# Appendix F

# Pile Cutoff Depth Evaluation Memorandum

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# Memorandum

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| To | Kenneth Foster & Cynthia Herzog (CSLC) | Page | 1 of 4 |
| CC | Sharon Evans (Phillips 66) | | |
| Subject | Port Costa Wharf Deconstruction – Pile Cutoff Depth Evaluation | | |
| From | AECOM (on Behalf of Phillips 66) | | |
| Date | October 9, 2013 | | |

## GENERAL

The Port Costa Wharf deconstruction project involves removal of approximately 117 timber piles, 11 concrete piles, and 24 steel piles. The proposed removal plan for each type of pile is as follows:

- Timber piles: Completely extract the timber piles when feasible. If breaking occurs during the removal procedure, remove any remnants to a depth of 2 feet below the existing mudline.
- Concrete piles: Cut the concrete piles at the adjacent riprap level.
- Steel piles: Completely extract the steel piles when feasible. If not feasible (e.g., extraction proves too difficult), remove any remnants to a depth of 2 feet below the existing mudline.

This removal plan is proposed based upon the evaluations presented below. Detailed topographic cross sections with typical pile removal plans along the project site, based on bathymetric survey conducted in May 2012, are provided in Attachment 1. Please note that the above proposed removal plan is slightly different from that proposed in the administrative draft IS/MND submitted on April 18, 2013. Based upon a conference call with CSLC held on April 30, 2013, Phillips 66 understands that CSLC would like the timber pile remnants to be removed to a depth of 5 feet below the existing mudline if complete extraction is infeasible. Therefore, this memorandum presents various evaluations to demonstrate that the 2-foot cutoff depth is adequate for the timber pile remnant removal.

## EXISTING SITE GEOLOGICALCONDITIONS

Geological cross sections from a nearby site are provided in Attachment 2. This information, along with some subsurface data along the land side of the shoreline railroad, suggests that the embankment in the project area is generally on fill which appears to be 5 to 15 feet thick. The fill transitions to native materials are likely evident as offshore breaks in the slopes, as shown in the cross sections in Attachment 1. The fill is mainly rock fragments in a clay/silt matrix and overlying rock riprap placed for erosion protection along the shoreline. Given the project site location along the strait, it is in a high velocity marine environment and little to no soft sediments likely exist offshore. Locally the fill appears to be underlain by some clayey colluvial soils generated by sloughing of the steep rock slopes above the railroad. As a result, there may be a thin layer of relatively weak clay below the rock fill.

## SITE DEPOSITION VERSUS EROSION ASSESSMENT

Typically sites with either erosion or sedimentation have specific characteristics. Erosive sites typically have susceptible soils and are located in high energy environments consisting of strong currents and/or large waves resulting in slope failure and/or scour around structures. Depositional areas typically have low energy environments consisting of low currents and/or minimal wave action resulting in shallow slopes and deposits of soft, unconsolidated sediments. Based on best engineering judgment, the project site appears to be stable relative to shoreline erosion and sediment deposition. The rationales are presented as follows.

A review of historical aerial photographs indicates that the railroad embankment experienced significant erosional failures around 1939. For example, the 1939 photo (see Attachment 3) appears to show an area north of the wharf where the embankment and tracks had been lost due to embankment instability. Shortly after the failure the area appears to have been restored with fill and protected with a rip-rap revetment. Given the probable soil profile in the area, past localized instability has likely been due to shoreline erosion (at the water line) with inadequate erosion protection material rather than deep seated instability. This is also consistent with the diving survey results (conducted in March 2013) that the piles nearest shore were protected by medium size riprap. Since the riprap did not cover the whole area, it appears to have been placed after installation of the wharf. The riprap was likely intended for shoreline protection from waves and vessel wakes and their potential effects on existing adjacent rail lines and possibly related to the various structures. In addition, it appears that most of the past instability has occurred above the elevation where the piles to be removed penetrate the seafloor. Furthermore, it appears that most of the piles are embedded in residual soil/weathered bedrock which likely exists at shallow depth below the mudline and generally offshore of the MLLW line. It is likely that the piles have minimal embedment in stiff residual soils/rock. This is consistent with the observation of the divers from the March 2013 diving survey in that there was firm soil and rocky conditions exposed in most areas offshore. This is also consistent with the review of post-1939 aerial photographs, which indicates that the shoreline has been stable in its current condition since that time. For example, the 2012 aerial photo (see Attachment 3) shows well established vegetation, indicative of stable slopes, at both the top and toe of the slope. Furthermore, the bathymetric survey conducted in May 2012 and the dive survey conducted in March 2013 did not report scour around any piles. As a result, the project site appears to be in a stable erosion environment. The only significant potential for erosion is the fill embankment itself which is mitigated by riprap slope protection which is apparently maintained by the railroad.

The project site also does not appear to be depositional. Typically sediment does not deposit on steep channel slopes. Sedimentation will typically occur at the toe of the slope/channel bottom and fill upward over time. The project site is exposed to relatively strong currents that appear to have prevented suspended sediments from depositing on the slopes near the surface. Sediments tend to deposit in areas with low currents and shallow to flat bottoms, which are not present at this site. Also, deposited sediment tends to be soft and unconsolidated, which is the opposite of the firm and consolidated slope surface found by the dive team.

It should be noted that the divers encountered strong currents and poor visibility during the survey. These conditions appear to have been caused primarily by sediments being transported through the Strait rather than an indication of bottom disturbance. The divers also found two pipes on the slope that were oriented generally parallel to shore. Based upon the as-built drawings, these two pipes may have fallen into the Bay during a fire on the wharf approximately 30 years ago. However, the divers found that the pipes were almost entirely exposed; the channel side showed signs of minor erosion while with the shore side showed minimal deposition of fine grained sediments.

Based on direct observations by divers and an understanding of the typical characteristics of erosive and depositional areas, the natural offshore channel slopes where most of the piles are found appear to be in equilibrium. The lack of signs of shoreline erosion, slope failure, and scour suggest that the project site is

erosionally stable and has been that way for many years. The lack of soft, unconsolidated sediments and shallow slopes suggest that the project site is most likely not depositional either. Based on this assessment, the possibility of exposing pile remnants below a depth of 2 feet due to erosion appears to be low. Additionally, in order to minimize the risk of future embankment erosion, disturbance of the existing riprap shall be minimized to the extent possible. Please note that Union Pacific Railroad has been consulted on the railroad embankment impact from the pile removal and cutoff depths, and has not provided feedback at this time.

## CONSTRUCTABILITY ASSESSMENT

Due to the age of the Port Costa Wharf, some of the timber piles may be too fragile to be completely extracted without breaking. However, given the probable subsurface conditions, the presence of riprap slope protection on the fill embankment, and stable natural underwater slopes, it is highly unlikely that any pile remnants 2 feet below the mudline will be exposed by future erosion.

Given that the most appropriate pile cutoff method is hand excavation by divers followed by cutting with diver operated power tools, deepening cutoffs from 2 to 5 feet would be a substantial change in level of effort for hand excavation. Expanding the cutoff depth may require the use of a barge mounted clamshell to remove the overburden and pile. This will not only be more expensive (likely doubled or tripled), but will require larger temporary excavations which are inherently less stable and introduce unnecessary risk during the deconstruction. Based upon initial discussions with well-established marine contractors, the equipment and field procedures for the up to 2 feet pile cutoff depth are readily available for implementation, and none of the marine contractors contacted have the field procedures for 5 feet pile cutoff depth readily available. The uncertainties on the field approach will likely introduce more risks during the deconstruction. For example, excavation more than 2 feet below mudline will increase the possibility of encountering unforeseen soil conditions, such as localized sloughing or slope failure that can cause construction difficulties and concern.

The timber piles appear to be creosoted treated, and according to a report prepared for California State Coastal Conservancy and titled “Removal of Creosote-treated Pilings and Structures from San Francisco Bay” (Werme, et al., 2010), best management practices (BMP) for pile removal developed by the Washington State Department of Natural Resources (DNR) have been adopted for the San Francisco Bay. Three of the BMPs are (1) complete removal is preferable over partial removal; (2) piles that cannot be completely removed should be cut at least two feet below the mudline (for the San Francisco Bay while one foot for the Washington State DNR); and (3) sediment disturbance should be minimized. In addition, similar BMPs were developed by United States Environmental Protection Agency (2007) with one foot below the mudline requirement when complete removal is not feasible. The San Francisco Regional Water Quality Control Board has verbally expressed their interests in minimizing sediment disturbance during future deconstruction. As a result, the proposed pile removal plan and cutoff depths for the Port Costa Wharf are in line with these BMPs by various agencies.

## CONCLUSIONS AND RECOMMENDATIONS

Based upon the above assessments, the project site does not appear to be erosional or depositional, and the possibility of exposing pile remnants below a depth of 2 feet due to erosion appears to be low. As a result, when complete removal of the timber and steel piles are not feasible, a 2-foot cutoff depth below the mudline appears to be adequate. Please note that the concrete piles will be cut at the adjacent riprap level. Furthermore, in order to minimize the risk of future embankment erosion, disturbance of the existing riprap shall be minimized to the extent possible. This pile removal plan is also consistent with the best management practice for creosoted-treated timber piles and appears to be within the scope commonly implemented by marine contractors without causing potential construction difficulties or concerns.

## ATTACHMENTS:

Attachment 1 – Site Cross Sections
Attachment 2 – Geological Cross Sections at nearby Site
Attachment 3 – 1939 and 2012 Aerial Photos