E RT Crane 50mt	1.00	24.00	HR	152.12	100.00	152.12	3,650.88
LA02	Laborer (CS)	4.00	96.00	MH	31.49	100.00	67.23	6,454.01
OE12	Crane Operator (<100 tn)	1.00	24.00	MH	46.17	100.00	94.56	2,269.51

Biditem - Parent

130

SETUP UNLD SUPPORT BARGES

Takeoff Qty: 1.000 LS

Bid Qty: 1.000 LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	34,901.08	37,339.53	72,240.61	92,431.81	0.00	0.00	0.00	164,672.42
Total	34,901.08	37,339.53	72,240.61	92,431.81	0.00	0.00	0.00	164,672.42

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
748.0000	0.0013	748.0000	220.1503	46.6592	96.5784	0.0000

Biditem

131

DRIVE PILES FOR SUPPORT BARGES

Takeoff Qty: 1.000 LS

Bid Qty: 1.000 LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	28,773.36	30,658.72	59,432.08	82,691.73	0.00	0.00	0.00	142,123.81
Total	28,773.36	30,658.72	59,432.08	82,691.73	0.00	0.00	0.00	142,123.81

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
616.0000	0.0016	616.0000	230.7205	46.7100	96.4806	0.0114

Activity: 131010 Load Piles on Barge Quantity: 1 Unit: LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	2,615.76	2,787.16	5,402.92	7,517.43	0.00	0.00	0.00	12,920.35
Total	2,615.76	2,787.16	5,402.92	7,517.43	0.00	0.00	0.00	12,920.35

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
12,920.3500	8.0000	0.1250	1,615.0438	1.0000	1.0000	1.0000	12,920.3500

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
56.0000	0.0179	56.0000	96.4807	2,615.7600

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: CRBG7 Crane Barge, 7-Men Prod: S 1 Eff: 100.00 Crew Hrs: 8 Labor Pcs: 7.00 Equipment Pcs: 8.00

Notes: Assume piles are procured in bay - no open water tow.
12.5min/pile*20pile=4.2hr
(Assume 1ea 8hr shift)

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
803AC0250	Portable Air Comp - 250-cfm	1.00	8.00	HR	28.39	100.00	28.39	227.13
811LGS0020D	20kW Large GenSet	1.00	8.00	HR	20.60	100.00	20.60	164.79
814CB150	Crane Barge - 150 Ton	1.00	8.00	HR	231.11	100.00	231.11	1,848.88
814DCB0140	Flat Deck Barge 1,253 Ton	1.00	8.00	HR	117.17	100.00	117.17	937.37
814ITB0700	Inland Tug - 700hp	1.00	8.00	HR	365.66	100.00	365.66	2,925.26
814RUN016	Runabout 16ft	1.00	8.00	HR	22.57	100.00	22.57	180.53
815DH06222	DELMAG D62-22 Dsl Hammer	1.00	8.00	HR	144.88	100.00	144.88	1,159.07
818PW350S	Portable Welder Skid 350 amp	1.00	8.00	HR	9.30	100.00	9.30	74.40
OE09	Crane Operator (>100 tn)	1.00	8.00	MH	47.99	100.00	96.94	775.48
OE10	Crane Oiler (>100 tn)	1.00	8.00	MH	38.73	100.00	84.35	674.78
PD01	Piledriver Foreman	1.00	8.00	MH	49.65	100.00	100.99	807.94
PD02	Piledriver	4.00	32.00	MH	47.65	100.00	98.27	3,144.72

Activity: 131011 Fly Leads, Hammer and Power Pack to Quantity: 1 Unit: LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	2,615.76	2,787.16	5,402.92	7,517.43	0.00	0.00	0.00	12,920.35
Total	2,615.76	2,787.16	5,402.92	7,517.43	0.00	0.00	0.00	12,920.35

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
12,920.3500	8.0000	0.1250	1,615.0438	1.0000	1.0000	1.0000	12,920.3500

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
56.0000	0.0179	56.0000	96.4807	2,615.7600

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: CRBG7 (Mod) Crane Barge, 7-Men Prod: S 1 Eff: 100.00 Crew Hrs: 8 Labor Pcs: 7.00 Equipment Pcs: 8.00

Notes: Rig into and fly leads onto barge, fly power pack and hammer (Assume 1ea 8hr shift)

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
803AC0250	Portable Air Comp - 250-cfm	1.00	8.00	HR	28.39	100.00	28.39	227.13
811LGS0020D	20kW Large GenSet	1.00	8.00	HR	20.60	100.00	20.60	164.79
814CB150	Crane Barge - 150 Ton	1.00	8.00	HR	231.11	100.00	231.11	1,848.88
814DCB0140	Flat Deck Barge 1,253 Ton	1.00	8.00	HR	117.17	100.00	117.17	937.37
814ITB0700	Inland Tug - 700hp	1.00	8.00	HR	365.66	100.00	365.66	2,925.26
814RUN016	Runabout 16ft	1.00	8.00	HR	22.57	100.00	22.57	180.53

815DH06222	DELMAG D62-22 Dsl Hammer	1.00	8.00	HR	144.88	100.00	144.88	1,159.07
818PW350S	Portable Welder Skid 350 amp	1.00	8.00	HR	9.30	100.00	9.30	74.40
OE09	Crane Operator (>100 tn)	1.00	8.00	MH	47.99	100.00	96.94	775.48
OE10	Crane Oiler (>100 tn)	1.00	8.00	MH	38.73	100.00	84.35	674.78
PD01	Piledriver Foreman	1.00	8.00	MH	49.65	100.00	100.99	807.94
PD02	Piledriver	4.00	32.00	MH	47.65	100.00	98.27	3,144.72

Activity: 131012 Tow Pile Driving Spread Quantity: 1 Unit: LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	1,307.88	1,393.57	2,701.45	3,758.71	0.00	0.00	0.00	6,460.16
Total	1,307.88	1,393.57	2,701.45	3,758.71	0.00	0.00	0.00	6,460.16

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
6,460.1600	4.0000	0.2500	1,615.0400	0.5000	2.0000	0.5000	12,920.3200

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
28.0000	0.0357	28.0000	96.4804	1,307.8800

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: CRBG7 Crane Barge, 7-Men Prod: S 0.5 Eff: 100.00 Crew Hrs: 4 Labor Pcs: 7.00 Equipment Pcs: 8.00

Notes: (Assume 4hr)

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
803AC0250	Portable Air Comp - 250-cfm	1.00	4.00	HR	28.39	100.00	28.39	113.56
811LGS0020D	20kW Large GenSet	1.00	4.00	HR	20.60	100.00	20.60	82.40
814CB150	Crane Barge - 150 Ton	1.00	4.00	HR	231.11	100.00	231.11	924.44
814DCB0140	Flat Deck Barge 1,253 Ton	1.00	4.00	HR	117.17	100.00	117.17	468.68
814ITB0700	Inland Tug - 700hp	1.00	4.00	HR	365.66	100.00	365.66	1,462.63
814RUN016	Runabout 16ft	1.00	4.00	HR	22.57	100.00	22.57	90.26
815DH06222	DELMAG D62-22 Dsl Hammer	1.00	4.00	HR	144.88	100.00	144.89	579.54
818PW350S	Portable Welder Skid 350 amp	1.00	4.00	HR	9.30	100.00	9.30	37.20
OE09	Crane Operator (>100 tn)	1.00	4.00	MH	47.99	100.00	96.94	387.74
OE10	Crane Oiler (>100 tn)	1.00	4.00	MH	38.73	100.00	84.35	337.39
PD01	Piledriver Foreman	1.00	4.00	MH	49.65	100.00	100.99	403.96
PD02	Piledriver	4.00	16.00	MH	47.65	100.00	98.27	1,572.36

Activity: 131013 Get Into Leads, Prep to Drive Pile Quantity: 1 Unit: LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	2,615.76	2,787.16	5,402.92	7,517.43	0.00	0.00	0.00	12,920.35
Total	2,615.76	2,787.16	5,402.92	7,517.43	0.00	0.00	0.00	12,920.35

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
12,920.3500	8.0000	0.1250	1,615.0438	1.0000	1.0000	1.0000	12,920.3500

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
56.0000	0.0179	56.0000	96.4807	2,615.7600

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: CRBG7 Crane Barge, 7-Men Prod: S 1 Eff: 100.00 Crew Hrs: 8 Labor Pcs: 7.00 Equipment Pcs: 8.00

Notes: Get into leads, set hammer, lay hydraulic hose, hookup power pack and test, set anchors
(Assume 1 ea 8hr shifts)

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
803AC0250	Portable Air Comp - 250-cfm	1.00	8.00	HR	28.39	100.00	28.39	227.13
811LGS0020D	20kW Large GenSet	1.00	8.00	HR	20.60	100.00	20.60	164.79
814CB150	Crane Barge - 150 Ton	1.00	8.00	HR	231.11	100.00	231.11	1,848.88
814DCB0140	Flat Deck Barge 1,253 Ton	1.00	8.00	HR	117.17	100.00	117.17	937.37
814ITB0700	Inland Tug - 700hp	1.00	8.00	HR	365.66	100.00	365.66	2,925.26
814RUN016	Runabout 16ft	1.00	8.00	HR	22.57	100.00	22.57	180.53

815DH06222	DELMAG D62-22 Dsl Hammer	1.00	8.00	HR	144.88	100.00	144.88	1,159.07
818PW350S	Portable Welder Skid 350 amp	1.00	8.00	HR	9.30	100.00	9.30	74.40
OE09	Crane Operator (>100 tn)	1.00	8.00	MH	47.99	100.00	96.94	775.48
OE10	Crane Oiler (>100 tn)	1.00	8.00	MH	38.73	100.00	84.35	674.78
PD01	Piledriver Foreman	1.00	8.00	MH	49.65	100.00	100.99	807.94
PD02	Piledriver	4.00	32.00	MH	47.65	100.00	98.27	3,144.72

Activity: 131020 Drive 24" Steel Pipe Plumb Piles Quantity: 1 Unit: LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	7,847.28	8,361.46	16,208.74	22,552.29	0.00	0.00	0.00	38,761.03
Total	7,847.28	8,361.46	16,208.74	22,552.29	0.00	0.00	0.00	38,761.03

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
38,761.0300	24.0000	0.0417	1,615.0429	3.0000	0.3333	3.0000	12,920.3433

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
168.0000	0.0060	168.0000	96.4806	7,847.2800

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: CRBG7 Crane Barge, 7-Men Prod: S 3 Eff: 100.00 Crew Hrs: 24 Labor Pcs: 7.00 Equipment Pcs: 8.00

Notes: Drive 12ea 120'x24" steel pipe plumb piles
Piles are spaced ~55' apart on avg.
(Assume 5 piles/8hr shift, 12piles/(5pile/day)=3 shifts)

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
803AC0250	Portable Air Comp - 250-cfm	1.00	24.00	HR	28.39	100.00	28.39	681.38
811LGS0020D	20kW Large GenSet	1.00	24.00	HR	20.60	100.00	20.60	494.38
814CB150	Crane Barge - 150 Ton	1.00	24.00	HR	231.11	100.00	231.11	5,546.64
814DCB0140	Flat Deck Barge 1,253 Ton	1.00	24.00	HR	117.17	100.00	117.17	2,812.10
814ITB0700	Inland Tug - 700hp	1.00	24.00	HR	365.66	100.00	365.66	8,775.79
814RUN016	Runabout 16ft	1.00	24.00	HR	22.57	100.00	22.57	541.58
815DH06222	DELMAG D62-22 Dsl Hammer	1.00	24.00	HR	144.88	100.00	144.88	3,477.22
818PW350S	Portable Welder Skid 350 amp	1.00	24.00	HR	9.30	100.00	9.30	223.20
OE09	Crane Operator (>100 tn)	1.00	24.00	MH	47.99	100.00	96.94	2,326.44
OE10	Crane Oiler (>100 tn)	1.00	24.00	MH	38.73	100.00	84.35	2,024.35
PD01	Piledriver Foreman	1.00	24.00	MH	49.65	100.00	100.99	2,423.79
PD02	Piledriver	4.00	96.00	MH	47.65	100.00	98.27	9,434.16

Activity: 131021 Drive 24" Steel Pipe Batter Piles Quantity: 1 Unit: LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	5,231.52	5,574.32	10,805.84	15,034.87	0.00	0.00	0.00	25,840.71
Total	5,231.52	5,574.32	10,805.84	15,034.87	0.00	0.00	0.00	25,840.71

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
25,840.7100	16.0000	0.0625	1,615.0444	2.0000	0.5000	2.0000	12,920.3550

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
112.0000	0.0089	112.0000	96.4807	5,231.5200

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: CRBG7 Crane Barge, 7-Men Prod: S 2 Eff: 100.00 Crew Hrs: 16 Labor Pcs: 7.00 Equipment Pcs: 8.00

Notes: Drive 8ea 120'x24" steel pipe batter piles
(Assume 4 piles/8hr shift, 8 piles/(4piles/day)=2 shifts)

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
803AC0250	Portable Air Comp - 250-cfm	1.00	16.00	HR	28.39	100.00	28.39	454.26
811LGS0020D	20kW Large GenSet	1.00	16.00	HR	20.60	100.00	20.60	329.58
814CB150	Crane Barge - 150 Ton	1.00	16.00	HR	231.11	100.00	231.11	3,697.76
814DCB0140	Flat Deck Barge 1,253 Ton	1.00	16.00	HR	117.17	100.00	117.17	1,874.74
814ITB0700	Inland Tug - 700hp	1.00	16.00	HR	365.66	100.00	365.66	5,850.53

814RUN016	Runabout 16ft	1.00	16.00	HR	22.57	100.00	22.57	361.06
815DH06222	DELMAG D62-22 Dsl Hammer	1.00	16.00	HR	144.88	100.00	144.88	2,318.14
818PW350S	Portable Welder Skid 350 amp	1.00	16.00	HR	9.30	100.00	9.30	148.80
OE09	Crane Operator (>100 tn)	1.00	16.00	MH	47.99	100.00	96.94	1,550.97
OE10	Crane Oiler (>100 tn)	1.00	16.00	MH	38.73	100.00	84.35	1,349.57
PD01	Piledriver Foreman	1.00	16.00	MH	49.65	100.00	100.99	1,615.85
PD02	Piledriver	4.00	64.00	MH	47.65	100.00	98.27	6,289.45

Activity: 131030 Get out of Leads Quantity: 1 Unit: LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	2,615.76	2,787.16	5,402.92	7,517.43	0.00	0.00	0.00	12,920.35
Total	2,615.76	2,787.16	5,402.92	7,517.43	0.00	0.00	0.00	12,920.35

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
12,920.3500	8.0000	0.1250	1,615.0438	1.0000	1.0000	1.0000	12,920.3500

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
56.0000	0.0179	56.0000	96.4807	2,615.7600

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: CRBG7 Crane Barge, 7-Men Prod: S 1 Eff: 100.00 Crew Hrs: 8 Labor Pcs: 7.00 Equipment Pcs: 8.00

Notes: Get out of leads, set hammer, lay hydraulic hose, disconnect power pack, hang anchors
(Assume 1 ea 8hr shifts)

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
803AC0250	Portable Air Comp - 250-cfm	1.00	8.00	HR	28.39	100.00	28.39	227.13
811LGS0020D	20kW Large GenSet	1.00	8.00	HR	20.60	100.00	20.60	164.79
814CB150	Crane Barge - 150 Ton	1.00	8.00	HR	231.11	100.00	231.11	1,848.88
814DCB0140	Flat Deck Barge 1,253 Ton	1.00	8.00	HR	117.17	100.00	117.17	937.37
814ITB0700	Inland Tug - 700hp	1.00	8.00	HR	365.66	100.00	365.66	2,925.26
814RUN016	Runabout 16ft	1.00	8.00	HR	22.57	100.00	22.57	180.53
815DH06222	DELMAG D62-22 Dsl Hammer	1.00	8.00	HR	144.88	100.00	144.88	1,159.07
818PW350S	Portable Welder Skid 350 amp	1.00	8.00	HR	9.30	100.00	9.30	74.40
OE09	Crane Operator (>100 tn)	1.00	8.00	MH	47.99	100.00	96.94	775.48
OE10	Crane Oiler (>100 tn)	1.00	8.00	MH	38.73	100.00	84.35	674.78
PD01	Piledriver Foreman	1.00	8.00	MH	49.65	100.00	100.99	807.94
PD02	Piledriver	4.00	32.00	MH	47.65	100.00	98.27	3,144.72

Activity: 131031 Tow Pile Driving Spread - Demob Quantity: 1 Unit: LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	1,307.88	1,393.57	2,701.45	3,758.71	0.00	0.00	0.00	6,460.16
Total	1,307.88	1,393.57	2,701.45	3,758.71	0.00	0.00	0.00	6,460.16

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
6,460.1600	4.0000	0.2500	1,615.0400	0.5000	2.0000	0.5000	12,920.3200

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
28.0000	0.0357	28.0000	96.4804	1,307.8800

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: CRBG7 Crane Barge, 7-Men Prod: S 0.5 Eff: 100.00 Crew Hrs: 4 Labor Pcs: 7.00 Equipment Pcs: 8.00

Notes: Tow Pile Driving Spread
(Assume 4hr)

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
803AC0250	Portable Air Comp - 250-cfm	1.00	4.00	HR	28.39	100.00	28.39	113.56
811LGS0020D	20kW Large GenSet	1.00	4.00	HR	20.60	100.00	20.60	82.40
814CB150	Crane Barge - 150 Ton	1.00	4.00	HR	231.11	100.00	231.11	924.44
814DCB0140	Flat Deck Barge 1,253 Ton	1.00	4.00	HR	117.17	100.00	117.17	468.68
814ITB0700	Inland Tug - 700hp	1.00	4.00	HR	365.66	100.00	365.66	1,462.63

814RUN016	Runabout 16ft	1.00	4.00	HR	22.57	100.00	22.57	90.26
815DH06222	DELMAG D62-22 Dsl Hammer	1.00	4.00	HR	144.88	100.00	144.89	579.54
818PW350S	Portable Welder Skid 350 amp	1.00	4.00	HR	9.30	100.00	9.30	37.20
OE09	Crane Operator (>100 tn)	1.00	4.00	MH	47.99	100.00	96.94	387.74
OE10	Crane Oiler (>100 tn)	1.00	4.00	MH	38.73	100.00	84.35	337.39
PD01	Piledriver Foreman	1.00	4.00	MH	49.65	100.00	100.99	403.96
PD02	Piledriver	4.00	16.00	MH	47.65	100.00	98.27	1,572.36

Activity: 131032 Fly Pile Driving Eq to Shore & Store Quantity: 1 Unit: LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	2,615.76	2,787.16	5,402.92	7,517.43	0.00	0.00	0.00	12,920.35
Total	2,615.76	2,787.16	5,402.92	7,517.43	0.00	0.00	0.00	12,920.35

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
12,920.3500	8.0000	0.1250	1,615.0438	1.0000	1.0000	1.0000	12,920.3500

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
56.0000	0.0179	56.0000	96.4807	2,615.7600

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: CRBG7 Crane Barge, 7-Men Prod: S 1 Eff: 100.00 Crew Hrs: 8 Labor Pcs: 7.00 Equipment Pcs: 8.00

Notes: Fly Leads, hammer, hyd hoses and power pack to shore and store
Rig into and fly leads, power pack and hammer
(Assume 1ea 8hr shift)

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
803AC0250	Portable Air Comp - 250-cfm	1.00	8.00	HR	28.39	100.00	28.39	227.13
811LGS0020D	20kW Large GenSet	1.00	8.00	HR	20.60	100.00	20.60	164.79
814CB150	Crane Barge - 150 Ton	1.00	8.00	HR	231.11	100.00	231.11	1,848.88
814DCB0140	Flat Deck Barge 1,253 Ton	1.00	8.00	HR	117.17	100.00	117.17	937.37
814ITB0700	Inland Tug - 700hp	1.00	8.00	HR	365.66	100.00	365.66	2,925.26
814RUN016	Runabout 16ft	1.00	8.00	HR	22.57	100.00	22.57	180.53
815DH06222	DELMAG D62-22 Dsl Hammer	1.00	8.00	HR	144.88	100.00	144.88	1,159.07
818PW350S	Portable Welder Skid 350 amp	1.00	8.00	HR	9.30	100.00	9.30	74.40
OE09	Crane Operator (>100 tn)	1.00	8.00	MH	47.99	100.00	96.94	775.48
OE10	Crane Oiler (>100 tn)	1.00	8.00	MH	38.73	100.00	84.35	674.78
PD01	Piledriver Foreman	1.00	8.00	MH	49.65	100.00	100.99	807.94
PD02	Piledriver	4.00	32.00	MH	47.65	100.00	98.27	3,144.72

Biditem

132

SETUP SUPPORT BARGE(S)

Takeoff Qty: 1.000 LS

Bid Qty: 1.000 LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	6,127.72	6,680.81	12,808.53	9,740.08	0.00	0.00	0.00	22,548.61
Total	6,127.72	6,680.81	12,808.53	9,740.08	0.00	0.00	0.00	22,548.61

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
132.0000	0.0076	132.0000	170.8228	46.4221	97.0343	0.0179

Activity: 132010 Install Pile Keepers Quantity: 4 Unit: S

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	858.38	907.85	1,766.23	680.94	0.00	0.00	0.00	2,447.17
Total	3,433.52	3,631.41	7,064.93	2,723.76	0.00	0.00	0.00	9,788.69

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
2,447.1725	8.0000	0.1250	305.8966	4.0000	1.0000	1.0000	2,447.1725

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
72.0000	0.0556	18.0000	98.1240	858.3800

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: WLD3 3 Man weld crew Prod: HU 8 Eff: 100.00 Crew Hrs: 32 Labor Pcs: 2.25 Equipment Pcs: 2.25

Notes:
```
Install 4 ea pile keepers per barge, assume 2ea barges (170'x40'). 8ea keepers total.
Assume pile keepers are 1"x36"x12" doubler plates w/ 4ea 3"x.25"x30" square tube.
Assume 0.5 day prep and welding/doubler plate.
Assume 0.25 day welding/square tubing box
(0.5*8 + .25*8 = 6  shifts)
Assume 2 ea. welding crews
```

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
814CB150	Crane Barge - 150 Ton	0.25	8.00	HR	231.11	100.00	231.11	1,848.88
818PW500S	Portable Welder Skid 500 amp	2.00	64.00	HR	13.67	100.00	13.67	874.88
OE09	Crane Operator (>100 tn)	0.25	8.00	MH	47.99	100.00	96.94	775.48
PD02	Piledriver	2.00	64.00	MH	47.65	100.00	98.27	6,289.45

Activity: 132020 Tow Flat Barges Quantity: 1 Unit: LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	488.72	616.85	1,105.57	2,827.22	0.00	0.00	0.00	3,932.79
Total	488.72	616.85	1,105.57	2,827.22	0.00	0.00	0.00	3,932.79

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
3,932.7900	4.0000	0.2500	983.1975	0.5000	2.0000	0.5000	7,865.5800

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
12.0000	0.0833	12.0000	92.1308	488.7200

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: MARINE Over Water Work

Crew: TOWL (Mod) Towing - Local Crew Prod: HU 4 Eff: 100.00 Crew Hrs: 4 Labor Pcs: 3.00 Equipment Pcs: 3.00

Notes: `Assume 1ea tandem tow for the 2ea flat barges (Assume 4hr)`

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
814DCB0140	Flat Deck Barge 1,253 Ton	2.00	8.00	HR	117.17	100.00	117.17	937.37
814TB1350	Tow Boat - 1,350hp %50	1.00	4.00	HR	741.73	100.00	472.46	1,889.85
OE15	Leverman	1.00	4.00	MH	45.88	100.00	99.33	397.33
OE17	Engineer	1.00	4.00	MH	39.80	100.00	90.84	363.34
OE19	Deckhand	1.00	4.00	MH	36.50	100.00	86.23	344.90

Activity: 132110 Tow Flat Barges - Demob Quantity: 1 Unit: TOW

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	488.72	616.85	1,105.57	2,827.22	0.00	0.00	0.00	3,932.79
Total	488.72	616.85	1,105.57	2,827.22	0.00	0.00	0.00	3,932.79

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
3,932.7900	4.0000	0.2500	983.1975	0.5000	2.0000	0.5000	7,865.5800

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
12.0000	0.0833	12.0000	92.1308	488.7200

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: MARINE Over Water Work

Crew: TOWL (Mod) Towing - Local Crew Prod: HU 4 Eff: 100.00 Crew Hrs: 4 Labor Pcs: 3.00 Equipment Pcs: 3.00

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
814DCB0140	Flat Deck Barge 1,253 Ton	2.00	8.00	HR	117.17	100.00	117.17	937.37
814TB1350	Tow Boat - 1,350hp %50	1.00	4.00	HR	741.73	100.00	472.46	1,889.85
OE15	Leverman	1.00	4.00	MH	45.88	100.00	99.33	397.33
OE17	Engineer	1.00	4.00	MH	39.80	100.00	90.84	363.34
OE19	Deckhand	1.00	4.00	MH	36.50	100.00	86.23	344.90

Activity: 132120 Grind/burn off keepers Quantity: 2 Unit: S

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total

U. Cost	858.38	907.85	1,766.23	680.94	0.00	0.00	0.00	2,447.17
Total	1,716.76	1,815.70	3,532.46	1,361.88	0.00	0.00	0.00	4,894.34

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
2,447.1700	8.0000	0.1250	305.8963	2.0000	1.0000	1.0000	2,447.1700

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
36.0000	0.0556	18.0000	98.1239	858.3800

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA2 Pile Driving - Marine

Crew: WLD3 3 Man weld crew Prod: HU 8 Eff: 100.00 Crew Hrs: 16 Labor Pcs: 2.25 Equipment Pcs: 2.25

Notes: Grind/burn off keepers (Assume 2 shifts)

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
814CB150	Crane Barge - 150 Ton	0.25	4.00	HR	231.11	100.00	231.11	924.44
818PW500S	Portable Welder Skid 500 amp	2.00	32.00	HR	13.67	100.00	13.67	437.44
OE09	Crane Operator (>100 tn)	0.25	4.00	MH	47.99	100.00	96.94	387.74
PD02	Piledriver	2.00	32.00	MH	47.65	100.00	98.27	3,144.72

Biditem - Parent

140

LEVEE REPAIRS

Takeoff Qty: 19,200.000 LF

Bid Qty: 19,200.000 LF

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	17.75	18.26	36.01	47.93	0.00	0.09	0.00	84.02
Total	340,837.20	350,547.35	691,384.55	920,168.62	0.00	1,646.25	0.00	1,613,199.42

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
8,036.2300	2.3892	0.4186	200.7408	42.4126	86.0334	0.0000

Biditem

141

MOB/DEMOB EQUIPMENT

Takeoff Qty: 1.000 LS

Bid Qty: 1.000 LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	25,970.98	29,290.76	55,261.74	28,686.42	0.00	1,646.25	0.00	85,594.41
Total	25,970.98	29,290.76	55,261.74	28,686.42	0.00	1,646.25	0.00	85,594.41

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
736.0000	0.0014	736.0000	116.2968	35.2867	75.0839	0.0040

Activity: 14110 Load Out Equipment at Yard Quantity: 2 Unit: SH

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	1,969.36	2,193.40	4,162.76	1,815.09	0.00	0.00	0.00	5,977.85
Total	3,938.72	4,386.79	8,325.51	3,630.18	0.00	0.00	0.00	11,955.69

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
5,977.8450	8.0000	0.1250	747.2306	2.0000	1.0000	1.0000	5,977.8450

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
112.0000	0.0179	56.0000	74.3349	1,969.3600

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Crew: 4PD (Mod) 4-Man PD Crew Prod: S 2 Eff: 100.00 Crew Hrs: 16 Labor Pcs: 7.00 Equipment Pcs: 1.00

Notes: Allow for crew to load equipment, supplies, small tools, pile template, storage boxes, etc. onto trucks for delivery to the project site.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
813CMLBC1000	MANITOWOC 10000 100t	1.00	16.00	HR	226.89	100.00	226.89	3,630.18
LA01	Laborer Foreman	1.00	16.00	MH	33.49	100.00	69.95	1,119.24

LA02	Laborer (CS)	4.00	64.00	MH	31.49	100.00	67.23	4,302.68
OE09	Crane Operator (>100 tn)	1.00	16.00	MH	47.99	100.00	97.04	1,552.66
OE10	Crane Oiler (>100 tn)	1.00	16.00	MH	38.73	100.00	84.43	1,350.93

Activity: 14120 Mobilize Equipment Quantity: 10 Unit: LDS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	258.24	323.99	582.23	538.64	0.00	0.00	0.00	1,120.87
Total	2,582.40	3,239.87	5,822.27	5,386.40	0.00	0.00	0.00	11,208.67

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
1,120.8670	8.0000	0.1250	140.1084	10.0000	1.0000	1.0000	1,120.8670

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
80.0000	0.1250	8.0000	72.7784	258.2400

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Crew: HAUL Trucking Crew Prod: HU 8 Eff: 100.00 Crew Hrs: 80 Labor Pcs: 1.00 Equipment Pcs: 1.00

Notes: Allow for truck trips to mobilize equipment to the project site. Allow for long-reach excavator, loader, dozer, storage boxes, fencing, small tools, office trailer, materials, etc. Assume 10 truckloads at 8 hours/load.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
820OHFT045	On Hwy Flatbed Truck 45K	1.00	80.00	HR	67.33	100.00	67.33	5,386.40
TE03	Truck Driver (8-25 cy)	1.00	80.00	MH	32.28	100.00	72.78	5,822.27

Activity: 14130 Set Up Site Quantity: 1 Unit: EA

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	3,405.28	3,804.25	7,209.53	2,933.73	0.00	0.00	0.00	10,143.26
Total	3,405.28	3,804.25	7,209.53	2,933.73	0.00	0.00	0.00	10,143.26

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
10,143.2600	16.0000	0.0625	633.9538	2.0000	0.5000	2.0000	5,071.6300

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
96.0000	0.0104	96.0000	75.0993	3,405.2800

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Crew: 4LB (Mod) 4-Man Labor Crew Prod: S 2 Eff: 100.00 Crew Hrs: 16 Labor Pcs: 6.00 Equipment Pcs: 2.00

Notes: Allow for set up of trailers, utilities, security fencing, etc.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
809FEL966	CAT 966H F.E. Loader 5.5cy	1.00	16.00	HR	120.31	100.00	120.31	1,924.93
813FLRT08	Forklift Truck RT 8t	1.00	16.00	HR	63.05	100.00	63.05	1,008.80
LA01	Laborer Foreman	1.00	16.00	MH	33.49	100.00	69.95	1,119.24
LA02	Laborer (CS)	3.00	48.00	MH	31.49	100.00	67.23	3,227.01
OE04	Operator (Gr 3)	1.00	16.00	MH	43.76	100.00	91.28	1,460.50
OE06	Operator (Gr 5)	1.00	16.00	MH	41.11	100.00	87.67	1,402.78

Activity: 14140 Offload Equipment at Site Quantity: 2 Unit: SH

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	1,702.64	1,902.13	3,604.77	1,466.87	0.00	0.00	0.00	5,071.63
Total	3,405.28	3,804.25	7,209.53	2,933.73	0.00	0.00	0.00	10,143.26

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
5,071.6300	8.0000	0.1250	633.9538	2.0000	1.0000	1.0000	5,071.6300

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
96.0000	0.0208	48.0000	75.0993	1,702.6400

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Crew: 4LB 4-Man Labor Crew Prod: S 2 Eff: 100.00 Crew Hrs: 16 Labor Pcs: 6.00 Equipment Pcs: 2.00

Notes: Allow for crew to offload equipment, supplies, small tools, storage boxes, etc. from trucks at the project site.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
809FEL966	CAT 966H F.E. Loader 5.5cy	1.00	16.00	HR	120.31	100.00	120.31	1,924.93
813FLRT08	Forklift Truck RT 8t	1.00	16.00	HR	63.05	100.00	63.05	1,008.80
LA01	Laborer Foreman	1.00	16.00	MH	33.49	100.00	69.95	1,119.24
LA02	Laborer (CS)	3.00	48.00	MH	31.49	100.00	67.23	3,227.01
OE04	Operator (Gr 3)	1.00	16.00	MH	43.76	100.00	91.28	1,460.50
OE06	Operator (Gr 5)	1.00	16.00	MH	41.11	100.00	87.67	1,402.78

Activity: 14150 Load Out Equipment at Site Quantity: 2 Unit: SH

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	1,702.64	1,902.13	3,604.77	1,466.87	0.00	0.00	0.00	5,071.63
Total	3,405.28	3,804.25	7,209.53	2,933.73	0.00	0.00	0.00	10,143.26

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
5,071.6300	8.0000	0.1250	633.9538	2.0000	1.0000	1.0000	5,071.6300

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
96.0000	0.0208	48.0000	75.0993	1,702.6400

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Crew: 4LB 4-Man Labor Crew Prod: S 2 Eff: 100.00 Crew Hrs: 16 Labor Pcs: 6.00 Equipment Pcs: 2.00

Notes: Allow for crew to load equipment, supplies, small tools, storage boxes, etc. onto trucks for delivery to contractor's yard for storage.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
809FEL966	CAT 966H F.E. Loader 5.5cy	1.00	16.00	HR	120.31	100.00	120.31	1,924.93
813FLRT08	Forklift Truck RT 8t	1.00	16.00	HR	63.05	100.00	63.05	1,008.80
LA01	Laborer Foreman	1.00	16.00	MH	33.49	100.00	69.95	1,119.24
LA02	Laborer (CS)	3.00	48.00	MH	31.49	100.00	67.23	3,227.01
OE04	Operator (Gr 3)	1.00	16.00	MH	43.76	100.00	91.28	1,460.50
OE06	Operator (Gr 5)	1.00	16.00	MH	41.11	100.00	87.67	1,402.78

Activity: 14160 Demobilize Equipment Quantity: 10 Unit: LDS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	258.24	323.99	582.23	538.64	0.00	0.00	0.00	1,120.87
Total	2,582.40	3,239.87	5,822.27	5,386.40	0.00	0.00	0.00	11,208.67

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
1,120.8670	8.0000	0.1250	140.1084	10.0000	1.0000	1.0000	1,120.8670

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
80.0000	0.1250	8.0000	72.7784	258.2400

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Crew: HAUL Trucking Crew Prod: HU 8 Eff: 100.00 Crew Hrs: 80 Labor Pcs: 1.00 Equipment Pcs: 1.00

Notes: Allow for truck trips to demobilize equipment from the project site. Allow for excavator, loader, forklift, storage boxes, office trailer, fencing, small tools, etc. Assume 10 truckloads at 8 hours/load.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
820OHFT045	On Hwy Flatbed Truck 45K	1.00	80.00	HR	67.33	100.00	67.33	5,386.40
TE03	Truck Driver (8-25 cy)	1.00	80.00	MH	32.28	100.00	72.78	5,822.27

Activity: 14170 Clean Up Site Quantity: 1 Unit: LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	4,682.26	4,818.10	9,500.36	3,667.16	0.00	1,646.25	0.00	14,813.77
Total	4,682.26	4,818.10	9,500.36	3,667.16	0.00	1,646.25	0.00	14,813.77

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
13,167.5200	20.0000	0.0500	658.3760	2.0000	0.5000	2.0000	7,406.8850

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
120.0000	0.0083	120.0000	79.1697	4,682.2600

Calendar: 50S 5 x 10 Hr - Single Hrs/Shift: 10 WC: CA1 CA - Land Avg.

Crew: 4LB 4-Man Labor Crew Prod: S 2 Eff: 100.00 Crew Hrs: 20 Labor Pcs: 6.00 Equipment Pcs: 2.00

Notes: Allow for removal of trailers, utilities, fencing, and final site cleanup after demobilization.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
3511	Disposal Fee-20cy Debris Box	1.00	2.00	LD	750.00	109.75	823.13	1,646.25
809FEL966	CAT 966H F.E. Loader 5.5cy	1.00	20.00	HR	120.31	100.00	120.31	2,406.16
813FLRT08	Forklift Truck RT 8t	1.00	20.00	HR	63.05	100.00	63.05	1,261.00
LA01	Laborer Foreman	1.00	20.00	MH	33.49	110.00	73.80	1,475.91
LA02	Laborer (CS)	3.00	60.00	MH	31.49	110.00	70.84	4,250.57
OE04	Operator (Gr 3)	1.00	20.00	MH	43.76	110.00	96.30	1,926.06
OE06	Operator (Gr 5)	1.00	20.00	MH	41.11	110.00	92.39	1,847.82

Activity: 14180 Offload Equipment at Yard Quantity: 1 Unit: SH

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	1,969.36	2,193.38	4,162.74	1,815.09	0.00	0.00	0.00	5,977.83
Total	1,969.36	2,193.38	4,162.74	1,815.09	0.00	0.00	0.00	5,977.83

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
5,977.8300	8.0000	0.1250	747.2288	1.0000	1.0000	1.0000	5,977.8300

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
56.0000	0.0179	56.0000	74.3346	1,969.3600

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA1 CA - Land Avg.

Crew: 4PD (Mod) 4-Man PD Crew Prod: S 1 Eff: 100.00 Crew Hrs: 8 Labor Pcs: 7.00 Equipment Pcs: 1.00

Notes: Allow for crew to offload equipment, supplies, small tools, pile template, storage boxes, etc. from trucks and place in storage at the contractor's yard.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
813CMLBC1000	MANITOWOC 10000 100t	1.00	8.00	HR	226.89	100.00	226.89	1,815.09
LA01	Laborer Foreman	1.00	8.00	MH	33.49	100.00	69.95	559.61
LA02	Laborer (CS)	4.00	32.00	MH	31.49	100.00	67.23	2,151.33
OE09	Crane Operator (>100 tn)	1.00	8.00	MH	47.99	100.00	97.04	776.33
OE10	Crane Oiler (>100 tn)	1.00	8.00	MH	38.73	100.00	84.43	675.47

Biditem

142

REPAIR E2/E1 LEVEE

Takeoff Qty: 4,500.000 LF

Bid Qty: 4,500.000 LF

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	41.47	42.31	83.79	117.42	0.00	0.00	0.00	201.21
Total	186,624.82	190,412.47	377,037.29	528,391.71	0.00	0.00	0.00	905,429.00

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
4,326.9300	1.0400	0.9615	209.2544	43.1310	87.1374	3.1200

Activity: 14110 Repair E2/E1 Levee Quantity: 45000 Unit: CY

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	4.15	4.23	8.38	11.74	0.00	0.00	0.00	20.12
Total	186,624.82	190,412.47	377,037.29	528,391.71	0.00	0.00	0.00	905,429.00

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
20.1206	0.0321	31.2000	627.7641	144.2308	312.0000	0.0032	6,277.6410

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
4,326.9300	10.4000	0.0962	87.1374	4.1472

Calendar: 50S 5 x 10 Hr - Single Hrs/Shift: 10 WC: CA1 CA - Land Avg.

Crew: EXC1 Excavation Crew Prod: US 312 Eff: 100.00 Crew Hrs: 1442.3077 Labor Pcs: 3.00 Equipment Pcs: 2.00

Notes: [[Attached Files: Excavator Production.xls]]
Current E2/E1 levee is approx. 4,500 ft. long with a 10 ft. wide bench and near vertical slopes. The north facing slope has been washed away due to wave fetch across the pond. Allow for a 20 ft. wide levee section to be constructed with 2:1 side slopes up to EL +10 ft. NAVD88. The average pond bottom elevation for both ponds is approx. +4.8' NAVD88. Allowing for the current levee configuration it is estiamted that 4 cy/lf are required to reconstruct the levee. Assume a long reach excavator borrows material from the ponds adjacent to the levee with an LGP dozer track walking the material. The neat amount of material reuqired is 4,500 lf*4 cy/lf = 18,000 cy. Assuming a 2.5 borrow to fill ratio - 18,000 cy*2.5 = 45,000 cy total borrow, or approx. 10 cy/lf.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
809LGPD06T	CAT D6T LGP Dozer	1.00	1,442.31	HR	149.41	100.00	149.41	215,501.31
810CME345	CAT 345D L Excavator 2.36cy	1.00	1,442.31	HR	216.94	100.00	216.94	312,890.40
LA02	Laborer (CS)	1.00	1,442.31	MH	31.49	110.00	70.84	102,177.17
OE04	Operator (Gr 3)	1.00	1,442.31	MH	43.76	110.00	96.30	138,899.21
OE05	Operator (Gr 4)	1.00	1,442.31	MH	42.38	110.00	94.27	135,960.91

Biditem 143

REPAIR E2/E4 LEVEE

Takeoff Qty: 2,600.000 LF

Bid Qty: 2,600.000 LF

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	45.98	46.91	92.89	130.18	0.00	0.00	0.00	223.07
Total	119,543.61	121,969.79	241,513.40	338,464.37	0.00	0.00	0.00	579,977.77

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
2,771.6400	0.9381	1.0660	209.2544	43.1310	87.1374	2.8142

Activity: 14310 Repair E2/E4 Levee Quantity: 28825 Unit: CY

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	4.15	4.23	8.38	11.74	0.00	0.00	0.00	20.12
Total	119,543.61	121,969.79	241,513.40	338,464.37	0.00	0.00	0.00	579,977.77

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
20.1207	0.0321	31.2000	627.7643	92.3878	312.0000	0.0032	6,277.6432

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
2,771.6400	10.4000	0.0962	87.1374	4.1472

Calendar: 50S 5 x 10 Hr - Single Hrs/Shift: 10 WC: CA1 CA - Land Avg.

Crew: EXC1 Excavation Crew Prod: US 312 Eff: 100.00 Crew Hrs: 923.8782 Labor Pcs: 3.00 Equipment Pcs: 2.00

Notes: [[Attached Files: Excavator Production.xls]]
Current E2/E4 levee is approx. 2,600 ft. long with a 5 ft. wide bench and severely degraded slopes. There are larger breaches at each end of the levee and a smaller one along the length. Allow for a 20 ft. wide levee section to be constructed with 2:1 side slopes up to EL +10 ft. NAVD88. The average pond bottom elevation for Pond E2 is approx. +4.8' NAVD88 and approx. 5.6' NAVD88 for Pond E4. Allowing for the current levee configuration it is estiamted that 4.4 cy/lf are required to reconstruct the levee. Assume a long reach excavator borrows material from the ponds adjacent to the levee with an LGP dozer track walking the material. The neat amount of material reuqired is 2,600 lf*4.43 cy/lf = 11,530 cy. Assuming a 2.5 borrow to fill ratio - 11,530 cy*2.5 = 28,825 cy total borrow, or approx. 11.1 cy/lf.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
809LGPD06T	CAT D6T LGP Dozer	1.00	923.88	HR	149.41	100.00	149.41	138,040.61
810CME345	CAT 345D L Excavator 2.36cy	1.00	923.88	HR	216.94	100.00	216.94	200,423.76
LA02	Laborer (CS)	1.00	923.88	MH	31.49	110.00	70.84	65,450.17
OE04	Operator (Gr 3)	1.00	923.88	MH	43.76	110.00	96.30	88,972.69
OE05	Operator (Gr 4)	1.00	923.88	MH	42.38	110.00	94.27	87,090.54

Biditem 144

REPAIR/REGRADE INTERIOR LEVEES

Takeoff Qty: 12,100.000 LF

Bid Qty: 12,100.000 LF

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total

U. Cost	0.72	0.73	1.45	2.04	0.00	0.00	0.00	3.49
Total	8,697.79	8,874.33	17,572.12	24,626.12	0.00	0.00	0.00	42,198.24

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
201.6600	60.0020	0.0167	209.2544	43.1310	87.1374	180.0001

Activity: 14410 Repair/Regrade Levees Quantity: 12100 Unit: LF

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	0.72	0.73	1.45	2.04	0.00	0.00	0.00	3.49
Total	8,697.79	8,874.33	17,572.12	24,626.12	0.00	0.00	0.00	42,198.24

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
3.4875	0.0056	180.0001	627.7426	6.7222	1,800.0006	0.0006	6,277.4262

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
201.6600	60.0020	0.0167	87.1374	0.7188

Calendar: 50S 5 x 10 Hr - Single Hrs/Shift: 10 WC: CA1 CA - Land Avg.

Crew: EXC1 Excavation Crew Prod: UH 180 Eff: 100.00 Crew Hrs: 67.2222 Labor Pcs: 3.00 Equipment Pcs: 2.00

Notes: Allow for dozer to clear levees and grade levee crown. Assume long reach borrows material to raise grades at low spots and narrow sections.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
809LGPD06T	CAT D6T LGP Dozer	1.00	67.22	HR	149.41	100.00	149.41	10,043.61
810CME345	CAT 345D L Excavator 2.36cy	1.00	67.22	HR	216.94	100.00	216.94	14,582.51
LA02	Laborer (CS)	1.00	67.22	MH	31.49	110.00	70.84	4,762.04
OE04	Operator (Gr 3)	1.00	67.22	MH	43.76	110.00	96.30	6,473.51
OE05	Operator (Gr 4)	1.00	67.22	MH	42.38	110.00	94.27	6,336.57

Biditem

150

WEIR UPGRADES

Takeoff Qty: 5.000 EA

Bid Qty: 5.000 EA

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	9,258.70	9,623.15	18,881.85	2,056.35	6,585.00	0.00	0.00	27,523.20
Total	46,293.50	48,115.73	94,409.23	10,281.75	32,925.00	0.00	0.00	137,615.98

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
1,250.0000	0.0040	250.0000	110.0928	37.0348	75.5274	0.0200

Activity: 15010 Construct New Weir Quantity: 5 Unit: EA

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	9,258.70	9,623.15	18,881.85	2,056.35	6,585.00	0.00	0.00	27,523.20
Total	46,293.50	48,115.73	94,409.23	10,281.75	32,925.00	0.00	0.00	137,615.98

Crew $/Unit	Crew Hrs/Unit	Units/Crew Hr	$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	$/Shift
20,938.1960	50.0000	0.0200	418.7639	25.0000	0.2000	5.0000	5,504.6392

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
1,250.0000	0.0040	250.0000	75.5274	9,258.7000

Calendar: 50S 5 x 10 Hr - Single Hrs/Shift: 10 WC: CA1 CA - Land Avg.

Crew: 4BKH 4-Man Backhoe Crew Prod: S 25 Eff: 100.00 Crew Hrs: 250 Labor Pcs: 5.00 Equipment Pcs: 1.00

Notes: Construct new weirs at levees connecting the four bayside ponds and one additional weir in Pond E6 that discharges into Old Alameda Creek. Excavate levee for discharge pipe, place new discharge pipe through levee section, connect to weir structure and weld in place, install bracing and new flashboards, and reconstruct levee.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
2L1TL0312	3"x12" Treated Timber	1.00	720.00	BF	2.50	109.75	2.74	1,975.50
2SF30	Light Fab'd Steel	1.00	5,000.00	LB	3.00	109.75	3.29	16,462.50
2SP24050	Pipe Pile - 24" Dia x 0.500"	1.00	300.00	LF	44.00	109.75	48.29	14,487.00

809TLB416E	CAT 416E Backhoe	1.00	250.00	HR	41.13	100.00	41.13	10,281.75
LA02	Laborer (CS)	4.00	1,000.00	MH	31.49	110.00	70.84	70,842.71
OE05	Operator (Gr 4)	1.00	250.00	MH	42.38	110.00	94.27	23,566.52

Biditem

90000

CONTRACTOR INDIRECTS

Takeoff Qty: 1.000 LS

Bid Qty: 1.000 LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	497,529.36	234,350.08	731,879.44	293,037.75	0.00	230,816.71	0.00	1,255,733.90
Total	497,529.36	234,350.08	731,879.44	293,037.75	0.00	230,816.71	0.00	1,255,733.90

Manhours	Unit/MH	MH/Unit	$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
1,044.0000	0.0010	1,044.0000	1,202.8102	476.5607	701.0339	0.0000

Activity: 90100 Contractors Office — Quantity: 9 — Unit: MO

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	0.00	0.00	0.00	0.00	0.00	5,450.00	0.00	5,450.00
Total	0.00	0.00	0.00	0.00	0.00	49,050.00	0.00	49,050.00

Calendar: 724 7 Days x 24 Hrs Hrs/Shift: 8 WC: CA3 Dredging

Notes: Allow for contractors office for duration of mob/demob activities only.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
990008	Office - Gen. Contractor	1.00	9.00	MO	1,000.00	100.00	1,000.00	9,000.00
990009	Storage - Gen. Contractor	1.00	9.00	MO	300.00	100.00	300.00	2,700.00
990011	Utilities - Monthly	1.00	9.00	MO	400.00	100.00	400.00	3,600.00
990012	Sanitary	1.00	9.00	MO	300.00	100.00	300.00	2,700.00
990013	Temporary Fencing	1.00	2,000.00	LF	10.00	100.00	10.00	20,000.00
990014	Cell Phones	1.00	9.00	MO	500.00	100.00	500.00	4,500.00
990017	Office Equipment - monthly	1.00	9.00	MO	350.00	100.00	350.00	3,150.00
990031	Jobsite Photos	1.00	9.00	MO	100.00	100.00	100.00	900.00
990032	Aerial Photos	1.00	1.00	LS	2,500.00	100.00	2,500.00	2,500.00

Activity: 90200 Owners Office — Quantity: 9 — Unit: MO

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Calendar: 724 7 Days x 24 Hrs Hrs/Shift: 8 WC: CA3 Dredging

Notes: Assume owners office is not provided as part of contractor's responsibility.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
990007	Office - Owner/Engineer	1.00	0.00	MO	0.00	100.00	0.00	0.00
990011	Utilities - Monthly	1.00	0.00	MO	0.00	100.00	0.00	0.00
990012	Sanitary	1.00	0.00	MO	0.00	100.00	0.00	0.00
990017	Office Equipment - monthly	1.00	0.00	MO	0.00	100.00	0.00	0.00

Activity: 90300 QC Facilities/Testing — Quantity: 9 — Unit: MO

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	0.00	0.00	0.00	0.00	0.00	555.56	0.00	555.56
Total	0.00	0.00	0.00	0.00	0.00	5,000.00	0.00	5,000.00

Calendar: 724 7 Days x 24 Hrs Hrs/Shift: 8 WC: CA3 Dredging

Notes: Allow for QC Facilities/Testing for Mob/Demob items only.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
990018	QC Storage Facility	1.00	0.00	MO	0.00	100.00	0.00	0.00

990019	QC Laboratory - On-Site	1.00	0.00	MO	0.00	100.00	0.00	0.00
990020	Testing Services - Off-Site	1.00	0.00	MO	0.00	100.00	0.00	0.00
990044	SWPP Plan	1.00	1.00	EA	5,000.00	100.00	5,000.00	5,000.00
990045	Effluent Testing	1.00	0.00	MO	10,000.00	100.00	0.00	0.00

Activity: 90400 Supervision — Quantity: 9 — Unit: MO

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	51,704.78	25,144.83	76,849.61	0.00	0.00	0.00	0.00	76,849.61
Total	465,343.03	226,303.50	691,646.53	0.00	0.00	0.00	0.00	691,646.53

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
1,044.0000	0.0086	116.0000	662.4967	51,704.7811

Calendar: 724 7 Days x 24 Hrs Hrs/Shift: 8 WC: CA3 Dredging

Notes: Allow cost for supervision during mob/demob activities only. Allow cost for surveyor and rodman at half-time during levee repair activities.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
SU02	▫ Instrumentman	1.00	522.00	MH	41.94	121.43	100.61	52,520.08
SU03	▫ Chainman/Rodman	1.00	522.00	MH	39.06	121.43	95.88	50,049.45
ZZ02	▫ Project Manager	1.00	9.00	MO	14,500.00	100.00	20,312.25	182,810.25
ZZ04	▫ Project Engineer	0.00	0.00	MO	12,000.00	100.00	0.00	0.00
ZZ07	▫ QC Engineer	0.00	0.00	MO	12,000.00	100.00	0.00	0.00
ZZ08	▫ Safety Engineer	0.00	0.00	MO	9,500.00	100.00	0.00	0.00
ZZ10	▫ Field Engineer	2.00	18.00	MO	9,500.00	100.00	13,309.75	239,575.50
ZZ13	▫ Project Superintendent	1.00	9.00	MO	12,500.00	100.00	18,521.25	166,691.25
ZZ25	▫ Secretary/Receptionist	0.00	0.00	MO	3,500.00	100.00	0.00	0.00

Activity: 90500 Survey — Quantity: 9 — Unit: MO

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	0.00	0.00	0.00	0.00	0.00	750.00	0.00	750.00
Total	0.00	0.00	0.00	0.00	0.00	6,750.00	0.00	6,750.00

Calendar: 724 7 Days x 24 Hrs Hrs/Shift: 8 WC: CA3 Dredging

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
990025	Survey Equipment	1.00	9.00	MO	500.00	100.00	500.00	4,500.00
990026	Survey Supplies	1.00	9.00	MO	250.00	100.00	250.00	2,250.00

Activity: 90600 Vehicle Expenses — Quantity: 9 — Unit: MO

Calendar: 724 7 Days x 24 Hrs Hrs/Shift: 8 WC: CA3 Dredging

Notes: Allow vehicles for overhead personnel and survey for duration of project - 5 people * 174 hrs/mo * 9 mo = 7,830 hrs.; Avg. rate from historic costs is approx. $2,500/mo/vehicle.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
820OHLDTC42	▫ LD Truck 4x2 1.75t	5.00	7,830.00	HR	37.43	100.00	37.43	293,037.75

Activity: 90700 Lodging Expenses — Quantity: 9 — Unit: MO

Calendar: 724 7 Days x 24 Hrs Hrs/Shift: 8 WC: CA3 Dredging

Notes: Assume all supervision is local to the Bay Area.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
990028	Subsistence	0.00	0.00	MO	0.00	100.00	0.00	0.00

Activity: 90800 Travel Expenses — Quantity: 9 — Unit: MO

Calendar: 724 7 Days x 24 Hrs Hrs/Shift: 8 WC: CA3 Dredging

Notes: Travel is allowance for flights for Project Manager, Engineers and Home Office personnel.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total

990029	Travel	0.00	0.00	MO	0.00	100.00	0.00	0.00

Activity: 90900 Security Quantity: 9 Unit: MO

Calendar: 724 7 Days x 24 Hrs Hrs/Shift: 8 WC: CA3 Dredging

Notes: Assume no additional security is needed during mob/demob activities since critical work sites will be fenced.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
990001	Security	1.00	0.00	MO	0.00	100.00	0.00	0.00

Activity: 91000 Safety Training & Supplies Quantity: 9 Unit: MO

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
U. Cost	0.00	0.00	0.00	0.00	0.00	1,955.56	0.00	1,955.56
Total	0.00	0.00	0.00	0.00	0.00	17,600.00	0.00	17,600.00

Calendar: 724 7 Days x 24 Hrs Hrs/Shift: 8 WC: CA3 Dredging

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
990004	Safety Training Classes	1.00	1.00	EA	2,000.00	100.00	2,000.00	2,000.00
990005	Safety - Initial	1.00	24.00	EA	275.00	100.00	275.00	6,600.00
990006	Safety - Monthly	1.00	9.00	MO	1,000.00	100.00	1,000.00	9,000.00

Activity: 91100 Permits Quantity: 1 Unit: EA

Calendar: 724 7 Days x 24 Hrs Hrs/Shift: 8 WC: CA3 Dredging

Notes: Assume all permits are provided by the owner and no additional permits are required.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
990030	Permits	1.00	0.00	LS	0.00	100.00	0.00	0.00

Activity: 91300 Small Tools & Supplies Quantity: 1 Unit: EA

Calendar: 724 7 Days x 24 Hrs Hrs/Shift: 8 WC: CA3 Dredging

Notes: Small tools and supplies are based on 7.5% of direct labor costs.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
3*DL	Small Tools & Supplies	1.00	1,609,316.37	DLB$	0.08	100.00	0.08	120,698.73

Activity: 91400 Premium for Unscheduled Overtime Quantity: 1 Unit: EA

Calendar: 40S 5 x 8 Hr - Single Shift Hrs/Shift: 8 WC: CA3 Dredging

Notes: The premium for unscheduled overtime is based on 2.5% of direct labor costs.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
Z*DL	▫ Premium for Unsheduled OT	1.00	1,609,316.37	DLB$	0.02	100.00	0.03	40,232.91

Activity: 91500 General Liability Insurance Quantity: 1 Unit: EA

Calendar: 724 7 Days x 24 Hrs Hrs/Shift: 8 WC: CA3 Dredging

Notes: Allow for contractors general liability insurance at 0.5% of contract costs less Subcontractor costs.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
3*TS	General Liability Ins.	1.00	6,343,596.52	TLS$	0.01	100.00	0.00	31,717.98

Report Summary

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Total
Total	1,279,012	1,062,184	2,341,196	1,924,345	2,711,390	622,400	4,978,472	12,577,802

Job Notes

Estimate created on: 06/25/2012 by User#: 1 - Jack Fink
Source used: C:\HEAVYBID\HBSAVE\ESTMAST.zip (a backup) from 09/13/2011 4:19:37 PM

**********Estimate created on: 07/16/2019 by User#: 4 - Matthew Taylor
Source estimate used: L:\HEAVYBID\EST\ESTMAST

**********Estimate created on: 11/10/2019 by User#: 1 - Jack Fink
Source estimate used: L:\HEAVYBID\EST\2019-33

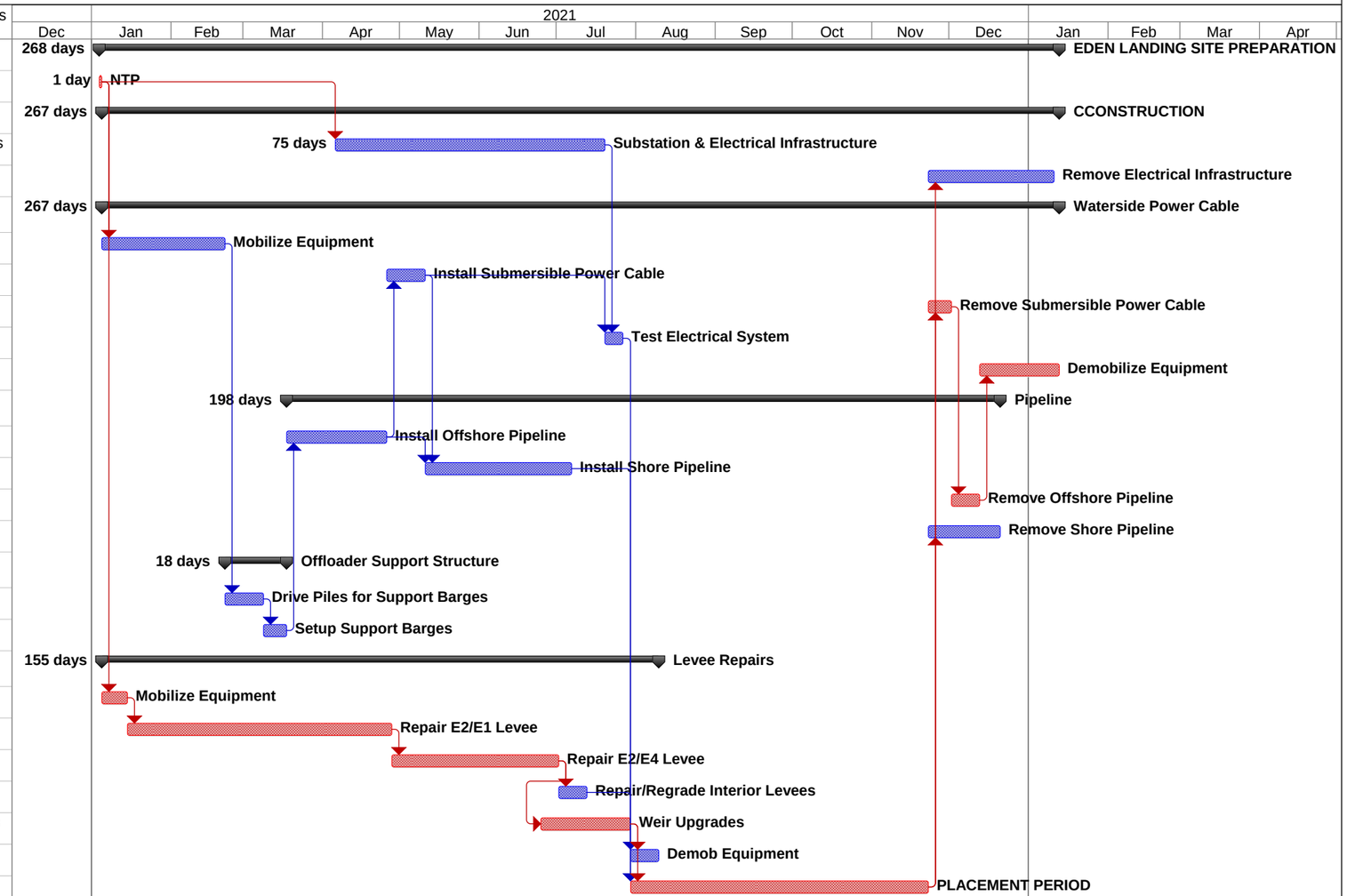
Calendars Used In Estimate

40S	5 x 8 Hr - Single Shift
S24	24 Hr Shipping Schedule
724	7 Days x 24 Hrs
50S	5 x 10 Hr - Single

In equipment resources, Rent % and EOE % that are not 100% are represented as XXX%YYY, where XXX = Rent % and YYY = EOE %

EDEN LANDING SITE PREPARATION
CONCESSION MODEL

ID	Task Name	Duration	Start	Finish	Predecessors
1	**EDEN LANDING SITE PREPARATION**	**268 days**	**Mon 1/4/21**	**Thu 1/13/22**	
2	NTP	1 day	Mon 1/4/21	Tue 1/5/21	
3	**CCONSTRUCTION**	**267 days**	**Tue 1/5/21**	**Thu 1/13/22**	
4	Substation & Electrical Infrastructure	75 days	Tue 4/6/21	Tue 7/20/21	2FS+65 days
5	Remove Electrical Infrastructure	35 days	Tue 11/23/21	Tue 1/11/22	27
6	**Waterside Power Cable**	**267 days**	**Tue 1/5/21**	**Thu 1/13/22**	
7	Mobilize Equipment	34 days	Tue 1/5/21	Mon 2/22/21	2
8	Install Submersible Power Cable	11 days	Mon 4/26/21	Tue 5/11/21	13
9	Remove Submersible Power Cable	7 days	Tue 11/23/21	Thu 12/2/21	27
10	Test Electrical System	5 days	Tue 7/20/21	Tue 7/27/21	4,8
11	Demobilize Equipment	23 days	Mon 12/13/21	Thu 1/13/22	15
12	**Pipeline**	**198 days**	**Thu 3/18/21**	**Tue 12/21/21**	
13	Install Offshore Pipeline	27 days	Thu 3/18/21	Mon 4/26/21	19
14	Install Shore Pipeline	41 days	Tue 5/11/21	Wed 7/7/21	13,8
15	Remove Offshore Pipeline	7 days	Thu 12/2/21	Mon 12/13/21	9
16	Remove Shore Pipeline	20 days	Tue 11/23/21	Tue 12/21/21	27
17	**Offloader Support Structure**	**18 days**	**Mon 2/22/21**	**Thu 3/18/21**	
18	Drive Piles for Support Barges	11 days	Mon 2/22/21	Tue 3/9/21	7
19	Setup Support Barges	7 days	Tue 3/9/21	Thu 3/18/21	18
20	**Levee Repairs**	**155 days**	**Tue 1/5/21**	**Tue 8/10/21**	
21	Mobilize Equipment	8 days	Tue 1/5/21	Fri 1/15/21	2
22	Repair E2/E1 Levee	73 days	Fri 1/15/21	Wed 4/28/21	21
23	Repair E2/E4 Levee	47 days	Wed 4/28/21	Fri 7/2/21	22
24	Repair/Regrade Interior Levees	7 days	Fri 7/2/21	Tue 7/13/21	23
25	Weir Upgrades	25 days	Fri 6/25/21	Fri 7/30/21	23FS-5 days
26	Demob Equipment	7 days	Fri 7/30/21	Tue 8/10/21	25,24
27	**PLACEMENT PERIOD**	82 days	Fri 7/30/21	Tue 11/23/21	25,10,14



EDEN LANDING SITE PREPARATION - CONCESSION MODEL
Project: M&N File 10547
Date: 20 APRIL 2020

Task	Rolled Up Critical Task	Project Summary	Inactive Summary	Start-only
Critical Task	Rolled Up Milestone	Group By Summary	Manual Task	Finish-only
Milestone	Rolled Up Progress	Inactive Task	Duration-only	Progress
Summary	Split	Inactive Task	Manual Summary Rollup	Deadline
Rolled Up Task	External Tasks	Inactive Milestone	Manual Summary

ATTACHMENT E

CONCESSION MODEL OFFLOADER SUMMARY COSTS

EDEN LANDING PHASE 2 PROJECT
CONCESSION MODEL OFFLOADER COST ESTIMATE SUMMARY (ELECTRIC)

SCENARIO 1 - FEDERAL ONLY (2 PROJECTS; EXISTING LEVEES)

Year	Predicted Placement Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to SCC in 2020 dollars ($)	Escalation	Totals Cost	Totals Unit Cost	Duration (Months)
2021	Site Preparation									$15,097,000	$15,097,000		$452,910	$905,820	$3,774,250	$20,229,980	1.03	$20,836,898		9.00
2021	726,880		436	836	$3,129	$3,979,923	3	$16,200	$196,000	$711,000	$4,903,123	$6.75	$147,094	$294,187	$1,225,781	$6,570,184	1.03	$6,767,296	$9.31	1.74
2022	726,880		436	836	$3,129	$3,979,923	10	$54,100	$392,000	$0	$4,426,023	$6.09	$132,781	$265,561	$1,106,506	$5,930,870	1.06	$6,292,097	$8.66	1.74
2023	726,880	1,667	436	836	$3,129	$3,979,923	10	$54,100	$392,000	$0	$4,426,023	$6.09	$132,781	$265,561	$1,106,506	$5,930,870	1.09	$6,480,822	$8.92	1.74
2024	726,880		436	836	$3,129	$3,979,923	10	$54,100	$392,000	$0	$4,426,023	$6.09	$132,781	$265,561	$1,106,506	$5,930,870	1.13	$6,675,246	$9.18	1.74
2025	386,650		232	440	$3,122	$2,097,702	7	$37,900	$196,000	$0	$2,331,602	$6.03	$69,948	$139,896	$582,900	$3,124,346	1.16	$3,621,973	$9.37	0.92
	3,294,170		1,976	3,784		$18,017,392		$216,400	$1,568,000	$15,808,000	$35,609,792	$10.81	$1,068,294	$2,136,588	$8,902,448	$47,717,122		$50,674,331	$15.38	16.89
				7.89 months															*$/Mo*	*$3,000,183*
				250 Avg. Hrs/Mo unloading																

Cost Estimate Assumptions:

1.) Costs are included for disposal site preparation and other upland infrastructure placement requirements (e.g. interior levee improvements, water control structures).
2.) No costs are included for environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland and Redwood City Federal Maintenance Dredging Projects.
4.) Total volume considered for the placement at the project site is 3.3 MCY (0.477 MCY to E1, 2.0 MCY to E2, 0.371 MCY to E4, and 0.443 MCY to E7).
5.) Predicted Placement Quantity includes 10% bulking factor on top of the dredge quantity.
6.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and are assumed to be completed as quickly as possible within the six month work window.
7.) Unloading equipment hourly costs are based on the Eden Landing Offloader Cost Estimate dated March 2020.
8.) Costs and dredging cycles are based on a single Unloader contract.
9.) Mob/Demob costs include Offloader installation, booster pump installation, pipeline installation, submersible electrical cable installation, temporary overhead power line, substation installation, levee repairs, and water control structures costs.
10.) All equipment costs assume electrically powered engines for the Offloader and Booster Pump.
11.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
12.) Costs have been included to maintain site security, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
13.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2, updated 31 March 2019.

Dredging & Transport Costs

Oakland Harbor	$11.98
Redwood City	$7.53

Total Unit Cost - Dredging, Transport, Offloading

Oakland Harbor	$27.36
Redwood City	$22.91

EDEN LANDING PHASE 2 PROJECT
CONCESSION MODEL OFFLOADER COST ESTIMATE SUMMARY (ELECTRIC)

SCENARIO 1 - FEDERAL ONLY (2 PROJECTS; IMPROVED LEVEES)

Year	Predicted Placement Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to SCC in 2020 dollars ($)	Escalation	Totals Cost	Totals Unit Cost	Duration (Months)
2021	Site Preparation									$15,097,000	$15,097,000		$452,910	$905,820	$3,774,250	$20,229,980	1.03	$20,836,898		9.00
2021	Perimeter Levee Improvements (5,600 CY)									$280,000	$280,000		$8,400	$16,800	$70,000	$375,200	1.03	$386,456	$69.01	0.92
2021	726,880		436	836	$3,129	$3,979,923	3	$16,200	$196,000	$711,000	$4,903,123	$6.75	$147,094	$294,187	$1,225,781	$6,570,184	1.03	$6,767,296	$9.31	1.74
2022	726,880		436	836	$3,129	$3,979,923	10	$54,100	$392,000	$0	$4,426,023	$6.09	$132,781	$265,561	$1,106,506	$5,930,870	1.06	$6,292,097	$8.66	1.74
2023	726,880		436	836	$3,129	$3,979,923	10	$54,100	$392,000	$0	$4,426,023	$6.09	$132,781	$265,561	$1,106,506	$5,930,870	1.09	$6,480,822	$8.92	1.74
2024	726,880	1,667	436	836	$3,129	$3,979,923	10	$54,100	$392,000	$0	$4,426,023	$6.09	$132,781	$265,561	$1,106,506	$5,930,870	1.13	$6,675,246	$9.18	1.74
2025	726,880		436	836	$3,129	$3,979,923	10	$54,100	$392,000	$0	$4,426,023	$6.09	$132,781	$265,561	$1,106,506	$5,930,870	1.16	$6,875,503	$9.46	1.74
2026	726,880		436	836	$3,129	$3,979,923	10	$54,100	$392,000	$0	$4,426,023	$6.09	$132,781	$265,561	$1,106,506	$5,930,870	1.19	$7,081,793	$9.74	1.74
2027	363,770		218	430	$3,122	$2,022,784	7	$37,900	$196,000	$0	$2,256,684	$6.20	$67,701	$135,401	$564,171	$3,023,956	1.23	$3,719,100	$10.22	0.89
	4,725,050		2,834	5,446		$25,902,320		$324,600	$2,352,000	$16,088,000	$44,666,920	$9.45	$1,340,008	$2,680,015	$11,166,730	$59,853,672		$65,115,211	$13.78	11.34
				11.34	*months*														*$/Mo*	*$5,740,834*
				250	*Avg. Hrs/Mo unloading*															

Cost Estimate Assumptions:

1.) Costs are included for disposal site preparation and other upland infrastructure placement requirements (e.g. interior levee improvements, water control structures).
2.) Costs are included for perimeter levee improvements to raise the levees to EL +10' NAVD88 to allow for additional material to be placed.
3.) No costs are included for environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
4.) The costs and quantities are for the Oakland and Redwood City Federal Maintenance Dredging Projects.
5.) Total volume considered for the project is 4.6 MCY (1.1 MCY to E1, 2.4 MCY to E2, 0.501 MCY to E4, and 0.723 MCY to E7).
6.) Predicted Placement Quantity includes 10% bulking factor on top of the dredge quantity.
7.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and are assumed to be completed as quickly as possible within the six month work window.
8.) Unloading equipment hourly costs are based on the Eden Landing Offloader Cost Estimate dated March 2020.
9.) Costs and dredging cycles are based on a single Unloader contract.
10.) Mob/Demob costs include Offloader installation, booster pump installation, pipeline installation, submersible electrical cable installation, temporary overhead power line, substation installation, levee repairs, and water control structures costs.
11.) All equipment costs assume electrically powered engines for the Offloader and Booster Pump.
12.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
13.) Costs have been included to maintain site security, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
14.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2, updated 31 March 2019.

Dredging & Transport Costs

Oakland Harbor	$11.98
Redwood City	$7.53

Total Unit Cost - Dredging, Transport, Offloading

Oakland Harbor	$25.76
Redwood City	$21.31

EDEN LANDING PHASE 2 PROJECT
CONCESSION MODEL OFFLOADER COST ESTIMATE SUMMARY (ELECTRIC)

SCENARIO 2 - FEDERAL ONLY (3 PROJECTS; EXISTING LEVEES)

Year	Predicted Placement Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	Maintenance of Facility during Non-Unloading ($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to SCC in 2020 dollars ($)	Escalation	Totals Cost	Totals Unit Cost	Duration (Months)
2021	Site Preparation									$15,097,000	$15,097,000		$452,910	$905,820	$3,774,250	$20,229,980	1.03	$20,836,898		9.00
2021	1,041,810		625	1,439	$3,125	$6,449,174	2	$10,900	$196,000	$712,000	$7,368,074	$7.07	$221,042	$442,084	$1,842,019	$9,873,220	1.03	$10,169,425	$9.76	2.83
2022	1,041,810	1,667	625	1,439	$3,125	$6,449,174	9	$48,900	$392,000	$0	$6,890,074	$6.61	$206,702	$413,404	$1,722,519	$9,232,700	1.06	$9,795,028	$9.40	2.83
2023	1,041,810		625	1,439	$3,125	$6,449,174	9	$48,900	$392,000	$0	$6,890,074	$6.61	$206,702	$413,404	$1,722,519	$9,232,700	1.09	$10,088,820	$9.68	2.83
2024	168,740		101	235	$3,127	$1,050,830	7	$38,000	$196,000	$0	$1,284,830	$7.61	$38,545	$77,090	$321,207	$1,721,672	1.13	$1,937,757	$11.48	0.46
	3,294,170		1,976	4,552		$20,398,353		$146,700	$1,176,000	$15,809,000	$37,530,053	$11.39	$1,125,902	$2,251,803	$9,382,513	$50,290,271		$52,827,928	$16.04	8.94
				8.94	*months*														*$/Mo*	*$5,907,535*
				221	*Avg. Hrs/Mo unloading*															

Cost Estimate Assumptions:

1.) Costs are included for disposal site preparation and other upland infrastructure placement requirements (e.g. interior levee improvements, water control structures).
2.) No costs are included for environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland, Richmond, and Redwood City Federal Maintenance Dredging Projects.
4.) Total volume considered for the project is 3.3 MCY (0.477 MCY to E1, 2.0 MCY to E2, 0.371 MCY to E4, and 0.443 MCY to E7).
5.) Predicted Placement Quantity includes 10% bulking factor on top of the dredge quantity.
6.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and are assumed to be completed as quickly as possible within the six month work window.
7.) Unloading equipment hourly costs are based on the Eden Landing Offloader Cost Estimate dated March 2020.
8.) Costs and dredging cycles are based on a single Unloader contract.
9.) Mob/Demob costs include Offloader installation, booster pump installation, pipeline installation, submersible electrical cable installation, temporary overhead power line, substation installation, levee repairs, and water control structures costs.
10.) All equipment costs assume electrically powered engines for the Offloader and Booster Pump.
11.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
12.) Costs have been included to maintain site security, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
13.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2, updated 31 March 2019.

Dredging & Transport Costs

Oakland Harbor	$11.98
Redwood City	$7.53
Richmond Harbor	$12.54

Total Unit Cost - Dredging, Transport, Offloading

Oakland Harbor	$28.02
Redwood City	$23.57
Richmond Harbor	$28.58

EDEN LANDING PHASE 2 PROJECT
CONCESSION MODEL OFFLOADER COST ESTIMATE SUMMARY (ELECTRIC)

SCENARIO 2 - FEDERAL ONLY (3 PROJECTS; IMPROVED LEVEES)

Year	Predicted Placement Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to SCC in 2020 dollars ($)	Escalation	Totals Cost	Totals Unit Cost	Duration (Months)
2021	Site Preparation									$15,097,000	$15,097,000		$452,910	$905,820	$3,774,250	$20,229,980	1.03	$20,836,898		9.00
2021	Perimeter Levee Improvements (5,600 CY)									$280,000	$280,000		$8,400	$16,800	$70,000	$375,200	1.03	$386,456	$69.01	0.92
2021	1,041,810		625	1,439	$3,125	$6,449,174	2	$10,900	$196,000	$712,000	$7,368,074	$7.07	$221,042	$442,084	$1,842,019	$9,873,220	1.03	$10,169,425	$9.76	2.83
2022	1,041,810		625	1,439	$3,125	$6,449,174	9	$48,900	$392,000	$0	$6,890,074	$6.61	$206,702	$413,404	$1,722,519	$9,232,700	1.06	$9,795,028	$9.40	2.83
2023	1,041,810	1,667	625	1,439	$3,125	$6,449,174	9	$48,900	$392,000	$0	$6,890,074	$6.61	$206,702	$413,404	$1,722,519	$9,232,700	1.09	$10,088,820	$9.68	2.83
2024	1,041,810		625	1,439	$3,125	$6,449,174	9	$48,900	$392,000	$0	$6,890,074	$6.61	$206,702	$413,404	$1,722,519	$9,232,700	1.13	$10,391,484	$9.97	2.83
2025	557,810		335	769	$3,127	$3,452,727	7	$38,000	$196,000	$0	$3,686,727	$6.61	$110,602	$221,204	$921,682	$4,940,214	1.16	$5,727,061	$10.27	1.51
	4,725,050		2,834	6,526		$29,249,424		$195,600	$1,568,000	$16,089,000	$47,102,024	$9.97	$1,413,061	$2,826,121	$11,775,506	$63,116,713		$67,395,172	$14.26	12.82
				12.82 months															*$/Mo*	*$5,256,247*
				221 Avg. Hrs/Mo unloading																

Cost Estimate Assumptions:

1.) Costs are included for disposal site preparation and other upland infrastructure placement requirements (e.g. interior levee improvements, water control structures).
2.) Costs are included for perimeter levee improvements to raise the levees to EL +10' NAVD88 to allow for additional material to be placed.
3.) No costs are included for environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
4.) The costs and quantities are for the Oakland, Richmond, and Redwood City Federal Maintenance Dredging Projects.
5.) Total volume considered for the project is 4.6 MCY (1.1 MCY to E1, 2.4 MCY to E2, 0.501 MCY to E4, and 0.723 MCY to E7).
6.) Predicted Placement Quantity includes 10% bulking factor on top of the dredge quantity.
7.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and are assumed to be completed as quickly as possible within the six month work window.
8.) Unloading equipment hourly costs are based on the Eden Landing Offloader Cost Estimate dated March 2020.
9.) Costs and dredging cycles are based on a single Unloader contract.
10.) Mob/Demob costs include Offloader installation, booster pump installation, pipeline installation, submersible electrical cable installation, temporary overhead power line, substation installation, levee repairs, and water control structures costs.
11.) All equipment costs assume electrically powered engines for the Offloader and Booster Pump.
12.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
13.) Costs have been included to maintain site security, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
14.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2, updated 31 March 2019.

Dredging & Transport Costs

Oakland Harbor	$11.98
Redwood City	$7.53
Richmond Harbor	$12.54

Total Unit Cost - Dredging, Transport, Offloading

Oakland Harbor	$26.24
Redwood City	$21.79
Richmond Harbor	$26.80

SCENARIO 3 - FEDERAL & NON-FEDERAL (5 PROJECTS; EXISTING LEVEES)

Year	Predicted Placement Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to SCC in 2020 dollars ($)	Escalation	Totals Cost	Totals Unit Cost	Duration (Months)
2021	Site Preparation									$15,097,000	$15,097,000		$452,910	$905,820	$3,774,250	$20,229,980	1.03	$20,836,898		9.00
2021	1,251,580		751	1,889	$3,143	$8,296,226	1	$5,500	$197,000	$716,000	$9,214,726	$7.36	$276,442	$552,884	$2,303,682	$12,347,733	1.03	$12,718,177	$10.16	3.62
2022	1,251,580	1,667	751	1,889	$3,143	$8,296,226	8	$43,700	$394,000	$0	$8,733,926	$6.98	$262,018	$524,036	$2,183,482	$11,703,461	1.06	$12,416,274	$9.92	3.62
2023	790,900		474	1,206	$3,140	$5,275,654	7	$38,200	$197,000	$0	$5,510,854	$6.97	$165,326	$330,651	$1,377,713	$7,384,544	1.09	$8,069,290	$10.20	2.30
	3,294,060		1,976	4,984		$21,868,106		$87,400	$788,000	$15,813,000	$38,556,506	$11.70	$1,156,695	$2,313,390	$9,639,127	$51,665,719		$54,040,638	$16.41	9.53
				9.53 months															*$/Mo*	*$5,668,055*
				207 Avg. Hrs/Mo unloading																

Cost Estimate Assumptions:

1.) Costs are included for disposal site preparation and other upland infrastructure placement requirements (e.g. interior levee improvements, water control structures).
2.) No costs are included for environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland, Richmond, and Redwood City Federal Maintenance Dredging Projects along with mid-sized non-federal projects Oakland Berths and Chevron.
4.) Total volume considered for the project is 3.3 MCY (0.477 MCY to E1, 2.0 MCY to E2, 0.371 MCY to E4, and 0.443 MCY to E7).
5.) Predicted Placement Quantity includes 10% bulking factor on top of the dredge quantity.
6.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and are assumed to be completed as quickly as possible within the six month work window.
7.) Unloading equipment hourly costs are based on the Eden Landing Offloader Cost Estimate dated March 2020.
8.) Costs and dredging cycles are based on a single Unloader contract.
9.) Mob/Demob costs include Offloader installation, booster pump installation, pipeline installation, submersible electrical cable installation, temporary overhead power line, substation installation, levee repairs, and water control structures costs.
10.) All equipment costs assume electrically powered engines for the Offloader and Booster Pump.
11.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
12.) Costs have been included to maintain site security, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
13.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2, updated 31 March 2019.

EDEN LANDING PHASE 2 PROJECT
CONCESSION MODEL OFFLOADER COST ESTIMATE SUMMARY (ELECTRIC)

SCENARIO 3 - FEDERAL & NON-FEDERAL (5 PROJECTS; IMPROVED LEVEES)

Year	Predicted Placement Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	Maintenance of Facility during Non-Unloading ($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to SCC in 2020 dollars ($)	Escalation	Totals Cost	Totals Unit Cost	Duration (Months)
2021	Site Preparation									$15,097,000	$15,097,000		$452,910	$905,820	$3,774,250	$20,229,980	1.03	$20,836,898		9.00
2021	Perimeter Levee Improvements (5,600 CY)									$280,000	$280,000		$8,400	$16,800	$70,000	$375,200	1.03	$386,456	$69.01	0.92
2021	1,251,580		751	1,889	$3,143	$8,296,226	1	$5,500	$197,000	$716,000	$9,214,726	$7.36	$276,442	$552,884	$2,303,682	$12,347,733	1.03	$12,718,177	$10.16	3.62
2022	1,251,580	1,667	751	1,889	$3,143	$8,296,226	8	$43,700	$394,000	$0	$8,733,926	$6.98	$262,018	$524,036	$2,183,482	$11,703,461	1.06	$12,416,274	$9.92	3.62
2023	1,251,580		751	1,889	$3,143	$8,296,226	8	$43,700	$394,000	$0	$8,733,926	$6.98	$262,018	$524,036	$2,183,482	$11,703,461	1.09	$12,788,688	$10.22	3.62
2024	970,310		582	1,458	$3,140	$6,406,151	7	$38,200	$197,000	$0	$6,641,351	$6.84	$199,241	$398,481	$1,660,338	$8,899,410	1.13	$10,016,363	$10.32	2.79
	4,725,050		2,834	7,126		$31,294,830		$131,100	$1,182,000	$16,093,000	$48,700,930	$10.31	$1,461,028	$2,922,056	$12,175,233	$65,259,246		$69,162,856	$14.64	13.64
				13.64	*months*														*$/Mo*	*$5,069,165*
				208	*Avg. Hrs/Mo unloading*															

Cost Estimate Assumptions:

1.) Costs are included for disposal site preparation and other upland infrastructure placement requirements (e.g. interior levee improvements, water control structures).
2.) Costs are included for perimeter levee improvements to raise the levees to EL +10' NAVD88 to allow for additional material to be placed.
3.) No costs are included for environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
4.) The costs and quantities are for the Oakland, Richmond, and Redwood City Federal Maintenance Dredging Projects along with mid-sized non-federal projects Oakland Berths and Chevron.
5.) Total volume considered for the project is 4.6 MCY (1.1 MCY to E1, 2.4 MCY to E2, 0.501 MCY to E4, and 0.723 MCY to E7).
6.) Predicted Placement Quantity includes 10% bulking factor on top of the dredge quantity.
7.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and are assumed to be completed as quickly as possible within the six month work window.
8.) Unloading equipment hourly costs are based on the Eden Landing Offloader Cost Estimate dated March 2020.
9.) Costs and dredging cycles are based on a single Unloader contract.
10.) Mob/Demob costs include Offloader installation, booster pump installation, pipeline installation, submersible electrical cable installation, temporary overhead power line, substation installation, levee repairs, and water control structures costs.
11.) All equipment costs assume electrically powered engines for the Offloader and Booster Pump.
12.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
13.) Costs have been included to maintain site security, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
14.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2, updated 31 March 2019.

EDEN LANDING PHASE 2 PROJECT
CONCESSION MODEL OFFLOADER COST ESTIMATE SUMMARY (DIESEL)

SCENARIO 1 - FEDERAL ONLY (2 PROJECTS; EXISTING LEVEES)

Year	Predicted Placement Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to SCC in 2020 dollars ($)	Escalation	Totals Cost	Totals Unit Cost	Duration (Months)
2021	Site Preparation									$6,226,000	$6,226,000		$186,780	$373,560	$1,556,500	$8,342,840	1.03	$8,593,133		9.00
2021	726,880		436	836	$3,314	$4,214,797	3	$16,400	$201,000	$729,000	$5,161,197	$7.10	$154,836	$309,672	$1,290,299	$6,916,005	1.03	$7,123,491	$9.80	1.74
2022	726,880		436	836	$3,314	$4,214,797	10	$54,700	$402,000	$0	$4,671,497	$6.43	$140,145	$280,290	$1,167,874	$6,259,807	1.06	$6,641,067	$9.14	1.74
2023	726,880	1,667	436	836	$3,314	$4,214,797	10	$54,700	$402,000	$0	$4,671,497	$6.43	$140,145	$280,290	$1,167,874	$6,259,807	1.09	$6,840,260	$9.41	1.74
2024	726,880		436	836	$3,314	$4,214,797	10	$54,700	$402,000	$0	$4,671,497	$6.43	$140,145	$280,290	$1,167,874	$6,259,807	1.13	$7,045,467	$9.69	1.74
2025	386,650		232	440	$3,314	$2,226,685	7	$38,300	$201,000	$0	$2,465,985	$6.38	$73,980	$147,959	$616,496	$3,304,420	1.16	$3,830,728	$9.91	0.92
	3,294,170		1,976	3,784		$19,085,875		$218,800	$1,608,000	$6,955,000	$27,867,675	$8.46	$836,030	$1,672,061	$6,966,919	$37,342,685		$40,074,145	$12.17	16.89
				7.89 months															*$/Mo*	*$2,372,597*
				250 Avg. Hrs/Mo unloading																

Cost Estimate Assumptions:

1.) Costs are included for disposal site preparation and other upland infrastructure placement requirements (e.g. interior levee improvements, water control structures).
2.) No costs are included for environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland and Redwood City Federal Maintenance Dredging Projects.
4.) Total volume considered for the project is 3.3 MCY (0.477 MCY to E1, 2.0 MCY to E2, 0.371 MCY to E4, and 0.443 MCY to E7).
5.) Predicted Placement Quantity includes 10% bulking factor on top of the dredge quantity.
6.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and are assumed to be completed as quickly as possible within the six month work window.
7.) Unloading equipment hourly costs are based on the Eden Landing Offloader Cost Estimate dated March 2020.
8.) Costs and dredging cycles are based on a single Unloader contract.
9.) Site Mobilization costs include Offloader installation, booster pump installation, pipeline installation, levee repairs, and water control structures costs.
10.) All equipment costs assume diesel powered engines for the Offloader and Booster Pump.
11.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
12.) Costs have been included to maintain site security, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
13.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2, updated 31 March 2019.

Dredging & Transport Costs	
Oakland Harbor	$11.98
Redwood City	$7.53

Total Unit Cost - Dredging, Transport, Offloading	
Oakland Harbor	$24.15
Redwood City	$19.70

EDEN LANDING PHASE 2 PROJECT
CONCESSION MODEL OFFLOADER COST ESTIMATE SUMMARY (DIESEL)

SCENARIO 1 - FEDERAL ONLY (2 PROJECTS; IMPROVED LEVEES)

Year	Predicted Placement Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to SCC in 2020 dollars ($)	Escalation	Totals Cost	Totals Unit Cost	Duration (Months)
2021	Site Preparation									$6,226,000	$6,226,000		$186,780	$373,560	$1,556,500	$8,342,840	1.03	$8,593,133		9.00
2021	Perimeter Levee Improvements (5,600 CY)									$280,000	$280,000		$8,400	$16,800	$70,000	$375,200	1.03	$386,456	$69.01	0.92
2021	726,880		436	836	$3,314	$4,214,797	3	$16,400	$201,000	$729,000	$5,161,197	$7.10	$154,836	$309,672	$1,290,299	$6,916,005	1.03	$7,123,491	$9.80	1.74
2022	726,880		436	836	$3,314	$4,214,797	10	$54,700	$402,000	$0	$4,671,497	$6.43	$140,145	$280,290	$1,167,874	$6,259,807	1.06	$6,641,067	$9.14	1.74
2023	726,880		436	836	$3,314	$4,214,797	10	$54,700	$402,000	$0	$4,671,497	$6.43	$140,145	$280,290	$1,167,874	$6,259,807	1.09	$6,840,260	$9.41	1.74
2024	726,880	1,667	436	836	$3,314	$4,214,797	10	$54,700	$402,000	$0	$4,671,497	$6.43	$140,145	$280,290	$1,167,874	$6,259,807	1.13	$7,045,467	$9.69	1.74
2025	726,880		436	836	$3,314	$4,214,797	10	$54,700	$402,000	$0	$4,671,497	$6.43	$140,145	$280,290	$1,167,874	$6,259,807	1.16	$7,256,830	$9.98	1.74
2026	726,880		436	836	$3,314	$4,214,797	10	$54,700	$402,000	$0	$4,671,497	$6.43	$140,145	$280,290	$1,167,874	$6,259,807	1.19	$7,474,562	$10.28	1.74
2027	363,770		218	430	$3,314	$2,147,161	7	$38,300	$201,000	$0	$2,386,461	$6.56	$71,594	$143,188	$596,615	$3,197,858	1.23	$3,932,977	$10.81	0.89
	4,725,050		2,834	5,446		$27,435,946		$328,200	$2,412,000	$7,235,000	$37,411,146	$7.92	$1,122,334	$2,244,669	$9,352,786	$50,130,935		$55,294,243	$11.70	11.34
				11.34	*months*														*$/Mo*	*$4,874,975*
				250	*Avg. Hrs/Mo unloading*															

Cost Estimate Assumptions:

1.) Costs are included for disposal site preparation and other upland infrastructure placement requirements (e.g. interior levee improvements, water control structures).
2.) Costs are included for perimeter levee improvements to raise the levees to EL +10' NAVD88 to allow for additional material to be placed.
3.) No costs are included for environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
4.) The costs and quantities are for the Oakland and Redwood City Federal Maintenance Dredging Projects.
5.) Total volume considered for the project is 4.6 MCY (1.1 MCY to E1, 2.4 MCY to E2, 0.501 MCY to E4, and 0.723 MCY to E7).
6.) Predicted Placement Quantity includes 10% bulking factor on top of the dredge quantity.
7.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and are assumed to be completed as quickly as possible within the six month work window.
8.) Unloading equipment hourly costs are based on the Eden Landing Offloader Cost Estimate dated March 2020.
9.) Costs and dredging cycles are based on a single Unloader contract.
10.) Site Mobilization costs include Offloader installation, booster pump installation, pipeline installation, levee repairs, and water control structures costs.
11.) All equipment costs assume diesel powered engines for the Offloader and Booster Pump.
12.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
13.) Costs have been included to maintain site security, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
14.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2, updated 31 March 2019.

Dredging & Transport Costs

Oakland Harbor	$11.98
Redwood City	$7.53

Total Unit Cost - Dredging, Transport, Offloading

Oakland Harbor	$23.68
Redwood City	$19.23

EDEN LANDING PHASE 2 PROJECT
CONCESSION MODEL OFFLOADER COST ESTIMATE SUMMARY (DIESEL)

SCENARIO 2 - FEDERAL ONLY (3 PROJECTS; EXISTING LEVEES)

Year	Predicted Placement Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to SCC in 2020 dollars ($)	Escalation	Totals Cost	Totals Unit Cost	Duration (Months)
2021	Site Preparation									$6,226,000	$6,226,000		$186,780	$373,560	$1,556,500	$8,342,840	1.03	$8,593,133		9.00
2021	1,041,810		625	1,439	$3,321	$6,854,977	2	$11,000	$202,000	$731,000	$7,798,977	$7.49	$233,969	$467,939	$1,949,744	$10,450,630	1.03	$10,764,158	$10.33	2.83
2022	1,041,810	1,667	625	1,439	$3,321	$6,854,977	9	$49,400	$403,000	$0	$7,307,377	$7.01	$219,221	$438,443	$1,826,844	$9,791,886	1.06	$10,388,272	$9.97	2.83
2023	1,041,810		625	1,439	$3,321	$6,854,977	9	$49,400	$403,000	$0	$7,307,377	$7.01	$219,221	$438,443	$1,826,844	$9,791,886	1.09	$10,699,858	$10.27	2.83
2024	168,740		101	235	$3,321	$1,115,927	7	$38,400	$202,000	$0	$1,356,327	$8.04	$40,690	$81,380	$339,082	$1,817,478	1.13	$2,045,587	$12.12	0.46
	3,294,170		1,976	4,552		$21,680,859		$148,200	$1,210,000	$6,957,000	$29,996,059	$9.11	$899,882	$1,799,764	$7,499,015	$40,194,719		$42,491,007	$12.90	8.94
				8.94 months															*$/Mo*	*$4,751,599*
				221 Avg. Hrs/Mo unloading																

Cost Estimate Assumptions:

1.) Costs are included for disposal site preparation and other upland infrastructure placement requirements (e.g. interior levee improvements, water control structures).
2.) No costs are included for environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland, Richmond, and Redwood City Federal Maintenance Dredging Projects.
4.) Total volume considered for the project is 3.3 MCY (0.477 MCY to E1, 2.0 MCY to E2, 0.371 MCY to E4, and 0.443 MCY to E7).
5.) Predicted Placement Quantity includes 10% bulking factor on top of the dredge quantity.
6.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and have been optimized to be completed based on a the minimum monthly productions using four large dump scows.
7.) Unloading equipment hourly costs are based on the Eden Landing Offloader Cost Estimate dated March 2020.
8.) Costs and dredging cycles are based on a single Unloader contract.
9.) Site Mobilization costs include Offloader installation, booster pump installation, pipeline installation, levee repairs, and water control structures costs.
10.) All equipment costs assume diesel powered engines for the Offloader and Booster Pump.
11.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
12.) Costs have been included to maintain site security, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
13.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2, updated 31 March 2019.

Dredging & Transport Costs

Oakland Harbor	$11.98
Redwood City	$7.53
Richmond Harbor	$12.54

Total Unit Cost - Dredging, Transport, Offloading

Oakland Harbor	$24.88
Redwood City	$20.43
Richmond Harbor	$25.44

EDEN LANDING PHASE 2 PROJECT
CONCESSION MODEL OFFLOADER COST ESTIMATE SUMMARY (DIESEL)

SCENARIO 2 - FEDERAL ONLY (3 PROJECTS; IMPROVED LEVEES)

Year	Predicted Placement Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to SCC in 2020 dollars ($)	Escalation	Totals Cost	Totals Unit Cost	Duration (Months)
2021	Site Preparation									$6,226,000	$6,226,000		$186,780	$373,560	$1,556,500	$8,342,840	1.03	$8,593,133		9.00
2021	Perimeter Levee Improvements (5,600 CY)									$280,000	$280,000		$8,400	$16,800	$70,000	$375,200	1.03	$386,456	$69.01	0.92
2021	1,041,810		625	1,439	$3,321	$6,854,977	2	$11,000	$202,000	$731,000	$7,798,977	$7.49	$233,969	$467,939	$1,949,744	$10,450,630	1.03	$10,764,158	$10.33	2.83
2022	1,041,810		625	1,439	$3,321	$6,854,977	9	$49,400	$403,000	$0	$7,307,377	$7.01	$219,221	$438,443	$1,826,844	$9,791,886	1.06	$10,388,272	$9.97	2.83
2023	1,041,810	1,667	625	1,439	$3,321	$6,854,977	9	$49,400	$403,000	$0	$7,307,377	$7.01	$219,221	$438,443	$1,826,844	$9,791,886	1.09	$10,699,858	$10.27	2.83
2024	1,041,810		625	1,439	$3,321	$6,854,977	9	$49,400	$403,000	$0	$7,307,377	$7.01	$219,221	$438,443	$1,826,844	$9,791,886	1.13	$11,020,852	$10.58	2.83
2025	557,810		335	769	$3,321	$3,666,616	7	$38,400	$202,000	$0	$3,907,016	$7.00	$117,210	$234,421	$976,754	$5,235,401	1.16	$6,069,264	$10.88	1.51
	4,725,050		2,834	6,526		$31,086,526		$197,600	$1,613,000	$7,237,000	$40,134,126	$8.49	$1,204,024	$2,408,048	$10,033,531	$53,779,728		$57,921,993	$12.26	12.82
				12.82 months															*$/Mo*	*$4,517,420*
				221 Avg. Hrs/Mo unloading																

Cost Estimate Assumptions:

1.) Costs are included for disposal site preparation and other upland infrastructure placement requirements (e.g. interior levee improvements, water control structures).
2.) Costs are included for perimeter levee improvements to raise the levees to EL +10' NAVD88 to allow for additional material to be placed.
3.) No costs are included for environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
4.) The costs and quantities are for the Oakland, Richmond, and Redwood City Federal Maintenance Dredging Projects.
5.) Total volume considered for the project is 4.6 MCY (1.1 MCY to E1, 2.4 MCY to E2, 0.501 MCY to E4, and 0.723 MCY to E7).
6.) Predicted Placement Quantity includes 10% bulking factor on top of the dredge quantity.
7.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and are assumed to be completed as quickly as possible within the six month work window.
8.) Unloading equipment hourly costs are based on the Eden Landing Offloader Cost Estimate dated March 2020.
9.) Costs and dredging cycles are based on a single Unloader contract.
10.) Site Mobilization costs include Offloader installation, booster pump installation, pipeline installation, levee repairs, and water control structures costs.
11.) All equipment costs assume diesel powered engines for the Offloader and Booster Pump.
12.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
13.) Costs have been included to maintain site security, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
14.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2, updated 31 March 2019.

Dredging & Transport Costs	
Oakland Harbor	$11.98
Redwood City	$7.53
Richmond Harbor	$12.54

Total Unit Cost - Dredging, Transport, Offloading	
Oakland Harbor	$24.24
Redwood City	$19.79
Richmond Harbor	$24.80

SCENARIO 3 - FEDERAL & NON-FEDERAL (5 PROJECTS; EXISTING LEVEES)

Year	Predicted Placement Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to SCC in 2020 dollars ($)	Escalation	Totals Cost	Totals Unit Cost	Duration (Months)
2021	Site Preparation									$6,226,000	$6,226,000		$186,780	$373,560	$1,556,500	$8,342,840	1.03	$8,593,133		9.00
2021	1,251,580		751	1,889	$3,334	$8,801,575	1	$5,500	$202,000	$735,000	$9,744,075	$7.79	$292,322	$584,645	$2,436,019	$13,057,061	1.03	$13,448,784	$10.75	3.62
2022	1,251,580	1,667	751	1,889	$3,334	$8,801,575	8	$44,200	$405,000	$0	$9,250,775	$7.39	$277,523	$555,047	$2,312,694	$12,396,039	1.06	$13,151,034	$10.51	3.62
2023	790,900		474	1,206	$3,334	$5,601,002	7	$38,700	$202,000	$0	$5,841,702	$7.39	$175,251	$350,502	$1,460,426	$7,827,881	1.09	$8,553,737	$10.82	2.30
	3,294,060		1,976	4,984		$23,204,153		$88,400	$809,000	$6,961,000	$31,062,553	$9.43	$931,877	$1,863,753	$7,765,638	$41,623,821		$43,746,688	$13.28	9.53
				9.53 months															*$/Mo*	*$4,588,374*
				207 Avg. Hrs/Mo unloading																

Cost Estimate Assumptions:

1.) Costs are included for disposal site preparation and other upland infrastructure placement requirements (e.g. interior levee improvements, water control structures).
2.) No costs are included for environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland, Richmond, and Redwood City Federal Maintenance Dredging Projects along with mid-sized non-federal projects Oakland Berths and Chevron.
4.) Total volume considered for the project is 3.3 MCY (0.477 MCY to E1, 2.0 MCY to E2, 0.371 MCY to E4, and 0.443 MCY to E7).
5.) Predicted Placement Quantity includes 10% bulking factor on top of the dredge quantity.
6.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and have been optimized to be completed based on a the minimum monthly productions using four large dump scows.
7.) Unloading equipment hourly costs are based on the Eden Landing Offloader Cost Estimate dated March 2020.
8.) Costs and dredging cycles are based on a single Unloader contract.
9.) Site Mobilization costs include Offloader installation, booster pump installation, pipeline installation, levee repairs, and water control structures costs.
10.) All equipment costs assume diesel powered engines for the Offloader and Booster Pump.
11.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
12.) Costs have been included to maintain site security, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
13.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2, updated 31 March 2019.

EDEN LANDING PHASE 2 PROJECT
CONCESSION MODEL OFFLOADER COST ESTIMATE SUMMARY (DIESEL)

SCENARIO 3 - FEDERAL & NON-FEDERAL (5 PROJECTS; IMPROVED LEVEES)

Year	Predicted Placement Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to SCC in 2020 dollars ($)	Escalation	Totals Cost	Totals Unit Cost	Duration (Months)
2021	Site Preparation									$6,226,000	$6,226,000		$186,780	$373,560	$1,556,500	$8,342,840	1.03	$8,593,133		9.00
2021	Perimeter Levee Improvements (5,600 CY)									$280,000	$280,000		$8,400	$16,800	$70,000	$375,200	1.03	$386,456	$69.01	0.92
2021	1,251,580		751	1,889	$3,334	$8,801,575	1	$5,500	$202,000	$735,000	$9,744,075	$7.79	$292,322	$584,645	$2,436,019	$13,057,061	1.03	$13,448,784	$10.75	3.62
2022	1,251,580	1,667	751	1,889	$3,334	$8,801,575	8	$44,200	$405,000	$0	$9,250,775	$7.39	$277,523	$555,047	$2,312,694	$12,396,039	1.06	$13,151,034	$10.51	3.62
2023	1,251,580		751	1,889	$3,334	$8,801,575	8	$44,200	$405,000	$0	$9,250,775	$7.39	$277,523	$555,047	$2,312,694	$12,396,039	1.09	$13,545,486	$10.82	3.62
2024	970,310		582	1,458	$3,334	$6,801,217	7	$38,700	$202,000	$0	$7,041,917	$7.26	$211,258	$422,515	$1,760,479	$9,436,169	1.13	$10,620,490	$10.95	2.79
	4,725,050		2,834	7,126		$33,205,943		$132,600	$1,214,000	$7,241,000	$41,793,543	$8.85	$1,253,806	$2,507,613	$10,448,386	$56,003,347		$59,745,383	$12.64	13.64
				13.64	*months*														*$/Mo*	*$4,378,929*
				208	*Avg. Hrs/Mo unloading*															

Cost Estimate Assumptions:

1.) Costs are included for disposal site preparation and other upland infrastructure placement requirements (e.g. interior levee improvements, water control structures).
2.) Costs are included for perimeter levee improvements to raise the levees to EL +10' NAVD88 to allow for additional material to be placed.
3.) No costs are included for environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
4.) The costs and quantities are for the Oakland, Richmond, and Redwood City Federal Maintenance Dredging Projects along with mid-sized non-federal projects Oakland Berths and Chevron.
5.) Total volume considered for the project is 4.6 MCY (1.1 MCY to E1, 2.4 MCY to E2, 0.501 MCY to E4, and 0.723 MCY to E7).
6.) Predicted Placement Quantity includes 10% bulking factor on top of the dredge quantity.
7.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and are assumed to be completed as quickly as possible within the six month work window.
8.) Unloading equipment hourly costs are based on the Eden Landing Offloader Cost Estimate dated March 2020.
9.) Costs and dredging cycles are based on a single Unloader contract.
10.) Site Mobilization costs include Offloader installation, booster pump installation, pipeline installation, levee repairs, and water control structures costs.
11.) All equipment costs assume diesel powered engines for the Offloader and Booster Pump.
12.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
13.) Costs have been included to maintain site security, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
14.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2, updated 31 March 2019.

ATTACHMENT F

USACE SF DISTRICT DREDGING CONTRACT AWARDS

EDEN LANDING PHASE 2 PROJECT
USACE SF DISTRICT DREDGING CONTRACT AWARDS

Maintenance Projects Considered	Disposal Site	Bid Qty (CY)	Actual Qty (CY)	2019 Mob/ Demob	2019 Unit Rate	2019 Total	Bid Qty (CY)	Actual Qty (CY)	2018 Mob/ Demob	2018 Unit Rate	2018 Total	Bid Qty (CY)	Actual Qty (CY)	2017 Mob/ Demob	2017 Unit Rate	2017 Total
FEDERAL																
Oakland Inner & Outer Harbor	SF-11															
Oakland Inner & Outer Harbor	Hamilton															
Oakland Inner & Outer Harbor	Montezuma	456,000		$2,400,000	$22.35	$16,715,000	605,000	691,397	$300,000	$30.98	$24,679,944					
Oakland Inner & Outer Harbor	SF-DODS	300,000			$13.75		145,000	147,395		$20.07		635,000	999,312	$400,000	$19.77	$20,153,030
Oakland Inner & Outer Harbor	Winter Island															
Redwood City Harbor	SF-11	324,000		$747,735	$14.12	$7,596,135						129,000	249,507	$540,000	$10.80	$5,888,448
Redwood City Harbor	SF-11 / SF-10															
Redwood City Harbor	SF-DODS											130,500	120,626		$22.00	
Redwood City Harbor	Montezuma	92,000			$24.70											
Richmond Inner & Outer Harbor	SF-DODS						107,000	99,953	$400,000	$35.00	$3,898,355					
Richmond Inner & Outer Harbor	Hamilton															
Richmond Inner & Outer Harbor	Montezuma															
Richmond Inner & Outer Harbor	SF-10															
Richmond Inner & Outer Harbor	Cullinan						33,000	0		$17.00		271,000	438,479	$150,000	$27.33	$12,133,631

Notes:

1.) Volumes, frequency, and disposal sites based off 2008-2017 DMMO annual dredging reports.
2.) Oakland Inner & Outer Harbor is annualized over 8 years due to the -50 Ft. Deepening work taking place in 2008 and 2009.
3.) Redwood City Harbor annualized amount is 351,912 when annualized over 7 years that dredging occurred.
4.) Redwood City Harbor annualized amount does not include dredging performed by USACE dredge Yaquina in 2010.
5.) Richmond Inner & Outer Harbor annualized amount does not include dredging performed by USACE dredge Essayons.
6.) Actual volumes from Oakland for 2018 are spread based on monthly averages since dredging continued into 2019.
7.) Costs shown for 2019 are bid costs only.

EDEN LANDING PHASE 2 PROJECT
USACE SF DISTRICT DREDGING CONTRACT AWARDS

Maintenance Projects Considered	Disposal Site	Bid Qty (CY)	Actual Qty (CY)	2016 Mob/ Demob	2016 Unit Rate	2016 Total	Bid Qty (CY)	Actual Qty (CY)	2015 Mob/ Demob	2015 Unit Rate	2015 Total	Bid Qty (CY)	Actual Qty (CY)	2014 Mob/ Demob	2014 Unit Rate	2014 Total
FEDERAL																
Oakland Inner & Outer Harbor	SF-11															
Oakland Inner & Outer Harbor	Hamilton															
Oakland Inner & Outer Harbor	Montezuma	635,000	38,214	$400,000	$19.69	$8,169,921	635,000	561,626	$1,371,429	$21.87	$22,618,783	158,000	389,984	$151,000	$27.75	$10,971,822
Oakland Inner & Outer Harbor	SF-DODS		356,406					347,577								
Oakland Inner & Outer Harbor	Winter Island							62,159								
Redwood City Harbor	SF-11	245,000	205,356	$1,120,000	$10.45	$5,813,172						352,000	394,382	$1,808,000	$19.50	$13,481,310
Redwood City Harbor	SF-11 / SF-10											247,000	271,339		$14.68	
Redwood City Harbor	SF-DODS	80,000	27,526		$24.00											
Redwood City Harbor	Montezuma	65,000	55,746		$33.85		249,000	290,763	$2,282,950	$34.00	$12,168,892					
Richmond Inner & Outer Harbor	SF-DODS							359,537		$23.00			206,722		$27.00	
Richmond Inner & Outer Harbor	Hamilton						165,000		$800,000		$15,601,627	212,000		$2,150,000		$14,058,199
Richmond Inner & Outer Harbor	Montezuma							167,901		$23.00			204,567		$27.00	
Richmond Inner & Outer Harbor	SF-10						200,000	232,222		$11.50		56,600	73,036		$11.00	
Richmond Inner & Outer Harbor	Cullinan															

EDEN LANDING PHASE 2 PROJECT
USACE SF DISTRICT DREDGING CONTRACT AWARDS

Maintenance Projects Considered	Disposal Site	Bid Qty (CY)	Actual Qty (CY)	2013 Mob/ Demob	2013 Unit Rate	2013 Total	Bid Qty (CY)	Actual Qty (CY)	2012 Mob/ Demob	2012 Unit Rate	2012 Total	Bid Qty (CY)	Actual Qty (CY)	2011 Mob/ Demob	2011 Unit Rate	2011 Total
FEDERAL																
Oakland Inner & Outer Harbor	SF-11	90,400	124,200		$9.18							141,000	233,506		$6.90	
Oakland Inner & Outer Harbor	Hamilton			$240,000		$12,970,801						1,092,384		$5,000,000		$20,325,619
Oakland Inner & Outer Harbor	Montezuma	330,600	429,297		$27.00								777,743		$17.63	
Oakland Inner & Outer Harbor	SF-DODS						518,500	1,705,000	$835,100	$16.90	$29,642,366					
Oakland Inner & Outer Harbor	Winter Island															
Redwood City Harbor	SF-11											159,500	124,670	$490,000	$17.65	$2,690,680
Redwood City Harbor	SF-11 / SF-10															
Redwood City Harbor	SF-DODS															
Redwood City Harbor	Montezuma															
Richmond Inner & Outer Harbor	SF-DODS						196,500	236,100	$1,755,000	$23.08	$7,204,044	607,200	271,700	$1,700,000	$15.56	$8,966,613
Richmond Inner & Outer Harbor	Hamilton												195,399		$15.56	
Richmond Inner & Outer Harbor	Montezuma															
Richmond Inner & Outer Harbor	SF-10															
Richmond Inner & Outer Harbor	Cullinan															

ATTACHMENT G

USACE MODEL OFFLOADER SUMMARY COST

EDEN LANDING PHASE 2 PROJECT
USACE MODEL OFFLOADER SUMMARY COST

FEDERAL ONLY BUNDLED PROJECT (2 PROJECTS; EXISTING LEVEES)

	Predicted		Mobilization / Demobilization																		
	Placement	Offshore		Shore		Clamshell	Site	Dredging	Offloading	Add'l Dredging	Add'l Dredging			Design Fee	CM @ 6%	Contingency	Cost in 2020		Totals		Duration
Year	Quantity (CY)	Piles ($)	Pipeline ($)	Crew ($)	Unloader ($)	Dredges ($)	Improvements ($)	Cost ($)	Cost ($)	Amount (CY)	Cost ($)	Cost Subtotal ($)	Unit Cost ($/cy)	@ 3% ($)	($)	@ 25% ($)	dollars ($)	Escalation	Cost	Unit Cost	(Months)
2021	Site Improvements						$3,383,000					$3,383,000		$101,490	$202,980	$845,750	$4,533,220	1.03	$4,669,221		8.00
2021	726,880	$315,000	$2,528,000	$145,000	$674,000	$973,000		$8,334,000	$4,628,000	394,100	$9,904,643	$27,501,643	$37.84			$4,399,250	$31,900,893	1.03	$32,857,949	$45.20	7.00
2022	726,880	$315,000	$2,528,000	$145,000	$674,000	$973,000		$8,334,000	$4,628,000	394,100	$9,904,643	$27,501,643	$37.84			$4,399,250	$31,900,893	1.06	$33,843,853	$46.56	7.00
2023	726,880	$315,000	$2,528,000	$145,000	$674,000	$973,000		$8,334,000	$4,628,000	394,100	$9,904,643	$27,501,643	$37.84			$4,399,250	$31,900,893	1.09	$34,858,967	$47.96	7.00
2024	726,880	$315,000	$2,528,000	$145,000	$674,000	$973,000		$8,334,000	$4,628,000	394,100	$9,904,643	$27,501,643	$37.84			$4,399,250	$31,900,893	1.13	$35,904,733	$49.40	7.00
2025	386,650	$315,000	$2,528,000	$157,000	$741,000	$1,036,000		$4,529,000	$2,638,000	703,400	$17,673,720	$29,617,720	$76.60			$2,986,000	$32,603,720	1.16	$37,796,640	$97.75	7.00
	3,294,170	$1,575,000	$12,640,000	$737,000	$3,437,000	$4,928,000	$3,383,000	$37,865,000	$21,150,000	2,279,800	$57,292,294	$143,007,294	$43.41	$101,490	$202,980	$21,428,750	$164,740,514		$179,931,363	$54.62	43.00
																				$/Mo	*$4,184,450*

Cost Estimate Assumptions:

1.) Costs are included for disposal site preparation and other upland infrastructure placement requirements (e.g. interior levee improvements, water control structures).
2.) No costs are included for environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for a bundled Oakland and Redwood City Federal Maintenance Dredging Project.
4.) Total volume considered for the project is 3.3 MCY (0.477 MCY to E1, 2.0 MCY to E2, 0.371 MCY to E4, and 0.443 MCY to E7).
5.) Predicted Placement Quantity includes 10% bulking factor on top of the dredge quantity.
6.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and are assumed to be completed as quickly as possible within the six month work window.
7.) Unloading equipment hourly costs are based on the Eden Landing Offloader Cost Estimate dated March 2020.
8.) Costs and dredging cycles are based on a single annual Corps bundled project as an alternative bid to the Federal Standard disposal sites.
9.) Site Improvement costs include levee repairs, and water control structures costs.
10.) Mob/Demob costs include Offloader installation, booster pump installation, pipeline installation, and offshore pile installation costs.
11.) Pipeline costs are based on an amortization of a portion of the cost to the project based on the quantity of material that is pumped through it.
12.) All equipment costs assume diesel powered engines for the Offloader and Booster Pump.
13.) The Offloader, booster pump, pipeline, support barges, and offshore support piles will be removed at the end of the project and taken offsite. No infrastructure will remain onsite.
14.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2, updated 31 March 2019.

FEDERAL ONLY BUNDLED PROJECT (2 PROJECTS; IMPROVED LEVEES)

	Predicted		Mobilization / Demobilization																		
	Placement	Offshore		Shore		Clamshell	Site	Dredging	Offloading	Add'l Dredging	Add'l Dredging			Design Fee	CM @ 6%	Contingency	Cost in 2020		Totals		Duration
Year	Quantity (CY)	Piles ($)	Pipeline ($)	Crew ($)	Unloader ($)	Dredges ($)	Improvements ($)	Cost ($)	Cost ($)	Amount (CY)	Cost ($)	Cost Subtotal ($)	Unit Cost ($/cy)	@ 3% ($)	($)	@ 25% ($)	dollars ($)	Escalation	Cost	Unit Cost	(Months)
2021	Site Improvements						$3,383,000					$3,383,000		$101,490	$202,980	$845,750	$4,533,220	1.03	$4,669,221		8.00
2021	Perimeter Levee Improvements (5,600 CY)						$280,000					$280,000	$50.00	$8,400	$16,800	$70,000	$375,200	1.03	$386,456	$69.01	0.92
2021	726,880	$315,000	$2,528,000	$145,000	$674,000	$973,000		$8,334,000	$4,628,000	394,100	$9,904,643	$27,501,643	$37.84			$4,399,250	$31,900,893	1.03	$32,857,949	$45.20	7.00
2022	726,880	$315,000	$2,528,000	$145,000	$674,000	$973,000		$8,334,000	$4,628,000	394,100	$9,904,643	$27,501,643	$37.84			$4,399,250	$31,900,893	1.06	$33,843,853	$46.56	7.00
2023	726,880	$315,000	$2,528,000	$145,000	$674,000	$973,000		$8,334,000	$4,628,000	394,100	$9,904,643	$27,501,643	$37.84			$4,399,250	$31,900,893	1.09	$34,858,967	$47.96	7.00
2024	726,880	$315,000	$2,528,000	$145,000	$674,000	$973,000		$8,334,000	$4,628,000	394,100	$9,904,643	$27,501,643	$37.84			$4,399,250	$31,900,893	1.13	$35,904,733	$49.40	7.00
2025	726,880	$315,000	$2,528,000	$145,000	$674,000	$973,000		$8,334,000	$4,628,000	394,100	$9,904,643	$27,501,643	$37.84			$4,399,250	$31,900,893	1.16	$36,981,871	$50.88	7.00
2026	726,880	$315,000	$2,528,000	$145,000	$674,000	$973,000		$8,334,000	$4,628,000	394,100	$9,904,643	$27,501,643	$37.84			$4,399,250	$31,900,893	1.19	$38,091,464	$52.40	7.00
2027	363,770	$315,000	$2,528,000	$159,000	$748,000	$1,042,000		$4,228,000	$2,564,000	724,200	$18,196,180	$29,780,180	$81.87			$2,896,000	$32,676,180	1.23	$40,187,742	$110.48	7.00
	4,725,050	$2,205,000	$17,696,000	$1,029,000	$4,792,000	$6,880,000	$3,663,000	$54,232,000	$30,332,000	3,088,800	$77,624,041	$198,453,041	$42.00	$109,890	$219,780	$30,207,250	$228,989,961		$257,782,256	$54.56	43.92
																				$/Mo	*$5,869,359*
										1,120,980											

Cost Estimate Assumptions:

1.) Costs are included for disposal site preparation and other upland infrastructure placement requirements (e.g. interior levee improvements, water control structures).
2.) No costs are included for environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for a bundled Oakland and Redwood City Federal Maintenance Dredging Project.
4.) Total volume considered for the project is 3.3 MCY (0.477 MCY to E1, 2.0 MCY to E2, 0.371 MCY to E4, and 0.443 MCY to E7).
5.) Predicted Placement Quantity includes 10% bulking factor on top of the dredge quantity.
6.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and are assumed to be completed as quickly as possible within the six month work window.
7.) Unloading equipment hourly costs are based on the Eden Landing Offloader Cost Estimate dated March 2020.
8.) Costs and dredging cycles are based on a single annual Corps bundled project as an alternative bid to the Federal Standard disposal sites.
9.) Site Improvement costs include levee repairs, and water control structures costs.
10.) Mob/Demob costs include Offloader installation, booster pump installation, pipeline installation, and offshore pile installation costs.
11.) Pipeline costs are based on an amortization of a portion of the cost to the project based on the quantity of material that is pumped through it.
12.) All equipment costs assume diesel powered engines for the Offloader and Booster Pump.
13.) The Offloader, booster pump, pipeline, support barges, and offshore support piles will be removed at the end of the project and taken offsite. No infrastructure will remain onsite.
14.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2, updated 31 March 2019.

EDEN LANDING PHASE 2 PROJECT
USACE MODEL OFFLOADER SUMMARY COST

2015 - 2019 OAKLAND INNER AND OUTER CHANNEL MAINTENANCE DREDGING

Year	Bid Quantity (CY)	Beneficial Reuse Quantity (CY)	SFDODS Quantity (CY)	Mob/ Demob ($)	Dredging Cost ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Escalation to 2020$ ($)	Totals Cost	Totals Unit Cost
2015	635,000	623,785	347,577	$1,371,429	$21,243,687	$22,615,116	$23.28	1.14	$25,687,882	$26.45
2016	635,000	38,214	356,406	$400,000	$7,770,068	$8,170,068	$20.70	1.16	$9,457,321	$23.97
2017	635,000		999,312	$400,000	$19,756,398	$20,156,398	$20.17	1.09	$22,047,525	$22.06
2018	750,000	691,397	147,395	$300,000	$24,377,697	$24,677,697	$29.42	1.02	$25,070,774	$29.89
2019	756,000	456,000	300,000	$2,400,000	$14,316,600	$16,716,600	$22.11	1.03	$17,206,955	$22.76
	3,411,000	1,809,396	2,150,690	$4,871,429	$87,464,450	$92,335,879			$99,470,456	$25.12
			3,960,086					Avg. $ value per year	$19,894,091	
			792,017							

2015 - 2019 REDWOOD CITY HARBOR CHANNEL MAINTENANCE DREDGING

Year	Bid Quantity (CY)	Beneficial Reuse Quantity (CY)	In-Bay/ SFDODS Quantity (CY)	Mob/ Demob ($)	Dredging Cost ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Escalation to 2020$ ($)	Totals Cost	Totals Unit Cost
2015	249,000	290,763	0	$2,282,950	$9,885,942	$12,168,892	$41.85	1.14	$13,822,306	$47.54
2016	390,000	55,746	232,882	$1,120,000	$4,693,596	$5,813,596	$20.14	1.16	$6,729,571	$23.32
2017	259,500	120,626	249,507	$540,000	$5,348,448	$5,888,448	$15.91	1.09	$6,440,917	$17.40
2018					$0	$0	#DIV/0!	1.02	$0	#DIV/0!
2019	416,000	92,000	324,000	$747,735	$6,847,280	$7,595,015	$18.26	1.03	$7,817,803	$18.79
	1,314,500	559,135	806,389	$4,690,685	$26,775,266	$31,465,951			$34,810,597	$25.49
			1,365,524					Avg. $ value per year	$6,962,119	
			273,105							
								Avg. $ value per year, Oakland & RWC bundled	$26,856,211	

Notes:

1.) Above contractor costs are based on unit costs from bid prices and actual quantities dredged from DMMO records.
2.) Above costs are for the low bid contractor.
3.) Total cost is based on average unit cost from actual costs or bid costs (2019) and escalated to 2020 dollars.

EDEN LANDING PHASE 2 PROJECT
USACE MODEL OFFLOADER SUMMARY COST

EXISTING LEVEE CONDITION

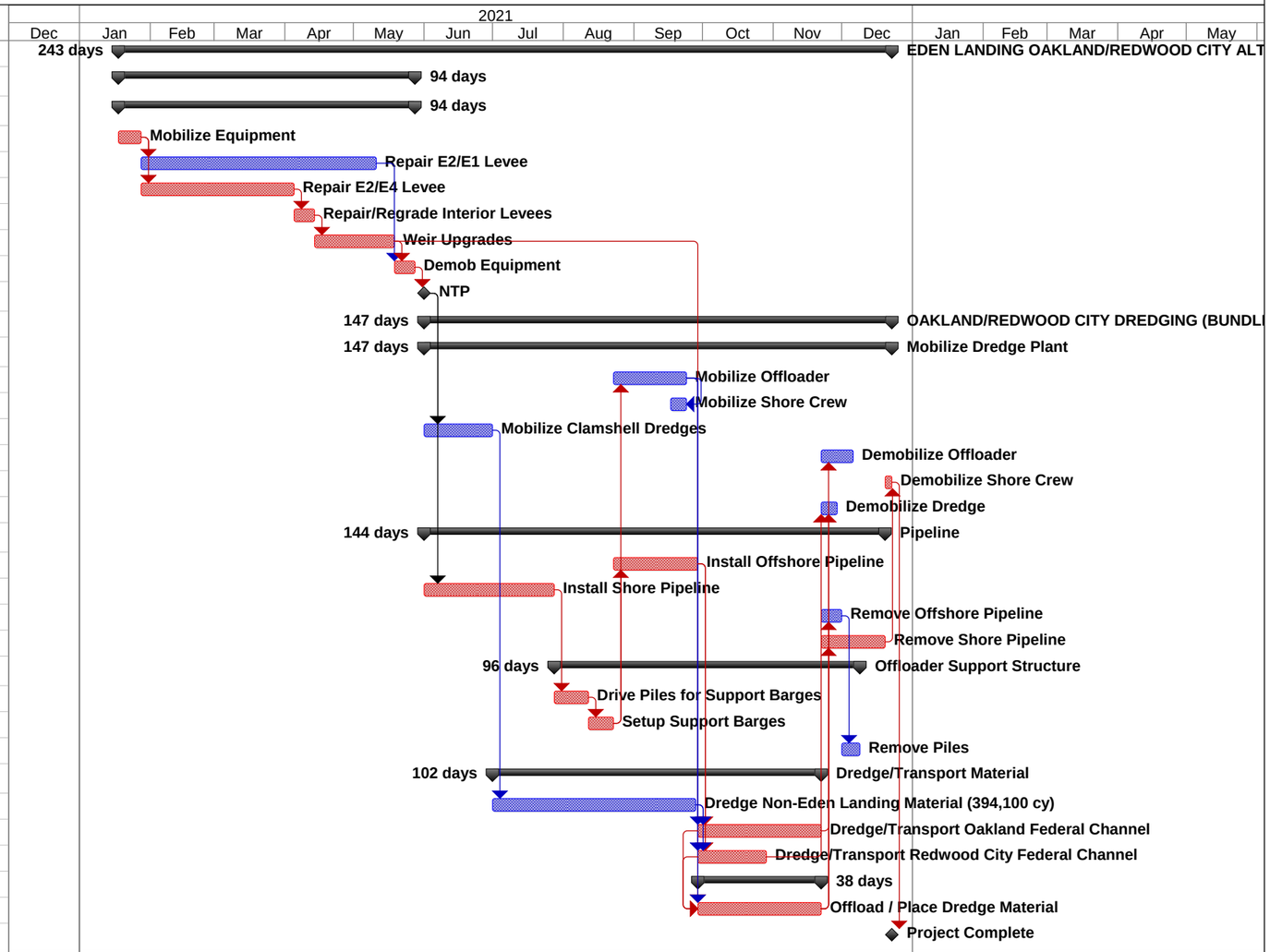
Year	Mob/ Demob	Dredging Cost	Avg. Annual $ Oak/RWC Projects	Escalation	Total Cost	Difference	
2021	$2,096,687	$24,759,524	$26,856,211	1.03	$27,661,921	$5,196,028	
2022	$2,096,687	$24,759,524	$26,856,211	1.06	$28,491,919	$5,351,935	
2023	$2,096,687	$24,759,524	$26,856,211	1.09	$29,346,506	$5,512,461	
2024	$2,096,687	$24,759,524	$26,856,211	1.13	$30,226,898	$5,677,834	
2025	$2,096,687	$24,759,524	$26,856,211	1.16	$31,133,702	$6,662,937	
	$10,483,435	$123,797,618	$134,281,053		$146,860,946	$28,401,196	
						$8,869,221	Site Improvements + Site Maintenance
						$37,270,416	Total Difference
						$7,454,083	Avg. Annual Difference

IMPROVED LEVEE CONDITION

Year	Mob/ Demob	Dredging Cost	Avg. Annual $ Oak/RWC Projects	Escalation	Total Cost	Difference	
2021	$2,096,687	$24,759,524	$26,856,211	1.03	$27,661,921	$5,196,028	
2022	$2,096,687	$24,759,524	$26,856,211	1.06	$28,491,919	$5,351,935	
2023	$2,096,687	$24,759,524	$26,856,211	1.09	$29,346,506	$5,512,461	
2024	$2,096,687	$24,759,524	$26,856,211	1.13	$30,226,898	$5,677,834	
2025	$2,096,687	$24,759,524	$26,856,211	1.16	$31,133,702	$5,848,169	
2026	$2,096,687	$24,759,524	$26,856,211	1.19	$32,067,829	$6,023,635	
2027	$2,096,687	$24,759,524	$26,856,211	1.23	$33,029,885	$7,157,857	
	$14,676,809	$173,316,665	$187,993,475		$211,958,660	$40,767,919	
						$10,955,677	Site Improvements + Site Maintenance
						$51,723,596	Total Difference
						$7,389,085	Avg. Annual Difference

EDEN LANDING
OAKLAND / REDWOOD CITY ALTERNATE

ID	Task Name	Duration	Start	Finish	Predecessors
1	**EDEN LANDING OAKLAND/REDWOOD CITY ALTERNATE**	**243 days**	**Mon 1/18/21**	**Thu 12/23/21**	
2	**EDEN LANDING SITE PREP**	**94 days**	**Mon 1/18/21**	**Fri 5/28/21**	
3	**Levee Repairs**	**94 days**	**Mon 1/18/21**	**Fri 5/28/21**	
4	Mobilize Equipment	8 days	Mon 1/18/21	Thu 1/28/21	
5	Repair E2/E1 Levee	73 days	Thu 1/28/21	Tue 5/11/21	4
6	Repair E2/E4 Levee	47 days	Thu 1/28/21	Mon 4/5/21	4
7	Repair/Regrade Interior Levees	7 days	Mon 4/5/21	Wed 4/14/21	6
8	Weir Upgrades	25 days	Wed 4/14/21	Wed 5/19/21	7
9	Demob Equipment	7 days	Wed 5/19/21	Fri 5/28/21	8,5
10	**NTP**	0 days	Tue 6/1/21	Tue 6/1/21	9FS+2 days
11	**OAKLAND/REDWOOD CITY DREDGING (BUNDLED)**	**147 days**	**Tue 6/1/21**	**Thu 12/23/21**	
12	**Mobilize Dredge Plant**	**147 days**	**Tue 6/1/21**	**Thu 12/23/21**	
13	Mobilize Offloader	24 days	Mon 8/23/21	Fri 9/24/21	26
14	Mobilize Shore Crew	5 days	Fri 9/17/21	Fri 9/24/21	13FF
15	Mobilize Clamshell Dredges	22 days	Tue 6/1/21	Thu 7/1/21	10
16	Demobilize Offloader	10 days	Mon 11/22/21	Mon 12/6/21	33
17	Demobilize Shore Crew	3 days	Mon 12/20/21	Thu 12/23/21	23
18	Demobilize Dredge	5 days	Mon 11/22/21	Mon 11/29/21	30,31
19	**Pipeline**	**144 days**	**Tue 6/1/21**	**Mon 12/20/21**	
20	Install Offshore Pipeline	27 days	Mon 8/23/21	Wed 9/29/21	26
21	Install Shore Pipeline	41 days	Tue 6/1/21	Wed 7/28/21	10
22	Remove Offshore Pipeline	7 days	Mon 11/22/21	Wed 12/1/21	33
23	Remove Shore Pipeline	20 days	Mon 11/22/21	Mon 12/20/21	33
24	**Offloader Support Structure**	**96 days**	**Wed 7/28/21**	**Thu 12/9/21**	
25	Drive Piles for Support Barges	11 days	Wed 7/28/21	Thu 8/12/21	21
26	Setup Support Barges	7 days	Thu 8/12/21	Mon 8/23/21	25
27	Remove Piles	6 days	Wed 12/1/21	Thu 12/9/21	22
28	**Dredge/Transport Material**	**102 days**	**Thu 7/1/21**	**Mon 11/22/21**	
29	Dredge Non-Eden Landing Material (394,100 cy)	63 days	Thu 7/1/21	Tue 9/28/21	15
30	Dredge/Transport Oakland Federal Channel	38 days	Wed 9/29/21	Mon 11/22/21	13,20,29
31	Dredge/Transport Redwood City Federal Channel	22 days	Wed 9/29/21	Fri 10/29/21	13,20,29
32	**Offload/Place Dredge Material at Eden Landing**	**38 days**	**Wed 9/29/21**	**Mon 11/22/21**	
33	Offload / Place Dredge Material	38 days	Wed 9/29/21	Mon 11/22/21	30SS,13,31SS,8
34	**Project Complete**	0 days	Thu 12/23/21	Thu 12/23/21	17



EDEN LANDING OAKLAND / REDWOOD CITY ALTERNATE
Project: M&N File 10547
Date: 20 APRIL 2020

Task	Rolled Up Critical Task	Project Summary	Inactive Summary	Start-only
Critical Task	Rolled Up Milestone	Group By Summary	Manual Task	Finish-only
Milestone	Rolled Up Progress	Inactive Task	Duration-only	Progress
Summary	Split	Inactive Task	Manual Summary Rollup	Deadline
Rolled Up Task	External Tasks	Inactive Milestone	Manual Summary	

ATTACHMENT H

AIR QUALITY ANALYSIS

EDEN LANDING PHASE 2 PROJECT
DIESEL EQUIPMENT EMISSIONS

Summary of Construction Emissions - Eden Landing Offloader

EDEN LANDING OFFLOADER - Emissions in tons (2021)

	Scenario 1	Scenario 2	Scenario 3
NOx	16.28	23.35	28.11
PM10	0.49	0.71	0.85
PM2.5	0.48	0.68	0.82
ROG	1.61	2.31	2.78
CO	4.75	6.81	8.20
SOx	0.02	0.02	0.03
CO2	1759.95	2524.50	3039.07
N20	0.06	0.09	0.11
CH4	0.08	0.11	0.13

EDEN LANDING OFFLOADER - Emissions in tons (2022)

	Scenario 1	Scenario 2	Scenario 3
NOx	16.47	23.63	28.44
PM10	0.51	0.73	0.88
PM2.5	0.49	0.71	0.85
ROG	1.65	2.37	2.86
CO	4.81	6.90	8.31
SOx	0.02	0.02	0.03
CO2	1759.95	2524.50	3039.07
N20	0.06	0.09	0.11
CH4	0.08	0.11	0.13

EDEN LANDING PHASE 2 PROJECT
DIESEL EQUIPMENT EMISSIONS

EDEN LANDING OFFLOADER - Emissions in tons (2023)

	Scenario 1	Scenario 2	Scenario 3
NOx	16.67	23.91	18.14
PM10	0.52	0.75	0.57
PM2.5	0.51	0.73	0.55
ROG	1.70	2.44	1.85
CO	4.88	7.00	5.31
SOx	0.02	0.02	0.02
CO2	1759.95	2524.50	1915.36
N20	0.06	0.09	0.07
CH4	0.08	0.11	0.08

EDEN LANDING OFFLOADER - Emissions in tons (2024)

	Scenario 1	Scenario 2	Scenario 3
NOx	16.86	3.92	0.00
PM10	0.54	0.13	0.00
PM2.5	0.52	0.12	0.00
ROG	1.74	0.41	0.00
CO	4.95	1.15	0.00
SOx	0.02	0.00	0.00
CO2	1759.95	409.11	0.00
N20	0.06	0.01	0.00
CH4	0.08	0.02	0.00

EDEN LANDING OFFLOADER - Emissions in tons (2025)

	Scenario 1	Scenario 2	Scenario 3
NOx	9.08	0.00	0.00
PM10	0.30	0.00	0.00
PM2.5	0.29	0.00	0.00
ROG	0.95	0.00	0.00
CO	2.67	0.00	0.00
SOx	0.01	0.00	0.00
CO2	937.22	0.00	0.00
N20	0.03	0.00	0.00
CH4	0.04	0.00	0.00

EDEN LANDING PHASE 2 PROJECT
DIESEL EQUIPMENT EMISSIONS

TOTALS

	Scenario 1		
	Total Tons	Avg. tons/yr	Avg. lbs/day
NOx	75.36	15.07	628.02
PM10	2.36	0.47	19.67
PM2.5	2.29	0.46	19.08
ROG	7.66	1.53	63.83
CO	22.05	4.41	183.78
SOx	0.07	0.01	0.59
CO2	7977.02	1595.40	66475.14
N20	0.29	0.06	2.40
CH4	0.35	0.07	2.89

	Scenario 2		
	Total Tons	Avg. tons/yr	Avg. lbs/day
NOx	74.80	18.70	550.02
PM10	2.31	0.58	17.00
PM2.5	2.24	0.56	16.49
ROG	7.53	1.88	55.34
CO	21.86	5.47	160.74
SOx	0.07	0.02	0.52
CO2	7982.60	1995.65	58695.56
N20	0.29	0.07	2.12
CH4	0.35	0.09	2.55

EDEN LANDING PHASE 2 PROJECT
DIESEL EQUIPMENT EMISSIONS

	Scenario 3		
	Total Tons	Avg. tons/yr	Avg. lbs/day
NOx	74.69	24.90	515.10
PM10	2.30	0.77	15.85
PM2.5	2.23	0.74	15.37
ROG	7.49	2.50	51.64
CO	21.82	7.27	150.46
SOx	0.07	0.02	0.49
CO2	7993.49	2664.50	55127.50
N20	0.29	0.10	1.99
CH4	0.35	0.12	2.39

Notes and Assumptions:

- Dredge material volumes for the three placement scenarios are based on average annual quantities determined from 10 years of DMMO dredging records.
- Equipment information and engine horsepowers are based on equipment information provided by dredge contractors.
- Calculations for workboats, and crew/survey boats based on California Air Resources Board Appendix B 'Emissions Methodology for Commercial Harbor Craft Operating 'in California'
- Work tug and crew boat considered as "work boats" according to Appendix B
- Calculations for the Offloader and Booster Pump are based on California Air Resources Board 2017 Off-Road Emissions Factor Documentation and CalEEModel Appendix D.
- Load factors and emission factors for the Offloader and Booster Pumps are based on large generators powering the electrical motors.
- Emissions by equipment type broken out in individual tabs; A summary for the three scenarios is included in the tables above.
- Deterioration factor for greenhouse gases taken from 2013 Port of Los Angeles Inventory (harborcraft section).
- Equipment operating days and hours are based on the Eden Landing Offloader Cost Estimate dated March 2020.

Criteria Pollutants Non-Attainment Level for Alameda County

8-Hour Ozone (2015 Standard)	Marginal Non-Attainment
8-Hour Ozone (2008 Standard)	Marginal Non-Attainment
PM2.5 (2006 Standard)	Moderate Non-Attainment
Sulfur Dioxide (2010 Standard)	
Lead (2008 Standard)	
Carbon Monoxide (1971 Standard)	
Nitrogen Dioxide (1971 Standard)	

Work Tug Emissions - Offloader at Eden Landing

Construction Year: 2021

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	660,800	947,100	1,137,800
	Offloading Time	250	221	208
	Offloading Duration	53	86	110

WORK TUG INFORMATION				
	Main Engine	150	150	150
	Auxiliary Engine	25	25	25
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	2	2	2
	Model Year	2008	2008	2008

TOTAL OPERATING HOURS				
	Months to Complete	1.74	2.83	3.62
	Main Engine	130	187	225
	Auxiliary Engine	130	187	225

TOTAL OPERATING HOURS PER WORK TUG				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	130	187	225
	Auxiliary Engine	130	187	225

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	0.05	0.07	0.09
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.01	0.01	0.01
	CO	0.04	0.06	0.07
	SOx	0.00	0.00	0.00
	CO2	5.0	7.1	8.6
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Aux Engine	NOx	0.01	0.01	0.01
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.00	0.00	0.01
	CO	0.01	0.01	0.01
	SOx	0.00	0.00	0.00
	CO2	0.8	1.1	1.4
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**0.06**	**0.09**	**0.10**
	PM10	**0.00**	**0.00**	**0.00**
	PM2.5	**0.00**	**0.00**	**0.00**
	ROG	**0.01**	**0.01**	**0.02**
	CO	**0.05**	**0.07**	**0.08**
	SOx	**0.00**	**0.00**	**0.00**
	CO2	**5.8**	**8.2**	**9.9**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.0**

Work Tug Emissions - Offloader at Eden Landing

Construction Year: 2022

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	660,800	947,100	1,137,800
	Offloading Time	250	221	208
	Offloading Duration	53	86	110

WORK TUG INFORMATION				
	Main Engine	150	150	150
	Auxiliary Engine	25	25	25
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	2	2	2
	Model Year	2008	2008	2008

TOTAL OPERATING HOURS				
	Months to Complete	1.74	2.83	3.62
	Main Engine	130	187	225
	Auxiliary Engine	130	187	225

TOTAL OPERATING HOURS PER WORK TUG				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	130	187	225
	Auxiliary Engine	130	187	225

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	0.05	0.08	0.09
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.01	0.01	0.01
	CO	0.04	0.06	0.07
	SOx	0.00	0.00	0.00
	CO2	5.0	7.1	8.6
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Aux Engine	NOx	0.01	0.01	0.01
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.00	0.00	0.01
	CO	0.01	0.01	0.01
	SOx	0.00	0.00	0.00
	CO2	0.8	1.1	1.4
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**0.06**	**0.09**	**0.10**
	PM10	**0.00**	**0.00**	**0.00**
	PM2.5	**0.00**	**0.00**	**0.00**
	ROG	**0.01**	**0.01**	**0.02**
	CO	**0.05**	**0.07**	**0.08**
	SOx	**0.00**	**0.00**	**0.00**
	CO2	**5.8**	**8.2**	**9.9**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.0**

Work Tug Emissions - Offloader at Eden Landing

Construction Year: 2023

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	660,800	947,100	719,000
	Offloading Time	250	221	206
	Offloading Duration	53	86	70

WORK TUG INFORMATION				
	Main Engine	150	150	150
	Auxiliary Engine	25	25	25
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	2	2	2
	Model Year	2008	2008	2008

TOTAL OPERATING HOURS				
	Months to Complete	1.74	2.83	2.30
	Main Engine	130	187	142
	Auxiliary Engine	130	187	142

TOTAL OPERATING HOURS PER WORK TUG				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	130	187	142
	Auxiliary Engine	130	187	142

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	0.05	0.08	0.06
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.01	0.01	0.01
	CO	0.04	0.06	0.04
	SOx	0.00	0.00	0.00
	CO2	5.0	7.1	5.4
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Aux Engine	NOx	0.01	0.01	0.01
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.00	0.01	0.00
	CO	0.01	0.01	0.01
	SOx	0.00	0.00	0.00
	CO2	0.8	1.1	0.9
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**0.06**	**0.09**	**0.07**
	PM10	**0.00**	**0.00**	**0.00**
	PM2.5	**0.00**	**0.00**	**0.00**
	ROG	**0.01**	**0.01**	**0.01**
	CO	**0.05**	**0.07**	**0.05**
	SOx	**0.00**	**0.00**	**0.00**
	CO2	**5.8**	**8.2**	**6.3**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.0**

Work Tug Emissions - Offloader at Eden Landing

Construction Year: 2024

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	660,800	153,400	1,137,800
	Offloading Time	250	220	0
	Offloading Duration	53	14	0

WORK TUG INFORMATION				
	Main Engine	150	150	150
	Auxiliary Engine	25	25	25
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	2	2	2
	Model Year	2008	2008	2008

TOTAL OPERATING HOURS			
Months to Complete	1.74	0.46	0.00
Main Engine	130	30	0
Auxiliary Engine	130	30	0

TOTAL OPERATING HOURS PER WORK TUG			
No. of Work Tugs Proposed	1	1	1
Main Engine	130	30	0
Auxiliary Engine	130	30	0

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	0.05	0.01	0.00
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.01	0.00	0.00
	CO	0.04	0.01	0.00
	SOx	0.00	0.00	0.00
	CO2	5.0	1.2	0.0
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Aux Engine	NOx	0.01	0.00	0.00
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.00	0.00	0.00
	CO	0.01	0.00	0.00
	SOx	0.00	0.00	0.00
	CO2	0.8	0.2	0.0
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**0.06**	**0.01**	**0.00**
	PM10	**0.00**	**0.00**	**0.00**
	PM2.5	**0.00**	**0.00**	**0.00**
	ROG	**0.01**	**0.00**	**0.00**
	CO	**0.05**	**0.01**	**0.00**
	SOx	**0.00**	**0.00**	**0.00**
	CO2	**5.8**	**1.3**	**0.0**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.0**

Work Tug Emissions - Offloader at Eden Landing

Construction Year: 2025

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	351,500	947,100	1,137,800
	Offloading Time	252	0	0
	Offloading Duration	28	0	0

WORK TUG INFORMATION				
	Main Engine	150	150	150
	Auxiliary Engine	25	25	25
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	2	2	2
	Model Year	2008	2008	2008

TOTAL OPERATING HOURS				
	Months to Complete	0.92	0.00	0.00
	Main Engine	69	0	0
	Auxiliary Engine	69	0	0

TOTAL OPERATING HOURS PER WORK TUG				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	69	0	0
	Auxiliary Engine	69	0	0

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	0.03	0.00	0.00
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.00	0.00	0.00
	CO	0.02	0.00	0.00
	SOx	0.00	0.00	0.00
	CO2	2.6	0.0	0.0
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Aux Engine	NOx	0.00	0.00	0.00
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.00	0.00	0.00
	CO	0.00	0.00	0.00
	SOx	0.00	0.00	0.00
	CO2	0.4	0.0	0.0
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**0.03**	**0.00**	**0.00**
	PM10	**0.00**	**0.00**	**0.00**
	PM2.5	**0.00**	**0.00**	**0.00**
	ROG	**0.01**	**0.00**	**0.00**
	CO	**0.03**	**0.00**	**0.00**
	SOx	**0.00**	**0.00**	**0.00**
	CO2	**3.1**	**0.0**	**0.0**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.0**

Crew Boat Emissions - Offloader at Eden Landing

Construction Year: 2021

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	660,800	947,100	1,137,800
	Offloading Time	250	221	208
	Offloading Duration	53	86	110

CREW BOAT INFORMATION				
	Main Engine	100	100	100
	Auxiliary Engine	40	40	40
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	2	2	2
	Model Year	2008	2008	2008

TOTAL OPERATING HOURS				
	Months to Complete	1.74	2.83	3.62
	Main Engine	130	187	225
	Auxiliary Engine	130	187	225

TOTAL OPERATING HOURS PER CREW BOAT				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	130	187	225
	Auxiliary Engine	130	187	225

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	0.04	0.05	0.06
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.01	0.01	0.01
	CO	0.03	0.04	0.05
	SOx	0.00	0.00	0.00
	CO2	3.3	4.7	5.7
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Aux Engine	NOx	0.01	0.02	0.02
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.01	0.01	0.01
	CO	0.01	0.02	0.02
	SOx	0.00	0.00	0.00
	CO2	1.3	1.8	2.2
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**0.05**	**0.07**	**0.08**
	PM10	**0.00**	**0.00**	**0.00**
	PM2.5	**0.00**	**0.00**	**0.00**
	ROG	**0.01**	**0.02**	**0.02**
	CO	**0.04**	**0.05**	**0.07**
	SOx	**0.00**	**0.00**	**0.00**
	CO2	**4.6**	**6.6**	**7.9**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.0**

Crew Boat Emissions - Offloader at Eden Landing

Construction Year: 2022

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	660,800	947,100	1,137,800
	Offloading Time	250	221	208
	Offloading Duration	53	86	110

CREW BOAT INFORMATION				
	Main Engine	100	100	100
	Auxiliary Engine	40	40	40
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	2	2	2
	Model Year	2008	2008	2008

TOTAL OPERATING HOURS				
	Months to Complete	1.74	2.83	3.62
	Main Engine	130	187	225
	Auxiliary Engine	130	187	225

TOTAL OPERATING HOURS PER CREW BOAT				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	130	187	225
	Auxiliary Engine	130	187	225

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	0.04	0.05	0.06
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.01	0.01	0.01
	CO	0.03	0.04	0.05
	SOx	0.00	0.00	0.00
	CO2	3.3	4.7	5.7
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Aux Engine	NOx	0.01	0.02	0.02
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.01	0.01	0.01
	CO	0.01	0.02	0.02
	SOx	0.00	0.00	0.00
	CO2	1.3	1.8	2.2
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**0.05**	**0.07**	**0.08**
	PM10	**0.00**	**0.00**	**0.00**
	PM2.5	**0.00**	**0.00**	**0.00**
	ROG	**0.01**	**0.02**	**0.02**
	CO	**0.04**	**0.05**	**0.07**
	SOx	**0.00**	**0.00**	**0.00**
	CO2	**4.6**	**6.6**	**7.9**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.0**

Crew Boat Emissions - Offloader at Eden Landing

Construction Year: 2023

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	660,800	947,100	719,000
	Offloading Time	250	221	206
	Offloading Duration	53	86	70

CREW BOAT INFORMATION				
	Main Engine	100	100	100
	Auxiliary Engine	40	40	40
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	2	2	2
	Model Year	2008	2008	2008

TOTAL OPERATING HOURS				
	Months to Complete	1.74	2.83	2.30
	Main Engine	130	187	142
	Auxiliary Engine	130	187	142

TOTAL OPERATING HOURS PER CREW BOAT				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	130	187	142
	Auxiliary Engine	130	187	142

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	0.04	0.05	0.04
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.01	0.01	0.01
	CO	0.03	0.04	0.03
	SOx	0.00	0.00	0.00
	CO2	3.3	4.7	3.6
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Aux Engine	NOx	0.01	0.02	0.01
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.01	0.01	0.01
	CO	0.01	0.02	0.01
	SOx	0.00	0.00	0.00
	CO2	1.3	1.8	1.4
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**0.05**	**0.07**	**0.05**
	PM10	**0.00**	**0.00**	**0.00**
	PM2.5	**0.00**	**0.00**	**0.00**
	ROG	**0.01**	**0.02**	**0.01**
	CO	**0.04**	**0.06**	**0.04**
	SOx	**0.00**	**0.00**	**0.00**
	CO2	**4.6**	**6.6**	**5.0**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.0**

Crew Boat Emissions - Offloader at Eden Landing

Construction Year: 2024

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	660,800	153,400	1,137,800
	Offloading Time	250	220	0
	Offloading Duration	53	14	0

CREW BOAT INFORMATION				
	Main Engine	100	100	100
	Auxiliary Engine	40	40	40
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	2	2	2
	Model Year	2008	2008	2008

TOTAL OPERATING HOURS				
	Months to Complete	1.74	0.46	0.00
	Main Engine	130	30	0
	Auxiliary Engine	130	30	0

TOTAL OPERATING HOURS PER CREW BOAT				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	130	30	0
	Auxiliary Engine	130	30	0

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	0.04	0.01	0.00
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.01	0.00	0.00
	CO	0.03	0.01	0.00
	SOx	0.00	0.00	0.00
	CO2	3.3	0.8	0.0
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Aux Engine	NOx	0.01	0.00	0.00
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.01	0.00	0.00
	CO	0.01	0.00	0.00
	SOx	0.00	0.00	0.00
	CO2	1.3	0.3	0.0
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**0.05**	**0.01**	**0.00**
	PM10	**0.00**	**0.00**	**0.00**
	PM2.5	**0.00**	**0.00**	**0.00**
	ROG	**0.01**	**0.00**	**0.00**
	CO	**0.04**	**0.01**	**0.00**
	SOx	**0.00**	**0.00**	**0.00**
	CO2	**4.6**	**1.1**	**0.0**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.0**

Crew Boat Emissions - Offloader at Eden Landing

Construction Year: 2025

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	351,500	947,100	1,137,800
	Offloading Time	252	0	0
	Offloading Duration	28	0	0

CREW BOAT INFORMATION				
	Main Engine	100	100	100
	Auxiliary Engine	40	40	40
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	2	2	2
	Model Year	2008	2008	2008

TOTAL OPERATING HOURS				
	Months to Complete	0.92	0.00	0.00
	Main Engine	69	0	0
	Auxiliary Engine	69	0	0

TOTAL OPERATING HOURS PER CREW BOAT				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	69	0	0
	Auxiliary Engine	69	0	0

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	0.02	0.00	0.00
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.00	0.00	0.00
	CO	0.01	0.00	0.00
	SOx	0.00	0.00	0.00
	CO2	1.8	0.0	0.0
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Aux Engine	NOx	0.01	0.00	0.00
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.00	0.00	0.00
	CO	0.01	0.00	0.00
	SOx	0.00	0.00	0.00
	CO2	0.7	0.0	0.0
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**0.03**	**0.00**	**0.00**
	PM10	**0.00**	**0.00**	**0.00**
	PM2.5	**0.00**	**0.00**	**0.00**
	ROG	**0.01**	**0.00**	**0.00**
	CO	**0.02**	**0.00**	**0.00**
	SOx	**0.00**	**0.00**	**0.00**
	CO2	**2.4**	**0.0**	**0.0**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.0**

Offloader Emissions - Offloader at Eden Landing

Construction Year: 2021

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	660,800	947,100	1,137,800
	Offloading Time	250	221	208
	Offloading Duration	53	86	110

OFFLOADER INFORMATION				
	Main Engine	4700	4700	4700
	Auxiliary Engine	400	400	400
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	4	4	4
	Model Year	2014	2014	2014

TOTAL OPERATING HOURS				
	Months to Complete	1.74	2.83	3.62
	Main Engine	434	623	750
	Auxiliary Engine	434	623	750

TOTAL OPERATING HOURS PER OFFLOADER				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	434	623	750
	Auxiliary Engine	434	623	750

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	8.90	12.76	15.36
	PM10	0.27	0.38	0.46
	PM2.5	0.26	0.37	0.45
	ROG	0.87	1.25	1.51
	CO	2.54	3.65	4.39
	SOx	0.01	0.01	0.01
	CO2	946.5	1,357.7	1,634.4
	N20	0.0	0.0	0.1
	CH4	0.0	0.1	0.1
Aux Engine	NOx	0.53	0.76	0.91
	PM10	0.02	0.02	0.03
	PM2.5	0.02	0.02	0.03
	ROG	0.05	0.08	0.09
	CO	0.18	0.26	0.31
	SOx	0.00	0.00	0.00
	CO2	80.6	115.5	139.1
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**9.43**	**13.52**	**16.28**
	PM10	**0.28**	**0.41**	**0.49**
	PM2.5	**0.28**	**0.40**	**0.48**
	ROG	**0.93**	**1.33**	**1.60**
	CO	**2.73**	**3.91**	**4.71**
	SOx	**0.01**	**0.01**	**0.02**
	CO2	**1,027.1**	**1,473.2**	**1,773.5**
	N20	**0.0**	**0.1**	**0.1**
	CH4	**0.0**	**0.1**	**0.1**

Offloader Emissions - Offloader at Eden Landing

Construction Year: 2022

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	660,800	947,100	1,137,800
	Offloading Time	250	221	208
	Offloading Duration	53	86	110

OFFLOADER INFORMATION				
	Main Engine	4700	4700	4700
	Auxiliary Engine	400	400	400
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	4	4	4
	Model Year	2014	2014	2014

TOTAL OPERATING HOURS				
	Months to Complete	1.74	2.83	3.62
	Main Engine	434	623	750
	Auxiliary Engine	434	623	750

TOTAL OPERATING HOURS PER OFFLOADER				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	434	623	750
	Auxiliary Engine	434	623	750

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	9.00	12.92	15.55
	PM10	0.28	0.40	0.48
	PM2.5	0.27	0.38	0.46
	ROG	0.90	1.29	1.55
	CO	2.58	3.70	4.46
	SOx	0.01	0.01	0.01
	CO2	946.5	1,357.7	1,634.4
	N20	0.0	0.0	0.1
	CH4	0.0	0.1	0.1
Aux Engine	NOx	0.54	0.77	0.93
	PM10	0.02	0.03	0.03
	PM2.5	0.02	0.02	0.03
	ROG	0.05	0.08	0.09
	CO	0.18	0.26	0.32
	SOx	0.00	0.00	0.00
	CO2	80.6	115.5	139.1
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**9.54**	**13.68**	**16.47**
	PM10	**0.29**	**0.42**	**0.51**
	PM2.5	**0.29**	**0.41**	**0.49**
	ROG	**0.95**	**1.37**	**1.64**
	CO	**2.76**	**3.97**	**4.77**
	SOx	**0.01**	**0.01**	**0.02**
	CO2	**1,027.1**	**1,473.2**	**1,773.5**
	N20	**0.0**	**0.1**	**0.1**
	CH4	**0.0**	**0.1**	**0.1**

Offloader Emissions - Offloader at Eden Landing

Construction Year: 2023

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	660,800	947,100	719,000
	Offloading Time	250	221	206
	Offloading Duration	53	86	70

OFFLOADER INFORMATION				
	Main Engine	4700	4700	4700
	Auxiliary Engine	400	400	400
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	4	4	4
	Model Year	2014	2014	2014

TOTAL OPERATING HOURS				
	Months to Complete	1.74	2.83	2.30
	Main Engine	434	623	473
	Auxiliary Engine	434	623	473

TOTAL OPERATING HOURS PER OFFLOADER				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	434	623	473
	Auxiliary Engine	434	623	473

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	9.11	13.07	9.92
	PM10	0.28	0.41	0.31
	PM2.5	0.28	0.40	0.30
	ROG	0.92	1.32	1.00
	CO	2.62	3.75	2.85
	SOx	0.01	0.01	0.01
	CO2	946.5	1,357.7	1,030.1
	N20	0.0	0.0	0.0
	CH4	0.0	0.1	0.0
Aux Engine	NOx	0.54	0.78	0.59
	PM10	0.02	0.03	0.02
	PM2.5	0.02	0.03	0.02
	ROG	0.06	0.08	0.06
	CO	0.19	0.27	0.20
	SOx	0.00	0.00	0.00
	CO2	80.6	115.5	87.7
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**9.65**	**13.85**	**10.51**
	PM10	**0.30**	**0.43**	**0.33**
	PM2.5	**0.29**	**0.42**	**0.32**
	ROG	**0.98**	**1.40**	**1.06**
	CO	**2.80**	**4.02**	**3.05**
	SOx	**0.01**	**0.01**	**0.01**
	CO2	**1,027.1**	**1,473.2**	**1,117.8**
	N20	**0.0**	**0.1**	**0.0**
	CH4	**0.0**	**0.1**	**0.0**

Offloader Emissions - Offloader at Eden Landing

Construction Year: 2024

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	660,800	153,400	1,137,800
	Offloading Time	250	220	0
	Offloading Duration	53	14	0

OFFLOADER INFORMATION				
	Main Engine	4700	4700	4700
	Auxiliary Engine	400	400	400
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	4	4	4
	Model Year	2014	2014	2014

TOTAL OPERATING HOURS				
	Months to Complete	1.74	0.46	0.00
	Main Engine	434	101	0
	Auxiliary Engine	434	101	0

TOTAL OPERATING HOURS PER OFFLOADER				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	434	101	0
	Auxiliary Engine	434	101	0

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	9.22	2.14	0.00
	PM10	0.29	0.07	0.00
	PM2.5	0.28	0.07	0.00
	ROG	0.95	0.22	0.00
	CO	2.65	0.62	0.00
	SOx	0.01	0.00	0.00
	CO2	946.5	220.0	0.0
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Aux Engine	NOx	0.55	0.13	0.00
	PM10	0.02	0.00	0.00
	PM2.5	0.02	0.00	0.00
	ROG	0.06	0.01	0.00
	CO	0.19	0.04	0.00
	SOx	0.00	0.00	0.00
	CO2	80.6	18.7	0.0
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**9.77**	**2.27**	**0.00**
	PM10	**0.31**	**0.07**	**0.00**
	PM2.5	**0.30**	**0.07**	**0.00**
	ROG	**1.00**	**0.23**	**0.00**
	CO	**2.84**	**0.66**	**0.00**
	SOx	**0.01**	**0.00**	**0.00**
	CO2	**1,027.1**	**238.7**	**0.0**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.0**

Offloader Emissions - Offloader at Eden Landing

Construction Year: 2025

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	351,500	947,100	1,137,800
	Offloading Time	252	221	208
	Offloading Duration	28	0	0

OFFLOADER INFORMATION				
	Main Engine	4700	4700	4700
	Auxiliary Engine	400	400	400
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	4	4	4
	Model Year	2014	2014	2014

TOTAL OPERATING HOURS				
	Months to Complete	0.92	0.00	0.00
	Main Engine	231	0	0
	Auxiliary Engine	231	0	0

TOTAL OPERATING HOURS PER OFFLOADER				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	231	0	0
	Auxiliary Engine	231	0	0

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	4.97	0.00	0.00
	PM10	0.16	0.00	0.00
	PM2.5	0.16	0.00	0.00
	ROG	0.52	0.00	0.00
	CO	1.43	0.00	0.00
	SOx	0.00	0.00	0.00
	CO2	504.0	0.0	0.0
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Aux Engine	NOx	0.30	0.00	0.00
	PM10	0.01	0.00	0.00
	PM2.5	0.01	0.00	0.00
	ROG	0.03	0.00	0.00
	CO	0.10	0.00	0.00
	SOx	0.00	0.00	0.00
	CO2	42.9	0.0	0.0
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**5.26**	**0.00**	**0.00**
	PM10	**0.17**	**0.00**	**0.00**
	PM2.5	**0.17**	**0.00**	**0.00**
	ROG	**0.55**	**0.00**	**0.00**
	CO	**1.53**	**0.00**	**0.00**
	SOx	**0.00**	**0.00**	**0.00**
	CO2	**546.9**	**0.0**	**0.0**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.0**

Booster Pump Emissions - Offloader at Eden Landing

Construction Year: 2021

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	660,800	947,100	1,137,800
	Offloading Time	250	221	208
	Offloading Duration	53	86	110

BOOSTER PUMP INFORMATION				
	Main Engine	3500	3500	3500
	Auxiliary Engine	88	88	88
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	4	4	4
	Model Year	2014	2014	2014

TOTAL OPERATING HOURS				
	Months to Complete	1.74	2.83	3.62
	Main Engine	434	623	750
	Auxiliary Engine	434	623	750

TOTAL OPERATING HOURS PER BOOSTER PUMP				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	434	623	750
	Auxiliary Engine	434	623	750

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	6.63	9.50	11.44
	PM10	0.20	0.29	0.34
	PM2.5	0.19	0.28	0.33
	ROG	0.65	0.93	1.12
	CO	1.89	2.72	3.27
	SOx	0.01	0.01	0.01
	CO2	704.8	1,011.0	1,217.1
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.1
Aux Engine	NOx	0.12	0.17	0.20
	PM10	0.00	0.01	0.01
	PM2.5	0.00	0.01	0.01
	ROG	0.01	0.02	0.02
	CO	0.04	0.06	0.07
	SOx	0.00	0.00	0.00
	CO2	17.7	25.4	30.6
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**6.74**	**9.67**	**11.64**
	PM10	**0.20**	**0.29**	**0.35**
	PM2.5	**0.20**	**0.28**	**0.34**
	ROG	**0.66**	**0.95**	**1.14**
	CO	**1.93**	**2.78**	**3.34**
	SOx	**0.01**	**0.01**	**0.01**
	CO2	**722.6**	**1,036.5**	**1,247.7**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.1**

Booster Pump Emissions - Offloader at Eden Landing

Construction Year: 2022

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	660,800	947,100	1,137,800
	Offloading Time	250	221	208
	Offloading Duration	53	86	110

BOOSTER PUMP INFORMATION				
	Main Engine	3500	3500	3500
	Auxiliary Engine	88	88	88
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	4	4	4
	Model Year	2014	2014	2014

TOTAL OPERATING HOURS				
	Months to Complete	1.74	2.83	3.62
	Main Engine	434	623	750
	Auxiliary Engine	434	623	750

TOTAL OPERATING HOURS PER BOOSTER PUMP				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	434	623	750
	Auxiliary Engine	434	623	750

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	6.71	9.62	11.58
	PM10	0.21	0.29	0.36
	PM2.5	0.20	0.29	0.34
	ROG	0.67	0.96	1.15
	CO	1.92	2.76	3.32
	SOx	0.01	0.01	0.01
	CO2	704.8	1,011.0	1,217.1
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.1
Aux Engine	NOx	0.12	0.17	0.20
	PM10	0.00	0.01	0.01
	PM2.5	0.00	0.01	0.01
	ROG	0.01	0.02	0.02
	CO	0.04	0.06	0.07
	SOx	0.00	0.00	0.00
	CO2	17.7	25.4	30.6
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**6.82**	**9.79**	**11.78**
	PM10	**0.21**	**0.30**	**0.36**
	PM2.5	**0.20**	**0.29**	**0.35**
	ROG	**0.68**	**0.98**	**1.18**
	CO	**1.96**	**2.81**	**3.39**
	SOx	**0.01**	**0.01**	**0.01**
	CO2	**722.6**	**1,036.5**	**1,247.7**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.1**

Booster Pump Emissions - Offloader at Eden Landing

Construction Year: 2023

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	660,800	947,100	719,000
	Offloading Time	250	221	206
	Offloading Duration	53	86	70

BOOSTER PUMP INFORMATION				
	Main Engine	3500	3500	3500
	Auxiliary Engine	88	88	88
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	4	4	4
	Model Year	2014	2014	2014

TOTAL OPERATING HOURS				
	Months to Complete	1.74	2.83	2.30
	Main Engine	434	623	473
	Auxiliary Engine	434	623	473

TOTAL OPERATING HOURS PER BOOSTER PUMP				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	434	623	473
	Auxiliary Engine	434	623	473

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	6.78	9.73	7.38
	PM10	0.21	0.30	0.23
	PM2.5	0.21	0.30	0.22
	ROG	0.69	0.98	0.75
	CO	1.95	2.79	2.12
	SOx	0.01	0.01	0.01
	CO2	704.8	1,011.0	767.1
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Aux Engine	NOx	0.12	0.17	0.13
	PM10	0.00	0.01	0.00
	PM2.5	0.00	0.01	0.00
	ROG	0.01	0.02	0.01
	CO	0.04	0.06	0.04
	SOx	0.00	0.00	0.00
	CO2	17.7	25.4	19.3
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**6.90**	**9.90**	**7.51**
	PM10	**0.22**	**0.31**	**0.24**
	PM2.5	**0.21**	**0.30**	**0.23**
	ROG	**0.70**	**1.00**	**0.76**
	CO	**1.99**	**2.85**	**2.16**
	SOx	**0.01**	**0.01**	**0.01**
	CO2	**722.6**	**1,036.5**	**786.4**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.0**

Booster Pump Emissions - Offloader at Eden Landing

Construction Year: 2024

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	660,800	153,400	1,137,800
	Offloading Time	250	220	0
	Offloading Duration	53	14	0

BOOSTER PUMP INFORMATION				
	Main Engine	3500	3500	3500
	Auxiliary Engine	88	88	88
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	4	4	4
	Model Year	2014	2014	2014

TOTAL OPERATING HOURS				
	Months to Complete	1.74	0.46	0.00
	Main Engine	434	101	0
	Auxiliary Engine	434	101	0

TOTAL OPERATING HOURS PER BOOSTER PUMP				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	434	101	0
	Auxiliary Engine	434	101	0

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	6.86	1.60	0.00
	PM10	0.22	0.05	0.00
	PM2.5	0.21	0.05	0.00
	ROG	0.70	0.16	0.00
	CO	1.97	0.46	0.00
	SOx	0.01	0.00	0.00
	CO2	704.8	163.8	0.0
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Aux Engine	NOx	0.12	0.03	0.00
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.01	0.00	0.00
	CO	0.04	0.01	0.00
	SOx	0.00	0.00	0.00
	CO2	17.7	4.1	0.0
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**6.99**	**1.62**	**0.00**
	PM10	**0.22**	**0.05**	**0.00**
	PM2.5	**0.22**	**0.05**	**0.00**
	ROG	**0.72**	**0.17**	**0.00**
	CO	**2.02**	**0.47**	**0.00**
	SOx	**0.01**	**0.00**	**0.00**
	CO2	**722.6**	**168.0**	**0.0**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.0**

Booster Pump Emissions - Offloader at Eden Landing

Construction Year: 2025

MATERIAL VOLUME & ENGINE INFORMATION	Eden Landing	Scenario 1	Scenario 2	Scenario 3
	Annual Volume	351,500	947,100	1,137,800
	Offloading Time	252	0	0
	Offloading Duration	28	0	0

BOOSTER PUMP INFORMATION				
	Main Engine	3500	3500	3500
	Auxiliary Engine	88	88	88
	Fuel Type	CARB Diesel	CARB Diesel	CARB Diesel
	Tier Level	4	4	4
	Model Year	2014	2014	2014

TOTAL OPERATING HOURS				
	Months to Complete	0.92	0.00	0.00
	Main Engine	231	0	0
	Auxiliary Engine	231	0	0

TOTAL OPERATING HOURS PER BOOSTER PUMP				
	No. of Work Tugs Proposed	1	1	1
	Main Engine	231	0	0
	Auxiliary Engine	231	0	0

ENGINE EMISSIONS (TONS)				
Main Engine	NOx	3.70	0.00	0.00
	PM10	0.12	0.00	0.00
	PM2.5	0.12	0.00	0.00
	ROG	0.38	0.00	0.00
	CO	1.07	0.00	0.00
	SOx	0.00	0.00	0.00
	CO2	375.3	0.0	0.0
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Aux Engine	NOx	0.07	0.00	0.00
	PM10	0.00	0.00	0.00
	PM2.5	0.00	0.00	0.00
	ROG	0.01	0.00	0.00
	CO	0.02	0.00	0.00
	SOx	0.00	0.00	0.00
	CO2	9.4	0.0	0.0
	N20	0.0	0.0	0.0
	CH4	0.0	0.0	0.0
Total	**NOx**	**3.76**	**0.00**	**0.00**
	PM10	**0.12**	**0.00**	**0.00**
	PM2.5	**0.12**	**0.00**	**0.00**
	ROG	**0.39**	**0.00**	**0.00**
	CO	**1.09**	**0.00**	**0.00**
	SOx	**0.00**	**0.00**	**0.00**
	CO2	**384.8**	**0.0**	**0.0**
	N20	**0.0**	**0.0**	**0.0**
	CH4	**0.0**	**0.0**	**0.0**

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