



**US Army Corps
of Engineers** ®
San Francisco District

Redwood City Harbor, California, Navigation Improvement
Feasibility Study

Appendix C

Cost Engineering

DRAFT

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1. Introduction

Reference materials used to prepare the Current Working Estimates (CWE) along with the basis for the estimates and any applicable facts and/or assumptions impacting the CWEs are documented below.

2. Project Description

The tentatively selected plan is to deepen the channels at RWC Harbor and San Bruno Shoal to 32 ft MLLW and place dredged material at SF-DODS.

If implemented, the channel at Redwood City Harbor would vary in width from 350 ft near the entrance, and as narrow as 294 ft between the inner and outer turning basins in the rest of the channel. The channel alignment at the turn into Redwood City Harbor would retain the existing width, but would be shifted 6 ft to the East to avoid adverse impacts to the Bair Island. As the channel moves West between Bair and Greco Islands in Reach 3 and continues to the end of the project at the inner turning basin in Reach 5, the channel would narrow, with the existing side slopes remaining undisturbed on either side of the channel. The channel boundary adjacent to the Port of Redwood City side of the channel would remain unchanged to avoid interference with existing port infrastructure. The channel would narrow by 6 ft, assuming 3:1 side slopes between -30 ft and -32 ft on the Bair Island side of the channel across from the Port of Redwood City.

All dredging, material transportation and material placement shall be in accordance with the project plans, specifications, permits, regulatory guidance and applicable contract clauses.

3. Basis, Facts, and Assumptions

- A single 21 CY clamshell dredge was assumed for each estimate. Multiple dredge crews were not assumed, but may want to be considered to shorten the construction schedule.
- Three fuel pipelines have been identified and cross the San Bruno Shoal. Relocation costs have been estimated at \$5 million each based on the Feasibility & Budgetary Cost report located in the references. Since the owners of each pipeline are responsible for the relocation costs, the pipeline work is reflected only in the benefit cost ratio and net benefits, and not the total project cost.
- Tipping fees for Montezuma (\$12.50/CY) and Cullinan Ranch (\$8.00/CY) were both based on historical rates provided by the Civil Design Section.
- An additional mobilization and demobilization was included for every additional dredge season needed to complete the dredging work.
- Cullinan Ranch does not own an offloader, therefore, an offloader cost was assumed to include the mobilization of a hydraulic dredge, modifications to the pumping system,

and pipeline costs. \$3/CY was assumed for a pumping cost from the offloader to Cullinan Ranch (based on the San Francisco Bay to Stockton Deepening Project Cost Estimate).

- 5% of the total dredge quantity (not including Reach 5b) was assumed to be upland non-cover but could be disposed of at SF-DODS.
- Material located between -32' and -34' at Reach 5b of the Redwood City Harbor was assumed to be contaminated and must be disposed of at Berth 10 and transported to a landfill. The following details the development of the Redwood City unit price for disposal at Berth 10.

Historical unit price for the Oakland Deepening Project in 2009:

$$\text{Oakland Deepening Project (2009)} = \frac{\$608,871}{7,000 \text{ CY}} = \$87 \text{ per CY}$$

Historical Oakland unit price plus a \$13/CY tipping fee and \$22,000 docking fee for an assumed one year time period:

$$\begin{aligned} \text{Redwood City Deepening (2009)} &= \\ & \$87 \text{ per CY} + \$13 \text{ per CY} + \$22,000 \times \frac{12 \text{ months}}{121,000 \text{ CY}} \\ & = \$102 \text{ per CY} \end{aligned}$$

Escalated Redwood City Deepening unit price based on CWCCIS:

$$\text{Redwood City Deepening (2015)} = \$102 \text{ per CY} \times \left(\frac{856.96}{703.47} \right) = \$125 \text{ per CY}$$

An updated unit price based on historical production rates and fees will be developed after the TSP milestone.

- The future increase in operations and maintenance costs for the deepened channel was based on quantities provided by *Delta Modeling Associates, Inc.* Future maintenance material was assumed to be disposed at SF-11.

3.1 Construction Window

Due to endangered species, the dredging window begins June 1st to November 30th each year.

3.2 Overtime

Work will be completed using two 12 hour shifts 7 days a week.

3.3 Acquisition Plan

The acquisition is unknown at this time, however, SDB and 8(a) contractors were not included in the development of unit prices.

3.4 Construction Method

Typical clamshell dredging is standard. No special construction technologies are required for the job.

3.5 Equipment, Labor Availability, and Distance Traveled

The project is located in Northern California. All labor and equipment is assumed available within a 1,010 mile radius (Tacoma, WA) in order to allow for fair competition.

3.6 Environmental Coordination

No special environmental concerns beyond those stated in the basis/facts/assumptions and Construction Window.

3.7 Labor Rates

The estimate meets the Davis-Bacon wage rates for Northern California.

4. References

- Report Synopsis, Redwood City Harbor, California, Navigation Improvement Feasibility Study Tentatively Selected Plan Milestone (31 March 2014)
- Sediment Transport Modeling for Navigation Channel Deepening of Redwood City Harbor, Interim Draft Report (16 December 2014)
- Feasibility & Budgetary costs to lower Kinder-Morgan Pipelines and Shell Pipeline across San Bruno Shoal (23 FEB 2015)
- 3E_Reach 11_Challenged Material_19August09.mlp.
- CSRA Abbreviated RWC -3X Feet (Disposal Site).xlsx
- FutureO&M.xlsx
- Array of Alternatives Cost Table.xlsx