APPENDIX B2

Stantec

Memo

To:	Zoe Merideth City of Antioch	From:	Elena Nuno Walnut Creek
File:	185705365	Date:	June 28, 2021

Reference: **Biological Assessment Prepared for Department of Army – Corps of Engineers Section 7 Endangered Species Act Consultation AMPORTS Antioch Berth Rehabilitation Project, Contra Costa County, California**

The Initial Study/Mitigated Negative Declaration (IS/MND) prepared for the AMPORTS Antioch Vehicle Processing Facility Project relied on the Biological Assessment prepared in December 2018 for a larger project. The 2018 Project contemplated using a larger land area for vehicle processing. The 2018 project contemplated using the land east of the project site for additional vehicle storage/processing. The wharf improvements contemplated under the 2018 project are consistent with the proposed improvements in the 2021 AMPORTS Antioch Vehicle Processing Facility Project. As such, the IS/MND for the 2021 AMPORTS Project has relied on previous findings related to acoustic impacts to aquatic species from the use of a vibratory hammer and impact hammer during in-water construction work.

The in-water work for the 2021 Project has been refined, therefore the summary of new and removed in-water piles and over-water structures should be based off the current 2021 Project Description. The in-water impacts evaluated in the 2018 report are within those evaluated in the 2021 Project.

Readers of this technical report should focus their attention to Section 5.0 of the 2018 Biological Assessment. Section 5.0 evaluates the way the construction of the project may affect species and critical habitat.

Stantec Consulting Services Inc.

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Attachment: Biological Assessment Prepared for Department of Army – Corps of Engineers Section 7 Endangered Species Act Consultation AMPORTS Antioch Berth Rehabilitation Project, Contra Costa County, California.

Biological Assessment

Prepared for Department of Army - Corps of Engineers

Section 7 Endangered Species Act Consultation

AMPORTS Antioch Berth Rehabilitation Project, Contra Costa County, California

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WRA Project: 27327

Date: December 2018

ENVIRONMENTAL CONSULTANTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

LIST OF ACCRONYMS AND ABBRIEVATIONS

Applicant	COWI North America, Inc.
BD	breasting dolphin
BMP	best management practice
°C	degrees Celsius
Caltrans	California Department of Transportation
CDFW	California Department of Fish and Wildlife
CNDDB	California Natural Diversity Database
CFR	Code of Federal Regulations
cm	centimeters
Corps	U.S. Army Corps of Engineers
dB	decibel
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
ft	feet or foot
GP	Georgia-Pacific
HDPE	High-density polyethylene
MD	mooring dolphin
MLLW	Mean Low Low Water
m	meter or meters
mm	millimeter
NAVD88	North American Vertical Datum of 1988
µPa	micro Pascal
m	meters
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NTUs	nephelometric turbidity units
ppt	parts per thousand
RMS	root mean square
River	San Joaquin River
RoRo	roll on, roll off
SEL	sound exposure level
USFWS	US Fish and Wildlife Service
WEAP	worker environmental awareness program
WRA	WRA Inc.

DEFINITION OF TERMS SPECIFIC TO PROPOSED PROJECT

Action – Required activities undertaken for mooring and berthing upgrades and wharf repair, including avoidance and minimization proposed for unavoidable impacts.

Action Area – The regions where the Action will take place and additional areas that may be affected by the Action. The Action Area includes the AMPORTS wharf, adjacent upland staging, access, and work areas. The Action Area also includes areas outside the Project Area (see Section 3.0) to demonstrate potential acoustic effects of the Action.

Project Area – The areas where berth rehabilitation and improvements will take place. The Project Area includes the existing AMPORTS wharf structure, and the areas to be occupied by the replacement wharf structures, mooring dolphins, breasting dolphins, along with adjacent staging, access, and work areas.

1.0 INTRODUCTION

The purpose of this Biological Assessment is to describe the proposed construction activities associated with required upgrades at the AMPORTS Antioch Berth Rehabilitation Project (Action) located in Antioch, Contra Costa County, California (Action Area, Figure 1 and Figure 2) in sufficient detail to determine to what extent the proposed Action may affect any of the threatened, endangered, or candidate species (Appendix A) that are likely to be present in the Action Area, and any designated or proposed critical habitat in the Action Area.

On behalf of the Applicant (AMPORTS), WRA, Inc. (WRA) submits this Biological Assessment to the Sacramento U.S. Army Corps of Engineers (Corps) Regulatory Division to accompany the Request for a Nationwide Permit for the Action Reference. Activities entail repairs and upgrades of the existing wharf and berth to convert the wharf to a "Roll on Roll off" (RoRo) facility for loading and unloading cargo. Based upon the analysis included herein, avoidance and minimization measures are recommended to avoid and limit take or other impacts to the listed species and critical habitat that may be affected by the proposed Action. Of the many species with potential to occur in the general region, six threatened or endangered fish species have the potential to occur in the Action Area: Delta smelt (*Hypomesus transpacificus*; Federal Threatened), Central Valley steelhead (*Oncorhynchus mykiss*; Federal Threatened), Southern Distinct Population Segment (DPS) green sturgeon (*Acipenser medirostris*; Federal Threatened), Central Valley spring-run Chinook salmon (*O. tshawytscha*; Federally Threatened), Sacramento River winter-run Chinook salmon (*O. tshawytscha*; Federally Endangered), and longfin smelt (*Spirinchus thaleichthys*; Federal Candidate). The Action Area also includes critical habitat for green sturgeon, Central Valley steelhead, and Delta smelt. This Biological Assessment is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (ESA) (16 U.S.C. 1536 (c)).

1.1 Federally Listed Species Considered (Including Candidate Species)

Species considered in this document are listed in Table 1. Any federal listed or proposed species recorded in the California Natural Diversity Database (CNDDB) within 5-miles of the Action Area are shown in Figures 3a and 3b. Primarily due to a lack of suitable habitat within the Action Area, or the Action Area being located outside of the current range of the species, it was determined that the proposed Action would have no effect on: salt-marsh harvest mouse, San Joaquin kit fox, American peregrine falcon, bald eagle, California brown pelican, California least tern, Ridgway's clapper rail, Western snowy plover, Alameda whipsnake, California red-legged frog, California tiger salamander, giant garter snake, Chinook salmon – Central California Coast, Coho salmon, Callippe silverspot butterfly, conservancy fairy shrimp, Delta green ground beetle, longhorn fairy shrimp, Lange's Metalmark Butterfly, San Bruno elfin butterfly, valley elderberry longhorn beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, Antioch Dunes evening primrose Colusa grass, Contra Costa goldfields Contra Costa wallflower, Keck's checker-mallow, large-flowered fiddleneck, or Soft bird's beak.

The Action is taking place in a fresh/brackish, deepwater, subtidal area in the San Joaquin River where no vegetation is present. The absence of vegetation such as salt marsh or habitat features such as tidal flats completely eliminates required habitat for species like salt marsh harvest mouse or California Ridgway's rail, and as such the aforementioned species have no potential to be present, or to be affected by the Action. Furthermore, areas adjacent to the Action do not support suitable habitats, or are outside of the area of influence for the Action. Further discussion of the lack of habitat, or absence of the species are discussed in Appendix A but these species are not considered further for this assessment.

Lange's metalmark butterfly (*Apodemia mormo langei*) is known to inhabit the Antioch Dunes Wildlife Refuge adjacent to the Action Area. However, the known habitats occupied by this species are more than 1,000 feet away from where work will occur. No host plants, suitable nectar plants or suitable natural upland habitats are present within the Action Area to support the species. No reasonably foreseen interrelated or interdependent activities associated with the wharf rehabilitation would result in potential indirect effects to the butterfly. Therefore while the species is known to occur in the vicinity, the species is unlikely to occur within the Action Area, or to be affected by operations within the Action Area.

Table 1. Federal listed and candidate species, critical habitat, and EFH considered in this document

Common name (Scientific name) Federal Status	**Effect Determination**
Wildlife	
Alameda whipsnake (*Masticophis lateralis euryxanthus*) T	No Effect
American peregrine falcon (*Falco peregrinus anatum*) D	No Effect
Bald eagle (*Haliaeetus leucocephalus*) D	No Effect
California brown pelican (*Pelecanus occidentalis californicus*) D	No Effect
California least tern (*Sternula antillarum* (=*Sterna, =albifrons*) *browni*) E	No Effect
California red-legged frog (*Rana aurora draytonii*) T	No Effect
California tiger salamander (*Ambystoma californiense*) T	No Effect
Callippe Silverspot Butterfly (*Speyeria callippe callippe*) E	No Effect
Chinook salmon - Central California Coast (*Oncorhynchus tshawytscha*)	No Effect
Chinook salmon - Central Valley Spring-run (*Oncorhynchus tshawytscha*) E	**Likely to Adversely Affect**
Chinook Salmon - Sacramento River Winter-run (*Oncorhynchus tshawytscha*) E	**Likely to Adversely Affect**
Coho salmon - Central California Coast (*Oncorhynchus kisutch*) E	No Effect
conservancy fairy shrimp (*Branchinecta conservation*) E	No Effect
Delta green ground beetle (*Elaphrus viridis*) T	No Effect
Delta smelt (*Hypomesus transpacificus*) T	**Likely to Adversely Affect**
giant garter snake (*Thamnophis gigas*) T	No Effect
green sturgeon – Southern DPS (*Acipenser medirostis*) T	**Likely to Adversely Affect**
Lange's Metalmark Butterfly (*Apodemia mormo langei*) E	No Effect
longfin smelt (*Spirinchus thaleichthys*) C	**Likely to Adversely Affect**
Ridgway's clapper Rail (*Rallus longirostris obsoletus*) E	No Effect
salt-marsh harvest mouse (*Reithrodontomys raviventris*) E	No Effect
San Bruno elfin butterfly (*Incisalia (=Callophrys) mossii bayensis*) E	No Effect

Table 1. Federal listed and candidate species, critical habitat, and EFH considered in this document

Common name (Scientific name) Federal Status	**Effect Determination**
San Joaquin kit fox (*Vulpes macrotis mutica*) E	No Effect
steelhead - California Central Valley (*Oncorhynchus mykiss*) T	**Likely to Adversely Affect**
steelhead - Central California Coastal (*Oncorhynchus mykiss*) T	No Effect
tidewater goby (*Eucyclogobius newberryi*) E	No Effect
valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) T	No Effect
vernal pool fairy shrimp (*Branchinecta lynchi*) T	No Effect
vernal pool tadpole shrimp (*Lepidurus packardi*) E	No Effect
western snowy plover (*Charadrius alexandrinus nivosus*) T	No Effect
Plants	**Effect Determination**
Antioch Dunes evening primrose (*Oenothera deltoides* ssp. *howellii*) E	No Effect
Contra Costa goldfields (*Lasthenia conjugens*) E	No Effect
Colusa grass (*Neostapfia colusana*) T	No Effect
Contra Costa wallflower (*Erysimum capitatum* ssp. *angustatum*) E	No Effect
Keck's checker-mallow (*Sidalcea keckii*)	No Effect
Large-flowered fiddleneck (*Amsinckia grandiflora*) E	No Effect
Soft bird's-beak (*Cordylanthus mollis* ssp. *mollis*) E	No Effect
Critical Habitat and Essential Fish Habitat	**Effect Determination**
Chinook Salmon - Spring-run	No Effect
Chinook Salmon - Winter-run	No Effect
Delta smelt	**Not Likely to Destroy or Adversely Modify**
green sturgeon – Southern DPS	**Not Likely to Destroy or Adversely Modify**
steelhead - Central California Coast	No Effect
Steelhead - Central Valley	**Not Likely to Destroy or Adversely Modify**
Chinook salmon EFH	**Not Likely to Destroy or Adversely Modify**
Coastal pelagic EFH	**Not Likely to Destroy or Adversely Modify**
Groundfish EFH	**Not Likely to Destroy or Adversely Modify**

Key to Listing Status:
E – Endangered
T – Threatened
D – Delisted

The analysis included herein concludes that the Action may adversely affect Delta smelt, Central Valley steelhead, Southern DPS green sturgeon, Central Valley spring-run Chinook salmon, Sacramento River winter-run Chinook salmon, and longfin smelt. The avoidance and minimization measures proposed by the Applicant will offset effects of the Action and avoid unnecessary take of these species. Also included with this Biological Assessment is an Assessment of Effects to Essential Fish Habitat (EFH), included as Appendix E.

1.2 Critical Habitat

Critical habitat is a term defined and used by the ESA as a specific geographic area that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. The ESA requires federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) to conserve listed species on their lands and to ensure that any activities or projects they fund, authorize, or carry out will not jeopardize the survival of a threatened or endangered species.

Critical habitat is currently designated for Southern DPS green sturgeon, Delta smelt and Central Valley steelhead within the Action Area (Figure 4). Designated critical habitat for Southern DPS green sturgeon, Central Valley steelhead, and Delta smelt is likely to be adversely modified by the Action due to a small increase in shaded area. However, effects to the habitat will be fully mitigated by the purchase of off-site credits at an approved mitigation bank, or through the restoration of an appropriate amount of habitat at an offsite location.

1.3 Consultation to Date

No consultation has been initiated to date.

1.4 Summary of Proposed Action

The proposed Action consists of structural upgrades at the wharf, including adding, replacing, and removing pilings as well as decking in order to comply with engineering requirements and renewed use of the wharf. Potential impacts to federal listed species during construction will be minimized by the Action's design and implementation.

1.4.1 Action Agency

The Action Agency for the proposed Action is the Corps.

1.4.2 Applicant, Contacts, and Authorized Agent

AMPORTS is the Applicant and will be responsible for minimization and avoidance measures related to the Action. The address and telephone number for the Applicant is:

> AMPORTS
> 1997 Elm Street
> Benicia, CA 94510Contact: Jimmy Triplett, Senior Vice PresidentPhone: (707) 745-2394
> Email: JTriplett@amports.com

This Biological Assessment was prepared by WRA and serves as the Authorized Agent. Contact information for the Authorized Agent is:

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San Rafael, California 94901
Contact: Katie Fedeli
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Additional information provided for the preparation of this document includes engineering design by the Applicant. The address and telephone number is:

Haze Rodgers COWI North America, Inc.
1300 Clay St.
7th Floor
Oakland, CA 94612

1.4.3 Purpose of Action

The purpose of the proposed Action is to convert the former Gaylord Paper facility pulp berth to a roll-on roll-off (RoRo) berth in order to accommodate vessels that will deliver and transfer cargo from the property to other locations. The proposed Action will include the demolition of treated timber structures such as wooden piles and planking, concrete repair, installation of new steel, and concrete piles, concrete deck installation, new breasting dolphin (BD) installation, and new mechanical and lighting components. The existing footprint of the wharf will remain primarily the same as existing conditions, with the exception of a new ramp to accommodate RoRo loading and unloading.

2.0 EXISTING CONDITIONS

2.1 Action Area Location and Site Description

The wharf and areas where new structures and work will occur (Project Area) is located offshore along the San Joaquin River (River) at 2301 Wilbur Avenue, in an unincorporated area of Contra Costa County, approximately 1.5 miles west of the Senator John A. Nejedly Bridge, and east of Suisun Bay (Figure 1). The existing wharf is situated approximately 60 feet (ft) off of the south shoreline and south of West Island. Industrial and commercial facilities are located immediately to the west, east and south of the Action Area. The Sardis Unit of the Antioch Dunes National Wildlife Refuge is located approximately 1,400 ft (0.26 mile) southwest of the Action Area.

2.2 Plant Communities

The majority of the Project Area is located in open water or consists of developed armored shoreline and paved parking lots. The River deposits in the area surrounding the Project Area generally consist of stiff to hard clays with medium dense to very dense sand with varying amounts of silt and clay. No rooted submerged aquatic vegetation is present within the Project Area.

The shoreline bordering the aquatic portion of the Project Area is a steep river bank armored with heavy rip rap and is mostly unvegetated. Small areas of ruderal vegetation occur along the top of the bank where a gap in the riprap allows a chain-link security fence to surround the

upland portions of the AMPORTS facility. The adjacent uplands are fully developed as parking lots which have been either paved, or covered in gravel to allow easy movement of vehicles.

2.3 Surveys for Federal Listed Species and Habitat

WRA searched the California Department of Fish and Wildlife (CDFW) CNDDB for documented occurrences of federal listed species near the Action Area (CDFW 2018). Results are presented in Figure 3a and 3b.

2.4 Hydrography

The bathymetry in the Project Area tapers dramatically from the shoreline to the center of the River. Water depth at the wharf is approximately 4.7 meters (m) (15.5 ft) below Mean Low Low Water (MLLW) (COWI 2017). Depths along the south side (shore side) of the wharf are within this same range and vary from 2.9 m to 4.7 m (9.8 to 15.5 ft) below MLLW. Depths on the north side of the wharf (river side) quickly drop off to more than 9 m (29.7 ft) MLLW. Current speed based on the National Oceanic and Atmospheric Administration (NOAA) 2014 tidal predictions for the general Action Area are a maximum ebb current of approximately 1.2 knots, and a maximum flow current of 0.7 knots (BCG 2014).

2.5 Current Operations

The wharf is currently in an inoperable state and has not serviced vessels for several years. The unsafe structural condition of the wharf has led to general disuse until the financial means have come available to undergo upgrades and rehabilitation.

Currently the section of River surrounding the wharf is maintained as a commercial shipping channel and is dredged to accommodate large ocean-going cargo ships moving to and from the Port of Stockton.

Upland areas directly adjacent to the project site are currently used for the storage and movement of automobiles. These operational conditions are anticipated to remain unchanged following completion of the project.

3.0 DESCRIPTION OF THE ACTION TO BE CONSIDERED

3.1 Description of General Activities

General activities involve structural upgrades of the mooring and berthing system that are required to assure structural integrity, seismic stability and to accommodate ocean-going vessels which will be calling on the wharf.

3.2 Delineation of Action Area

An Action Area is defined in 50 Code of Federal Regulations (CFR) § 402.02 as, "all areas to be affected directly or indirectly by the Federal Action and not merely the immediate area involved in the action." The delineation of the Action Area accounts for effects associated with ground disturbance, changes to surface water and ground water quantity and quality, air quality effects, lighting effects, and noise disturbance.

For the six aquatic species, managed by NMFS and USFWS, the Action Area includes the Project Area (location of the wharf and areas occupied by equipment and wharf structures) as

well as approximately 3,400 m[1] radius around the Project Area (Figure 5). It is anticipated that West Island would act as a barrier to underwater sound generated as a result of the Project, and would therefore prevent the southeast portion of Sherman Island from being affected. Table 2 provides the area for the aquatic Action Area, and more specific areas of activity within the aquatic environment.

Table 2. Action Area Details

Area	Radius (m)*	Description
Action Area	3,400	The anticipated maximum distance for 150 dB using attenuation; discussed in greater detail and shown on Fig 5 of the Biological Assessment.
Acoustic Impact Area	470	The anticipated maximum distance for cumulative SEL of 183 dB using attenuation; discussed in greater detail and shown on Fig 5.
*= Parts of a buffer that extends onto the shore (i.e. out of the channel) was not included in the area calculation as the impact to federal species is aquatic based		

Operational conditions following completion of the wharf rehabilitation are anticipated to remain unchanged from current conditions. Operations following the wharf upgrade will generally consist of the storage and movement of automobiles on existing paved and graveled areas. These operations are not reasonably foreseen to result in any direct or indirect effects to listed species. Therefore, areas upland of the project site are not considered to be part of the Action Area.

3.3 Action Description

3.3.1 Construction Schedule

Construction would take approximately five months to complete and is anticipated to occur as soon as documents and permits are obtained[2]. In-water work (including pile driving) would occur between July 1 and November 30 for concrete piles and August 1 and November 30 for steel piles to minimize impacts to sensitive fish species. The in-water work is anticipated to take approximately 8-14 weeks to complete. Work on structures raised above the water may occur outside of this window, supported by construction barges as-needed.

All work would occur between 7:00am and 6:00pm on weekdays and between 9:00am and 5:00pm on weekends and holidays.

[1] The NOAA Fisheries spreadsheet introduces the concept of "effective quiet." This concept assumes that energy from pile strikes that is less than 150 dB-SEL does not accumulate to cause injury. For any given condition, at some distance, sound attenuates to the level of effective quiet (i.e., 150 dB-SEL). The distance to a 150 dB-SEL for the largest pile being driven with the use of sound attenuation devices was assessed for a similar project in Illingworth & Rodkin, Inc. (2014) *Georgia-Pacific Antioch Terminal Breasting Dolphin Replacement Project Underwater Noise Assessment*. This distance is considered the full extent for potential impact of the proposed project.

[2] Specific construction dates are subject to change based on the timing of approvals from regulatory agencies.

3.3.2 Construction Equipment

The following large-scale construction equipment would be used to carry out the proposed Project.

- Derrick crane barges
- Material barges
- Tugboats
- Vibratory hammer
- Impact hammer

Additional details regarding the vibratory and impact hammers are included below.

Vibratory Hammer

A vibratory hammer would be used for both removal and installation of piles. For pile extraction, a vibratory hammer would be attached to the pile and then the pile would be pulled vertically with a crane. The vibratory hammer serves to break the seal or suction between the pile and the sediment holding the pile in place. Timber piles contained within the existing breasting dolphins will be broken off at the mudline to preserve the lateral soil capacities for the new steel piles to be placed nearby. For installation, the vibratory hammer would be used to sink any steel piles to the extent possible before installation is completed with the impact hammer. The vibratory hammer will also be used to install high density polyethylene (HDPE) fender piles.

Impact Hammer

A diesel impact hammer would be used to drive concrete piles required for construction, and to complete the installation of steel piles after the vibratory hammer has driven piles to refusal. The impact hammer would employ a hammer cushion and "soft-start" (slowly increasing the intensity of strikes). In addition, a bubble curtain system would be deployed when installing steel piles to reduce underwater noise levels.

3.3.3 Construction Activities

Construction activities, including areas left in place, areas to be demolished and not replaced, areas to be demolished and replaced, and new construction and repairs, are outlined below. Table 3 outlines the summary of volume of material to be demolished replaced below the waterline. Table 4 outlines the summary of surface area of new and removed over-water structures.

All existing timber is treated with creosote and will be disposed of at an upland facility. New breasting dolphin caps will be precast on land, then placed on top of the steel piles in-water.

Existing Structures to Remain in Place

There are four existing mooring dolphins (MD-1 through MD-4). These four mooring dolphins will remain in place.

The majority of the existing wharf will remain in place, with some small portions demolished and some structural and safety/operational repairs made as described below. An existing, isolated pier is located to the east of the main wharf facilities which will remain in place to allow operations and maintenance access to and egress from the easternmost mooring dolphins. There are two existing pipeways/timber walkways and an existing concrete ramp that connect the existing wharf facilities to the shoreline, which will remain in place to allow wharf access

from the landside. These pipes were previously used for the pulp conveyance, and will be left abandoned in place.

Structural and Operational Safety Repairs and Improvements

Structural and operational safety repairs and improvements include the following:

- Concrete spall repairs: Loose material will be removed and replaced with new concrete.
- Existing steel support beam repairs: Surface materials (oil, grease, dirt, etc.) will be removed and coated with new epoxy based paint.
- Pile sleeve repairs: Up to five existing corroded steel piles will be repaired using fiberglass pile sleeves. Corroded portions of piles will be removed, fiberglass pile sleeves will be installed, and a fully contained grout mixture will be injected into the pile sleeves.
- 55 steel H-piles will have their original epoxy coating repaired above mean lower low water.
- Damaged wood on existing retained walkways will be replaced in-kind.
- Decking and railing: Minor repairs will be conducted on existing decking and railing of walkways, such as adding a raised safety rail to existing decking.
- Fender pile repairs: New HDPE fender piles and blocking will be installed to replace damaged, missing, and removed existing creosote treated fender piles and blocking as needed.

Table 3. Summary of New and Removed In-Water Piles

Structure Type	# Piles Removed	# New Piles	Removed In-Water Volume (yd^3)	Added In-Water Volume (yd^3)	Removed In-Water Surface Area (ft^2)	Added In-Water Surface Area (ft^2)
Breasting Dolphins (BD-1, BD-2, BD-3, BD-4, BD-5) [Remove 16 -12" creosote piles, ea, BD 1-4, Replace with 1-72" pile ea, BD 1-5]	64	5	71	190	50	141
Decking and Framing (including walkway between MD-1 & MD-2) [Remove 12" and 15" creosote piles]	56	--	79	--	65	--
East Pier Pile Clusters [Remove 12" creosote piles]	8	--	7	--	6	--
Stern Ramp Fender System [13" HDPE piles]	--	29	--	38	--	26
Stern Ramp and Walkway [24" concrete piles]	--	47	--	127	--	155
Mooring Dolphin (MD-5) [72" steel pile]	--	1	--	22	--	28
Totals	**128**	**82**	**157**	**377**	**121**	**350**
Net Change	**- 46**		**+ 220**		**+ 229**	

Table 4. Summary of New and Removed Over-Water Structures

Structure Type	Solid / Grated Cover	Removed Over-Water Solid Surface Area (ft^2)	Added Over-Water Surface Area (ft^2)
Breasting Dolphins [BD-1, BD-2, BD-3, BD-4, BD-5]	Solid Cover	601	794
Existing Wharf Decking and Framing	Solid Cover	590	--
Stern Ramp and Fender System	Solid Cover	--	10,213
Mooring Dolphin [MD-5]	Solid Cover	--	186
Stairs, walkways	Removed Solid Cover New Grated Cover	1,441	667
Total		**2,632**	**11,860**
Summary		**9,228 ft^2 Total Net New Over-Water Cover (Including 667 ft^2 of Grated Cover)**	

Repairs to the existing piles would be performed concurrently with demolition and/or construction activities within the in-water work window, and would be performed from a barge moored alongside the wharf, small work skiffs, and work floats.

Demolition of Structures without Replacement

Demolition of structures not to be replaced are outlined below.

Decking and Framing

Selected reaches of the existing concrete and timber decking and framing along the northern and western margins of the existing wharf will be demolished and not replaced. This will result in a reduction of approximately 0.01 acre (590 sq. ft.) of solid over-water cover and removal of 56 creosote piles. Less than 0.01 acre (65 sq. ft.) of pile related fill will be removed. The decking will be removed by a combination of work on the wharf and by barge. Materials will be transported by barge to an approved disposal location.

East Pier Pile Clusters

Two clusters of existing creosote piles (eight total) will be demolished immediately north of the pier and will not be replaced. This will result in the removal of less than 0.01 acre (6 sq. ft.) of pile related fill. A barge would be used to remove the timber creosote pilings by using one or a combination of the following methods:

- **Vertical Pulling**: Involves gripping the pile with a chain, cable or collar and pulling up vertically with a cable or hydraulic crane. Vertical pulling is the preferred method of removal and will be attempted before other methods are employed.
- **Vibratory Extraction:** Vibratory extraction involves attaching a vibratory hammer to the pile and pulling vertically with a crane or excavator, as described above.

- **Horizontal Snapping and Breaking:** This method does not completely remove the pile, and would be employed only if complete removal was infeasible or if the piles break during the removal process due to deterioration. It typically involves pushing or pulling the pile laterally to break the pile off near the mudline. Snapping typically breaks the pile at the weakest point near the mudline which is typically one to three feet below the mudline, but this technique can leave part of the pile above mudline particularly if the pile is highly degraded, which increases the likelihood of a navigation or safety hazard. Snapping may result in more sunken or floating broken debris than pulling or cutting particularly for degraded piles. In the event a pile breaks during removal, a clamshell and/or chain would be used to grip the remaining broken piece and complete the removal process.

The pilings and/or piling remnants would be loaded onto a barge and removed from the Project area to an approved disposal facility. As described above, equipment would include a derrick barge, a tug, a material barge to hold the removed piles and debris and one or more smaller craft to move workers, supplies, anchors and other equipment.

Demolition and Replacement of Existing Structures

Existing Breasting Dolphins

All of the four existing breasting dolphins (BD-1 through BD-4) have failed, either structurally, geotechnically, or both. The existing breasting dolphins will be demolished and replaced with new dolphins equipped with energy absorbing fenders. This includes removing a total of 64 timber creosote piles, 16 12" piles per breasting dolphin, to the mudline, using the pile removal method described above. The new breasting dolphins will provide berthing capabilities to vessels along the face of the wharf. These four existing breasting dolphins would each be replaced with a single 72" steel pile outfitted with an energy-absorbing fender. Approximately 0.01 acre (601 sq. ft.) of existing solid over water cover will be demolished and removed and less than 0.01 acre (600 sq. ft.) of new solid over-water cover will be installed during construction. This will result in less than 0.01 acre (50 sq. ft.) of pile related fill to be removed and less than 0.01 acre (113 sq. ft.) of pile related fill to be replaced.

Western Walkway

The portion of the western walkway from the existing wharf to Mooring Dolphin 2 (MD-2) will be demolished and replaced with a new grated decking walkway. Wherever feasible, the project has been designed to incorporate grated decking into areas being replaced. Approximately 0.03 acre (1,441 sq. ft.) of solid over-water cover will be demolished and removed as a result of construction, and replaced with approximately 0.01 acre (approximately 667 sq. ft.) of grated decking material associated with the new stern ramp deck described below.

Existing Creosote Treated Fender Piles

Approximately 26 to 30 existing creosote treated, 12-14" diameter, timber fender piles at the existing wharf will be removed and replaced by 13" diameter HDPE fender piles with no net change in volume or area. Some associated creosote treated blocking between the piles at the approximate deck elevation will also be replaced with HDPE lumber with no net change in cover area.

New Construction and Repairs

New Breasting and Mooring Dolphins

One completely new breasting dolphin (BD-5), consisting of one new 72" pile and an energy-absorbing fender with new mooring hardware, will be constructed and one completely new mooring dolphin (MD-5), consisting of one new 72" pile with new mooring hardware, will be constructed in order to accommodate larger vessels. This will result in less than 0.01 acre (approximately 186 sq. ft.) of new solid over-water cover. This will result in less than 0.01 acre (28 sq. ft.) of new pile related fill. Less than 0.01 acre (380 sq. ft) of new solid deck area will also be installed.

Stern Ramp Deck and Fender System

A new stern ramp deck will be installed in the area between the existing Mooring Dolphin 1 (MD-1) and Mooring Dolphin 2 (MD-2). The existing walkway between MD-1 and MD-2, including 8 timber creosote piles will be demolished to accommodate the new stern ramp. The new stern ramp will consist of an approximately 0.23 acre (10,213 sq. ft.) of concrete slab over water supported by 47 new 24" octagonal concrete piles. The stern ramp will be bordered around the northern margin and portions of the western and eastern faces by a fender pile system consisting of 29 new 13" diameter HDPE piles. The concrete deck slab for the stern ramp will be cast-in-place after the concrete piles are installed. The stern ramp will be connected to MD-2 by a new grated tread steel staircase.

New Grated Cover Walkways and Stairs

Grated walkways will be designed to provide pedestrian access along the wharf facility. Less than 0.01 acre (354 sq. ft.) of new grated over-water cover will be constructed. Details are included below on these new structures:

- One grated deck steel walkway will be constructed between the existing wharf and breasting dolphin (BD-5) and will include less than 0.01 acre (12 sq. ft.) of new grated over-water cover.
- One aluminum grated walkway will be constructed from Mooring Dolphin 4 (MD-4) to Mooring Dolphin 5 (MD-5). A smaller, separate grated deck steel walkway will also provide access between MD-5 and the existing east pier, for a combined less than 0.01 acre (approximately 342 sq. ft.) of new grated over-water cover.

All existing timber is treated with creosote and will be disposed of at an upland facility. New breasting dolphin caps will be precast concrete on land, then placed on top of the steel piles in-water. No creosote treated timber will be used in the construction of new wharf features.

3.4 Pile Driving Activities

The contractor and Applicant's engineer anticipate using vibratory and impact hammers to drive the piles. Using data from previous projects in the vicinity, it is estimated that each steel shell pile will require approximately 30 minutes of vibratory driving, and 600 to 1,700 blows with an impact hammer to drive the piles to their final elevation, depending on the diameter of the piles (Illingworth & Rodkin 2017). It is anticipated that a vibratory hammer and a diesel impact hammer would be required to drive the 72-inch piles. Concrete piles used for the stern ramp and fender will be driven using a diesel impact hammer as driving concrete piles requires the use of an impact hammer.

Each steel pile is estimated to be driven to the majority of its required depth during the estimated 30 minute driving period. Once the pile reaches refusal, impact hammer driving would then be used until the pile reaches its required depth. The Action is anticipated to install one (1) steel pile per day (72-inch), and up to three (3) concrete piles per day. It is estimated that in-water construction will take 56 to 98 days. The high variability in work period is primarily related to the number of concrete piles that will be able to be driven per day by the contractor and varies based on weather conditions and conditions within the River. All pile driving activities are anticipated to occur between July 1 and November 30. A description of the type of pile to be driven and their location is provided in Table 3 and Appendix C.

3.5 Avoidance and Minimization Measures

The Applicant proposes a number of avoidance and minimization measures to reduce the potential for take of listed fish species. Prior to construction, a worker environmental awareness program (WEAP) will be conducted to discuss potential listed species on the site. At minimum, the WEAP will consist of a brief presentation by persons knowledgeable in listed species biology and legislative protection to those personnel performing in-water work within the Action Area. Contractors, their employees, and agency personnel will undergo WEAP training prior to involvement with construction activities in the Action Area. The WEAP will include the following:

- A description of the species and their habitat needs,
- Reports of occurrences in the Action Area,
- An explanation of the status of each listed species and their protection under the ESA, and
- A list of measures being taken to reduce potential effects to the species during construction and implementation.

Fact sheets conveying this information will be prepared for distribution to the above-mentioned people and anyone else involved with in-water work activities in the Action Area. Records of sensitive species training will be retained by the approved biologist.

For all work being performed:

1) Standard construction best management practices (BMPs) will be implemented during demolition and construction. BMPs used on site will include:
    a) A Spill Prevention and Control Plan will be developed and will contain measures to prevent and control potential spills of hazardous materials associated with mechanical equipment (oil, gas, hydraulics, etc.), as well as measures to minimize contact with the stream bed, such as work pads. The Spill Prevention and Control Plan and materials necessary to implement it will be accessible on site;
    b) A debris containment boom will be installed around the work area. Any debris discharged into water will be recovered immediately.

Measures proposed for use during in-water construction for the avoidance and minimization of potential hydroacoustic effects to fish include:

1) All in-water work shall be performed within the environmental work windows: between July 1 - November 30 for driving concrete piles, and from August 1 - November 30 for steel piles.
2) A vibratory hammer will be used to start the installation of each steel pile, and will continue as long as geotechnical conditions permit.

3) When installation with a vibratory hammer is no longer possible (i.e. the pile has reached refusal), an impact hammer will be used to complete installation and drive the pile to its final elevation.
4) Underwater sound monitoring will be performed during impact hammer driving of steel piles and for the first five (5) concrete piles. Underwater sound reduction measures will include one or more of the following:
    a) use of impact hammers only during daylight hours;
    b) use of a soft start. This method entails gradually increasing energy and frequency of impacts to permit wildlife to vacate the surrounding area,
    c) use of a bubble curtain during pile driving operations that use an impact hammer for driving steel piles, and
    d) impact hammers may also employ a metallic or other such cushion block. Wood cushion blocks will not be deployed to avoid fire danger.
    e) If an exceedance of the 187 dB SEL at 840 feet occurs, incidental take may be exceeded. At that time additional measures shall be reviewed for implementation by NMFS and the Applicant.
5) Concrete piles may be installed without the use of a bubble curtain or attenuation devices as they are not expected to surpass 206 decibel (dB) at any distance.
6) All water quality protection requirements identified in the 401 certification for the Project will be followed.

4.0 STATUS OF THE SPECIES AND CRITICAL HABITAT IN THE AREA

The life history information presented below is largely taken from the *Supplemental Biological Opinion for the Completion of Pile Driving and Other Remaining Activities* (NMFS 2009) and further informed by the Services Reinitiation of Formal Endangered Species Consultation and Amendment to the Biological Opinion (File # 1-1-96-F-40) for the New Benicia Martinez Bridge Project (January 9, 2001), the 2008 Formal ESA Consultation on the Proposed Coordinated Operations of the Central Valley Project and State Water Project, and the 2001 NMFS Biological Opinion for the San Francisco-Oakland Bay Bridge East Span Seismic Project (NMFS 2001).

4.1 General Life History for Green Sturgeon

The Southern DPS of green sturgeon was listed as threatened by the NMFS on April 7, 2006 (71 FR 17757). Critical habitat for the species was designated on October 9, 2009 (74 FR 52300). A 5-year status review of green sturgeon was completed on October 24, 2012; that review affirmed the need to retain green sturgeon as a threatened species.

Like all sturgeon, North American Green sturgeon are anadromous, long-lived, and a slow growing species (Adams et al. 2002). Along the Pacific Coast, North American Green sturgeon have been documented offshore from Ensenada, Mexico to the Bering Sea, Alaska and found in freshwater rivers from the Sacramento River to British Columbia (Moyle 2002). Two DPS of green sturgeon have been identified along the western coast of North America, and are known to occur in near shore marine waters, and are commonly observed in coastal bays, estuaries, and coastal marine waters from southern California to Alaska (Lindley et. al. 2008). Of the two DPS, only the southern DPS is listed as a threatened species under the ESA. The southern DPS is designated as populations originating from coastal watersheds south of the Eel River where the only known spawning population is in the Sacramento River (50 CFR part 226).

The life cycle of southern DPS green sturgeon can be broken into four distinct phases based on developmental stage and habitat use: (1) larvae and post-larvae less than 10 months of age; (2)

juveniles less than or equal to three or four years of age; (3) coastal migrant females between three or four and thirteen, and males between three or four and nine years of age; and (4) adult females greater than or equal to thirteen years of age and males greater than or equal to nine years of age (Nakamoto et. al. 1995).

Confirmed spawning populations of North American green sturgeon currently are found in only three river systems, the Sacramento and Klamath Rivers in California, and the Rogue River in southern Oregon (Erickson et. al. 2002, Farr and Kern, 2005). During the late summer and early fall, sub-adults and non-spawning adult Green sturgeon frequently can be found aggregating in estuaries along the Pacific coast (Emmett et. al. 1991). Relatively large concentrations occur in the Columbia River estuary, Willapa Bay and Grays Harbor, with smaller aggregations in San Francisco Estuary (Emmett et. al. 1991, Moyle et. al. 1992).

Green sturgeon may migrate long distances upstream to reach spawning habitat. Southern DPS green sturgeon adults typically begin their upstream spawning migrations into the San Francisco Bay by late February to early March, reach Knights Landing by April, and spawn between March and July (Heublein 2006). Peak spawning is believed to occur between mid-April to mid-June and thought to occur in deep, fast water (> 3 m), of large rivers (Emmett et. al. 1991, Adams et. al. 2002). Recent data regarding adult southern DPS green sturgeon has been collected from monitors located from the Golden Gate Bridge to the upper Sacramento River. Some fish that entered the estuary continued to the Sacramento River to spawn. Spawning has been documented on the mainstem over 240 miles upstream, both upstream and downstream of the Red Bluff Diversion Dam (Brown 2007). Based on the distribution of sturgeon eggs, larvae, and juveniles in the Sacramento River, CDFG (2002) indicated that southern DPS green sturgeon spawn in late spring and early summer above Hamilton City possibly to Keswick Dam.

Adults captured in the Sacramento-San Joaquin Delta are known to feed on invertebrates such as shrimp, mollusks, amphipods, and additionally upon small fish (Adams et. al. 2002). Juvenile green sturgeon in the San Francisco Estuary have been shown to feed on opossum shrimp (*Neomysis mercedie*) and amphipods (*Corophium spp*.) (Moyle 2002). Juvenile distribution and habitat use is still largely unknown, and juveniles are presumed present year round in all parts of the San Francisco Bay Estuary (Israel and Klimley 2008).

Waters within the Action Area provide a migratory corridor, and rearing habitat for this species. Spawning habitat is not supported in the vicinity; however, the species may still occur at any time of year while juveniles are foraging. Additionally, the Action Area contains critical habitat for this species.

4.2 General Life History for Chinook Salmon

There are two Evolutionarily Significant Units (ESU) of Chinook salmon designated for protection under the ESA. The Sacramento River winter-run Chinook salmon was reclassified from threatened to endangered by NMFS on January 4, 1994 (59 FR 440) and was reaffirmed as endangered on June 28, 2005 (70 FR 37160). Critical habitat for the species was originally designated on June 16, 1993 (58 FR 33212). The Central Valley spring-run Chinook salmon was listed as threatened by NMFS on September 16, 1999 (64 FR 50394) and was reaffirmed on June 28, 2005 (70 FR 37160). Critical habitat for spring-run Chinook salmon was designated on September 2, 2005 (70 FR 52488).

Chinook salmon runs are designated on the basis of adult migration timing; however, distinct runs also differ in the degree of maturation at the time of river entry, thermal regime and flow characteristics of their spawning site, and actual time of spawning (Myers et al. 1998). Both winter-run and spring-run Chinook salmon tend to enter freshwater as immature fish, migrate far

upriver, and delay spawning for weeks or months. For comparison, fall-run Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of rivers, and spawn within a few days or weeks of freshwater entry (Healey 1991). Adult Sacramento River winter-run Chinook salmon enter San Francisco Bay from November through June (Hallock and Fisher 1985), and delay spawning until spring or early summer. Adult Central Valley spring-run Chinook salmon enter the Sacramento Delta beginning in January and enter natal streams from March to July (Myers et. al. 1998). Central Valley spring-run Chinook salmon adults enter freshwater in the spring, hold over summer, and spawn in the fall. Central Valley spring-run Chinook salmon juveniles typically spend a year or more in freshwater before migrating toward the ocean. Adequate in-stream flows and cool water temperatures are more critical for the survival of Central Valley spring-run Chinook salmon due to over-summering by adults and/or juveniles.

Sacramento River winter-run Chinook salmon spawn primarily from mid-April to mid-August**,** peaking in May and June, in the Sacramento River reach between Keswick Dam and the Red Bluff Diversion Dam. Central Valley spring-run Chinook salmon typically spawn between September and October depending on water temperatures. Chinook salmon generally spawn in gravel beds that are located at the tails of holding pools (USFWS 1995). Eggs are deposited within the gravel where incubation, hatching, and subsequent emergence take place. The length of time required for eggs to develop and hatch is dependent on water temperature, and quite variable. Sacramento River winter-run Chinook salmon fry (newly emerged juveniles) begin to emerge from the gravel in late June to early July and continue through October (Fisher 1994). Central Valley spring-run Chinook salmon fry emerge from November to March and spend about 3 to 15 months in freshwater prior to migrating towards the ocean (Keljson et al. 1981). Post-emergent fry seek out shallow, near shore areas with slow current and good cover, and begin feeding on small terrestrial and aquatic insects and crustaceans.

In the Sacramento River and other tributaries, juveniles often migrate downstream from December through March (Moyle 2002). Fry may spend time rearing within riverine and/or estuarine habitats including natal tributaries, the Sacramento River, non-natal tributaries to the Sacramento River, and the Delta. Within estuarine habitat, juvenile Chinook salmon movements are generally dictated by tidal cycles, following the rising tide into shallow water habitats from the deeper main channels, and returning to the main channels when the tide recedes (Levy and Northcote 1982; Levings 1982; Healey 1991). Juvenile Chinook salmon forage in shallow areas with protective cover, such as intertidal and subtidal mudflats, marshes, channels and sloughs (Dunford 1975).

As juvenile Chinook salmon increase in length, they tend to school in the surface waters of the main and secondary channels and sloughs, following the tides into shallow water habitats to feed (Allen and Hassler 1986). Keljson et al. (1981) reported that juvenile Chinook salmon demonstrated a diel migration pattern, orienting themselves to near shore cover and structure during the day, but moving into more open, offshore waters at night. The fish also distributed themselves vertically in relation to ambient light. During the night, juveniles were distributed randomly in the water column, but would school up during the day into the upper 3 m of the water column. Juvenile Sacramento River winter-run Chinook salmon migrate to the sea after only rearing in freshwater for four to seven months, and occur in the delta from October through early May (CDFG 1998). Most Central Valley spring-run Chinook salmon smolts are present in the delta from mid-March through mid-May depending on flow conditions (CDFG 2000).

Waters of the Action Area provide a migratory corridor and juvenile rearing/foraging habitat for spring-run and winter-run Chinook salmon. Spawning habitat is not supported in the vicinity;

however, each species may still occur seasonally. The Action Area does not contain critical habitat for either ESU of this species.

4.3 General Life History for Steelhead

The Central Valley steelhead was originally designated as threatened by NMFS on March 19, 1998 (63 FR 13347) and was reaffirmed on January 5, 2006 (71 FR 834). Critical habitat for the species was designated on September 2, 2005 (70 FR 52488).

Steelhead are an anadromous form of *Oncorhynchus mykiss*, spending some time in both freshwater and saltwater. The older juvenile and adult life stages occur in the ocean, until the adults ascend freshwater streams to spawn. Unlike Pacific salmon, steelhead are iteroparous, or capable of spawning more than once before death (Busby et al. 1996). Eggs (laid in gravel nests called redds), alevins (gravel dwelling hatchlings), fry (juveniles newly emerged from stream gravels), and young juveniles, remain in freshwater until they become large enough to migrate to the ocean to finish rearing and maturing to adults. General reviews for steelhead in California document much variation in life history (Barnhart 1986, Busby et. al. 1996, McEwan 2001). Although variation occurs, steelhead usually live in freshwater for two years, then spend one or two years in the ocean before returning to their natal stream to spawn.

Steelhead from the tributaries of San Francisco Bay, typically migrate to freshwater between November and April, peaking in January and February. They migrate to the ocean as juveniles from March through June, with peak migration occurring in April and May (Fukushima and Lesh 1998). Steelhead fry generally rear in edgewater habitats and move gradually into pools and riffles as they grow larger. Cover is an important habitat component for juvenile steelhead, both as a velocity refuge and as a means of avoiding predation (Shirvell 1990, Meehan and Bjorn 1991). Steelhead, however, tend to use riffles and other habitats not strongly associated with cover during summer rearing more than other salmonids. Young steelhead feed on a wide variety of aquatic and terrestrial insects, and emerging fry are sometimes preyed upon by older juveniles. Rearing steelhead juveniles prefer water temperatures of 7.2-14.4 degrees Celsius (°C) and have an upper lethal limit of 23.9 °C (Barnhart 1986, Moyle 2002). They can survive in water up to 27 °C with saturated dissolved oxygen conditions and a plentiful food supply. Fluctuating diurnal water temperatures also aid in survivability of salmonids (Busby et. al. 1996).

Juvenile steelhead emigrate episodically from natal streams during fall, winter, and spring high flows. Emigrating Central Valley steelhead use the lower reaches of the Sacramento-San Joaquin Rivers and the Delta for rearing and as a migration corridor to the ocean. Barnhart (1986) reported that steelhead smolts in California range in size from 140 to 210 millimeter (mm) fork length. Juvenile steelhead in the Sacramento River Basin migrate downstream during most months of the year, but the peak period of emigration occurs in the spring, with a much smaller peak in the fall.

Waters of the Action Area provide a migratory corridor as well as juvenile rearing and foraging habitat for this species. Spawning habitat is not supported in the area; however, the species may still occur seasonally. Additionally, the Action Area contains critical habitat for this species.

4.4 General Life History for Delta Smelt

The USFWS proposed to list the Delta smelt as threatened with proposed critical habitat on October 3, 1991 (56 FR 50075). The USFWS listed the Delta smelt as threatened on March 5, 1993 (58 FR 12854), and designated critical habitat for this species on December 19, 1994 (59 FR 65256). The Delta smelt was one of eight fish species addressed in the Recovery Plan for the Sacramento–San Joaquin Delta Native Fishes (USFWS 1995). A 5-year status review of

the Delta smelt was completed on March 31, 2004; that review affirmed the need to retain the Delta smelt as a threatened species.

The Delta smelt is a member of the Osmeridae family (northern smelts) (Moyle 2002) and is one of six species currently recognized in the Hypomesus genus (Bennett 2005). The Delta smelt is endemic to the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta) in California, and is restricted to the area from San Pablo Bay upstream through the Delta in Contra Costa, Sacramento, San Joaquin, Solano, and Yolo counties (Moyle 2002). Their range extends from San Pablo Bay upstream to Verona on the Sacramento River and Mossdale on the San Joaquin River. The Delta smelt was formerly considered to be one of the most common pelagic fish in the upper Sacramento- San Joaquin Estuary. While aspects of this species life history are known, certain key components of wild fish, such as spawning habitat requirements and locations are less well known and often inferred by laboratory observations, trawl and sample catch locations of spent females and young larvae, and comparisons with similar species (USFWS 2008).

Delta smelt are euryhaline species that generally occur in water with less than 10-12 parts per thousand (ppt) salinity, although they have been collected in San Pablo Bay at 18.5 ppt and in the Carquinez Strait at 13.8 ppt. Collection activities tend to indicate that Delta smelt can spawn in temperatures ranging from 7 to 22 degrees Celsius. Delta smelt tend to be concentrated near the zone where out flowing fresh water and incoming salt water mix (mixing zone). The species inhabit open surface waters of the Delta and Suisun Bay. Delta smelt are found at all life stages in greatest abundance in the top 2 m of the water column and usually not in close association with the shoreline (USFWS 2004). Delta smelt usually aggregate but do not appear to be a strongly schooling species. Genetic analyses have confirmed that *H. transpacificus* presently exists as a single intermixing population (Trenham et al. 1998).

Spawning occurs in shallow water habitats in the Delta. Adult smelt migrate upstream from brackish water habitat associated with the mixing zone before spawning to disperse into river channels and tidally influenced backwater sloughs. The spawning season varies from year to year, between late winter (December) to early summer (July). Laboratory observations have indicated that Delta smelt are broadcast spawners with sinking (demersal) eggs with adhesive properties. It is postulated that the eggs sink and attach to substrates like tules, tree roots and other submerged vegetation in shallow waters (USFWS 2004). Newly hatched and juvenile Delta smelt forage in shallow waters until they reach 16 to 18 millimeter (mm) in length. Once they develop a swim bladder, they rise up higher into the water column and are washed downstream into the mixing zone. By August juvenile smelt are typically 40-50 mm (USFWS 2004).

Delta smelt feed on planktonic copepods, small crustaceans, amphipods, and to a lesser extent insect larvae. They are fed upon by subadult striped bass (*Morone saxatilis*) and have been found in the stomach contents of black crappie (*Pomoxis nigromaculatus*) and white catfish (*Ameiurus catus*) (USFWS 2004).

This species is known to occur in waters of the Action Area; however, shallow water spawning habitat does not occur in or adjacent to the Action Area. Water depths at the wharf range between 2.9 m (9.8 ft) to more than 9 m (29.7 ft), with the majority of the project site being approximately 4.7 m (15.5 ft) below MLLW (COWI 2017). Similar and deeper water depths are present throughout the Action Area, with no substantial shallow water spawning habitat know to be present. The Action Area provides foraging habitat for adult and juvenile Delta smelt. Additionally, the Action Area contains critical habitat for this species.

4.5 General Life History for Longfin Smelt

On August 8, 2007 the USFWS was petitioned to add the longfin smelt to the list of Threatened and Endangered Species. During the most recent review by the USFWS it was determined that the San Francisco Bay-Delta DPS of longfin smelt warranted protection under the Endangered Species Act. However, the USFWS has not yet listed the species, and it remains a candidate species at the federal level (USFWS 2013).

The longfin smelt is an anadromous fish found in California's bay, estuary, and nearshore coastal environments. The range of longfin smelt extends along the Pacific coast of North America from the Sacramento-San Joaquin estuary in California, north to the Gulf of Alaska. Outside of California the species primarily exists in scattered and isolated bays or estuaries (Moyle 2002). The San Francisco Estuary supports the southern-most longfin smelt population, and the largest population in California (Moyle 2002). Longfin smelt are known to inhabit the entire San Francisco Estuary, including portions of the Napa River, Suisun and Napa marshes, and the Sacramento-San Joaquin Delta (CDFW 2009).

This species is a member of the Osmeridae family (Moyle 2002). Most notably, they are distinguished from other smelts by the large pectoral fins for which they are named. Lifespan of the species is generally two years, but three-years-old smelt have been observed (CDFW 2009). Longfin smelt reach 6-7 centimeter (cm) in the first 9-10 months of life. Growth is minimal during their first winter, but the growth rate increases again in their second summer and fall when they reach 9-11 cm. The largest members of the species are female fish that may reach up to 15 cm in their third year (Calfish 2018).

The species can tolerate salinities ranging from freshwater to nearly pure seawater. Most longfin smelt occupy the middle or bottom of a water column and tend to favor temperatures in the range of 16-18°C and salinities ranging from 15-30 ppt (Calfish 2018). While longfin smelt encounter a wide variety of water temperatures, and salinities during their life cycle, they are rarely found in water temperatures greater than 22°C (CDFW 2009). Their spatial distribution within a bay or estuary is seasonally variable based on these temperature and salinity tolerances. Longfin smelt can also make daily migrations; remaining deep during the day and rising to the surface at night. Avoiding surface waters during the day helps them avoid predation from birds, marine mammals, and other fish (Calfish 2018). Generally speaking longfin smelt are found closer to the ocean during summer and move into streams during winter months for spawning (Baxter 1999).

Spawning occurs between February and April when fish move into freshwater streams and rivers (Calfish 2018). Spawning areas are generally gravel or sandy substrate where rocks and aquatic plants are present. Spawning occurs at night, and after fertilization, the eggs adhere to plants and gravel in the area. Eggs typically hatch at around 40 days. Winter and spring outflows transport recently hatched larvae downstream to Suisun Bay, San Pablo Bay, and San Francisco (Baxter 1999).

As juveniles longfin smelt feed on copepods and cladocerans. With subsequent growth their diet expands to include mysids and amphipods (CDFW 2009). Longfin smelt are an important prey species and are fed upon by many species of predatory fish. However, striped bass (*Morone saxatilis*) are a dominant predator of longfin smelt in the San Francisco Bay area (CDFW 2009). The other primary threats to the San Francisco Bay population are due mainly to the effects of water diversions from the Delta (Moyle 2002).

This species is known to occur in waters of the Action Area; however, sandy shallow water spawning habitat does not occur in or adjacent to the Action Area. The Action Area provides

habitat for juvenile rearing and adult migration. Critical habitat for this species has not been designated.

5.0 MANNER IN WHICH ACTION MAY AFFECT SPECIES AND CRITICAL HABITAT

The proposed Action is likely to adversely affect listed species that may be within the Action Area. The proposed Action is not likely to destroy or adversely modify critical habitat within the Action Area.

5.1 Analysis of Effects to Listed and Candidate Species

The following section provides an analysis of potential effects from the proposed Action on listed and candidate species.

5.1.1 Analysis of Direct Effects to Fish

Direct effects are those effects caused directly by the proposed Action that occur on-site within the Action Area and during Action implementation, i.e., disturbance within the Action Area.

Pile driving produces underwater noise, which manifests as pressure waves in the aquatic environment. In order to evaluate the potential effect to fishes exposed to elevated levels of underwater sound produced during pile driving, WRA analyzed data from a nearby pile driving project which installed similar size piles, as well as incorporating results of measurements from similar projects elsewhere, along with the thresholds established by California Department of Transportation (Caltrans) and NMFS.

This assessment estimates the levels of underwater sound (peak, root mean square [RMS] pressure, and accumulated SEL) received by fishes that are exposed to elevated levels of underwater sound produced during pile driving. Distance from each pile that the sound attenuates to threshold levels was determined, and the sound impact was used to compute effects to fish species that are presumed stationary. Sound levels for attenuated steel piles, and unattenuated concrete piles are addressed below, along with specific distances within which specific thresholds are exceeded. Based on past projects, it is estimated that sound levels can be reduced up to 10 dB using a properly deployed bubble curtain device (Illingworth & Rodkin 2014). Effects are addressed as a condition where fish are assumed to be stationary relative to the pile driving.

In general, species of herring, croakers, and shad are hearing specialists while most other fish are hearing generalists (ICF Jones and Stokes, and Illingworth and Rodkin, Inc., 2009). Sound specialists are likely to be affected by sound to a greater degree than sound generalists, and smaller fish are generally more susceptible to injury from sound than larger fish (ICF Jones and Stokes, and Illingworth and Rodkin, Inc. 2009). As such, the effects that are presented in this section are presumably higher than those that will actually occur during Action activities because:

a) impact calculations were determined using small and stationary fish in order to calculate a maximum potential impact area;
b) several of the listed fish species that may occur in the Action Area use the waters seasonally as a migratory corridor or for rearing habitat and not spawning (i.e. not stationary); and
c) currents and flow within the Action Area are not conducive to fish remaining stationary where accumulated sound effects can readily injure or stun fish.

The criteria used for the onset of physical injury and adverse behavioral effects are listed in Table 5. The onset of physical injury uses dual criteria - peak pressure and SEL. The onset of physical injury is expected if either of these criteria are exceeded. The criterion for accumulated SEL is based upon the mass of the fishes under consideration. Because Delta smelt and longfin smelt are known to occur within the Action Area, the more conservative 183 dB SEL criterion, which applies when fish smaller than 2 grams are present, may be required.

Table 5. Fish Impact Criteria

Effect	Metric	Fish mass (grams)	Threshold
Onset of physical injury	Peak pressure	N/A	206 dB (re: 1 µPa)
	Accumulated SEL	≥ 2 g	187 dB (re: 1µPa^2•sec)
		< 2 g	183 dB (re: 1µPa^2•sec)
Adverse behavioral effects	RMS	N/A	150 dB (re: 1 µPa)

The extent of sound levels anticipated for the Action are expected to be similar to those measured at the Georgia Pacific (GP) Antioch Wharf Replacement Project, located approximately 1-mile west of the Project Area within the same section of the River (Illingworth and Rodkins 2017). Results of acoustic monitoring for impact hammer driving of piles of equal size to those used for this Action are listed below in Table 6.

In addition to six steel shell piles, the Action will drive 47, 24 inch octagonal concrete piles to support the RoRo ramp and associated fenders. Data for 24 inch concrete piles is presented below in Table 7 and was obtained from the Caltrans Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish (Caltrans 2015). Data shown below in Table 7 is for unattenuated driving (i.e. no bubble curtain or other sound dampening devices were used).

Table 6. Measured Sound Pressure Levels from Impact Driving of Steel Shell Piles at the GP Antioch Wharf Project

Pile Size	Pile Strikes	Distance (Meters)	Peak (Maximum)	RMS (Average)	SEL (Cumulative)
72 inch steel shell	1,649	10	205*	189	211
		260	184	168	194
72 inch steel shell	1,389	10	206*	189	209
		300	-[1]	-[1]	-[1]
72 inch steel shell	1,621	10	203*	185	208
		150	188	171	191
72 inch steel shell	1,015	10	204*	188	207
		200	185	168	186
* - Measurements collected while driving with a bubble curtain. [1] – Hydrophone inoperable					

Table 7. Measured Sound for Projects Driving Various 24-inch Concrete Piles

Pile Type	Project	Peak (10 m)	RMS (10 m)	SEL (10 m)
24-inch octagonal concrete	Port of Oakland Berth 22	188	176	-A
24-inch octagonal concrete	Port of Oakland Berth 22	187	174	165
24-inch octagonal concrete	Port of Oakland Berth 22	186	175	164
24-inch octagonal concrete	Port of Oakland Berth 22	188	176	166
24-inch octagonal concrete	Port of Oakland Berth 32	185	173	162
24-inch octagonal concrete	Port of Oakland Berth 32	185	173	163
24-inch octagonal concrete	Port of Oakland Berth 32	184	174	161
24-inch octagonal concrete	Port of Oakland Berth 32	185	173	163
24-inch octagonal concrete	Port of Oakland Berth 32	185	173	161
A- Single strike SEL's below 150 dB do not accumulate to cause injury to fish.				

Using the above information, the following estimates of distance to the accumulated 187 dB and 183 dB SEL level are provided in Table 8.

Table 8. Sound Levels at 10 meters and Distances to the 187 dB and 183 dB Cumulative SEL Criterion for Pile Driving [3].

Pile Size and Type	Estimated Strikes	Attenuation	Single Strike Peak*	Single Strike RMS*	Single Strike SEL*	Cumulative SEL (dB) at 10 m	Distance to 187 dB Cumulative SEL (m)	Distance to 183 dB Cumulative SEL (m)
72-inch steel shell pile	1,600	bubble curtain, metal cushion block	206	188	176	208	253	470
24-inch octagonal concrete	500	Unattenuated	187	175	165	190	16	29
*= measurements at 10 m.								

The Peak values observed at 10 m for a single strike on the GP Antioch Wharf Project while driving 72-inch steel shell piles, did not surpass the 206 dB threshold except during adjustments to the bubble curtain when driving the first pile. Once adjustments were satisfactory, impact hammer driving of 72-inch steel piles produced Peak sounds at 203-206 dB (Illingworth and Rodkin 2017). Therefore, direct mortality to fish from pile driving is not anticipated from a single blow as long as the bubble curtain is deployed and operational. Cumulative SEL at 10 m for 72-inch piles was between 207 and 211 dB (Table 7, Illingworth and Rodkin 2017). Given the values observed at the Antioch Wharf project, cumulative SEL at 10 m will surpass the 183 dB injury threshold for fish under 2 grams, potentially causing mortality to fish within that range. However, prior to beginning pile driving with impact hammers on 72-inch steel piles, a prolonged period of use with a vibratory hammer (approximately 30 minutes), as well as a soft start will be employed to allow fish an opportunity to escape the immediate surrounds of the pile, thereby minimizing potential for mortality. Additionally, it is unlikely that a stunned fish would remain stationary and subject to the full breadth of sound pressure accumulation effects, given the swift currents within the Action Area.

Using data for the 72-inch steel shell piles at the GP Antioch wharf project (driven with the use of a bubble curtain), and assuming the maximum number of strikes by an impact hammer to drive a pile on that project (1,600 strikes), the 183 dB Cumulative SEL was estimated at 470 m (1,542 ft) using the NMFS pile driving calculator (Appendix D). Observed values at the GP Antioch wharf project shown in Table 5 reported cumulative SEL at various distances. The furthest cumulative SEL reading was at a distance of 260 m (853 ft) and registered at 194 dB. Given the 260 m distance is only 10 dB above the 183 dB threshold, it is assumed that the 470 m distance to the 183 dB threshold is appropriate. The 470 m distance represents an Acoustic Impact Area (Figure 5). Any fish within that area would be subject to direct effects, or cumulative SEL impacts, of between 183 and 187 dB. Using the NMFS pile driving calculator, the distance to where adverse behavioral effects may occur would extend 3,400 m from the largest piles being driven. The 3,400 meter range represents the full extent of the Acoustic Action Area, as fish outside of this range are not anticipated to be effected in any way.

In addition to the sound attention devices (bubble curtain) for the driving of steel piles, a soft start will be used at the start of each day when pile driving occurs or following a break of one

[3] Calculated using the NMFS Pile Driving Calculator. Worksheets for calculations are included in Appendix D.

hour or longer in pile driving. The soft start involves the gradual increase of energy and frequency of impacts to permit wildlife to vacate the surrounding area. Because special-status fish within the Action Area will be mobile juveniles or adults (as opposed to eggs or larvae, which tend to be subject to drift and are not freely mobile), they will have the opportunity to vacate the Acoustic Impact Area before peak sound levels occur.

Utilizing the outlined avoidance and minimization levels is anticipated to reduce sound levels during impact driving of 72-inch steel piles to levels at or below the 206 dB peak criteria for the majority of work. However, the 206 dB threshold may be surpassed within 10 m of 72-inch piles, or during installation of the first pile as adjustments are made to the bubble curtain and the hammer. The cumulative SEL is also anticipated to exceed the 183 and 187 dB criteria. These effects are primarily focused on the installation of 72-inch steel piles. To reduce the effect of any exceedance the cumulative SEL will have, installation of 72-inch steel shell piles shall be restricted to an environmental work window of August 1 to November 30. The work window is informed by NMFS, USFWS, and CDFW recommendations for avoidance of potential impacts to fish species in this region of the San Francisco Bay Delta. In-water work conducted within the work window will minimize the possibility that work activities will affect fish as listed fish species are less likely to utilize the Action Area for rearing or migration during this period, and are also unlikely to occur in a more sensitive life stage (i.e. egg or larvae). Additionally, hydroacoustic monitoring will be conducted during pile driving activity to identify any exceedance in threshold levels potentially affecting listed fish. Direct biological observation during pile driving is not practical for this location. If any fish are directly impacted by pile driving, the currents would carry injured or dead fish away from the injury location in a swift an unpredictable manner, and it is extraordinarily unlikely that a stationary biological monitor would be able to observe the injured or dead fish. Mobile methods for directly assessing fish injury and mortality as a result of pile driving (e.g., trawl surveys) are more likely to result in direct effects to captured fish that exceed the effects that they would otherwise be exposed to absent the implementation of that monitoring. Mobile methods may have greater coverage, but are also not guaranteed to capture potentially injured or dead fish.

For the installation of concrete piles the analysis shows that 24-inch concrete piles are not expected to create sound levels in excess of 206 dB either through a single strike, or through cumulative SEL. Additionally, concrete piles are only expected to produce a maximum of 187 dB Peak sound during installation. This sound level would be attenuated to 183 dB or less within 29 m (94 ft). The area affected by such sound levels falls within the shadow of the derrick barge performing the work. Typical derrick barges measure 145 to 250 ft in length, and 60 to 100 feet in width (Manson Construction Company 2018). Because sound pressure levels for mortality will never be reached, and SEL levels sufficient to potentially cause injury are less then the area occupied by the barge doing the work, driving concrete piles is unlikely to cause injury to protected fish. Therefore, an extended work window for driving concrete piles from July 1 – November 30 is not likely to cause additional impacts to protected fish.

Based on the hydroacoustic assessment, and the minimization measures, temporary direct effects to listed fish are estimated from the **maximum** hydroacoustic impact (using highest sound pressure levels) as follows:

- Fish within 3,400 m (Action Area) would be exposed to RMS sound levels of 150 dB.
- Any fish in the Acoustic Impact Area of 470 m (1,527 ft) will be subject to direct effects, or cumulative SEL impacts at or above 183 dB when driving 72-inch steel piles.
- Fish within 29 m (94 ft) will be subject to cumulative SEL impacts at or above 183 dB when driving 24-inch concrete piles.

- Fish within 10 m (33 ft) of pile driving for 72-inch steel piles may be exposed to peak sound levels above 206 dB.

These direct effects from pile driving activity are anticipated to be temporary, and no ongoing or permanent adverse effects are anticipated.

Additional in-water work for the removal of existing piles, along with the deployment of spuds from the barge, may contribute to increased water turbidity and mobilization of substrate. Elevated turbidity can impair gill function, reduce oxygen availability in the water column, decrease physiological capabilities, and increase stress in fish (Heath 1995). The increase in turbidity is anticipated to be localized and dissipate quickly due to tidal currents and river flow conditions. Activities that may result in temporary increases in turbidity are likely to occur with other forms of disturbance or sound generation, such as the movement of tugs and barges. These disturbances are likely to cause fish to move away from the areas where increases in turbidity would occur, prior to directly being exposed to the turbidity.

While turbidity can impact sensitive life stages of fish, elevated turbidity alone does not represent a uniform impact to protected fish species. Delta smelt distribution has been correlated with turbidity which can help increase foraging efficiency and decrease predation threat (Interagency Ecological Program 2015). Within the Delta, turbidity is generally between 20-40 nephelometric turbidity units (NTUs), and can increase to as high as 250-500 NTUs during high river flows (California Department of Water Resources 2013). The actual distance suspended sediment caused by the Project would move is dependent upon multiple factors (i.e. tide, river flow, wind condition, etc.) and turbidity from pile removal and vibratory driving is anticipated to be confined within 45.7 m (150 ft) of the pile and would likely dissipate within five minutes (USFWS 2013). For much more sediment intensive activities, like clamshell dredging, turbidity generally extends a maximum of 304 m (1,000 ft) at the surface and 457 m (1,500 ft) near the substrate when using ineffective equipment (Long Term Management Strategy 2009). Turbidity from such activities also typically dissipates into background levels within a single tidal cycle (Long Term Management Strategy 2009). Any area of potential turbidity increase is well within the 3,400 m Action Area, and is anticipated to occur within less than 10% of the area identified with the 470 m Acoustic Impact Area (Figure 5). Turbidity may result in areas such as the shallow water habitat between the wharf and the shoreline, being temporarily unsuitable for fish. Restricting in-water work to the approved work window will reduce the potential for sensitive life stages of listed fish to occur or be affected by Project generated turbidity. Additionally, all water quality protection requirements identified by the Regional Water Quality Control Board in the 401 certification for the Project will be followed.

Above-water work for the demolition and construction of the wharf will involve welding, drilling, and associated construction related activity. Such activities are expected to contribute minimally to hydroacoustic direct effects. The sound produced by this type of activity is likely to be deadened as the sources will be out of the water, and is typically not a high pressure sound wave such as those produced by an impact hammer. To minimize potential adverse effects from demolition and construction, worker environmental awareness training and BMPs including a debris containment boom and spill prevention kits will be used. Above-water work will be temporary, and is not anticipated to result in any adverse effects to listed fish.

5.1.2 Analysis of Indirect Effects to Fish

Indirect effects are those caused by or those that will result from the proposed Action later in time and outside the Action Area, but are still reasonably certain to occur.

The Action will result in a change in wharf size and use, but no barriers to fish migration will be created, and no toxic effects to waterways are anticipated. The wharf design will use steel or concrete piles to support the structures, avoiding use of any toxic materials. Additionally, any impacts to foraging efficiency by various species in the vicinity due to increased shading will be offset by the purchase of mitigation credits, removal of toxic (creosote) piles that currently occur in the Project Area, and by the addition of grated walkways and surfaces that will allow previously shaded areas to be illuminated. Therefore, because of these design features, no indirect effects are anticipated by the Action.

5.1.3 Analysis of Interrelated and Interdependent Effects to Fish

Interrelated actions are those actions that are part of the primary action and dependent upon that primary action for their justification.

In its current state, the wharf is unusable. General degradation of the structure over time does not allow for safe berthing of ships, and as such, use of the wharf has not been possible for several years. Once the wharf is rehabilitated, it will go back into regular service as ship traffic will be able to safely berth at the wharf again. Ships which will use the wharf are of similar size to those currently using the San Joaquin River or Sacramento River in route to the Ports of Stockton and Sacramento. Ships are anticipated to vary in length from 550 to 650-feet with a 90 to 110-foot wide beam, and up to a 30-foot draft. Because the adjacent San Joaquin River is maintained as a commercial channel for the Port of Stockton, this limits the draft for vessels that can access the area. No increase in dredging depth is anticipated to occur as a result of the Action as the ships calling on the berth are of similar size to those that already call upon ports upstream. Additionally, maintenance dredging is not anticipated to be required as depths are already sufficient to handle any anticipated ships calling on the wharf. Uplands within the Action Area are currently being used as storage for large numbers of vehicles which are parked, and operated on gravel or blacktop lots throughout the Action Area. These vehicles are continually being moved, maintained and shipped out according to varying needs. The presence of several thousand automobiles being parked, and operated provides a nearly continual source of anthropogenic disturbance throughout the uplands. Because this type of disturbance is already present throughout the uplands, any future use of the upland portions of the site would be expected to maintain a similar level of activity causing similar conditions (e.g. dust, or noise) to those that currently exist. Because additional effects due to dredging are not anticipated and extant disturbance within the uplands is extensive, interrelated or interdependent effects to these areas are not expected to change as a result of the Action. The only anticipated interrelated action will be an increase in vessel traffic.

The Port of Stockton services approximately 275 ships per year and is currently the fourth largest port in California (Port of Stockton 2018). Additionally, the junction of the Sacramento River which services the Port of Sacramento is located approximately 6-river miles west of the Action Area (downstream). The Port of Sacramento services an additional 60 to 80 vessels per year (Port of Sacramento 2018). Given the level of traffic at these two ports, it is not anticipated that ships using the AMPORTS facility will add significantly to the number of ships using the area. During high volume periods when multiple or large contracts are active it is anticipated that as many as six to eight ships per month may use the wharf. Ships are anticipated to be at the berth for approximately 24-hours and would then depart the area. Given the already high volume of ships moving both upstream, and downstream of the Action Area, the level of traffic is not anticipated to add significantly to the general commercial traffic in the vicinity.

Interdependent actions are those actions that have no independent utility apart from the primary action. Construction, maintenance, and use of a road required to access a site is an example of

an interdependent effect. Increased boat traffic around the wharf will result as part of the Action during construction. Work boats and material barges will be used to perform the Action. Effects from the use of work boats and material barges will last for the duration of the Action. Acoustic effects from the use of work boats and material barges are anticipated to be minimal, and are adequately captured in the Action Area as depicted. No additional interdependent effects are expected as a result of the Project because all construction and activities are considered under the primary Action.

5.1.4 Analysis of Cumulative Effects to Fish

Cumulative effects are those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation {50 CFR §402.02}. Future dredging or new dock projects would be considered cumulative effects.

Following rehabilitation of the wharf, the number of vessels using the wharf is anticipated to increase, however this effect has been analyzed as an interrelated effect because it is dependent upon the primary action for justification. No additional dredging is required as waters along the berth side of the wharf are of sufficient depth to accommodate the anticipated ships. There are also no currently proposed non-federal actions in the Action Area. Therefore, no cumulative effects are anticipated to occur.

5.2 Analysis of Effects to Critical Habitat

The following section provides an analysis of potential effects from the proposed Action on critical habitat.

5.2.1 Analysis of Direct Effects

Direct effects are those effects caused directly by the proposed Action that occur on-site within the Action Area and during Action implementation, i.e., ground disturbance within the Action Area. The proposed Action will affect critical habitat for green sturgeon, Central Valley steelhead, and Delta smelt.

The proposed Action will require the removal of 128 existing creosote treated piles and replacement with 82 HDPE, steel, and concrete piles. The new piles will result in a net decrease of 46 piles and removal of any exposed creosote piles from the wharf. However, the new piles will result in an increase of 220 cubic yards of fill (Table 7). In addition, the construction of the RoRo ramp, walkways and extension will result in an increase in shading of 9,228 square feet (Table 8). This impact will result in the loss or reduction in one or more Physical and Biological Elements of critical habitat for all three species. This Action will not result in impact to spawning habitat for these species as not suitable spawning habitat for any species is present.

Removal of the 128 timber piles will benefit critical habitat as removing these piles will reduce the amount of creosote leaching into San Joaquin River and the downstream San Francisco Bay-Delta (Werme et al 2010). During the construction process, sections of solid decking currently in existence will be removed and replaced with light penetrating surfaces (grated cover) totaling 667 square feet. Following the completion of the Project, and addition of proposed structures such as the RoRo ramp, the Action will result in a net increase in shading of 9,228 sq. feet (0.20 acres). To offset impacts for shading, the Applicant will purchase 0.20 acre of mitigation at an approved bank (e.g. Liberty Island or other such appropriate bank). Following purchase of credits at an approved mitigation bank, removal of creosote piles from the

San Joaquin River, and addition of light penetrating surfaces, the Action will mitigate all direct effects on critical habitat for green sturgeon, steelhead and Delta smelt.

5.2.2 Analysis of Indirect Effects

Indirect effects are those caused by or those that will result from the proposed Action later in time or outside the Action Area, but are still reasonably certain to occur.

No creosote or other toxic substances will be introduced as part of the new wharf components. Any steel components within the splash zone of the wharf will have coatings or galvanization to protect them from corrosion. Indirect effects will not adversely affect critical habitat as a result of the Action.

5.2.3 Analysis of Interrelated and Interdependent Effects

Interrelated actions are those actions that are part of the primary action and dependent upon that primary action for their justification. The only interrelated effect anticipated would be an increase in ship traffic following completion of the wharf.

In its current state the wharf is unusable. Once the wharf is rehabilitated, it will go back into regular service. Ships which will use the wharf are of similar size to those currently traveling through the area in route to the Ports of Stockton and Sacramento. Because the San Joaquin River is already maintained as a commercial channel for the Port of Stockton, and depths are sufficient to handle the ships anticipated to call on the wharf, dredging is not anticipated to be required as a result of the Action. Therefore, it is anticipated that the only interrelated effect will be an increase in vessel traffic. The combined traffic for the Port of Stockton and Port of Sacramento is estimated to be around 350 ships per year. The number of ships estimated to use the wharf is anticipated to peak at eight vessels per month. The number of vessels already using the two major ports far exceeds the numbers of ships expected to use the wharf. Additionally multiple marinas in the vicinity harbor several hundred personal watercraft which travel through the area daily. Therefore, given the number of heavy ships entering the Port of Stockton via the San Joaquin River, and the high number of personal watercraft harbored in the vicinity, it is not anticipated that the numbers of ships using the AMPORTS facility, even at full capacity would add significantly to disturbance in the vicinity.

Interdependent actions are those actions that have no independent utility apart from the primary action. Construction, maintenance, and use of a road required to access a site is an example of an interdependent effect.

Increased boat traffic around the wharf will result as part of the Action during construction. Work boats and material barges will be used to perform the Action. Effects from the use of work boats and material barges will last for the duration of the Action. Acoustic effects from the use of work boats and material barges are anticipated to be minimal, and are adequately captured in the Action Area as depicted. No interdependent effects are expected as a result of the Action because all construction and activities are considered under the primary Action.

5.2.4 Analysis of Cumulative Effects

Cumulative effects are those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation {50 CFR §402.02}. Future dredging or new dock projects would be considered cumulative effects.

Following rehabilitation of the wharf, the number of vessels using the wharf is anticipated to increase, however this effect has been analyzed as an interrelated effect because it is dependent upon that primary action for justification. No additional dredging is required as waters along the berth side of the wharf are already sufficient depth to support berthing by large ships. There are also no currently proposed non-federal actions in the Action Area. Therefore, no cumulative effects are anticipated to occur.

6.0 DETERMINATION OF EFFECT

The cumulative SEL arising from the construction aspects of the Action is anticipated to exceed the 183 and 187 dB criteria and as such could result in harm to fish species within the Action Area. Through an analysis of the biological resources within the Action Area, the Applicant has developed avoidance and minimization measures for the Action that minimize impacts to federally-listed fish species within the Action Area. These species include: Central Valley steelhead, winter and spring-run Chinook salmon, green sturgeon, delta smelt and longfin smelt. Numerous protection measures have been incorporated into the proposed Project design. Thus, while the proposed Action may affect and is likely to adversely affect listed fish species in the Action Area, the implementation of the proposed measures described above will greatly minimize the potential impacts, including the potential for take occurring.

The Action will result in an increase in shade by 9,228 square feet and will add 220 cubic yards of in-water fill. Through the removal of creosote treated piles, use of work windows and purchase of mitigation credits, impacts to critical habitat for Central Valley steelhead, southern DPS green sturgeon, and Delta smelt are not likely to adversely modify or destroy critical habitat for these species.

Due to several factors including a lack of suitable habitat within the Action Area, it was determined that the proposed Project would not affect salt-marsh harvest mouse, San Joaquin kit fox, American peregrine falcon, bald eagle, California brown pelican, California least tern, California Ridgway's rail, Western snowy plover, Alameda whipsnake, California red-legged frog, California tiger salamander, giant garter snake, Chinook salmon – Central California Coast, Coho salmon, Callippe silverspot butterfly, conservancy fairy shrimp, Delta green ground beetle, longhorn fairy shrimp, Lange's Metalmark Butterfly, San Bruno elfin butterfly, valley elderberry longhorn beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, Antioch Dunes evening primrose Colusa grass, Contra Costa goldfields Contra Costa wallflower, Keck's checker-mallow, large-flowered fiddleneck, or. Soft bird's beak.

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Appendix A

Table of Federally-Listed Species for the Area

Appendix A. Potential for special-status plant and wildlife species to occur in the Action Area. List compiled from the California Natural Diversity Database (CDFW 2018), U.S. Fish and Wildlife Service Species Lists (2018), and California Native Plant Society Rare and Endangered Plant Inventory (CNPS 2018) database searches for the Antioch North, Antioch South, Jersey Island and Brentwood USGS 7.5-minute quadrangles.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**
Wildlife			
Mammals			
California sea lion *Zalophus californianus*	MMPA	Range from central Mexico to British Columbia, Canada. Feeds on various fish and squid. Primary breeding range is from the Channel Islands in California to Southern Mexico.	**Present.** This species is known to seasonally travel up and down the portion of San Joaquin River where the Action Area is located.
harbor Seal *Phoca vitulina*	MMPA	Broadly distributed in coastal areas of the northern hemisphere. Most significant haul-out site in south San Francisco Bay is at Mowry Slough. Pups are born in March and April in Northern California.	**Present.** This species is known to seasonally travel up and down the portion of San Joaquin River where the Action Area is located.
salt-marsh harvest mouse *Reithrodontomys raviventris*	FE	Found only in the saline emergent wetlands of San Francisco Bay and its tributaries. Pickleweed is primary habitat. Do not burrow, build loosely organized nests. Require higher areas for flood escape.	**Not Present.** No pickleweed marsh or suitable undeveloped grasslands are present to support this species.
San Joaquin kit fox *Vulpes macrotis mutica*	FE	Annual grasslands or grassy open stages with scattered shrubby vegetation. Need loose-textured sandy soils for burrowing, and suitable prey base.	**Not Present.** No grassland or other suitable open habitat is present to support this species.
Birds			
American peregrine falcon *Falco peregrinus anatum*	FD	Largely resident. Requires protected cliffs, ledges or tall manmade structures for nesting. Often associated with coasts, bays, marshes and other open expanses of water. Preys primarily upon waterbirds; forages widely.	**Unlikely.** Suitable nesting structures including high transmission towers are present in the local area. However, none of those structures are within 500 feet of the Action Area. Eucalyptus trees near the eastern edge of the Action Area are not typically used by this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**
bald eagle *Haliaeetus leucocephalus*	FD	Occurs year-round in California, but primarily a winter visitor. Nests in large trees in the vicinity of larger lakes, reservoirs and rivers. Wintering habitat somewhat more variable but usually features large concentrations of waterfowl or fish.	**Not Present.** No suitable large trees are present within the Action Area or surrounds to support nesting by this species.
California brown pelican *Pelecanus occidentalis californicus*	FD	(Nesting colony) colonial nester on coastal islands just outside the surf line. Nests on coastal islands of small to moderate size which afford immunity from attack by ground-dwelling predators.	**Not Present.** This species nests on remote and unpopulated small islands. No islands or other such offshore habitat occur within the Action Area.
California least tern *Sterna antillarum browni*	FE	Nests along the coast from San Francisco bay south to northern Baja California. Colonial breeder on bare or sparsely vegetated, flat substrates: sand beaches, alkali flats, landfills, or paved areas.	**Not Present.** No suitable sand or gravel bars are present to support nesting by this species. This species is know to nest in the vicinity and as a result may be seen foraging in waters adjacent to the Action Area.
Ridgeway's clapper rail *Rallus longirostris obsoletus*	FE	Associated with tidal salt marsh and brackish marshes supporting emergent vegetation, upland refugia, and incised tidal channels.	**Not Present.** No suitable saltmarsh or tidal marsh habitat is present to support nesting by the species.
western snowy plover *Charadrius nivosus (alexandrines) nivosus*	FT, RP	Federal listing applies only to the Pacific coastal population. Year-round resident and winter visitor. Occurs on sandy beaches, salt pond levees, and the shores of large alkali lakes. Nests on the ground, requiring sandy, gravelly or friable soils.	**Not Present.** No suitable beach or shoreline habitat is present to support nesting by this species.
Reptiles and Amphibians			
Alameda whipsnake *Masticophis lateralis euryxanthus*	FT	Inhabits chaparral and foothill-hardwood habitats in the eastern Bay Area. Prefers south-facing slopes and ravines with rock outcroppings where shrubs form a vegetative mosaic with oak trees and grasses and small mammal burrows provide basking and refuge.	**Not Present.** The Action Area is comprised of developed uplands, or open waters. No chaparral or foothill woodland is present to support this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**
California red-legged frog *Rana aurora draytonii*	FT	Associated with quiet perennial to intermittent ponds, stream pools, and wetlands. Prefers shorelines with extensive vegetation. Documented to disperse through upland habitats after rains.	**Not Present.** No suitable freshwater marsh, ponds, or other such features are present within the local area to support breeding by this species.
California tiger salamander *Ambystoma californiense*	FT	Populations in Santa Barbara and Sonoma counties currently listed as endangered; threatened in remainder of range. Inhabits grassland, oak woodland, ruderal and seasonal pool habitats. Adults are fossorial and utilize mammal burrows and other subterranean refugia. Breeding occurs primarily in vernal pools and other seasonal water features.	**Not Present.** No suitable vernal pools, stock ponds, or other such features are present within the local area to support breeding by this species. Undeveloped uplands with burrows or other suitable aestivation habitat, which is also connected to breeding habitat, is not present.
giant garter snake *Thamnophis gigas*	FT	Prefers freshwater marsh and low gradient streams. Has adapted to drainage canals and irrigation ditches. This is the most aquatic of the garter snakes in California.	**Unlikely.** No freshwater marsh, low gradient streams, vegetated canals or irrigation ditches are present to provide both aquatic habitat and thick vegetative cover.
Fish			
Chinook Salmon - California coastal ESU *Oncorhynchus tshawytscha*	FT NMFS	California Coastal Chinook Salmon ESU includes all naturally spawned populations of Chinook salmon from rivers and streams south of the Klamath River (exclusive) to the Russian River (inclusive). Adult numbers depend on pool depth and volume, amount of cover, and proximity to gravel. Water temps >27 degrees C lethal to adults.	**Not Present**. Action Area is outside of the known range for this species.
Chinook salmon - central valley spring-run ESU *Oncorhynchus tshawytscha*	FT	Occurs in the Feather River and the Sacramento River and its tributaries, including Butte, Mill, Deer, Antelope and Beegum Creeks. Adults enter the Sacramento River from late March through September. Adults migrate upstream to spawn in cool, clear, well-oxygenated streams from mid-August through early October. Juveniles migrate	**Present.** This species is known to occur in the waters adjacent to the Project Area, and the Action Area is located within designated critical habitat for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**
		soon after emergence as young-of-the-year, or remain in freshwater and migrate as yearlings.	
Chinook salmon – Sacramento winter-run ESU *Oncorhynchus tshawytscha*	FE NMFS	Occurs in the Sacramento River below Keswick Dam. Spawns in the Sacramento River but not in tributary streams. Requires clean, cold water over gravel beds with water temperatures between 6 and 14 degrees C for spawning. Adults migrate upstream to spawn in cool, clear, well-oxygenated streams. Juveniles typically migrate to the ocean soon after emergence from the gravel.	**Present.** This species is known to occur in the waters adjacent to the Project Area.
coho salmon- central California coast ESU *Oncorhynchus kisutch*	FE NMFS	Federal listing includes populations between Punta Gorda and San Lorenzo River. State listing includes populations south of San Francisco Bay only. Occurs inland and in coastal marine waters. Requires beds of loose, silt-free, coarse gravel for spawning. Also needs cover, cool water, and sufficient dissolved oxygen.	**Not Present.** This species is considered extirpated from San Francisco Bay and San Joaquin River basin.
Delta smelt *Hypomesus transpacificus*	FT	Endemic to the Sacramento-San Joaquin delta area; found in areas where salt and freshwater systems meet. It occurs seasonally in Suisun Bay, Carquinez Strait and San Pablo Bay.	**Present.** This species is known to occur in waters surrounding the Action Area (CDFW 2018b). Waters of the Action Area are also designated as critical habitat for this species.
green sturgeon *Acipenser medirostris*	FT NMFS	Anadromous. Spawns in the Sacramento and Klamath River systems. Lingering transients may be found throughout the San Francisco Bay Estuary, particularly juveniles.	**Present.** This species is known to occur in waters surrounding the Action Area. Waters of the Action Area are within the species designated critical habitat.
longfin smelt *Spirinchus thaleichthys*	FC	Found in open waters of estuaries, mostly in the middle or bottom of the water column. This species prefers salinities of 15 to 30 ppt, but can be found in completely freshwater to almost pure seawater.	**Present.** This species is known to occur in waters surrounding the Action Area (CDFW 2018b).
steelhead - central CA coast DPS	FT	Occurs from the Russian River south to Soquel Creek and Pajaro River. Also in San Francisco and San Pablo Bay Basins. Adults migrate	**Unlikely.** This species range is generally only considered to extend through San Pablo Bay (2006, 71 FR 834 - 861). Upstream of San Pablo Bay and

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**
Oncorhynchus mykiss irideus		upstream to spawn in cool, clear, well-oxygenated streams. Juveniles remain in fresh water for 1 or more years before migrating downstream to the ocean.	into the San Joaquin River steelhead are classified as the Central Valley DPS. Therefore, the range of this species is outside of the Action Area.
steelhead - central valley DPS *Oncorhynchus mykiss irideus*	FT NMFS	Includes all naturally spawned populations (and their progeny) in the Sacramento and San Joaquin Rivers and their tributaries, excluding San Francisco and San Pablo bays and their tributaries. Preferred spawning habitat is in cool to cold perennial streams with high dissolved oxygen levels and fast flowing water. Abundant riffle areas for spawning and deeper pools with sufficient riparian cover for rearing are necessary for successful breeding.	**Present.** This species is known to occur in the waters of the Project Area, and the Action Area is located within designated critical habitat for this species.
tidewater goby *Eucyclogobius newberryi*	FE	Found in the brackish waters of coastal lagoons, marshes, creeks, and estuaries. Unique among fishes of the Pacific coast, gobies are restricted to waters of low salinity in coastal wetlands. They feed along the bottom, preferring clean, shallow, slow-moving waters	**Not Present.** This species is not known to occur near the Action Area, and is considered extirpated from San Francisco Bay.
Invertebrates			
Callippe silverspot butterfly *Speyeria callippe callippe*	FE	Two populations in San Bruno mountain and the Cordelia Hills are recognized. Hostplant is Viola pedunculata, which is found on serpentine soils. Most adults found on east-facing slopes; males congregate on hilltops in search of females.	**Not Present.** No potential host plants or suitable grassland habitats are present to support the species.
conservancy fairy shrimp *Branchinecta conservatio*	FE	Endemic to the grasslands of the northern two-thirds of the Central Valley; found in large, turbid pools. Inhabit astatic pools located in swales formed by old, braided alluvium; filled by winter/spring rains, last until June.	**Not Present.** No vernal pools are present within the Action Area to support this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**
Delta green ground beetle *Elaphrus viridis*	FT	Restricted to the margins of vernal pools in the grassland area between Jepson Prairie and Travis Air Force Base. Prefers the sandy mud substrate where it slopes gently into the water, with low-growing vegetation, 25 to100% cover.	**Not Present.** No vernal pools, grasslands or other suitable natural upland habitats are present within the Action Area to support this species.
Lange's metalmark butterfly *Apodemia mormo langei*	FE	Inhabits stabilized dunes along the San Joaquin River. Endemic to Antioch Dunes, Contra Costa County. Primary host plant is *Eriogonum nudum var. auriculatum*; feeds on nectar of other wildflowers, as well as host plant.	**Present.** This species is known to inhabit the Antioch Dunes Wildlife Refuge adjacent to the Action Area. However, the known habitats occupied by this species are approximately 500 feet outside of the Action Area. In addition, no host plants, suitable nectar plants or suitable natural upland habitats are present to support the species. No reasonably foreseen interrelated or interdependent activities associated with the wharf rehabilitation would result in potential indirect effects to the butterfly. The type of operations at the site would remain largely unchanged prior to and after wharf rehabilitation. Therefore the species is unlikely to occur within the Action Area, or to be affected by operations within the Action Area, but is present in the vicinity.
longhorn fairy shrimp *Branchinecta longiantenna*	FE	Endemic to the eastern margin of the central coast mountains in seasonally astatic grassland vernal pools. Inhabit small, clear-water depressions in sandstone and clear-to-turbid clay/grass-bottomed pools in shallow swales.	**Not Present.** The Action Area is outside of the known range for this species.
San Bruno elfin butterfly *Incisalia (=Callophrys) mossii bayensis*	FE	Limited to the vicinity of San Bruno Mountain, San Mateo County. Colonies are located on in rocky outcrops and cliffs in coastal scrub habitat on steep, north-facing slopes within the fog belt. Species range is tied to the distribution of the larval host plant, Sedum spathulifolium.	**Not Present.** The Action Area is outside of the limited known distribution for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**
valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	FT	Occurs only in the central valley of California, in association with blue elderberry (*Sambucus* spp.). Prefers to lay eggs in elderberrry 2 to 8 inches in diameter; some preference shown for "stressed" elderberry.	**Not Present.** The host plant for this species is not present within the Action Area.
vernal pool fairy shrimp *Branchinecta lynchi*	FT	Endemic to the grasslands of the Central Valley, central coast mountains, and south coast mountains, in astatic rain-filled pools. Inhabit small, clear-water sandstone-depression pools and grassed swale, earth slump, or basalt-flow depression pools.	**Not Present.** No vernal pools are present within the Action Area to support this species.
vernal pool tadpole shrimp *Lepidurus packardi*	FE	Inhabits vernal pools and swales in the Sacramento Valley containing clear to highly turbid water. Pools commonly found in grass bottomed swales of unplowed grasslands. Some pools are mud-bottomed and highly turbid.	**Not Present.** No vernal pools are present within the Action Area to support this species.
Plants			
Antioch Dunes evening-primrose *Oenothera deltoides ssp. howellii*	FE	Inland dunes. Elevation ranges from 0 to 100 feet (0 to 30 meters). Blooms Mar-Sep.	**Not Present.** The Action Area is highly developed with little exposed ground or shoreline. No suitable habitat is present for this species.
Colusa grass *Neostapfia colusana*	FT	Vernal pools (adobe, large). Elevation ranges from 15 to 655 feet (5 to 200 meters). Blooms May-Aug.	**Not Present**. The Action Area is highly developed with little exposed ground or shoreline. No suitable habitat is present for this species.
Contra Costa goldfields *Lasthenia conjugens*	FE	Cismontane woodland, playas (alkaline), valley and foothill grassland, vernal pools. Elevation ranges from 0 to 1540 feet (0 to 470 meters). Blooms Mar-Jun.	**Not Present**. The Action Area is highly developed with little exposed ground or shoreline. No suitable habitat is present for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**
Contra Costa wallflower *Erysimum capitatum var. angustatum*	FE	Inland dunes. Elevation ranges from 5 to 65 feet (3 to 20 meters). Blooms Mar-Jul.	**Not Present**. The Action Area is highly developed with little exposed ground or shoreline. No suitable habitat is present for this species.
Keck's checker-mallow *Sidalcea keckii*	FE	Endemic to California and grows in relatively open areas on grassy slopes of the Sierra foothills.	**Not Present.** The Action Area is highly developed with little exposed ground or shoreline. No suitable habitat is present for this species.
large-flowered fiddleneck *Amsinckia grandiflora*	FE	Cismontane woodland, valley and foothill grassland. Elevation ranges from 885 to 1805 feet (270 to 550 meters). Blooms (Mar)Apr-May.	**Not Present**. The Action Area is highly developed with little exposed ground or shoreline. No suitable habitat is present for this species.
soft bird's-beak *Chloropyron molle ssp. molle*	FE	Marshes and swamps (coastal salt). Elevation ranges from 0 to 10 feet (0 to 3 meters). Blooms Jun-Nov.	**Not Present**. The Action Area is highly developed with little exposed ground or shoreline. No suitable habitat is present for this species.

*** Key to status codes:**

FE	Federal Endangered
FT	Federal Threatened
FD	Federal Delisted
NMFS	National Marine Fisheries Service - Species of Concern

****Potential species occurrence definitions:**

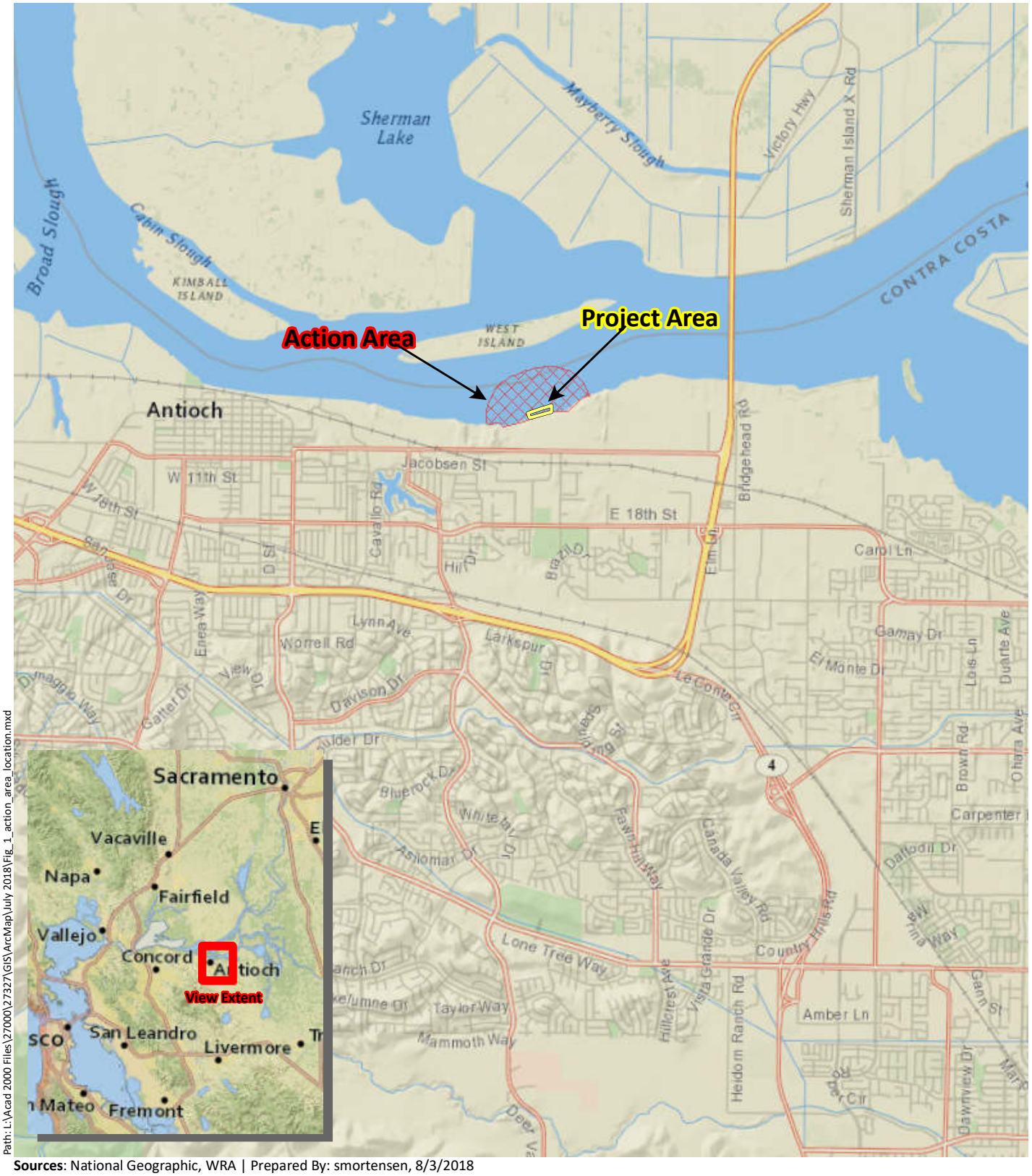
Present: Species is observed on the site or has been recorded (i.e., CNDDB, other reports) on the site recently.

Not Present. Habitat on and adjacent to the site is clearly unsuitable for the species requirements (foraging, breeding, cover, substrate, elevation, hydrology, plant community, site history, disturbance regime).

Unlikely. Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species has a low probability of being found on the site.

Appendix B

Figures



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Sources: National Geographic, WRA | Prepared By: smortensen, 8/3/2018

Figure 1. Action Area Location

AMPORTS Berth Rehabilitation
Contra Costa County, California

0 1 2 Miles

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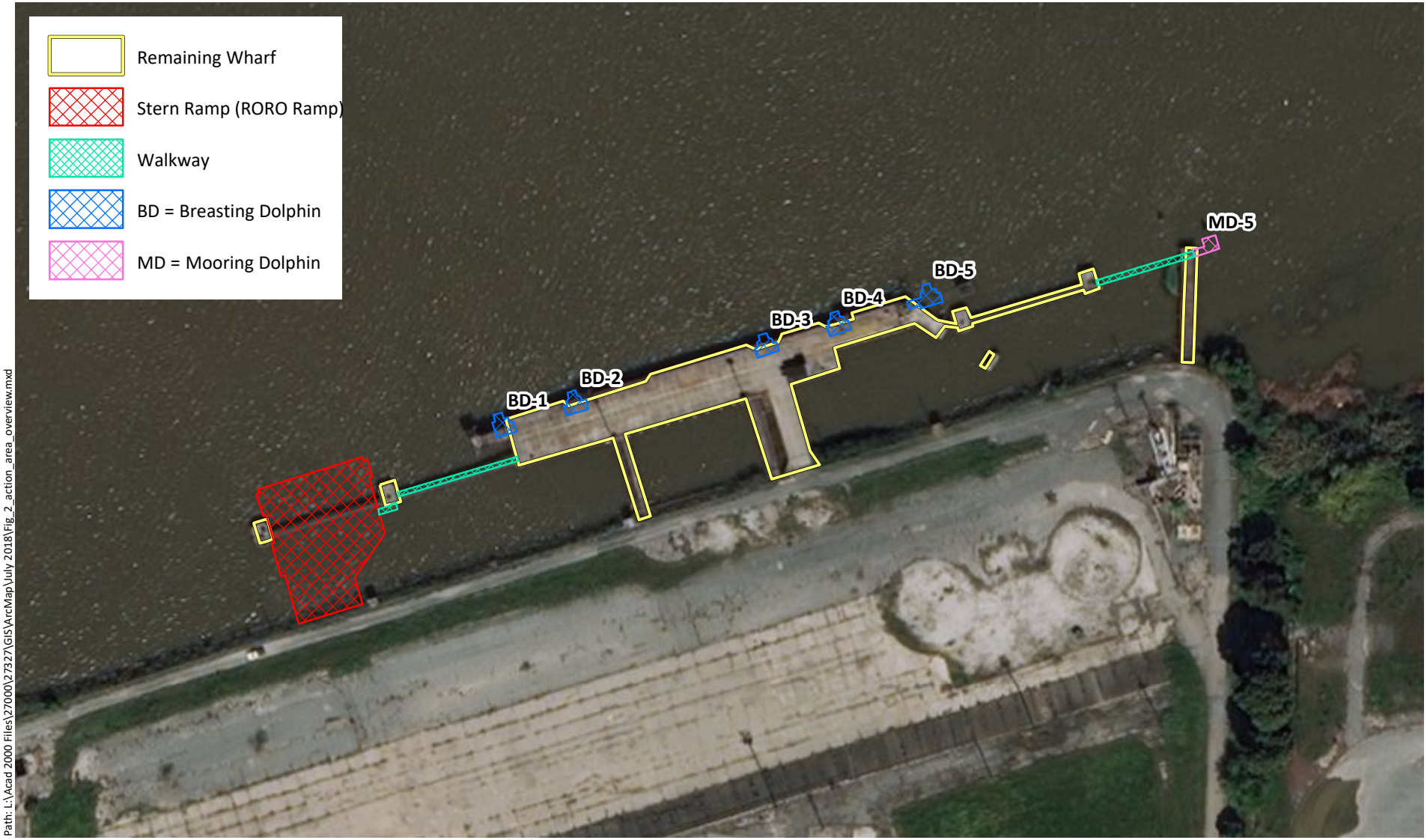
ENVIRONMENTAL CONSULTANTS



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Sources: Esri Streaming - NAIP 2016, WRA | Prepared By: mweidenbach, 11/30/2018

Figure 2. Project Overview

Fassier Avenue Residential Project
Supplemental Environmental Impact Report
Pacifica, California

0 200 400 Feet

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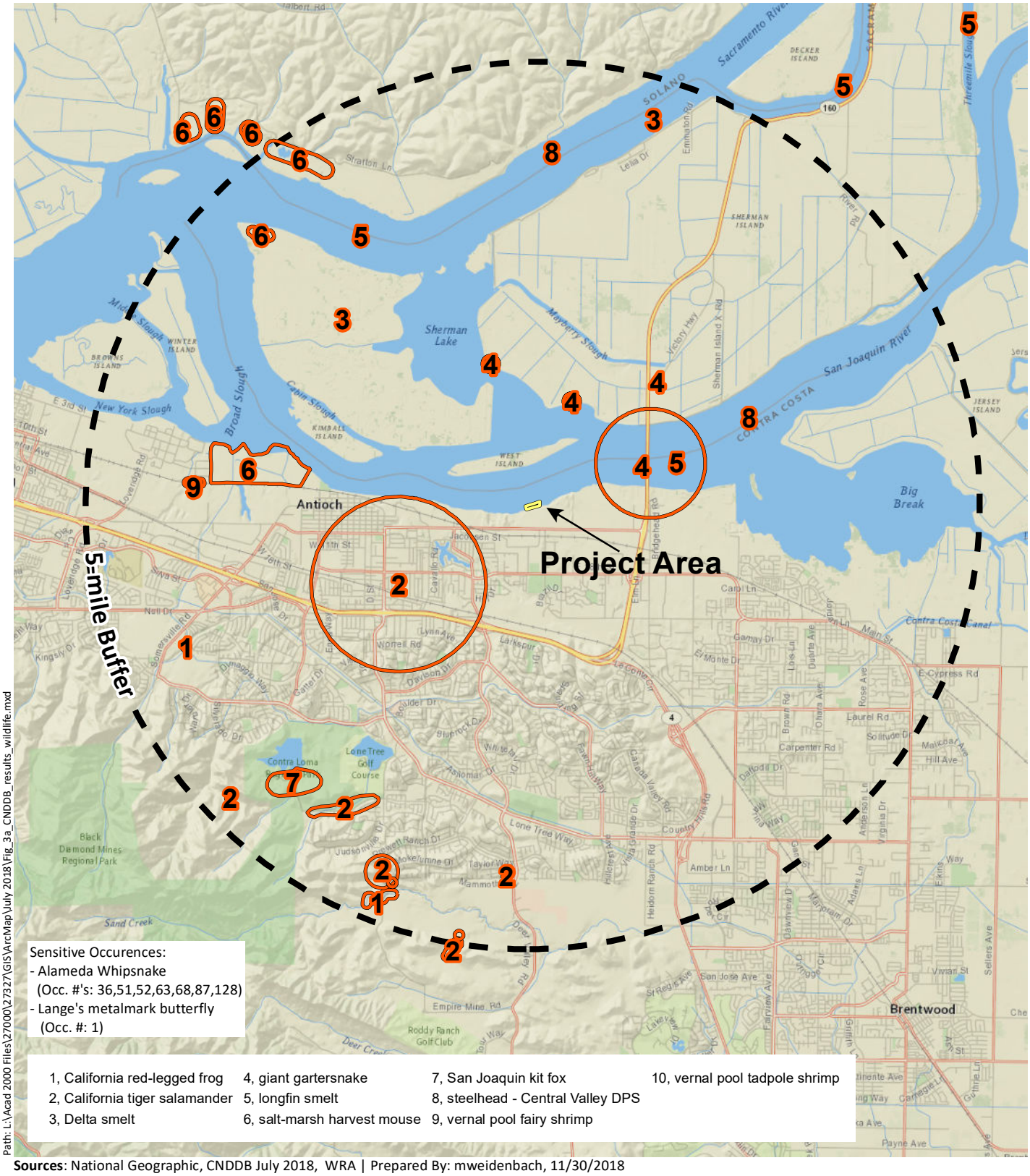
ENVIRONMENTAL CONSULTANTS



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Sources: National Geographic, CNDDB July 2018, WRA | Prepared By: mweidenbach, 11/30/2018

Figure 3a. California Natural Diversity Database Results Wildlife

AMPORTS Wharf Replacement
Contra Costa County, California

0 1 2 Miles

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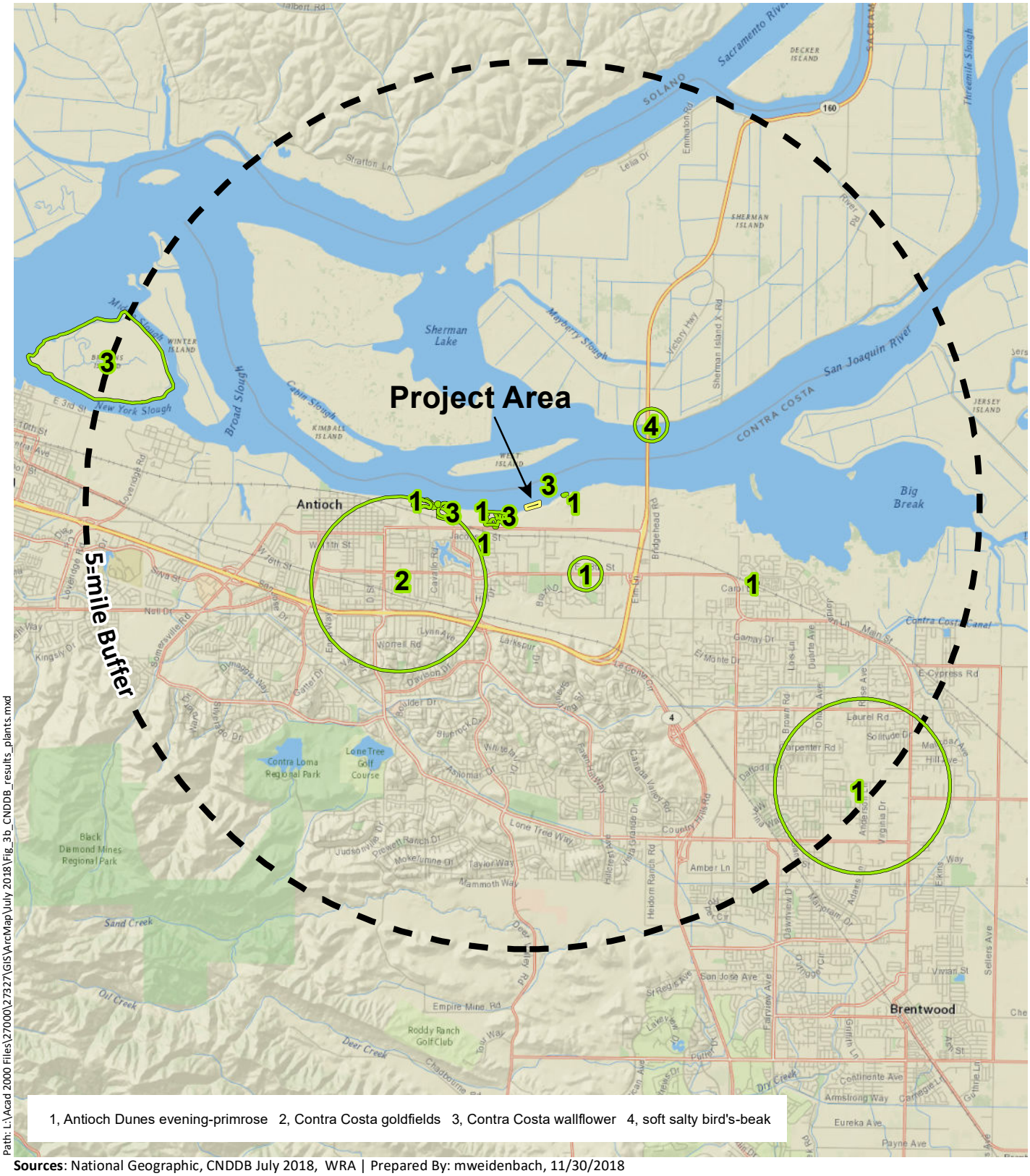
ENVIRONMENTAL CONSULTANTS



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Sources: National Geographic, CNDDB July 2018, WRA | Prepared By: mweidenbach, 11/30/2018

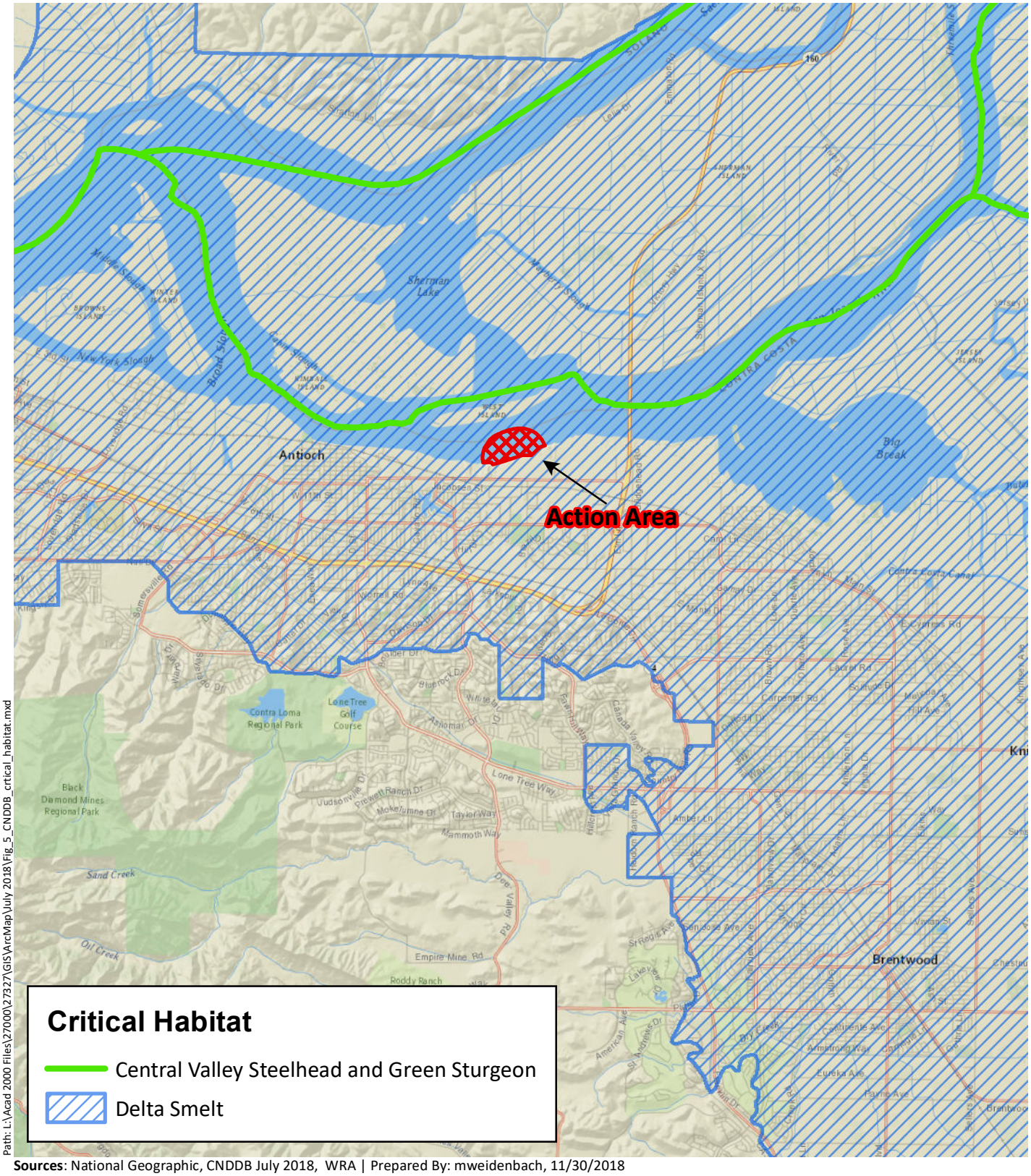
Figure 3b. California Natural Diversity Database Results Plants

AMPORTS Wharf Replacement
Contra Costa County, California

0 1 2 Miles

N

ENVIRONMENTAL CONSULTANTS



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Sources: National Geographic, CNDDB July 2018, WRA | Prepared By: mweidenbach, 11/30/2018

Figure 4. Critical Habitat within the Action Area

AMPORTS Wharf Replacement
Contra Costa County, California

0 1 2 Miles

N

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ENVIRONMENTAL CONSULTANTS

Sources: National Geographic, CNDDB July 2018, WRA | Prepared By: mweidenbach, 12/2/2018

Figure 5. Hydroacoustic Action Area

AMPORTS Wharf Replacement
Contra Costa County, California

0 0.5 1 Miles

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ENVIRONMENTAL CONSULTANTS

Appendix C

Plans Plans

AMPORTS

2301 - 2603 WILBUR AVENUE
ANTIOCH, CA 94509

ANTIOCH WHARF - PULP TO RORO BERTH CONVERSION PROJECT

DRAWING LIST

DRAWING NUMBER	DATE	DESCRIPTION
S-00	2-05-18	TITLE SHEET, DRAWING LIST
S-01	2-05-18	VICINITY MAP
S-02	2-05-18	USGS TOPOGRAPHIC MAP
S-03	2-05-18	OVERALL SITE PLAN WITH MAJOR FEATURES (EXISTING)
S-04	2-05-18	WHARF DEMOLITION DRAWING
S-05	2-05-18	OVERALL SITE PLAN WITH NEW FEATURES
S-06	2-05-18	NEW PILE PLAN
S-07	2-05-18	STERN RAMP SECTION
S-08	2-05-18	BREASTING DOLPHIN S1,2,3 AND 4
S-09	2-05-18	BREASTING DOLPHIN 5
S-10	2-05-18	MOORING DOLPHIN
S-11	2-05-18	WALKWAY SECTION
S-12	2-05-18	WALKWAY SECTION
S-13	2-05-18	WALKWAY ELEVATION
S-14	2-05-18	STRUCTURAL REPAIRS PILE SLEEVE

DRAWING BY: COWI
1300 Clay Street, 7th Floor
Oakland, CA 94612
Tel.: 510.839.8972
Fax: 510.839.9715
Website: www.cowi-na.com

CONTACT: JAMES KEARNEY, PE
(510)267-7170

DATUM: MLLW

TITLE SHEET AND DRAWING LIST

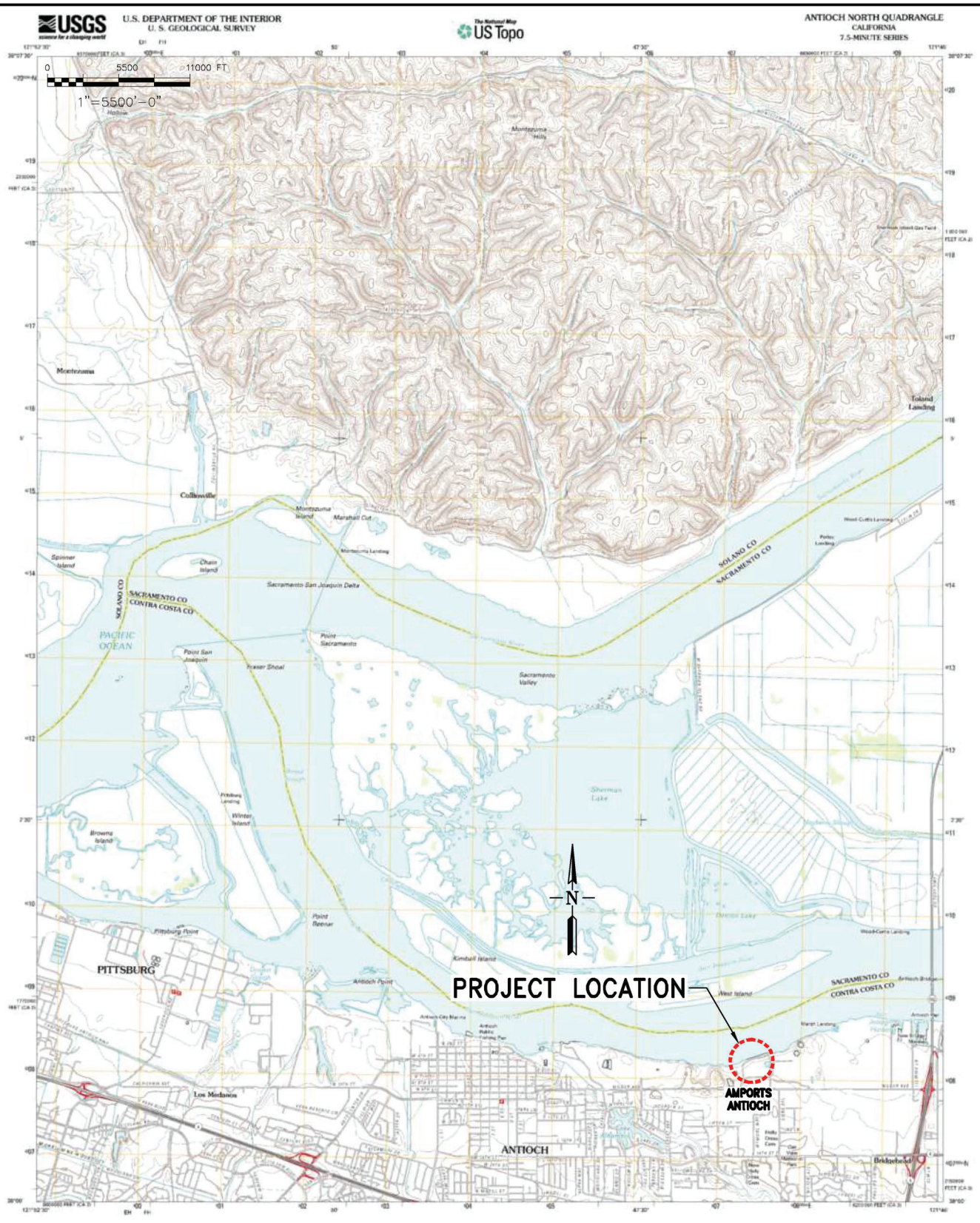
NOT TO SCALE

AMPORTS
2301-2603 WILBUR AVENUE
ANTIOCH, CA 94509

ANTIOCH WHARF - PULP TO RORO BERTH CONVERSION PROJECT

SHEET S-00 | DATE: 2-05-18

DRAWING BY: COWI 1300 Clay Street, 7th Floor Oakland, CA 94612 Tel.: 510.839.8972 Fax: 510.839.9715 Website: www.cowi-na.com	VICINITY MAP	ANTIOCH WHARF - PULP TO RORO BERTH CONVERSION PROJECT
CONTACT: JAMES KEARNEY, PE (510)267-7170	SCALE: 1"=12000'	
DATUM: MLLW	**AMPORTS** 2301-2603 WILBUR AVENUE ANTIOCH, CA 94509	SHEET S-01 DATE: 2-05-18



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CONTACT: JAMES KEARNEY, PE
(510)267-7170

DATUM: MLLW

USGS TOPOGRAPHIC MAP

AS SHOWN

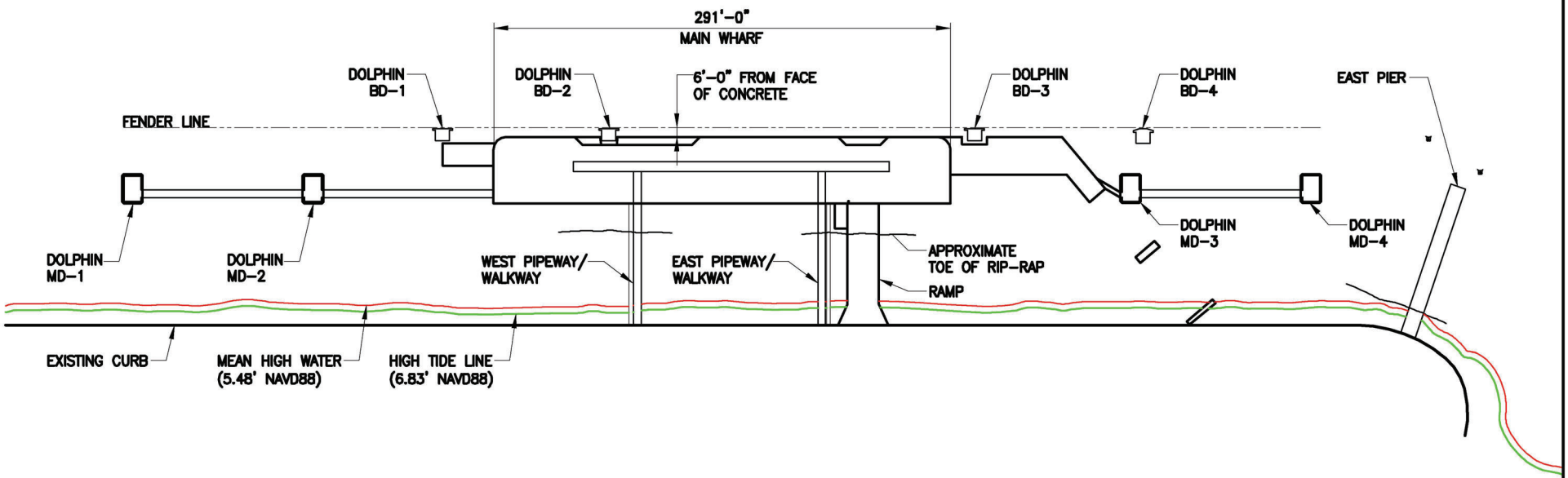
AMPORTS
2301-2603 WILBUR AVENUE
ANTIOCH, CA 94509

ANTIOCH WHARF - PULP TO RORO BERTH CONVERSION PROJECT

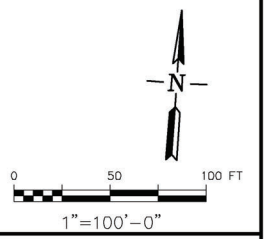
SHEET **S-02**

DATE: **2-05-18**

FILE LOCATION: O:\A100000\A104500\ADMIN\SIC 300\A104500-PERMIT SET\A104500-AMPORTS-S02-PERMITDWG DATE: 2/5/2018 7:53:56 AM DRAFTSPERSON: JULIUS BACNILO



1 — OVERALL SITE PLAN WITH MAJOR FEATURES (EXISTING)
1"=100'-0"



1"=100'-0"

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CONTACT: JAMES KEARNEY, PE
(510)267-7170

DATUM: MLLW

OVERALL SITE PLAN WITH MAJOR FEATURES (EXISTING)

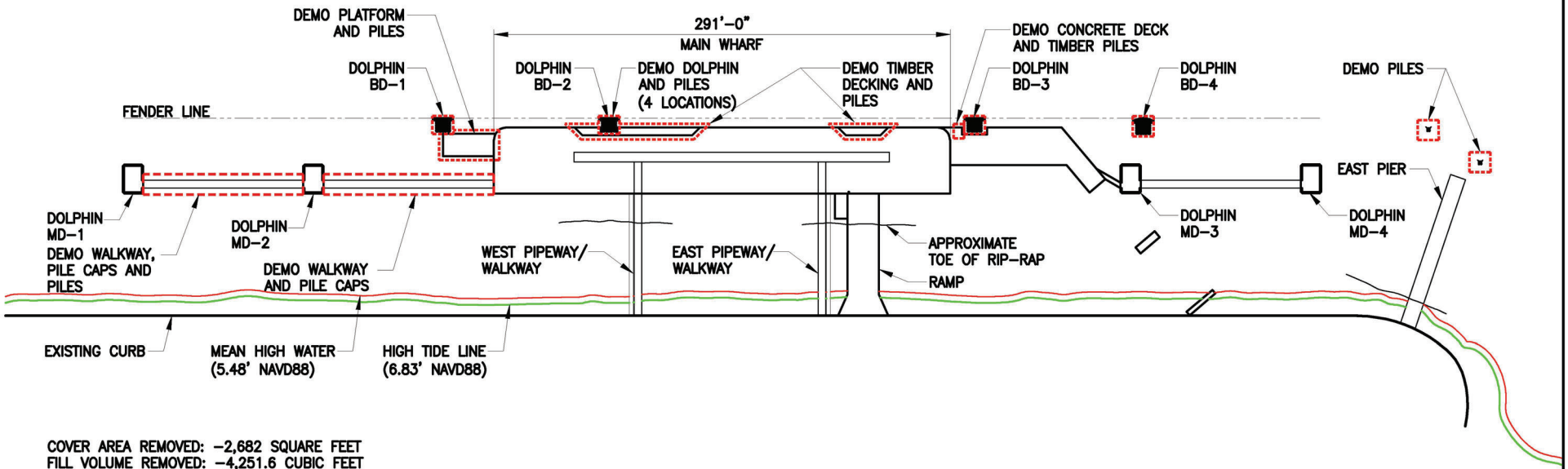
SCALE: 1"=100'

AMPORTS
2301-2603 WILBUR AVENUE
ANTIOCH, CA 94509

ANTIOCH WHARF - PULP TO RORO BERTH CONVERSION PROJECT

SHEET S-03

DATE: 2-05-18



COVER AREA REMOVED: –2,682 SQUARE FEET
FILL VOLUME REMOVED: –4,251.6 CUBIC FEET

SEE NEXT SHEET, S–05, FOR NEW COVER, FILL AND NET CHANGES.

1 – WHARF DEMOLITION PLAN
1"=100'–0"

0 50 100 FT
1"=100'–0"

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DATUM: MLLW

WHARF DEMOLITION DRAWING

SCALE: 1"=100'

AMPORTS
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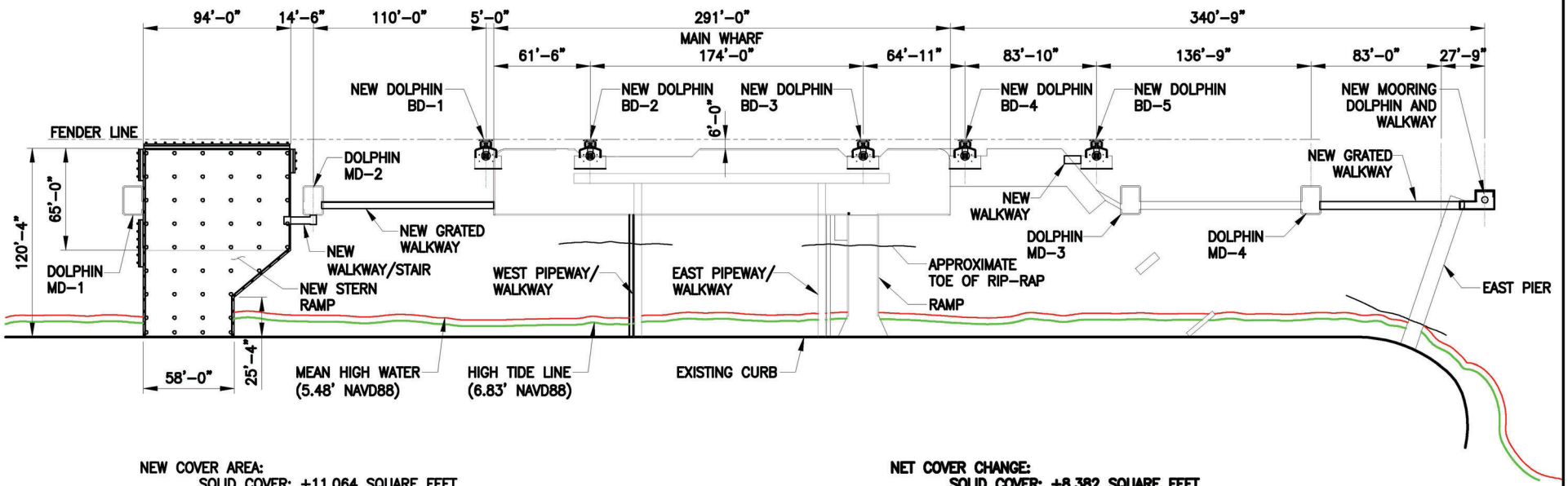
ANTIOCH, CA 94509

ANTIOCH WHARF - PULP TO RORO BERTH CONVERSION PROJECT

SHEET S–04

DATE: **2–05–18**



NEW COVER AREA:
SOLID COVER: +11,064 SQUARE FEET
GRATING COVER: +557 SQUARE FEET

NEW FILL VOLUME: +10,090 CUBIC FEET

NET COVER CHANGE:
SOLID COVER: +8,382 SQUARE FEET
GRATING COVER: +557 SQUARE FEET

NET FILL CHANGE: +5,838 CUBIC FEET

N

1 — OVERALL SITE PLAN WITH NEW FEATURES
1"=100'-0"

0 50 100 FT
1"=100'-0"

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DATUM: MLLW

OVERALL SITE PLAN WITH NEW FEATURES

SCALE: 1"=100'

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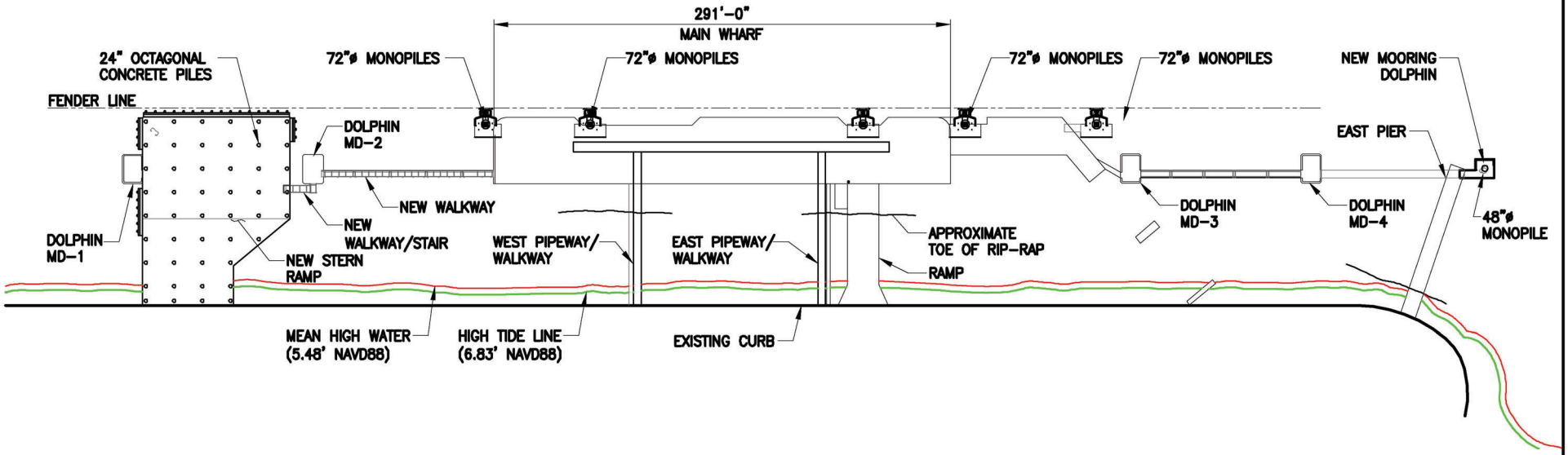
ANTIOCH WHARF - PULP TO RORO BERTH CONVERSION PROJECT

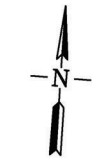
SHEET S-05

DATE: **2-05-18**

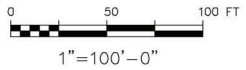


NOTE:

COAT STEEL PILES WITH 1 COAT WASSER MC-ZINC AND 2 COATS WASSER MC-TAR.



1 / – NEW PILE PLAN
1"=100'-0"



1"=100'-0"

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DATUM: MLLW

NEW PILE PLAN

SCALE: 1"=100'

AMPORTS
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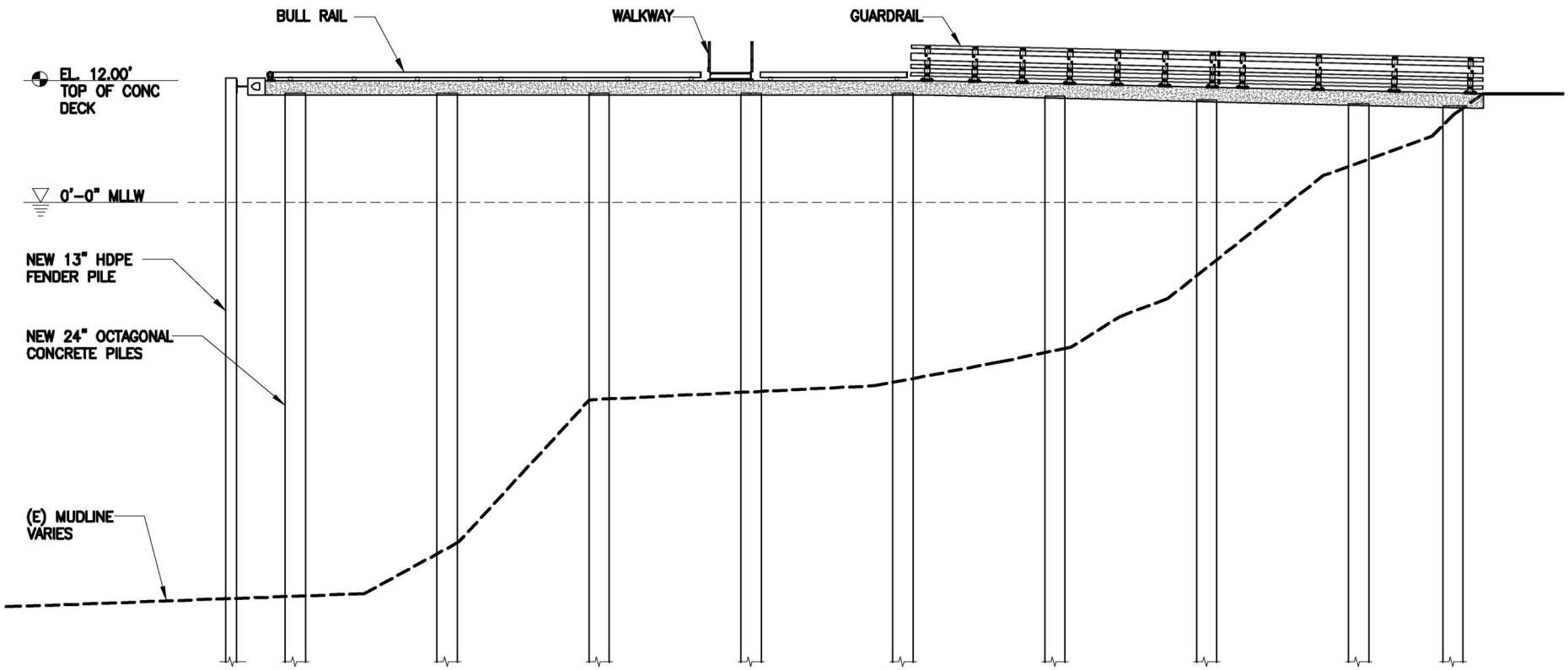
ANTIOCH, CA 94509

ANTIOCH WHARF - PULP TO RORO BERTH CONVERSION PROJECT

SHEET S-06

DATE: 2-05-18



0 4 8 12 16 FT

1/8"=1'-0"

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DATUM: MLLW

STERN RAMP SECTION

SCALE: 1/8"=1'-0"

AMPORTS
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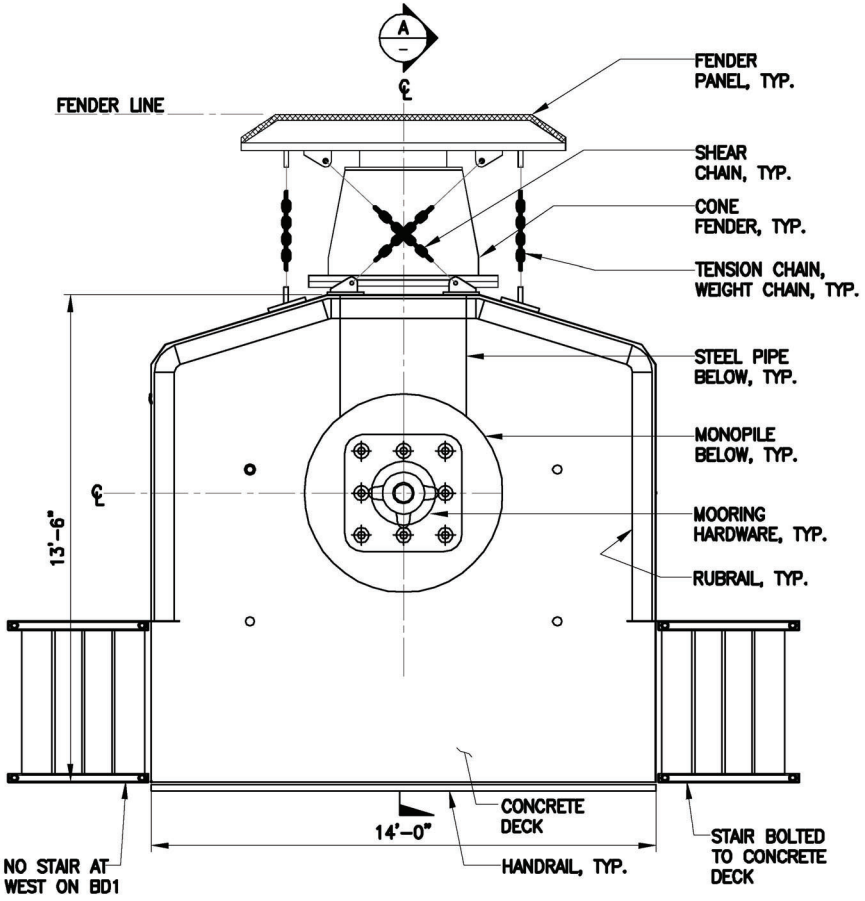
ANTIOCH, CA 94509

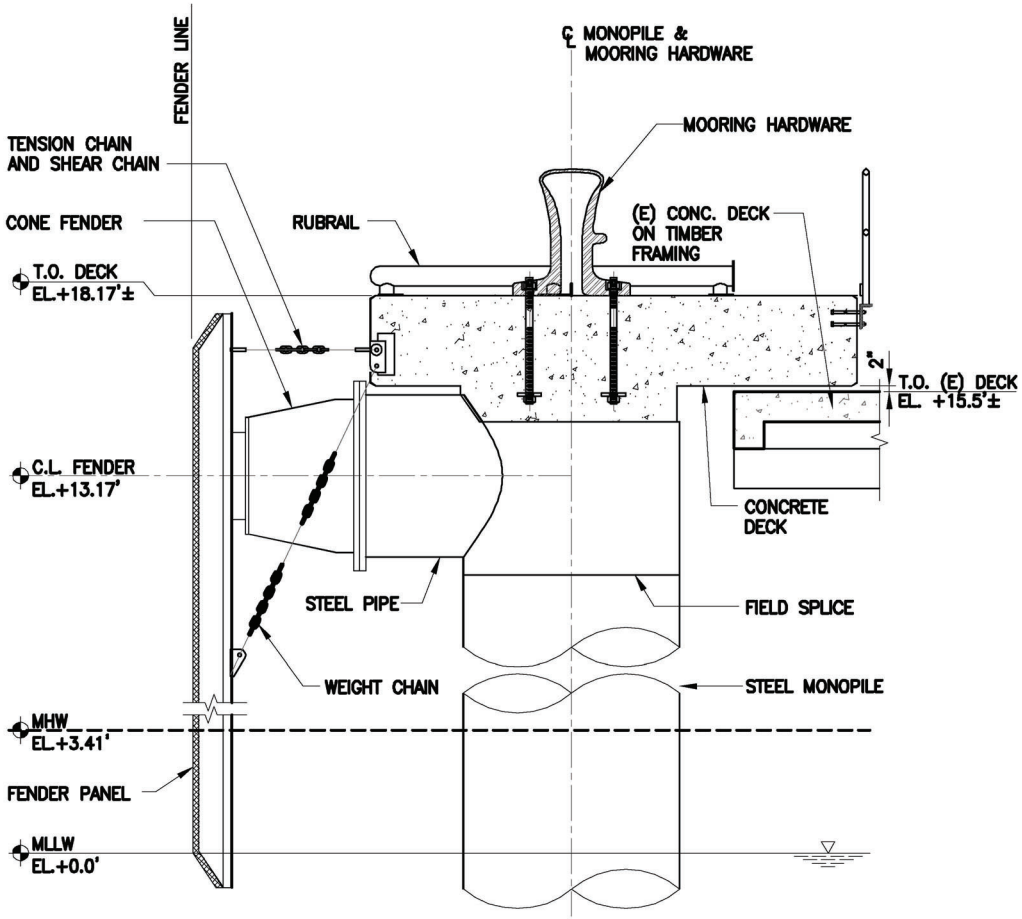
ANTIOCH WHARF - PULP TO RORO BERTH CONVERSION PROJECT

SHEET **S-07**

DATE: **2-05-18**



1 / – BREASTING DOLPHIN PLAN
3/16"=1'-0"



A / – BREASTING DOLPHIN SECTION
3/16"=1'-0"

0 3 6 9 12 FT
3/16"=1'-0"

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DATUM: MLLW

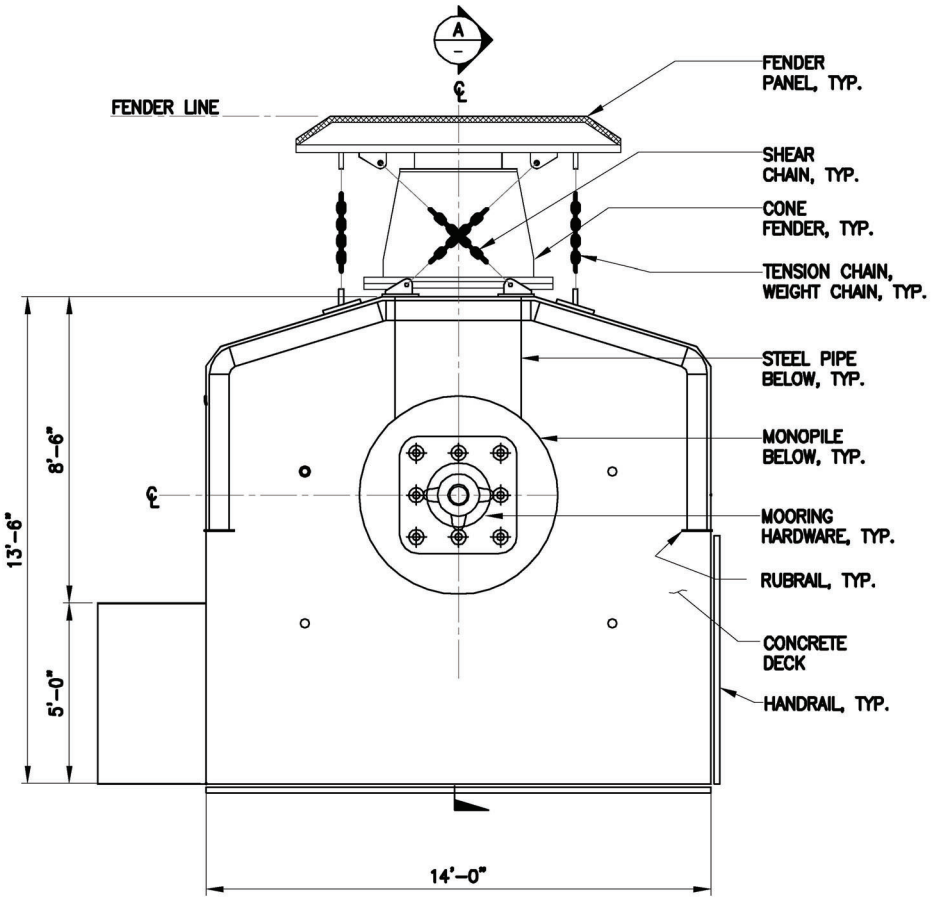
BREASTING DOLPHIN S1, 2, 3, AND 4

SCALE: 3/16"=1'-0"

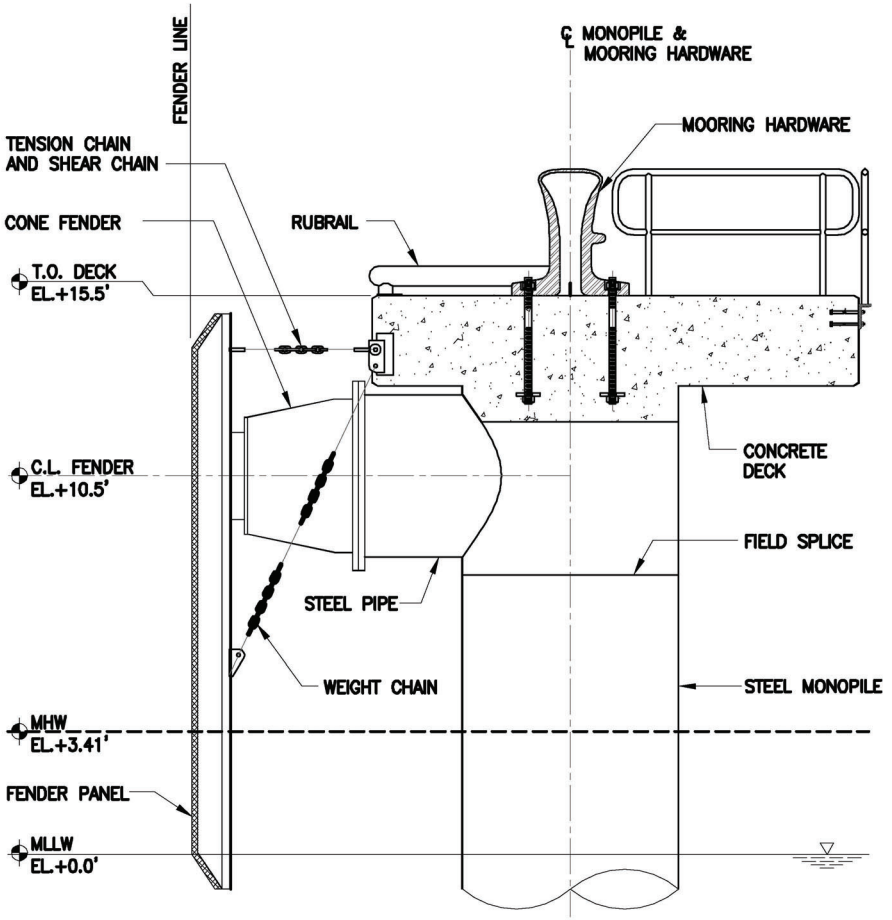
AMPORTS
2301-2603 WILBUR AVENUE
ANTIOCH, CA 94509

ANTIOCH WHARF - PULP TO RORO BERTH CONVERSION PROJECT

SHEET S–08 | DATE: 2–05–18



1 / – BREASTING DOLPHIN PLAN
3/16"=1'-0"



A / – BREASTING DOLPHIN SECTION
3/16"=1'-0"

0 3 6 9 12 FT
3/16"=1'-0"

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DATUM: MLLW

BREASTING DOLPHIN 5

SCALE: 3/16"=1'-0"

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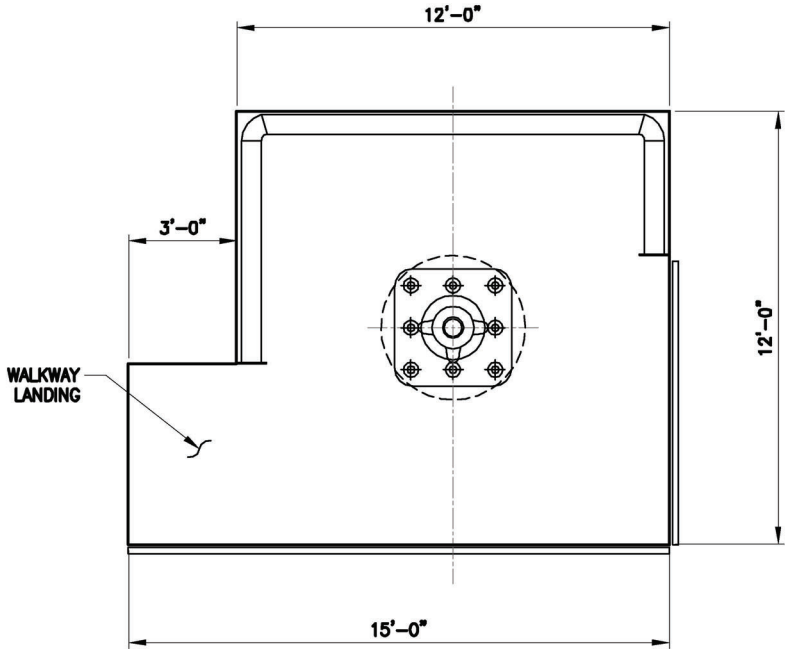
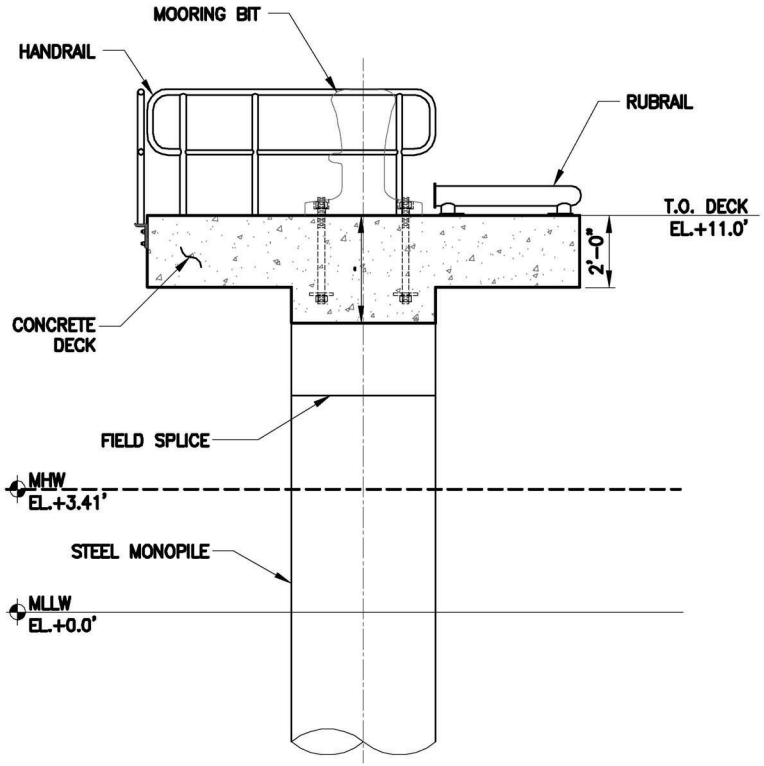
ANTIOCH WHARF - PULP TO RORO BERTH CONVERSION PROJECT

SHEET S–09

DATE: 2–05–18



1 / – MOORING DOLPHIN PLAN
3/16"=1'-0"



A / – MOORING DOLPHIN ELEVATION
3/16"=1'-0"

0 3 6 9 12 FT
3/16"=1'-0"

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DATUM: MLLW

MOORING DOLPHIN

SCALE: 3/16"=1'-0"

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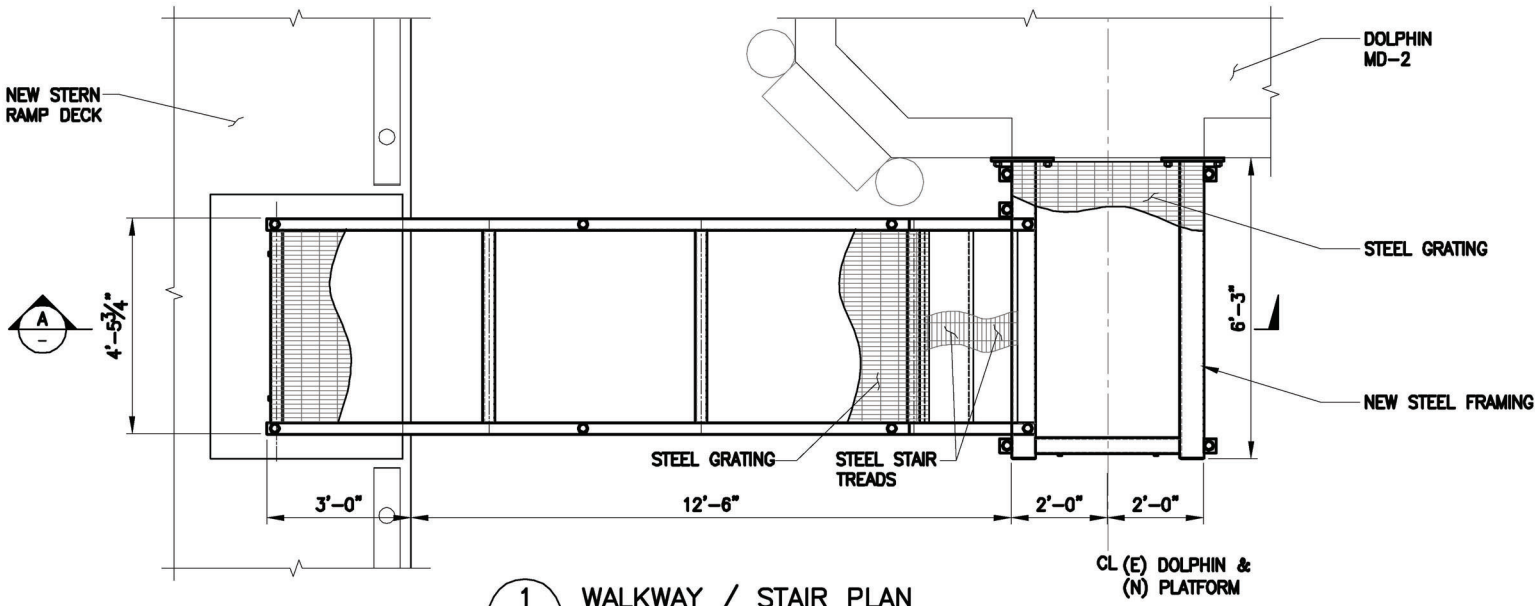
ANTIOCH, CA 94509

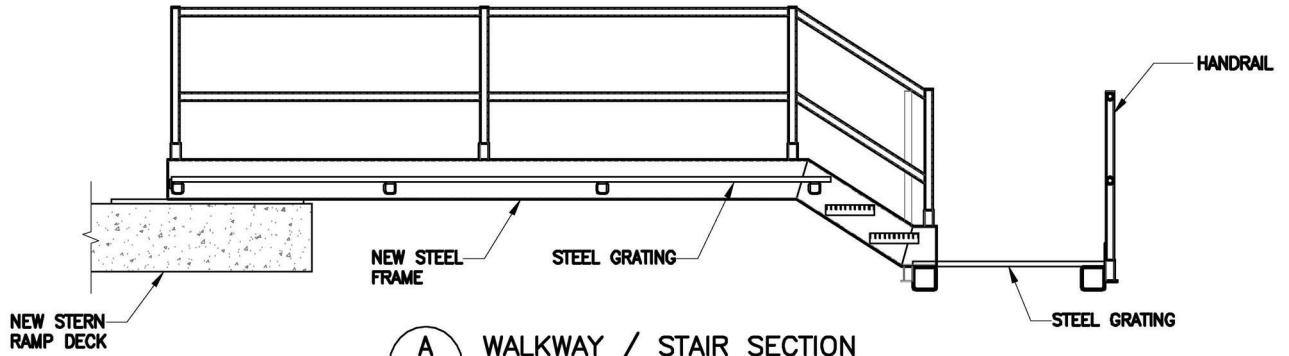
ANTIOCH WHARF - PULP TO RORO BERTH CONVERSION PROJECT

SHEET S-10

DATE: **2-05-18**



1 — WALKWAY / STAIR PLAN
1/4"=1'-0"



A — WALKWAY / STAIR SECTION
1/4"=1'-0"

0 2 4 6 8 FT
¼"=1'-0"

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DATUM: MLLW

WALKWAY SECTION

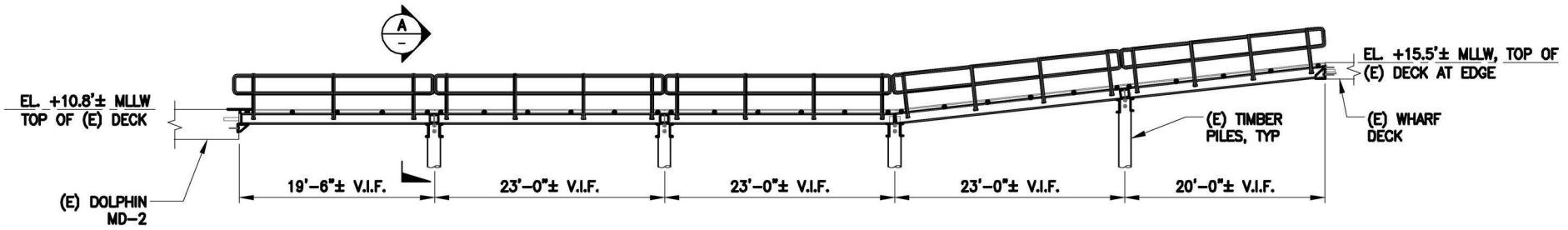
SCALE: AS SHOWN

AMPORTS
2301-2603 WILBUR AVENUE
ANTIOCH, CA 94509

ANTIOCH WHARF - PULP TO RORO BERTH CONVERSION PROJECT

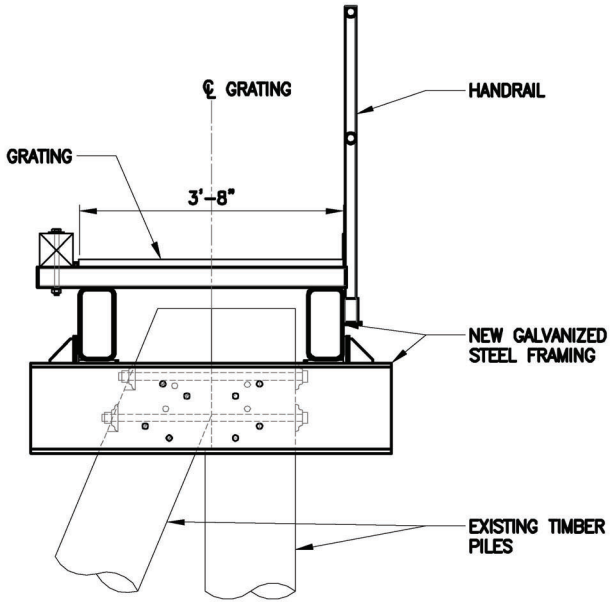
SHEET S-11

DATE: **2-05-18**



1 – GRATED WALKWAY ELEVATION

1/16"=1'-0"



A – WALKWAY SECTION

1/16"=1'-0"

0 2 4 6 8 FT

¼"=1'-0"

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(510)267-7170

DATUM: MLLW

WALKWAY SECTION

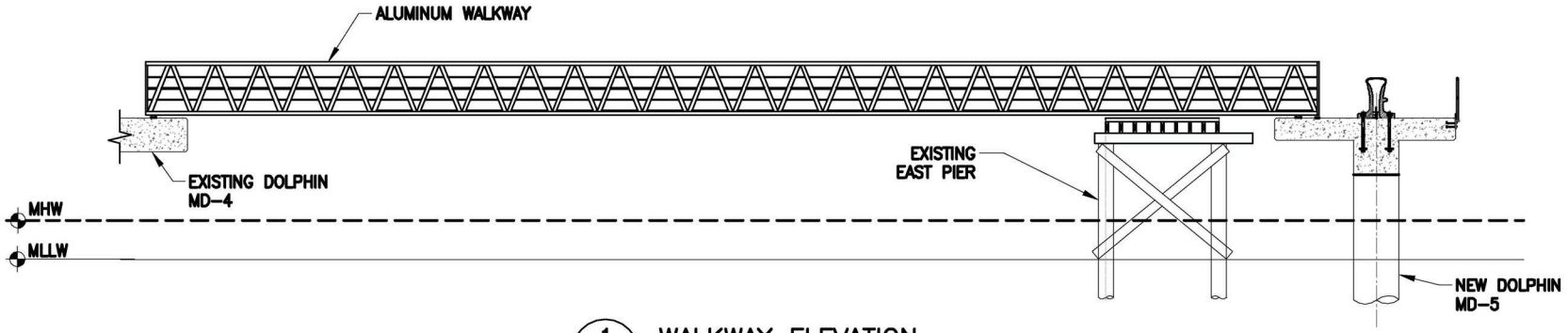
SCALE: AS SHOWN

AMPORTS
2301-2603 WILBUR AVENUE
ANTIOCH, CA 94509

ANTIOCH WHARF - PULP TO RORO BERTH CONVERSION PROJECT

SHEET S-12

DATE: **2-05-18**



1 / – WALKWAY ELEVATION

1/16"=1'–0"

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(510)267–7170

DATUM: MLLW

WALKWAY ELEVATION

SCALE: AS SHOWN

AMPORTS
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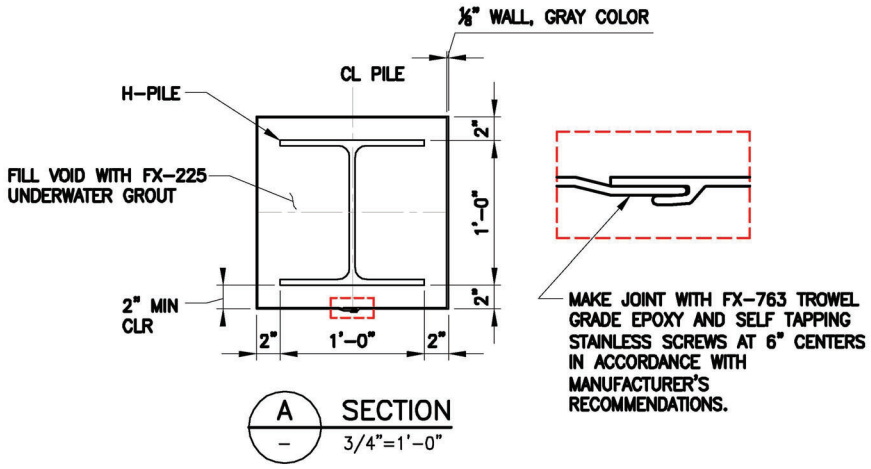
ANTIOCH, CA 94509

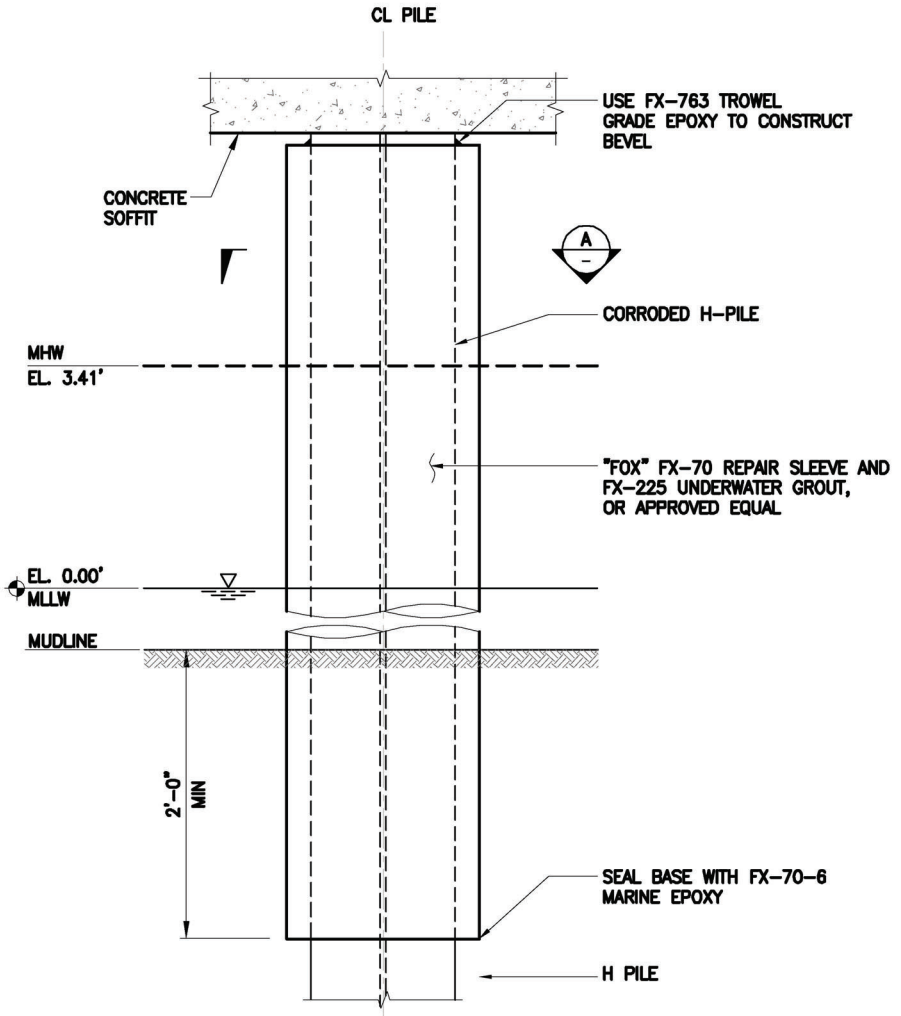
ANTIOCH WHARF - PULP TO RORO BERTH CONVERSION PROJECT

SHEET S–13

DATE: **2–05–18**



A / – SECTION
3/4"=1'-0"



1 / – ELEVATION – PILE REPAIR: SLEEVE
3/4"=1'-0"

0 1 2 3 FT
3/4"=1'-0"

NOTES:

1. INSTALL SLEEVE AT PILE.
2. CLEAN PILE OF MARINE GROWTH AND DELETERIOUS MATERIALS.
3. INSTALL SLEEVE AROUND PILE EXTENDING 2' INTO MUDLINE AND MAKE JOINT. USE STANDOFFS TO ACHIEVE 2" ANNULUS
4. INSTALL FX-70-6 MARINE EPOXY IN BOTTOM 4" OF ANNULUS. CURE.
5. INSTALL FX-225 UNDERWATER GROUT. HOLD BACK 6" FROM TOP.
6. INSTALL FX-763 TROWEL GRADE EPOXY AT TOP 6".

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(510)267-7170

DATUM: MLLW

STRUCTURAL REPAIRS
PILE SLEEVE

SCALE: AS SHOWN

AMPORTS
2301-2603 WILBUR AVENUE
ANTIOCH, CA 94509

ANTIOCH WHARF - PULP TO RORO BERTH CONVERSION PROJECT

SHEET S-14

DATE: 2-05-18

Appendix D

NMFS Pile Driving Calculations

Project Title	AMPORTS Wharf Rehabilitation
Pile information (size, type, number, pile strikes, etc.)	72- inch steel shell pile. 1,600 strikes.

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**206**	**176**	**188**	**150**
Distance (m)	**10**	**10**	**10**	

Estimated number of strikes	**1600**

Cumulative SEL at measured distance
208.04

	Distance (m) to threshold			
	Onset of Physical Injury			Behavior
	Peak	Cumulative SEL dB**		RMS
	dB	Fish ≥ 2 g	Fish < 2 g	dB
Transmission loss constant (15 if unknown)	206	187	183	150
15	**10**	**253**	**467**	**3415**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

Illingworth and Rodkin 2017. Final Acoustic Monitoring Report for GP Antioch Wharf Project.

Project Title	
Pile information (size, type, number, pile strikes, etc.)	24-inch octagonal concrete. Assume 500 strikes per pile to set.

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**186**	**163**	**174**	**150**
Distance (m)	**10**	**10**	**10**	

Estimated number of strikes	**500**

Cumulative SEL at measured distance
189.99

	Distance (m) to threshold			
	Onset of Physical Injury			Behavior
	Peak	Cumulative SEL dB**		RMS
	dB	Fish ≥ 2 g	Fish < 2 g	dB
Transmission loss constant (15 if unknown)	206	187	183	150
15	**0**	**16**	**29**	**398**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

Appendix E

EFH Assessment

Supplemental Essential Fish Habitat Information for AMPORTS Antioch Berth Conversion

The proposed Project is located within an area designated as Essential Fish Habitat (EFH) for three Fishery Management Plans (FMPs); the Coastal Pelagic Species, Pacific Groundfish, and Pacific Salmon Management Plans. Details of the location, purpose, and description of the proposed Project, along with minimization and avoidance measures, are discussed in the Biological Assessment (BA). A table of EFH within the Action Area identified in the BA, and the anticipated effect is provided below.

Essential Fish Habitat	Effect Determination
Coastal Pelagic Species	Not Likely to Destroy or Adversely Modify
Pacific Groundfish	Not Likely to Destroy or Adversely Modify
Pacific Salmon	Not Likely to Destroy or Adversely Modify

Background

The Magnuson-Stevens Act (as amended by the Sustainable Fisheries Act) requires FMPs to "describe and identify essential fish habitat …, minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat" (§303(a)(7)). The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." NMFS interpreted this definition in its regulations as follows: "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means "the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem"; and "spawning, breeding, feeding, or growth to maturity" covers the full life cycle of a species (§303(a)(7)). A brief description of each FMP for the Action Area is provided below.

The Pacific Coast Groundfish FMP manages 90-plus species over a large and ecologically diverse area (PFMC 2011a). EFH for Pacific Coast Groundfish is defined as the aquatic habitat necessary to allow for groundfish production to support long-term sustainable fisheries for groundfish and a healthy ecosystem.

The Coastal Pelagic Species fishery includes four finfish Pacific sardine (*Sardinops sagax*), Pacific [chub] mackerel (*Scomber australasicus*), northern anchovy (*Engraulis mordax*), and jack mackerel (*Trachurus symmetricus*), along with invertebrates, market squid (*Loligo opalescens*) and all krill (*Euphausiacea* spp) species that occur in the U.S. West Coast exclusive economic zone (EEZ) (PFMC 2011b). EFH for Coastal Pelagic Species includes all marine and estuarine waters from the shoreline along the coasts of California, Oregon, and Washington offshore to the limits of the EEZ and above the thermocline where sea surface temperatures range between 10˚C to 26˚C (PFMC 2011b). The Coastal Pelagic Species FMP also includes two Ecosystem Component Species; jacksmelt (*Atherinopsis californiensis*) and Pacific herring (*Clupea pallasii*).

The Pacific salmon FMP covers two species in California; Chinook salmon (*Oncorhynchus tshawytscha*) and coho salmon (*O. kisutch*). EFH for Pacific salmon means those waters and

substrates necessary for production needed for a health ecosystem and support a sustainable fishery.

Analysis of Effects to EFH

Direct Effects

Direct effects are those effects caused directly by the proposed Action that occur on-site within the Action Area and during Action implementation, i.e., ground disturbance within the Action Area.

The Action will remove existing creosote treated pilings and will rehabilitate the current wharf structure to support a RORO ramp as well as new breasting dolphins and mooring dolphins. Addition of the RORO ramp and rehabilitation of existing structures will increase overwater structures, thereby increasing overwater shading. New overwater structures will be supported by steel and concrete piles. The new piles as well as overwater structures associated with the berth conversion will result in a permanent increase in shading of 9,228 square feet (0.21 acre) with an increase of 220 cubic yards of fill (BA Table 3 and 4). To mitigate the effects of shading and fill, the Action will purchase mitigation credits at an approved bank such as Liberty Island. Any effects caused by shading will be fully offset by the purchase of mitigation credits. In addition, the removal of creosote piles and retrofitting of the wharf with light penetrating structures will further provide beneficial effects to EFH, helping to offset any impacts. The purchase of mitigation credits, combined with the beneficial effects of removing creosote treated piles, and replacing solid structure with light penetrating surfaces will fully mitigate for impacts to EFH, resulting in no loss, reduction, or change in habitat features or functions for the three EFH FMPs.

Indirect Effect

Indirect effects are those caused by or those that will result from the proposed Action later in time, but are still reasonably certain to occur.

The impact of sea-level rise over the functional lifespan of the berth has been evaluated with the Project design, and is not anticipated to affect the berth. Additionally, steel components within the splash zone of the berth will have coatings or galvanization to protect them from corrosion. Indirect effects will not adversely affect EFH as a result of the Project.

Interrelated and Interdependent Effects

Interrelated actions are those actions that are part of the primary action and dependent upon that primary action for their justification. The only interrelated effect anticipated would be an increase in ship traffic following completion of the wharf.

In its current state the wharf is unusable. Once the wharf is rehabilitated, it will go back into regular service. Ships which will use the wharf are of similar size to those currently traveling through the area in route to the Ports of Stockton and Sacramento. Because the San Joaquin River is already maintained as a commercial channel for the Port of Stockton, and depths are sufficient to handle the ships anticipated to call on the wharf, dredging is not anticipated to be required as a result of the Action. Therefore, it is anticipated that the only interrelated effect will be an increase in vessel traffic. The combined traffic for the Port of Stockton and Port of Sacramento is estimated to be around 350 ships per year. The number of ships estimated to use the wharf is anticipated to peak at eight vessels per month. The number of vessels already using the two major ports far exceeds the numbers of ships expected to use the wharf. Additionally multiple marinas in the vicinity harbor several hundred personal watercraft which travel through

the area daily. Therefore, given the number of heavy ships entering the Port of Stockton via the San Joaquin River, and the high number of personal watercraft harbored in the vicinity, it is not anticipated that the numbers of ships using the AMPORTS facility, even at full capacity would add significantly to disturbance of EFH.

Interdependent actions are those actions that have no independent utility apart from the primary action. Construction, maintenance, and use of a road required to access a site is an example of an interdependent effect.

Increased boat traffic around the wharf will result as part of the Action during construction. Work boats and material barges will be used to perform the Action. Effects from the use of work boats and material barges will last for the duration of the Action. Acoustic effects from the use of work boats and material barges are anticipated to be minimal, and are adequately captured in the Action Area as depicted. No interdependent effects are expected as a result of the Action because all construction activities are considered under the primary Action.

Cumulative Effects

Cumulative effects are those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation {50 CFR §402.02}. Future dredging or new dock projects would be considered cumulative effects.

Following rehabilitation of the wharf, the number of vessels using the wharf is anticipated to increase, however this effect has been analyzed as an interrelated effect because it is dependent upon that primary action for justification. No additional dredging is required as waters along the berth side of the wharf are already sufficient depth to support berthing by large ships. There are also no currently proposed non-federal actions in the Action Area. Therefore, no cumulative effects are anticipated to occur.

Conclusion

The Action will result in an increase in shading and fill around the berth. However, between the removal of creosote piles, addition of light penetrating surfaces, and purchase of mitigation credits, any effects from increased shading would be mitigated. Following mitigation there will be no adverse change in habitat type or function for EFH as a result of the Action. Furthermore, the Action is not likely to destroy or adversely modify EFH.