REGIONAL BIOLOGICAL ASSESSMENT FOR ‘MINIMAL THREAT’ FLOOD CONTROL ROUTINE MAINTENANCE ACTIVITIES

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SECTION 1
Introduction

1.1 Project Purpose and Need

San Francisco Bay Area flood control agencies perform numerous routine maintenance activities. Many of these activities fall under the jurisdiction of the U. S. Army Corps of Engineers (Corps) and the San Francisco Regional Water Quality Control Board (SFBRWQCB) as well as the California Department of Fish and Game (CDFG) and the Bay Conservation and Development Commission (BCDC). Although nationwide permits, under Section 404 of the Clean Water Act, exist for many activities, flood control agencies must apply for permits for nearly every activity. The result is an expenditure of time and resources that do not necessarily constitute an effective way of complying with the Clean Water Act, Endangered Species Act, or protecting the resources themselves. To improve the situation, the Operational Permits Committee (OPC), a subcommittee of the Bay Area Stormwater Management Agencies Association (BASMAA) is seeking a Regional General Permit (RGP) from the Corps for certain routine flood control maintenance activities that pose a minimal threat to water quality and no permanent loss or significant temporal loss of wetland or riparian habitat in terms of acreage, function, and value. These activities are collectively termed “Minimal Threat Activities for Flood Control Maintenance” and constitute the OPC Program under review. For convenience they will be referred to in this document as the OPC Program.

1.2 OPC History and Programs

In June of 2000 the OPC, on behalf of BASMAA, published the Flood Control Maintenance Best Management Practices Manual (BMP Manual) with the goal of avoiding or reducing impacts to natural resources. The comprehensive BMP Manual (OPC, 2000) is considered a work in progress, but as of the date of application for the RGP represents the state of the art for doing flood control work and consistently minimizing impacts. In the introduction to the manual, the OPC states “permits and/or approvals from federal, state or local regulatory authorities may be required to perform the work” to which the BMPs apply, and the current effort, this Regional Biological Assessment (RBA), is the OPC Program’s most significant step to obtain such permits for all of its member agencies.

1.3 Project Information (Project Sponsors)

The RGP proposes to cover six Bay Area jurisdictions: Alameda County, Zone 7 in eastern Alameda County, Contra Costa County (excluding the eastern portion), Eastern Marin County, Southern Sonoma County (the portion draining to San Pablo Bay), Fairfield, and Vallejo (see Figure 1). These are the project sponsors for the purposes of this RBA.
Insert Figure 1 – Project Area
Figure 1
Project Area
1.4 Purpose of this Document

The purpose of this Regional Biological Assessment (RBA) is to review the OPC’s flood control minimal threat maintenance activities (the OPC Program) to be covered by the RGP in sufficient detail to determine the extent to which the OPC Program may affect any federal threatened, endangered, proposed, or candidate species, or federal species of concern. This RBA is prepared in accordance with legal requirements set forth under Section 7 of the Federal Endangered Species Act (FESA) (16 United States Code 1536 [c]). This law requires federal agencies, in consultation with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), to ensure that “any action authorized, funded, or carried out by such agency…is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of (critical) habitat.”

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1 This RBA is a federal document. However, it is intended to be consistent with California Fish and Game Code Section 2053, which states in part “…it is the policy of this state and the intent of the Legislature that reasonable and prudent alternatives shall be developed by the department, together with the project proponent and the state lead agency, consistent with conserving the species, while at the same time maintaining the project purpose to the greatest extent possible.”
1.5 Threatened, Endangered, Proposed Threatened, Proposed Endangered, or other Species Covered in this RBA

The OPC and its consultant (ESA) considered a comprehensive suite of species (see Appendix A) in its determination of those which are listed (or might be reasonably expected to be listed during the term of the permit) and which may be affected by the OPC Program. This RBA covers most, if not all, listed aquatic, wetland, riparian and upland species that could occur within the geographic area covered by the RGP and is subject to impacts from minimal threat flood control activities. These species, collectively termed special-status species, and grouped by habitat, are:

**Riparian/Freshwater Marsh**
- California red-legged frog
- Valley elderberry longhorn beetle
- Kenwood Marsh checkermallow
- California tiger salamander

**Riverine (Aquatic)**
- California freshwater shrimp
- Delta smelt
- Steelhead – central California coast DPS

**Tidal Wetland/Mudflat**
- California clapper rail
- California least tern
- Western snowy tern
- Salt marsh harvest mouse
- Palmate-bracted bird’s beak
- Soft bird’s beak
- Suisun thistle
- California black rail
- Suisun song sparrow
- Suisun ornate shrew
- Salt marsh wandering shrew

**Upland Habitats**
- Vernal pool fairy shrimp
- Vernal pool tadpole shrimp
- Valley elderberry longhorn beetle
- California tiger salamander
- Burke’s goldfields
- Contra Costa goldfields
- Contra Costa wallflower
- Palmate-bracted bird’s beak
- Showy Indian clover
- White-rayed pentachaeta
- Yellow larkspur
- Swainson’s hawk
- Western burrowing owl

To develop the above special-status species list from Appendix A, the OPC and ESA conducted an iterative process that consisted of the following:

- A relatively broad search of the USGS quadrangles\(^2\) and the counties was conducted using the California Natural Diversity Database (CNDDB) and the California Native Plant Society (CNPS) Electronic Inventory.
- Additional species information was solicited from the USFWS (2002) and NMFS (2002).
- Location data for special-status species was projected on the USGS quads covering the RBA project area using ArcInfo GIS.
- Location data of flood control facilities was projected on the USGS special-status species quads.

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\(^2\) For a list of the USGS quadrangles, see Table 2 page 20.
• ESA biologists and botanists reviewed Appendix A and the location data for special-status species and flood control facilities to "filter out" any species that occur exclusively outside the project area, or occurring exclusively within habitat types that would not be affected by routine creek maintenance activities.

1.6 Critical Habitat

Critical Habitat (CH) has been designated for the following subset of the species listed in Section 1.5. Those with CH units designated within the project area shown on Figure 1 are in bold text:

- California red-legged frog
- Valley elderberry longhorn beetle
- California tiger salamander
- Western snowy plover
- Delta smelt
- Steelhead – central California coast DPS

- Vernal pool fairy shrimp
- Vernal pool tadpole shrimp
- Valley elderberry longhorn beetle
- Contra Costa wallflower
- Yellow larkspur

The project will not result in the destruction or adverse modification of CH for these species (as defined by the CH “primary constituent elements” when published in the Federal Register). As described in Section 2.0, the OPC Program only authorizes actions whose effects are either extremely unlikely or are insignificant with respect to “take” of either species or habitats. Critical habitat will not be analyzed further in this RBA.

1.7 Consultation to Date

The OPC has been working on developing a regional approach to managing routine flood control activities since the late 1990s. Molly Martindale, Corps, has been a constant federal representative on the OPC since that time. Another constant presence has been representatives from the SFBRWQCB (i.e., Larry Kolb, Keith Lichten, Bill Hurley, or Marla Lafer). As the OPC developed products, such as the BMP Manual and the draft training outline, other resource agencies, such as NMFS (Gary Stern and Miles Croom) and CDFG (Mike Rugg, NOTE TO REVIEWERS: WHO ELSE FROM CDFG WAS INVOLVED IN THESE EARLIER EFFORTS? ONLY CDFG WAS LISTED IN THE BMP MANUAL. WAS USFWS INVOLVED IN THE DRAFTING OF THE TRAINING OUTLINE OR OTHER EFFORTS?) contributed to these products.

Beginning in 2000, the OPC started developing the OPC Program (i.e., “Minimal Threat Activities for Flood Control Maintenance”) and has since worked with Ms Martindale, Mr. Hurley, Ms. Lafer, Maura Eagan Moody (NMFS), Cecilia Brown (USFWS), Eric Tattersall, Scott Wilson, Greg Martinelli, and Marcia Grefsrud (CDFG), and Bob Batha (BCDC). These individuals have reviewed the OPC Program, draft outlines of this RBA, draft avoidance and minimization measures, draft special management area figures, and draft tables 3 and 4 at various OPC meetings since 2000 and more specifically during 2004 to 2005 (e.g., June 3, 2004). As part of this consultation with the agencies, ESA explained the methodology used to develop the
species list noted in Section 1.5. Agency comments were incorporated to the extent feasible in this RBA and into the OPC Program.
SECTION 2
Description of the Proposed Action

2.1 Project Objectives

As noted in Section 1, San Francisco Bay Area flood control agencies perform routine maintenance of their facilities. The objective of this RBA is to demonstrate that a suite of selected “minimal threat” flood control maintenance activities pose either “no effect” or may “have an effect but are not likely to adversely affect” covered species. The RBA would form the basis for an RGP from the Corps, which will provide regulatory relief to the agencies while ensuring the Corps, USFWS, and NMFS, that species are being considered and protected as OPC Program activities are developed and implemented. In addition, the RBA may also be used by the SFBRWQCB, CDFG and BCDC in issuing permits for the work outlined in the RGP.

To demonstrate that the selected routine flood control maintenance activities authorized by the RGP are not likely to adversely affect listed species, they must meet the following effect criteria:

1) Discountable – these effects are extremely unlikely to occur; or
2) Insignificant – these effects relate to the scale of the impacts, which would not reach the scale where a take could occur.

In other words, an activity would have to demonstrate that, based on best professional judgment, a person would (1) not reasonably expect discountable effects to occur; or, (2) be able to meaningfully measure, detect, or evaluate effects of the activities listed in the RGP and conclude that they are insignificant.

2.2 Applicability of the RGP

Upon issuance of the RGP, member agencies would be required to document the following steps before and after implementation of routine maintenance activities covered by the RGP:

1) Determine that the activity is within the area covered by the RGP;
2) Determine that it is feasible to complete the proposed activity using routine methods also covered by the RGP;
3) Assess the potential to adversely affect special-status species and provide either (a) rationale for why the project would have no adverse effect, or (b) identify the protective measures to be employed during maintenance using the BMP Manual as a guideline, or
(c) identify other measures proposed in this RBA that may be implemented, according to the conditions of the RGP; and

4) If impacts could occur, quantify the impacts using an appropriate measure, such as acres, square feet, or linear feet of affected habitat, numbers of affected individuals, or duration of disturbance. The assessment would be documented in a standardized format and forwarded to the Corps, SFBRWQCB, CDFG, and BCDC for record-keeping (see Section 2.3).

2.3 Maintenance of the RGP

Occurrences of special status species and sensitive habitats are continuously updated by the California Natural Diversity Data Base (CNDDDB) maintained by the CDFG and the updated databases are usually made available annually. New occurrences could be located within the action area of the OPC Program, and could affect project planning. Similarly, changes in the protected status of species (i.e., listing of a species as threatened or endangered) also would result in changed conditions that could affect future planning of maintenance activities within the RGP area. To proactively prevent the data from becoming obsolete, the OPC will contact CDFG, USFWS and NMFS annually, either directly or through its consultant, to obtain updated information, and will add the information to the BMP Manual for future reference when planning projects covered by the RGP.

The project sponsors would submit a report consisting primarily of the individual assessments of maintenance activities, accompanied by an evaluation of the efficacy of any measures implemented in previous years. The annual report also would include the project sponsors predictions of maintenance activities for the following year. Sections 2.5.8 and 2.5.9 provide additional detail on monitoring and reporting.

It is anticipated that regulatory agencies would audit the records upon expiration of the RGP (most likely after five years), and annually, to determine that the thresholds of allowable activities have not been exceeded, and that the objectives of protecting, avoiding or mitigating special-status species have been met. Depending on the outcome of the review, the RBA may be updated, revised or extended in support of re-issuance of the RGP.

2.4 Project Location

Figure 2 displays the major streams (USGS “blueline”) within the jurisdictions of the OPC agencies. These may be viewed as the major features receiving floodwater from the participating agencies, and the location of most of the habitats which will be affected. The balance of the action area is the tributaries to these drainages, natural and artificial, and the adjacent riparian areas and uplands.
Insert Figure 2
Waterways in Project Area

a.k.a. ‘Major Streams Within the Jurisdictions of the OPC’
a.k.a. ‘Project Area With Labelled Blueline Streams’
2.5 Description of the Activities Included in the RGP

This section outlines the types of routine flood control maintenance activities that typically have minimal impact on water quality and wetlands or habitat when appropriate Best Management Practices (BMPs) are applied. In this RBA, these activities constitute the “project” for consultation with the USFWS and NMFS.

These channel maintenance activities are grouped into five categories: 1) sediment and debris removal, 2) vegetation management, 3) maintenance of structures, 4) bank stabilization, and 5) temporary water diversions. With implementation of appropriate BMPs, and pursuant to the conditions specified below and in Section 4, these activities will be considered minimal threat where there is no permanent loss or significant temporal loss of wetland or riparian habitat in terms of acreage, function, and value. A significant temporal loss or impact is defined as one that causes substantial or potentially substantial adverse change in the quantity and/or quality of the habitat at the project site.

Only the project sponsors which have adequately trained their maintenance crews and project engineers would be eligible for coverage under the RGP. The BMP Manual is extensive and is submitted as a companion document to this RBA. This section builds on the BMP Manual to focus on those routine flood control maintenance activities and activity specific conditions, which will be the authorized under the RGP. All of the information below is presented in tabular form as Table 1 at the end of this section.

2.5.1 General Conditions (Applicable to All Activities)

1) Appropriate BMPs shall be incorporated into each project to minimize the resuspension and discharge of sediments and other pollutants downstream.

2) Sediment and debris removed from a channel must be handled, stored and disposed of in accordance with applicable regulatory requirements (e.g., dredge material should never be temporarily stockpiled without adequate containment, and there should be no discharge of sediment laden water from storage impoundments in violation of applicable water quality standards).

3) Existing stream and riparian habitat such as pools, riffles and wetlands shall be protected to the maximum extent. Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. The channel and banks shall be stabilized as necessary through use of appropriate post-construction BMPs, including the successful reestablishment of native vegetation as appropriate, to enhance fish and wildlife habitat values, and to prevent and control erosion and sedimentation.

4) Appropriate post-construction BMPs shall be implemented to prevent channel erosion or destabilization.

5) A California Department of Fish and Game (CDFG) Stream Bed Alteration Agreement or routine maintenance MOU shall be obtained prior to the initiation of any construction activities in the channel, unless: 1) the project proponent has an equivalent agreement with
CDFG, or 2) CDFG has determined that a Stream Bed Alteration Agreement is not required for the project.

6) Decant water (nuisance water) that results from excavation shall be pumped from the project area using appropriate BMPs to prevent turbidity levels in the receiving water that exceed San Francisco Bay Basin Plan water quality objectives.

2.5.2 Prohibitions (Applicable to All Activities)

1) There shall be no permanent loss or significant temporal loss of wetland or riparian habitat in terms of acreage, function, or value.

2) Endangered, threatened, rare, and candidate species habitat shall not be adversely impacted by maintenance activities.

3) No heavy equipment shall be operated in stream channels where there is flowing or standing water.

4) No debris, soil, silt, sand, cement, concrete, or washings thereof, or other construction related materials or wastes, oil or petroleum products or other organic or earthen material shall be allowed to enter into or be placed where it may be washed by rainfall or runoff into waters of the State. When operations are completed, any excess material shall be removed from the work area and any areas adjacent to the work area where such material may be washed into waters of the State.

5) There shall be no significant tree or shrub removal except as necessary to maintain channel stability or where applicable, design capacity. There shall be no permanent channel alteration resulting from channel maintenance activities.

6) No materials deleterious to fish or wildlife shall be permitted to enter waters of the State.

7) Activities shall not result in any permanent barriers to upstream or downstream migration of anadromous fish.

8) Activities shall not result in greater than minimal impacts to water quality standards as described in the San Francisco Bay Basin Plan.

2.5.3 Sediment and Debris Removal Activities

2.5.3.1 Removal of sediment and debris from a lined concrete channel for the purpose of maintaining the channel’s design flow.

Activity Specific Conditions

1) This activity is limited to 3,000 linear feet of a watercourse, once per year.¹

¹ 3,000 linear feet is the distance commonly specified by CDFG in sediment removal routine maintenance MOUs for major Bay Area flood control districts.
2.5.3.2 Removal of sediment and debris from engineered in-channel siltation basins.

Activity Specific Conditions

1) This activity is limited to basins less than two acres.

2.5.3.3 Removal of debris from a natural channel.

Activity Specific Conditions

1) Delineate work area.

2) Retain woody material unless a structure, design flow, or access is compromised.

[NOTE TO REVIEWERS: FOR THE ACTIVITY SPECIFIC CONDITIONS FOR 2.5.3.3, I COPIED THE CONDITIONS FROM THE CCC RMA APPLICATION FROM MAY(?) 2004. NONE OF THE DRAFT ‘MINIMAL THREAT’ DOCS I POSSESS HAVE CONDITIONS. ‘DELINATE WORK AREA’ IS VAGUE AND NEEDS TO HAVE AN ACREAGE OR LINEAR FEET LIMIT ADDED.]

2.5.4 Vegetation Management

2.5.4.1 Cutting and removing vegetation above the ground by hand or low impact mechanical means which does not result in incidental fill of waters. Such vegetation control methods include: a) Hand removal or pruning of aquatic and terrestrial woody vegetation by use of loppers, hand saws, chainsaws, weed eaters and other tools; and, b) Repeat disturbance by mowing, or mulching of woody vegetation.

Activity Specific Conditions

1) This activity shall neither substantially disturb vegetation root systems nor involve mechanized pushing, dragging, or similar activities that redeposit excavated soil material.

2) This activity does not include the use of dozers, loaders, excavators and other heavy tracked or rubber-tired equipment.

3) Vegetation management and debris removal activities shall minimize disturbance of the channel banks and bottom, and shall not result in erosion or additional sedimentation of the channel.

4) Where feasible, vegetation management should consist of pruning trees and shrubs to remove lower brushy growth and encourage higher canopy development.

5) In engineered channels, vegetation management shall not exceed that necessary to accommodate the design flows.

6) Vegetation management shall be conducted to meet the objective of flood capacity while maximizing the shade, erosion control, water quality, and habitat functions of the vegetation.
2.5.4.2 Selective removal of vegetation in accordance with a vegetation management plan developed specifically for that water body or channel reach, and designed to optimize the habitat value of appropriate vegetation cover types unless channel is subject to implementation of Corps Operations and Maintenance (O&M) manual.

Activity Specific Conditions

1) Site-specific vegetation management plans and/or habitat conservation plans should clearly specify maintenance activities that will facilitate or preserve a targeted vegetation cover type or a succession of cover types over time.

2.5.4.3 Creek or riparian enhancement projects, including eradication of exotic species, enhancement of fish and wildlife habitat values and routine maintenance of riparian enhancement projects such as pruning, weeding, replanting, new planting.

Activity Specific Conditions

1) Bare soils shall be re-vegetated with appropriate California native species and protected using appropriate erosion control methods, to the maximum extent possible, following removal of invasive or exotic species.

2) Planting pallets shall consist of watershed-specific and appropriate California native species.

2.5.5 Maintenance, Repair, Rehabilitation and Replacement of Structures

2.5.5.1 Maintenance, repair or rehabilitation of flood control structures such as weirs or gates, including tidegates, diversion structures, trash racks, stream gauge structures, fish ladders, fish screens, grade control structures, energy dissipaters, utility line crossings, bridge structures, culverts, outfalls, and stormdrain or pump station inlet/outlet structures. Work not to exceed 100 lineal feet upstream or downstream of said structures.

Activity Specific Conditions

1) Maintenance activities shall not result in an increase in the facility footprint.

2) During culvert maintenance operations, where there is evidence that a culvert outfall or other structure is causing channel erosion or having other destabilizing effects on a salmonid bearing channel, a corrective action plan shall be developed and implemented to remediate the situation. The activities in the plan are not covered by the RGP.

2.5.5.2 In-kind replacement of weirs or gates, including tidegates, trash racks, stream gauge structures, energy dissipaters, utility lines, diversion structures, culverts, outfalls and replacement of stormdrain or pump station inlet/outlet structures of the same dimension, or with minor deviations in dimension, configuration or alignment.

Activity Specific Conditions
1) Replacement is limited to currently serviceable structures. Replacement of structures so degraded as to essentially require reconstruction does not constitute a minimum threat activity covered by the RGP.

2) Where there is evidence that a structure is causing channel erosion or having other destabilizing effects on a salmonid bearing channel, a corrective action plan shall be developed and implemented to remediate the situation. The activities in the plan are not covered by the RGP.

3) Minor deviations in the structure’s configuration or filled area including those due to changes in materials, construction techniques, or current construction codes or safety standards which are necessary for the replacement are allowed provided the adverse impacts are minimal.

2.5.5.3 Replacement of culvert with arched culvert or clear-span bridge in accordance with NMFS guidelines.

Activity Specific Conditions

1) Arched culvert must have an earthen bottom. Arched culverts involving buried bottoms are not included under this activity.

2) Concrete must be allowed to cure prior to being exposed to channel flow for a sufficient period of time to eliminate adverse impacts.

2.5.5.4 Bridge Replacement

Activity Specific Conditions

1) The stream shall not be channelized and the activity must not cause more than minimal changes to the hydraulic flow characteristics of the stream, increase flooding, or cause more than minimal degradation of water quality of any stream.

2) Replacement activities shall have a minimal impact on riparian and aquatic habitat.

2.5.5.5 Maintenance, repair, or in-kind replacement of piers and pilings, including the existing footings.

Activity Specific Conditions

1) Replacement piers and pilings shall not be treated with creosote. Replacement piers and pilings must be concrete, steel, or untreated wood. Pressure treated wood (e.g., ACZMA) may be excluded from use. Consult with appropriate agencies for current regulatory standards.
2.5.5.6 Maintenance or repair of engineered silt basins, debris basins, groundwater recharge basins, flood attenuation basins and retention basins. This includes basins constructed of earth sides and bottoms, and basins lined with hard lining materials.

Activity Specific Conditions

1) The discharge of sediment or other pollutants downstream shall be minimized.

2.5.5.7 Removal of debris, sediment and other obstructions to flow upstream and downstream of structures including streamflow measuring stations, culverts, outfalls, bridges, diversion structures, energy dissipaters, trash racks, utility lines, silt basins, dams, access ramps, bridges, and weirs and gates, including tidegates.

Activity Specific Conditions

1) The area of activity shall be appropriately marked so as to minimize disturbance to surrounding areas.

2) Woody material (such as live leaning trees, dead trees, tree trunks, large limbs, and stumps) will be retained unless impacting or threatening to impact a structure or a structure’s ability to function properly, or impedes channel design flows or reasonable access.

2.5.6 Bank Stabilization Activities

2.5.6.1 Repair or replacement of bank stabilization structures with in-kind structures or materials, or with less hardened alternatives (i.e., replacement of rip-rap with in-kind rip-rap, or with vegetated rip-rap, vegetated earthen banks or biotechnical alternatives such as wooden crib walls).

2.5.6.2 New stabilization of channel banks where the failing banks are composed of earthen materials and the stabilization activity is designed to restore and enhance the habitat values of the project area using biotechnical stabilization techniques (this could include limited use of rock rip rap, A-jacks, etc.).

Activity Specific Conditions

1) The length of the bank stabilization activities shall not exceed 500 feet.\(^2\)

2) The activity is part of a single and complete project (e.g., implementing contiguous projects in series exceeding 500 feet in length is not acceptable).

3) The use of grouted rip-rap, sackrete, concrete, concrete blocks and mattresses, gabions, and gunnite shall be prohibited for new construction.

\(^2\) This is consistent with current Corps NWP 13 length limitation
2.5.6.3 Installation of hardscape structure for earthen bank failures that directly threaten facilities.

Activity Specific Conditions

1) An analysis shall be prepared of the failure and justification that softer forms of repair are not feasible from an engineering / public safety standpoint.

2) Native riparian vegetation is incorporated into the design where channel design standards allow.

3) A standardized one page form is submitted to the resource agencies before proceeding with the bank stabilization activity.

2.5.7 Temporary Water Diversions and Access

2.5.7.1 Temporary water diversions using appropriate dewatering structures (such as cofferdams) or temporary access roads or structures associated with other channel maintenance activities.

Activity Specific Conditions

1) The channel shall be restored as near as possible to its original configuration after the work is complete, unless the overall project includes realignment or configuration of the channel to provide increased stability and habitat values and functions.

2) Passage for anadromous fish shall be maintained at all times in streams where they are known to occur in accordance with NMFS guidelines for dewatering (http://swr.nmfs.noaa.gov/hcd/fishscrn.htm).

2.5.8 Monitoring

Monitoring and documenting the implementation of these minimal impact activities is necessary to: 1) demonstrate that impacts associated with these conditioned activities are minimal; 2) verify that appropriate BMPs are being implemented by the maintenance crews; and 3) confirm that implemented BMPs are effective at minimizing impacts and provide feedback to enable refinement of the BMPs and project designs. Table 1 lists monitoring actions associated with individual activities.

2.5.9 Reporting

The reporting component of the OPC Program is modeled on the Santa Clara Valley Water District’s stream maintenance monitoring and reporting program (SCVWD, 2001). Each November, project sponsors will hold a “Lessons Learned” meeting to evaluate the OPC Program including the BMPs, Activity Specific Conditions and Avoidance and Minimization Measures (see Section 4). Projects from the preceding season will be reviewed, and modifications to the Program considered. Each project sponsor will submit an annual report detailing what routine
maintenance work was performed to the Corps, USFWS, CDFG, BCDC, NMFS, and SFBRWQCB at the end of the maintenance season (prior to January 1). The annual report will specify which projects were completed for the year including type of work, location, and size of the project. Any Program modifications recommended at the annual “lessons learned” meeting will be summarized in the annual report.

For the first five years of the OPC Program, the OPC will provide the regulatory and resource agencies with a tour of representative work areas for that year. This tour will take place after completion of the work season. Preconstruction photographs will also be provided.

Table 1 lists additional reporting activities associated with individual activities.

**Activity Specific Conditions for Reporting**

1) A determination that the activity is within the area covered by the RGP (see Figure 1) and is within one or more of the five categories of activities.

2) Assessment of the potential to adversely affect special-status species and identifying the protective measures employed during maintenance. If impacts occur, quantifying the impacts using an appropriate measure, such as acres, square feet, or linear feet of affected habitat, numbers of affected individuals, or duration of disturbance.

3) The assessment should be documented in a standardized format and forwarded to the Corps, SFBRWQCB, CDFG, and BCDC for record-keeping. The assessment shall be included in the yearly report.
### TABLE 1

**Control Routine Maintenance Activities Included in the RGP, Their Duration and Activity Specific-Conditions**

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>DESCRIPTION OF THE PROPOSED ACTION</th>
<th>REQUIREMENT</th>
<th>CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTIVITY</td>
<td>Conforms to non-Biological Assessment for BMPs</td>
<td>site specific implemented when and</td>
<td>sampling and documentation.</td>
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<tr>
<td>ACTIVITY</td>
<td>'Minimal Threat' lined channel.</td>
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<td>ACTIVITY</td>
<td>– In/Out</td>
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<td>ACTIVITY</td>
<td>– Sediment and Lined Channel and Debris Removal</td>
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<td>–ND Debris Removal</td>
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<td>– Installation of Hardscape</td>
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<td>ACTIVITY</td>
<td>– Temporary Water Diversion</td>
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1) Vegetate bare soils with native species; use erosion control methods following removal of invasive or exotic species.
2) Use watershed specific and appropriate California native species.
3) Minimize discharge of sediment or other pollutants downstream.
4) Prune to remove no erosion or additional disturbance to channel;
5) Develop and incorporate native riparian vegetation where channel design allow.
6) Conduct an analysis of the failure and justification for use of hardcape.
7) Incorporate native riparian vegetation where channel design allow.
8) Conduct an analysis of the failure and justification for use of hardcape.
9) Conduct an analysis of the failure and justification for use of hardcape.
10) No increase in facility footprint.
11) Develop and implement corrective action plan for improper operating conditions; activities in correction action plan are not covered.
12) Replacement is limited to currently serviceable structures.
13) Develop and implement corrective action plan for improper operating conditions; activities in correction action plan are not covered.
14) Minor deviations in configuration or filled area which are necessary for replacement are allowed provided adverse impacts are minimal.
15) No monitoring.
16) No monitoring.
17) Before and after photo documentation.
18) No monitoring.
19) Before and after photo documentation.
20) No monitoring.
21) Before and after photo documentation.
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59) Before and after photo documentation.
60) No monitoring.

*Note: Minimal Threat to Water Quality and Beneficial Uses, September 11, 2003.*

© 2018 Map 2021 3

Prepublication = Subject to Revision
SECTION 3
Existing Environment in the OPC Program Area

3.1 General

In preparing this RBA, the OPC and ESA reviewed:

- California Native Plant Society’s (CNPS’s) Inventory of Rare and Endangered Plants of California (Skinner and Palvik, 2004)
- California Natural Diversity Database (CNDDB) records search for the quadrangles listed in Table 2 (CDFG, 2004]
- On-line sources such as the Endangered Species Critical Habitat web page maintained by the USFWS Sacramento Field Office (www.fws.gov/sacramento/es/crit_hab.htm)
- Vegetation mapping developed for the California Gap Analysis Project (www.biogeog.ucsb.edu/projects/gap/gap_data2.html)
- ESA Biological Resources Group file information and existing literature, e.g., Goals Project (2000)

The review included CNDDB records mapped on each topographic quadrangle and over-layered with most of the OPC Program flood control facilities, as shown in Table 1.

The geographic area of the OPC Program as mapped in Figure 1 is difficult to ecologically classify in any meaningful way. Figure 2, which displays the major drainages, is somewhat more useful in that it displays the project area as a matrix of natural water conveyance features with which the flood control facilities are associated. The existing environment comprises the aquatic, riparian and adjacent upland habitats of these features, and the plant and wildlife resources they support.

1 The Gap Analysis Program (GAP) provides regional assessments of the conservation status of native vertebrate species and natural land cover types and facilitates the application of this information to land management activities. GAP is conducted as state-level projects and is coordinated by the U.S. Geological Survey Biological Resources Division.
3. Existing Environment in the OPC Program Area

3.2 Vegetation: Key Plant Communities and Representative Plant Species

The Goals Project (2000) provides the most concise listing of plant communities for the purposes of this RBA. They accord well with the Wildlife Habitat Relationships System classification (Mayer and Laudenslayer, 1988) and are presented below with representative plant species.

**Tidal Marsh**

Sea-pink *Armeria maritima* ssp. *californica*  
California saltbush *Atriplex californica*  
Fat-hen, spear scale *Atriplex triangularis*  
Johny-nip, salt marsh owl’s clover *Castilleja ambiguus* ssp. *ambiguus*  
Suisun thistle *Cirsium hydrophillum* var. *hydrophillum*  
Point Reyes bird’s-beak *Cordylanthus maritimus* ssp. *palustris*  
Soft bird’s-beak *Cordylanthus mollis* ssp. *mollis*  
Dodder *Cuscuta salina*  
Saltgrass *Distichlis spicata*  
Alkali-heath *Frankenia salina*  
Gumplant *Grindelia stricta* var. *angustifolia*  
Jaumea *Jaumea carnosa*  
Baltic and salt rush *Juncus balticus* and *J. lesueurii*  
Smooth goldfields *Lasthenia glabrata*  
Delta tule pea *Lathyurus jepsonii* var. *jepsonii*  
Pepper grass *Lepidium latifolium*  
Mason’s lilacopsis *Lilaeopsis masonii*  
Sea lavender, marsh rosemary *Limonium californicum*  
Silverweed *Potentilla anserina* ssp. *pacificana*  
Pickleweed *Salicornia virginica*  
Hardstem bulrush (tule) *Scirpus acutus*  
California bulrush (tule) *Scirpus californicus*
Tidal Marsh (cont.)

Alkali bulrush *Scirpus maritimus*  
Olney’s bulrush *Scirpus pungens*  
Smooth cordgrass *Spartina alterniflora*  
Dense-flowered cordgrass *Spartina densiflora*  

Pacific cordgrass *Spartina foliosa*  
Saltmeadow cordgrass *Spartina patens*  
California sea-blite *Suaeda californica*  
Cattails *Typha* spp.

Diked Baylands

Oat bent-grass *Agrostis avenacea*  
Wild mustards *Brassica* spp. and *Hirschfeldia incana*  
Goosefoot *Chenopodium berlandieri*  
Poison hemlock *Conium maculatum*  
Brass-buttons *Cotula coronopifolia*  
Saltgrass *Distichlis spicata*  
* Dittrichia *Dittrichia graveolens*  
Watergrass *Echinochloa crus-galli*  
Fennel *Foeniculum vulgare*  
Barley *Hordeum marinus* var. *gussoneanum*  

Baltic and salt rush *Juncus balticus* and *J. lesueurii*  
Pepper grass *Lepidium latifolium*  
Bird’s foot trefoil *Lotus corniculatus*  
Loosestrife *Lythrum hyssopifolia*  
Sago pondweed *Potamogeton pectinatus*  
Dock *Rumex crispus*  
Pickleweed *Salicornia virginica*  
Alkali bulrush *Scirpus maritimus*  
Cattails *Typha* spp.

Riparian Forest

Box elder *Acer negundo californicum*  
Giant reed *Arundo donax*  
Santa Barbara sedge *Carex barbarae*  
Creeping wildrye *Leymus triticoides*  
Western sycamore *Platanus racemosa*  
Cottonwood *Populus fremontii*  
Valley oak *Quercus lobata*  

California wild rose *Rosa californica*  
California blackberry *Rubus viitifolius*  
Red willow *Salix laevigata*  
Arroyo willow *Salix lasiolepis*  
Elderberry *Sambucus caerulea*  
California bay laurel *Umbellularia californica*

Willow Grove

California blackberry *Rubus vitifolius*  
Red willow *Salix laevigata*  
Arroyo willow *Salix lasiolepis*  
Soft chess *Bromus hordeaceus*

Grassland

Wild oat *Avena fatua* and *A. barbata*  
Ripgut brome *Bromus diandrus*  
Santa Barbara sedge *Carex barbarae*  

Creeping wildrye *Leymus triticoides*  
Italian ryegrass *Lolium multiflorum*  
Purple needlegrass *Nassella pulchra*

Moist Grassland

Santa Barbara sedge *Carex barbarae*  
Baltic rush *Juncus balticus*  
Iris-leaved rush *Juncus xiphioides*  

Creeping wildrye *Leymus triticoides*  
Italian ryegrass *Lolium multiflorum*
3. Existing Environment in the OPC Program Area

Grassland/Vernal Pool Complex
- Downingia Downingia pulchella
- Coyote-thistle Eryngium aristatum
- Goldfields Lasthenia spp.
- Loosestrife Lythrum hyssopifolium
- Popcorn flower Plagiobothrys bracteatus

Coastal Prairie
- Sweet vernal grass Anthoxanthum odoratum
- Pacific reedgrass Calamagrostis
- California oatgrass Danthonia californica var. californica
- Pacific hairgrass Deschampsia cespitosa ssp. holciformis
- Velvet grass Holcus lanatus
- Douglas iris Iris douglasiana

Coastal Sage
- California sagebrush Artemisia californica
- Coyote brush Baccharis pilularis

Foothill and Valley Oak Woodland
- Common manzanita Arctostaphylos manzanita
- Santa Barbara sedge Carex barbara
- Buckbrush Ceanothus cuneatus
- Creeping wildrye Leymus triticoides
- Digger pine Pinus sabiniana
- Blue oak Quercus douglasii
- Valley oak Quercus lobata
- California coffeeberry Rhamnus californica
- Pink-flowering currant Ribes anguineum

Coast Live Oak Woodland
- Pacific madrone Arbutus menziesii
- Toyon Heteromeles arbutifolia
- Cream bush Holodiscus discolor
- Coast live oak Quercus agrifolia
- California blackberry Rubus vitifolius
- Creeping snowberry Symphoricarpos albus var. laevigatus
- Poison oak Toxicodendron diversilobum

Mixed Evergreen Forest
- Bigleaf maple Acer macrophyllum
- Madrone Arbutus menziesii
- Coyote brush Baccharis pilularis
- Poison oak Toxicodendron diversilobum
- California bay laurel Umbellularia californica
- California huckleberry Vaccinium ovatum

3.3 Special-Status Species

Based on the CNDDB and flood control facility data layers, vegetation mapping and known habitat associations, ESA generated the list of plant and animal special-status species in Appendix B. At this point, the analysis combined the habitat associations, and known occurrence records, with Description of the Activities Included in the RGP (Section 2.5) to determine which species met the following criteria:

1) Likely to occur at or near flood control facilities;
2) Likely to be exposed to project direct or indirect effects;

3) Listed, proposed for listing or with a reasonable expectation of listing during the term of the RGP.

These species are discussed in more detail, below.

### 3.3.1 Listed Plant Species

#### Suisun thistle (*Cirsium hydrophilum var. hydrophilum*)

**Status.** Suisun thistle is a federal endangered species and is listed by the California Native Plant Society (CNPS) as rare and endangered (CNPS List 1B).

**Project Area Occurrence.** All known extant occurrences of Suisun thistle are recorded from Suisun Marsh, in the Fairfield-Suisun vicinity of the project area. Most records are located between Grizzly Island and the southwest base of the Potrero Hills, about two miles south of the project area. The remaining occurrence is located approximately ¼-mile south-southwest of Suisun City, associated with a minor offshoot of Peytonia Slough.

#### Soft bird’s beak (*Cordylanthus mollis ssp. mollis*)

**Status.** Soft bird’s beak is a federal endangered species, a state rare species, and a CNPS rare and endangered (1B) species.

**Project Area Occurrence.** Soft bird’s beak is known from fewer than 15 occurrences, limited to the edges of San Pablo Bay, the Suisun Marsh area, and Petaluma River. These areas include eastern Marin and southern Sonoma Counties, and southern Solano and northern Contra Costa Counties.

#### Palmate-bracted bird’s-beak (*Cordylanthus palmatus*)

**Status.** Palmate-bracted bird’s-beak is a federal and state endangered species, and a CNPS rare and endangered (1B) species.

**Project Area Occurrence.** Palmate-bracted bird’s-beak is known from nine occurrences, primarily east of the project area. It is represented in the project area by one somewhat disjunct occurrence at Springtown (Alameda County).

#### Yellow larkspur (*Delphinium luteum*)

**Status.** Yellow larkspur is a federal endangered species, a state rare species, and is a CNPS rare and endangered (1B) species.

**Project Area Occurrence.** An occurrence of yellow larkspur is recorded near Petaluma, Sonoma County. The known range of the species extends approximately 20 miles northwest from Petaluma, where it encompasses other known occurrences in Marin and Sonoma Counties, beyond the project area.
Burke’s goldfields (*Lasthenia burkei*)

**Status.** Burke’s goldfields is a federal and state endangered species, and a CNPS rare and endangered (1B) species.

**Project Area Occurrence.** Burke’s goldfields has been recorded historically in Lake, Mendocino and Sonoma Counties. Presently, the species is most abundant in the Santa Rosa Plains area of Sonoma County. The southernmost records of the species are from just north of the City of Cotati. The known range of occurrences of this species is outside of the project area, although the species range and the project area are adjacent near Cotati in Sonoma County.

Contra Costa wallflower (*Erysimum capitatum var. angustatum*)

**Status.** Contra Costa wallflower is a federal endangered species and a CNPS rare and endangered (1B) species.

**Project Area Occurrence.** Contra Costa wallflower grows naturally only in sand dune habitat along the San Joaquin River east of Antioch.

Contra Costa goldfields (*Lasthenia conjugens*)

**Status.** Contra Costa goldfields is a federal endangered species and a CNPS rare and endangered (1B) species.

**Project Area Occurrence.** In the project area, Contra Costa Goldfields historically ranged from southeastern Alameda County, through central Contra Costa County, to central Solano County. Many historical occurrences of Contra Costa goldfields have been extirpated.

White-rayed pentachaeta (*Pentachaeta bellidiflora*)

**Status.** White-rayed pentachaeta is a federal and state endangered species, and a CNPS rare and endangered (1B) species.

**Project Area Occurrence.** Once ranging from Santa Cruz to Marin Counties, white-rayed pentachaeta is presently only known to persist at one occurrence in San Mateo County. The northern end of the species’ historical range is represented by historic records in the southeastern portion of Marin County and extends into the project area in this area.

Kenwood Marsh checkermallow (*Sidalcea oregana ssp. valida*)

**Status.** Kenwood Marsh checkermallow is a federal and state endangered species, and a CNPS rare and endangered (1B) species.

**Project Area Occurrence.** Kenwood Marsh checkermallow, a Sonoma County endemic, is known from only two occurrences, one north of the project area in Knights Valley, and the other within the project area near the town of Kenwood in Kenwood Marsh.
Showy Indian clover (*Trifolium amoenum*)

**Status.** Showy Indian clover is a federal endangered species and a CNPS rare and endangered (1B) species.

**Project Area Occurrence.** Showy Indian clover, once considered potentially extinct, historically ranged from western Marin and Sonoma Counties to central Solano County with a disjunct record from southern Santa Clara County. The species was found near Occidental in 1993 (western Marin County, outside of the project area), but subsequent surveys proved absence and the site was subsequently developed. While historical occurrence records are few in the project area (three in Sonoma County in the vicinity of Petaluma, Cotati, and Kenwood), the species range includes most of Marin and Sonoma Counties.

### 3.3.2 Listed Animal Species

**Invertebrates**

**Vernal pool fairy shrimp (*Branchinecta lynchi*)**

**Status.** The vernal pool fairy shrimp is a federal threatened species.

**Project Area Occurrence.** Vernal pool fairy shrimp are highly adapted to vernal pools and other seasonal aquatic habitat and can be found in seasonal wetlands in Central Valley grassland habitat. A total of two occurrences recorded by the CNDDB (CDFG, 2004) are located within the project area, north of Livermore in Alameda County.

**Valley elderberry longhorn beetle (*Desmoscerus californicus dimorphus*)**

**Status.** The Valley elderberry longhorn beetle is a federal threatened species.

**Project Area Occurrence.** The Valley elderberry longhorn beetle is endemic to the Central Valley of California and is found in riparian habitats and associated upland habitats where elderberry (*Sambucus* spp.), the beetle’s host plant, grows. The beetle is most commonly found along the margins of rivers and streams in the lower Sacramento River and upper San Joaquin Valley, most often in riparian elderberry savannah or moist valley oak woodlands and is not known from the immediate project area, but habitat is present.

**Vernal pool tadpole shrimp (*Lepidurus packardi*)**

**Status.** The vernal pool tadpole shrimp is a federal endangered species.

**Project Area Occurrence.** This species is found in vernal pools and may potentially occur within the project area at locations near the City of Fremont, Alameda County, and near Travis Air Force Base in Fairfield, Solano County.
**California freshwater shrimp (Syncaris pacifica)**

**Status.** The California freshwater shrimp is a federal and state listed endangered species.

**Project Area Occurrence.** This species is known to occur in permanent streams with fishes and in pool areas of low-elevation, low-gradient streams; among exposed live tree roots of undercut banks, overhanging woody debris, or overhanging vegetation. The species is found in 17 stream segments within Marin, Napa and Sonoma Counties (CDFG, 2004). Many of these stream segments are isolated from the others by barriers, dewatered areas and low quality habitat.

**Fish**

**Delta smelt (Hypomesus transpacificus)**

**Status.** The delta smelt is a federal and state threatened species.

**Project Area Occurrence.** For a large part of their one-year life span, Delta smelt inhabit the saltwater-freshwater interface of the Delta. They spawn in shallow, fresh or slightly brackish water in tidally-influenced backwater sloughs and channel edgewaters and the eggs are thought to adhere to emergent vegetation such as cattails and tules, tree roots, and submerged branches. Within the study area, delta smelt are generally restricted to Suisun Bay, the larger sloughs of Suisun Marsh (e.g., Montezuma Slough), and the Sacramento-San Joaquin Delta. During high delta outflow periods, they may be found in San Pablo Bay, but they do not establish permanent populations there (Moyle, 2002).

**Steelhead – Central California Coast DPS (Oncorhynchus mykiss irideus)**

**Status.** The central California coast steelhead is a federal threatened Distinct Population Segment.

**Project Area Occurrence.** Central California coast steelhead occur in a relatively large number of watersheds draining into San Francisco and San Pablo Bays, although current habitat quality, availability, and accessibility, and thus population sizes, have been drastically reduced compared to historic levels. Steelhead require cool, clean water in streams that contain adequately sized spawning gravels, instream cover, and riparian shading. Steelhead are known from or have potential to occur in 17 watersheds within the project area (Leidy et al., 2003).

**Amphibians**

**California tiger salamander (Ambystoma californiense)**

**Status.** The California tiger salamander is a federal threatened species and is a California species of special concern.

**Project Area Occurrence.** This species utilizes seasonal freshwater ponds with little or no emergent vegetation for breeding during the rainy season and mammal burrows in upland habitat for aestivation during the dry season. California tiger salamander are reported to occur throughout western and eastern Alameda County, and western Contra Costa County within the project area.


**California red-legged frog (Rana aurora draytonii)**

**Status.** California red-legged frog is a federal threatened species and a California species of special concern.

**Project Area Occurrence.** The species breeds in stock ponds, pools, and slow-moving streams with emergent vegetation for cover and egg attachment. Where water is seasonal, these frogs often utilize mammal burrows in upland habitat for aestivation. It is reported to occur throughout Alameda County, and western Contra Costa County within the project area.

**Birds**

**Swainson’s hawk (Buteo swansoni)**

**Status.** The Swainson’s hawk is a federal species of concern and is listed as state threatened.

**Project Area Occurrence.** This species breeds in riparian areas and oak savannah and requires adjacent foraging habitat such as grasslands or fields supporting rodent populations. There are no reported occurrences within the project area, but suitable habitat is potentially present.

**Western snowy plover (Charadrius alexandrinus nivosus)**

**Status.** The western snowy plover is a federal threatened species and a California species of special concern.

**Project Area Occurrence.** This species nests and forages on sandy beaches on marine and estuarine shores and requires sandy, gravelly, or friable soils for nesting. It is reported to occur in western Alameda County within or adjacent to the project area (CDFG, 2004).

**California black rail (Laterallus jamaicensis coturniculus)**

**Status.** The California black rail is a federal species of concern and is listed as threatened by the state.

**Project Area Occurrence.** This species nests and forages in tidal emergent marshes with pickleweed and cordgrass. It is reported to occur within the project area in western Alameda County, southern Sonoma County, and eastern Marin County.

**California clapper rail (Rallus longirostris obsoletus)**

**Status.** The California clapper rail is a federal and state listed endangered species.

**Project Area Occurrence.** This species nests and forages in tidal wetlands with pickleweed, cordgrass, and bulrush. It is reported to occur within the project area in western Alameda County, western Contra Costa County, near Vallejo (Solano County), and eastern Marin County.
3. Existing Environment in the OPC Program Area

**California least tern (Sterna antillarum browni)**

**Status.** California least tern is a federal and state listed endangered species.

**Project Area Occurrence.** This species is a colonial breeder on bare or sparsely vegetated flat substrates including sand beaches, alkali flats, land fills, or paved areas. It is reported to occur east of Patterson slough in western Alameda County within the project area.

**Mammals**

**Salt marsh harvest mouse (Reithrodontomys raviventris)**

**Status.** Salt marsh harvest mouse is a federal and state listed endangered species.

**Project Area Occurrence.** This species is found in saline emergent marsh with dense pickleweed. It is reported to occur within the project area in southern Sonoma County, eastern Marin County, western Alameda County, western Contra County, in Suisun Marsh near Fairfield, and southeast of Vallejo (Solano County).

### 3.3.3 Candidate Species and Species of Special Concern

**Birds**

**Burrowing Owl (Athene cunicularia)**

**Status.** The burrowing owl is a California Species of Special Concern and its burrow sites are protected under CDFG Code 3503.5.

**Project Area Occurrence.** Burrowing owl is widely distributed in California as well as throughout the project area. Habitat for burrowing owl is primarily dry, open, short grass areas with abundant mammal burrows and the species can be found in urban vacant lots, airports, cemeteries, golf courses, and occasionally in agricultural areas.

**Suisun song sparrow (Melospiza melodia maxillaris)**

**Status.** The Suisun song sparrow is both a federal and state species of special concern.

**Project Area Occurrence.** This species can be found in brackish water marshes and sloughs with cattails, tules, and pickleweed within the vicinity of Suisun Marsh.

**Mammals**

**Suisun ornate shrew (Sorex ornatus sinuosus)**

**Status.** Suisun ornate shrew is a federal species of concern and is listed by CDFG as a California special concern species.

**Project Area Occurrence.** This species occurs in tidal marshes and requires dense low cover above the mean tide line for nesting and foraging. Records document its occurrence within the project area in the vicinity of Suisun Marsh.
Salt marsh wandering shrew (Sorex vagrans halicoetes)

**Status.** Salt marsh wandering shrew is both a federal and California species of special concern.

**Study Area Occurrence.** This species inhabits salt marshes and potentially occurs within the project area.
SECTION 4
Effects and Avoidance and Minimization Measures to Minimize Effects

4.1 Effects by Plant Species

4.1.1 Suisun thistle (*Cirsium hydrophilum* var. *hydrophilum*)

Suisun thistle is restricted to tidal marsh habitat, where it occurs near small watercourses. The species has potential to occur in tidal marsh areas of the Fairfield-Suisun portion of the project area, particularly in the vicinity of small watercourses such as minor slough offshoots and mosquito abatement channels. For example, the offshoot of Peytonia Slough where the species has been recorded continues north into the vicinity of a pumped basin and drain lines in the project area. This species may be exposed to impacts during implementation of minimal threat activities including sediment and debris removal; vegetation management; maintenance, repair, rehabilitation, and replacement of structures; bank stabilization; and temporary water diversions and access. Impacts may include degradation of habitat, trampling, and soil compaction or removal, which may result in disturbance or mortality of Suisun thistle. Specific activities that may result in these impacts include temporary removal of vegetation from a work area, temporary deposition of removed sediment, debris, or other fill placement, vehicular passage, inadvertent removal of the Suisun thistle during removal of exotic species, and installation of new bank stabilization structures. These potential project impacts are similar for all the following plant species discussed in this section.

4.1.2 Soft bird's beak (*Cordylanthus mollis* ssp. *mollis*)

Soft bird’s beak is restricted to salt marsh habitat. The nearest occurrence to the project area was documented approximately 0.15 mile of west of Vallejo near Mare Island Strait, although it may be extirpated from this location. This species may be exposed to impacts in the form of disturbance or mortality due to various actions potentially occurring during implementation of identified minimal threat activities.

4.1.3 Palmate-bracted bird's-beak (*Cordylanthus palmatus*)

Palmate-bracted bird’s-beak occurs in alkaline areas in chenopod scrub or grassland. Streams and channels in the project area pass through the Springtown population CNDDB occurrence polygon (CDFG, 2004). This species may be exposed to impacts in the form of disturbance or mortality due to various actions potentially occurring during implementation of identified minimal threat activities.
4.1.4 Yellow larkspur (*Delphinium luteum*)

Yellow larkspur occurs in moist sites on north-facing rocky slopes in chaparral, grasslands and scrub vegetation. Project area components near suitable habitat in portions of Marin and Sonoma Counties, in the Petaluma area for example, may potentially affect yellow larkspur. This species may be exposed to impacts in the form of disturbance or mortality due to various actions potentially occurring during implementation of identified minimal threat activities.

4.1.5 Contra Costa wallflower (*Erysimum capitatum* ssp. *angustatum*)

Contra Costa wallflower is only known from sand dune habitat east of Antioch, along the San Joaquin River. Two of three known population stands are protected in the Antioch Dunes National Wildlife Refuge, with the third stand occurring on private land just east of the Refuge. Apparently, barren areas of riverine or wind-blown sandy soils in the vicinity of Antioch may support viable seed banks. The species has potential to occur in the vicinity of project area components near Antioch, Contra Costa County, and may be subject to project impacts there. This species may be exposed to impacts in the form of disturbance or mortality due to various actions potentially occurring during implementation of identified minimal threat activities. Potential project impacts are similar for all plant species discussed in this section; see discussion above for Suisun thistle for greater detail.

4.1.6 Burke’s goldfields (*Lasthenia burkel*)

Burke’s goldfields is found in mesic meadows and seeps, but most often in vernal pools. Although the species is not known to occur specifically in the project area, the species has potential to occur in the vicinity of the project area facilities near Cotati, Sonoma County. This species may be exposed to impacts in the form of disturbance or mortality due to various actions potentially occurring during implementation of identified minimal threat activities.

4.1.7 Contra Costa goldfields (*Lasthenia conjugens*)

Contra Costa goldfields occur in vernal pools and swales, and sometimes open areas or alkali playas in grasslands and woodlands. Within the project area, occurrences in the vicinity of Concord and Pleasant Hill were extirpated by development and occurrences in Fremont near Sky Sailing Airport and northwest of Travis Air Force Base in Solano County are extant. The Fremont occurrence is in the vicinity of project area earthen flood control channels and the Solano County occurrence is in the vicinity of project area drainlines. This species may be exposed to impacts in the form of disturbance or mortality due to various actions potentially occurring during implementation of identified minimal threat activities.
4.1.8 White-rayed pentachaeta (*Pentachaeta bellidiflora*)

White-rayed pentachaeta occurs on dry rocky or grassy areas of open slopes, often in serpentine soils. Historic (extirpated) occurrences have been recorded near project area facilities in the southeastern portion of Marin County. Although probably extirpated from Marin County, this species potentially occurs in suitable upland habitat in these areas. This species may be exposed to impacts in the form of disturbance or mortality due to various actions potentially occurring during implementation of identified minimal threat activities.

4.1.9 Kenwood Marsh checkermallow (*Sidalcea oregana ssp. valida*)

Kenwood Marsh checkermallow occurs along the edges of freshwater marshes and swamps. The Kenwood Marsh checkermallow is found in Kenwood Marsh, Sonoma County Project. This species may be exposed to impacts in the form of disturbance or mortality due to various actions potentially occurring during implementation of identified minimal threat activities.

4.1.10 Showy Indian clover (*Trifolium amoenum*)

Showy Indian clover occurs usually in moist heavy soils in disturbed areas such as eroding cliff faces and roadsides. Found in grassland and coastal bluff scrub, sites are often exposed to full sun and soils are sometimes serpentine. The nearest historical occurrence record (possibly extirpated, but presumed extant) to proposed project area activities is in Kenwood, Sonoma County. Suitable habitat in Marin and Sonoma County project areas should be considered to potentially contain this species; thus, showy Indian clover is potentially subject to impacts in these areas. This species may be exposed to impacts in the form of disturbance or mortality due to various actions potentially occurring during implementation of identified minimal threat activities.

4.2 Effects by Animal Species

4.2.1 Vernal pool fairy shrimp (*Branchinecta lynchii*)

Vernal pool fairy shrimp are restricted to seasonal wetland habitat and have potential to occur in such habitat within the project area where grasslands are adjacent to small watercourses, irrigation ditches, or flood control channels. The species is known to occur in the Springtown Natural Communities Preserve and one other location north of I-580 but should be presumed present in suitable habitat elsewhere within the Livermore Valley, Alameda County. This species may be exposed to impacts during implementation of minimal threat activities such as sediment and debris removal; vegetation management; maintenance, repair, rehabilitation, and replacement of structures; bank stabilization activities; and temporary water diversions and access. Potential impacts include degradation or destruction of seasonal wetland habitat through deposition of fill or trampling and grading resulting in removal of hydrological features contributing to freshwater ponding. Such impacts could result in mortality of larval or adult vernal pool fairy shrimp or their eggs, depending on the season. Specific activities that could result in such impacts include
temporarily or permanent deposition of sediment, vegetation, or debris removed from channels; vehicle passage; and the use of grassland areas for materials laydown or equipment staging.

4.2.2 Valley elderberry longhorn beetle (*Desmoscerus californicus dimorphus*)

The Valley elderberry longhorn beetle is closely associated with elderberry shrubs in riparian and adjacent upland habitat. Three occurrences are documented northwest of the City of Fairfield, Solano County, including an occurrence from Gordon Valley Creek, about 1¼ miles northwest of the project area near Fairfield (CDFG, 2004); therefore, the beetle should be considered present where suitable habitat occurs here. This species may be exposed to impacts during implementation of minimal threat activities, primarily during vegetation management, but also potentially during maintenance, repair, rehabilitation, and replacement of structures and bank stabilization activities. Impacts could include damage to or removal of elderberry shrubs, which could result in loss of habitat for and direct mortality of the valley elderberry longhorn beetle should shrubs be inhabited by the beetle. Shrubs could be damaged through vehicular or equipment movement and portions of (or entire) shrubs could be temporarily or permanently removed.

4.2.3 Vernal pool tadpole shrimp (*Lepidurus packardi*)

Vernal pool tadpole shrimp can be found in upland habitats of the project area. For example, the species is documented near the project area earthen channels of southern Fremont, Alameda County, and near drain lines west of Travis Air Force Base, Solano County (CDFG, 2004) and should be presumed present in suitable habitat elsewhere. This species may be exposed to impacts during implementation of minimal threat activities including sediment and debris removal; vegetation management; and maintenance, repair, rehabilitation, and replacement of structures. Impacts may include degradation of habitat (through siltation of vernal pools or removal of hydrological features contributing to freshwater ponding) which may result in disturbance or mortality of vernal pool tadpole shrimp. Specific activities that may result in these impacts include temporary or permanent deposition of sediment, debris, or other fill placement, vehicular passage, installation of new bank stabilization structures, and grading.

4.2.4 California freshwater shrimp (*Syncaris pacifica*)

California freshwater shrimp can be found in riverine habitats of the project area. Within the project area, California freshwater shrimp are known to occur in Sonoma Creek, Sonoma County, and should be presumed present in suitable habitat elsewhere. This species may be exposed to impacts during implementation of minimal threat activities including sediment and debris removal; vegetation management; maintenance, repair, rehabilitation, and replacement of structures; bank stabilization; and temporary water diversions and access. Impacts may include degradation of habitat, increased predation, and temporary loss of breeding habitat, which may result in disturbance or mortality of California freshwater shrimp. Specific activities that may result in these impacts include temporary removal of vegetation from a work area, temporary
deposition of removed sediment, debris, or other fill placement, vehicular passage, installation of new bank stabilization structures, and temporary water diversions.

### 4.2.5 Delta smelt (*Hypomesus transpacificus*)

Delta smelt are endemic to the San Francisco Bay-Delta region and are found in open water as well as tidal sloughs. Known occurrences of the species reported by CNDDB (CDFG, 2004) are from tidal sloughs associated with the Napa River and San Pablo Bay in the vicinity of project elements located in southern Solano County. This species may be exposed to impacts during implementation of minimal threat activities, including sediment and debris removal; vegetation management; maintenance, repair, rehabilitation, and replacement of structures; bank stabilization; and temporary water diversions and access. Impacts could include degradation of water quality and removal of substrate for egg development, as well as larval food sources, which could result in direct mortality of larval and adult fishes, as well as destruction of their eggs. Specific activities that could result in such impacts include removal of emergent vegetation and woody debris from channels, dredging of sediments, and accidental discharge of sediments or chemicals during construction along or within tidal channels.

### 4.2.6 Steelhead – Central California Coast DPS (*Oncorhynchus mykiss*)

Steelhead require relatively high quality habitat provided by streams with intact riparian canopies, year-around water, and clean spawning gravels. It should be noted that in some of the project area watersheds, proposed project activities may occur upstream of migration barriers or in reaches that do not provide suitable habitat (e.g., flood control channels). However, due to the potential for water quality disturbances to reach downstream habitats and possible future migration barrier remediation/removal projects, the entire drainage areas of the project area watersheds are assumed to either support or potentially support central California coast steelhead. These watersheds include: Novato Creek, Coyote Creek, Gallinas Creek, Arroyo Corte Madera del Presidio, and Corte Madera Creek in Marin County; the Petaluma River, Sonoma Creek, and Schell Creek in Sonoma County; the Napa River in Solano County; Walnut Creek, San Pablo Creek, Wildcat Creek, and Pinole Creek in Contra Costa County; and San Lorenzo Creek, San Leandro Creek, and Alameda Creek in Alameda County.

Steelhead may be exposed to impacts during implementation of minimal threat activities, including those listed above under the description for vernal pool fairy shrimp. Reductions in water quality, increases in water temperature, degradation or destruction of instream habitat, increases in sedimentation, and dewatering could result from project activities and could cause direct mortality of adult and juvenile steelhead or their eggs, as well as impair reproductive success. Specific activities that could result in such impacts include removal of riparian vegetation, any work within creeks and other waterbodies causing resuspension of sediments, accidental discharge of sediments or chemicals into waterbodies, and direct physical disturbance of creek bed and banks.
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4.2.7 California tiger salamander (*Ambystoma californiense*)

California tiger salamander can be found in riparian and freshwater marsh habitats and upland habitats of the project area such as the streams and channels east of Livermore (CDFG 2004) and should be presumed present in suitable habitat elsewhere in the study area. This species may be exposed to impacts during implementation of minimal threat activities- sediment and debris removal; vegetation management; maintenance, repair, rehabilitation, and replacement of structures; bank stabilization; and temporary water diversions and access. Impacts may include degradation of habitat, trampling or crushing, and temporary loss of breeding habitat and upland burrows, which may result in disturbance or mortality of California tiger salamander. Specific activities that may result in these impacts include temporary deposition of removed sediment, debris, or other fill placement, vehicular passage, installation of new bank stabilization structures, and temporary water diversions.

4.2.8 California red-legged frog (*Rana aurora draytonii*)

California red-legged frog can be found in riparian and freshwater marsh habitats of the project area and should be presumed present in suitable habitat. This species may be exposed to impacts during implementation of minimal threat activities as listed above for the California tiger salamander. Impacts may include degradation of habitat, trampling or crushing, destruction of frog eggs, increased predation, and temporary loss of breeding habitat, which may result in disturbance or mortality of California red-legged frog. Specific activities that may result in these impacts include temporary removal of vegetation from a work area, temporary deposition of removed sediment, debris, or other fill placement, vehicular passage, installation of new bank stabilization structures, and temporary water diversions.

4.2.9 Swainson’s hawk (*Buteo swansoni*)

Swainson’s hawk could be found in grassland and riparian habitats of the project area. This species may be exposed to impacts during implementation of minimal threat activities including vegetation management; maintenance, repair, rehabilitation, and replacement of structures; and bank stabilization. Impacts may include degradation of habitat and temporary loss of breeding habitat, which may result in disturbance of adult birds or nest abandonment and possible mortality of young. Specific activities that may result in these impacts include temporary or permanent removal of vegetation from a work area and noise generated during construction.

4.2.10 Western snowy plover (*Charadrius alexandrinus nivosus*)

Western snowy plovers are found in the tidal marsh and mudflat habitats of the project area; for example, records indicate presence near project facilities west of Fremont (CDFG, 2004) and the species should be presumed present in suitable habitat elsewhere. This species may be exposed to impacts during implementation of minimal threat activities including sediment and debris removal and maintenance, repair, rehabilitation, and replacement of structures. Impacts may include degradation of breeding habitat, increased predation, trampling or crushing (nests and
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eggs), and temporary loss of breeding habitat, which may result in disturbance or mortality of western snowy plover. Specific activities that may result in these impacts include temporary deposition of removed sediment, debris, or other fill placement and vehicular passage.

4.2.11 California black rail (*Laterallus jamaicensis coturniculus*)

California black rail is restricted to tidal marsh and mudflat habitats of the project area. For example, this species may be found near project facilities north of the City of Pittsburg and should be presumed present in suitable habitat elsewhere. This species may be exposed to impacts during implementation of minimal threat activities including sediment and debris removal and maintenance, repair, rehabilitation, and replacement of structures. Impacts may include degradation of habitat, trampling or crushing of nests and eggs, and temporary loss of breeding habitat, which may result in disturbance or mortality of California black rail. Specific activities that may result in these impacts include temporary deposition of removed sediment, debris, or other fill placement, vehicular passage, and noise associated with maintenance activities.

4.2.12 California clapper rail (*Rallus longirostris obsoletus*)

California clapper rail can be found in tidal wetland and mudflat habitats of the project area. For example, the species occurs near project facilities in the Newark-Fremont area (CDFG, 2004) and should be presumed present in suitable habitat elsewhere. This species may be exposed to impacts during implementation of minimal threat activities including sediment and debris removal and vegetation management. Impacts may include degradation of habitat (removal of nesting materials), trampling or crushing of nests or eggs, and temporary loss of breeding habitat, which may result in disturbance or mortality of California clapper rail. Specific activities that may result in these impacts include temporary removal of vegetation from a work area, temporary deposition of removed sediment, debris, or other fill placement, vehicular passage, and noise associated with maintenance activities.

4.2.13 California least tern (*Sternula antillarum browni*)

California least tern are found in tidal wetland and mudflats of the project area; for example, those located near the western portion of the Alameda Flood Control Channel in Newark. This species may be exposed to impacts during implementation of minimal threat activities including sediment and debris removal, as well as maintenance, repair, rehabilitation, and replacement of structures. Impacts may include degradation of breeding habitat, trampling or crushing of nests and eggs, and temporary loss of breeding habitat, which may result in disturbance or mortality of California least tern. Specific activities that may result in these impacts include temporary deposition of removed sediment, debris, or other fill placement and vehicular passage, and noise associated with maintenance activities.
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4.2.14 Salt marsh harvest mouse (*Reithrodontomys raviventris*)

The salt marsh harvest mouse can be found in tidal wetlands and mudflats with dense pickleweed within the project area, such as those located near the project facilities south of the City of Fairfield and should be presumed present in suitable habitat elsewhere. This species may be exposed to impacts during implementation of minimal threat activities, including sediment and debris removal; vegetation management; and maintenance, repair, rehabilitation, and replacement of structures. Impacts may include degradation of habitat, trampling or crushing of nests and young, and temporary loss of breeding habitat, which may result in disturbance or mortality of salt marsh harvest mouse. Specific activities that may result in these impacts include temporary removal of vegetation from a work area, temporary deposition of removed sediment, debris, or other fill placement, and vehicular passage.

4.2.15 Burrowing owl (*Athene cunicularia*)

Burrowing owl are known to occur throughout the project area, ranging from Skaggs Island in Sonoma County to Newark and the Livermore Valley in Alameda County (CDFG, 2004) and they should be presumed present where suitable habitat occurs within the project area. Burrowing owl may be exposed to impacts during implementation of minimal threat activities including sediment and debris removal; maintenance, repair, rehabilitation, and replacement of structures; and bank stabilization. Impacts could include degradation or destruction of habitat or disruption of the reproductive cycle for the species, which could result in direct mortality of individuals or nest abandonment. Specific activities that could result in such impacts include temporary deposition of sediment and other debris in areas where active burrows are located and operation of vehicles and other equipment, as well as other general maintenance activity, in close proximity to active burrows.

4.2.16 Suisun song sparrow (*Melospiza melodia maxillaris*)

Suisun song sparrow can be found in tidal marsh and mudflat habitats within the project area and should be presumed present in suitable habitat within the vicinity of Suisun Marsh. This species may be exposed to impacts during implementation of minimal threat activities including sediment and debris removal; vegetation management; and maintenance, repair, rehabilitation, and replacement of structures. Impacts may include degradation of habitat, trampling or crushing of eggs or nests, and temporary loss of nesting habitat, which may result in disturbance or mortality of Suisun song sparrow. Specific activities that may result in these impacts include temporary removal of vegetation from a work area, temporary deposition of removed sediment, debris, or other fill placement, and vehicular passage, and noise associated with maintenance activities.

4.2.17 Suisun ornate shrew (*Sorex ornatus sinuosus*)

Suisun ornate shrew is restricted to tidal marsh and mudflat habitats and has been documented in Suisun Marsh, where project facilities occur. This species may be exposed to impacts during implementation of minimal threat activities including sediment and debris removal and maintenance, repair, rehabilitation, and replacement of structures. Impacts may include
degradation of habitat, trampling or crushing of vegetation, increased predation, and temporary loss of breeding habitat, which may result in disturbance or mortality of Suisun ornate shrew. Specific activities that may result in these impacts include temporary deposition of removed sediment, debris, or other fill placement, and vehicular passage.

4.2.18 Salt marsh wandering shrew (*Sorex vagrans halicoetes*)

Salt marsh wandering shrew is restricted to tidal marsh and mudflat habitats of the project area. Records of this species occur near project facilities south of San Lorenzo near the bay (CDFG, 2004) and the species should be presumed present in suitable habitat elsewhere. This species may be exposed to impacts during implementation of minimal threat activities including sediment and debris removal; vegetation management; maintenance, repair, rehabilitation, and replacement of structures; and bank stabilization. Impacts may include degradation of habitat, trampling or crushing, increased predation and temporary loss of breeding habitat, which may result in disturbance or mortality of salt marsh wandering shrew. Specific activities that may result in these impacts include temporary removal of vegetation from a work area, temporary deposition of removed sediment, debris, or other fill placement, vehicular passage, and installation of new bank stabilization structures.

4.3 Avoidance and Minimization Measures

4.3.1 Activity Specific Conditions, Best Management Practices and Avoidance and Minimization Measures

There are two categories of measures which reduce impacts of the minimal threat activities. Section 2 of this RBA listed certain “Activity Specific Conditions” which are part of the OPC Program and are considered part of the proposed action, along with all of the detailed direction contained in the BMP Manual (OPC, 2000). For example, Section III – SC-4 of the Manual sets out the manner and method of erosion control. When discussing the use of sand bags it requires that sediment be removed “when it is one-third of the height of the barrier” and that the barrier be removed when no longer needed. This kind of highly specific direction covers virtually all of the BASMAA/OPC actions in flood control situations. Its mandated use is the first level of constraint and forms the background for the additional actions which will be made part of the RGP.

This section describes additional actions termed “Avoidance and Minimization Measures” (AMMs). These measures, described below, are intended to support a determination by USFWS and NMFS that routine flood control maintenance activities pose either “no effect” or “may have an affect but not likely to adversely affect” listed species.

4.3.2 Special Management Areas

Due to the non-uniform distribution of the species which are covered by this RBA, not all of the AMMs are valid throughout the project area (Figure 1). For instance, California freshwater
shrimp are only known from Marin, Napa and Sonoma counties (CDFG, 2004). These Special Management Areas (SMAs) are as follows (Figures 3 – 9, which are at the end of this section):

- SMA #1 - Palmate-Bracted Bird’s Beak; Vernal Pool Fairy Shrimp
- SMA #2 - Vernal Pool Fairy Shrimp; Vernal Pool Tadpole Shrimp; Valley Elderberry Longhorn Beetle Swainson’s Hawk; Contra Costa Goldfields
- SMA #3 - Vernal Pool Tadpole Shrimp; Western Snowy Plover; Contra Costa Goldfields
- SMA #4 - Vernal Pool Tadpole Shrimp; Contra Costa Goldfields
- SMA #5 - California Freshwater Shrimp
- SMA #6 - California Tiger Salamander
- SMA #7 - Salt Marsh Harvest Mouse; Suisun Ornate Shrew; Salt Marsh Wandering Shrew

### 4.3.3 AMMs for Plant Species

**PLA-1 – Kenwood Marsh checkermallow, Soft bird’s beak and Suisun thistle, Burke’s goldfields, Contra Costa goldfields, Contra Costa wallflower, Showy Indian clover, White-rayed pentachaeta and yellow larkspur**

For all maintenance activities, a qualified botanist will conduct a habitat assessment to determine the presence of potentially suitable habitat for the aforementioned listed plant species. If no potentially suitable habitat is identified during the habitat assessment, then avoidance has been accomplished and no further actions are necessary. If suitable habitat is determined present within the maintenance area. The following measures shall apply:

- A qualified botanist will identify the appropriate species-specific focused surveys and surveying period for these listed plant species. All species-specific focused surveys will be conducted in accordance with USFWS plant survey guidelines,

- If no listed plant species are observed during the species-specific focused surveys, then no further actions are necessary.

- If listed species are observed or presumed present, then the project sponsor will redesign the project to avoid listed plant species.

- If the activity can not be redesigned, then crews will use matting or a comparable method to minimize impacts to the plants and reduce the affected area to minimize the take of plants beyond what would be considered incidental.

- If the maintenance activity occurs adjacent to a known or presumed present listed plant species or its habitat, then an exclusionary fence shall be erected in consultation with a qualified botanist. The project sponsor will maintain fence for the duration of the maintenance activity.
PLA-2 – Palmate-bracted bird’s beak
For maintenance activities in SMA 1 (Springtown, see Figure 3), measures similar to PLA-1 will be implemented; for this species the flowering period is May to October.

PLA-3 – Serpentinite Areas
Although work in serpentinite areas is not anticipated, the project sponsor shall avoid disturbance to these areas which shall be marked on project plans so that stockpiling of materials or sediment will be avoided.

4.3.4 AMMs for Invertebrate Species

INV-1 – Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp
When conducting maintenance activities in SMA 1 (see Figure 3), 2 (see Figure 4), 3 (see Figure 5), and 4 (see Figure 6), a qualified biologist will assess the presence of suitable habitat for these crustaceans. The habitat assessment will include seasonal pools, ponds and puddles located within the areas to be disturbed and within 50 feet of the maintenance activity (access permitting).

Based on the results of the habitat assessment, if suitable habitat is not identified within the maintenance area and within 50 feet of the maintenance activity, then avoidance has been accomplished and no further action is necessary. If suitable habitat is identified, the following conditions shall apply consistent with the Programmatic Biological Opinion for the Issuance of 404 Permits for Projects with Relatively Small Effects on Vernal Pools Within the Jurisdiction of the Sacramento Field Office (USFWS, 1995):

- The maintenance activities would be designed to the extent feasible, to avoid the potential for direct and indirect mortality, harm, and harassment of the crustaceans and their habitat. The Environmental Compliance Coordinator\(^1\) (ECC – see Section 4.3.8) will inspect the maintenance activity at the proposed project site to ensure that no unnecessary take of listed species or destruction of habitat occurs.

INV-2 – California Freshwater Shrimp
When conducting maintenance activities in SMA 5\(^2\), Sonoma Creek, (see Figure 7) a qualified biologist will assess the presence of suitable habitat for California freshwater shrimp (CFS). Maintenance activities that affect CFS would likely be limited to bank stabilization, vegetation management, and sediment removal at a few locations in SMA 5.

For activities proposed in SMA 5, the following measures shall apply:

- Modifications to stream channels in areas that are determined to support CFS will be minimal or limited, and will retain habitat elements (e.g., undercut banks with exposed, fine roots of willows or alders, trailing vines and overhauling woody vegetation) so that areas continue to provide habitat for this species.

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\(^1\) See Section 4.3.8, GEN-1.
\(^2\) No other activities are proposed within the known range of the CFS.
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- Maintenance activities will not include any permanent barriers that may inhibit CFS movement up- or downstream.

- All in-stream maintenance activities will be restricted to a modified low-flow period of June 15 through October 15. Work above the flow line will not be subject to this modified work period. The June 15 date may be pushed back depending on whether there was a wet spring or late spring rains.

- Sediment curtains will be placed downstream of any water diversion system, including water diversion pipe outlets, to prevent transporting and depositing sediment disturbed during maintenance activities outside of the maintenance activity zone.

**INV-3 – Valley elderberry longhorn beetle**

When conducting maintenance activities in SMA 2 (generally east of a line drawn between Fairfield in Solano County and Cedar Mountain in Alameda County; see Figure 4), the following measures shall apply:

- The ECC will flag all elderberry shrubs in the clearing and grubbing zone. The ECC shall coordinate with the supervisor who is to be present during the maintenance activity to ensure that flagged elderberry shrubs are not cut.

- If avoidance is not feasible, habitat impacts shall be mitigated in accordance with the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS, 1999a).

**4.3.5 AMMs for Fish**

**FIS-1 – CCC steelhead**

Before conducting maintenance activities in actively flowing channels, the ECC will check available data to determine if the channel is a known or a historical steelhead creek. If steelhead are known to be absent from the project area and there are long-standing natural or artificial downstream barriers sufficient to prevent upstream migration, then avoidance has been accomplished and no further actions are necessary.

If steelhead are determined or presumed present in the maintenance activity area, then the following shall be implemented:

- All in-stream maintenance activities will be restricted to a modified low-flow period of June 15 through October 15. Work above the flow line will not be subject to this modified work period. The June 15 date may be pushed back depending on whether there was a wet spring or late spring rains.

- Sediment curtains will be placed downstream of the water diversion system, including the water diversion pipe outlets to prevent transporting and depositing sediment disturbed during maintenance activities outside of the maintenance activity zone.

- Before construction of the water diversion system and placement of the sediment curtains, a qualified biologist with appropriate permit(s) will conduct fish relocation activities, and immediately release captured fish to a suitable habitat near the project site.
- Screens shall be placed on pumps\(^3\) used for dewatering the work area in accordance with NOAA Fisheries' *Fish Screening Criteria for Anadromous Salmonids* (NMFS, 1997). A qualified biologist will be on-site during the dewatering phase to ensure that any fish that may have remained within the maintenance area are relocated to suitable habitat near the project site in accordance with the Biological Opinion.

- For culvert and bridge replacement projects in known salmonid streams, the new structures will be designed and constructed to meet fish passage criteria described in NMFS' *Guidelines for Salmonid Passage at Stream Crossing* (2001). For historical salmonid streams, the new structures will be designed and constructed to meet fish passage criteria if there are no long-standing natural or artificial downstream barriers or if the barriers are to be removed within the life span of the culvert or bridge.

### 4.3.6 AMMs for Amphibians

**AMP-1 – California red-legged frog (CRLF)**

For maintenance activities (except vegetation management), qualified personnel will conduct habitat assessments per the following criteria:

- channel morphology;
- type of vegetation community;
- presence of deep pools; and,
- presence of emergent vegetation.

Following this assessment, each maintenance site shall be ranked using the following criteria:

- habitat assessment;
- proximity of known CRLF sites (e.g., within one mile, especially within same watershed);
- other biologically relevant factors (e.g., salinity, hydrologic connection).

Rankings are:

- **Rank 1** – non-natural channel, little or no vegetation, no shade, no deep pools (0.7 m) or emergent vegetation, and substantial barriers to CRLF migration;
- **Rank 2** – non-natural channel, managed channel bank vegetation (e.g., annual grasses), little or no shade, few (if any) deep pools, and none to some emergent vegetation (e.g., cattails);
- **Rank 3** – non-natural or natural channel, riparian vegetation providing sufficient shade, few to some pools, and none to some emergent vegetation; and,
- **Rank 4** – natural channel, substantial riparian vegetation providing sufficient shade, presence of both deep pools and emergent vegetation.

For projects ranked 1 or 2, no further studies or CRLF protection measures would be required and the maintenance activity would proceed.

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\(^3\) Gravity systems do not need to be screened.
In areas ranked 3 or 4, the following shall apply. These measures generally follow the Programmatic Biological Opinion for California red-legged frog (USFWS, 1999b)

- A qualified biologist shall conduct two daytime and two nighttime surveys. If no CRLF are found, no further studies or CRLF protection measures would be required and the maintenance activity would proceed.

- If CRLF adults or eggs are found, the ECC shall contact the USFWS to determine if moving any of these life-stages is appropriate. If the USFWS approves the moving of animals, the ECC shall be allowed sufficient time to move CRLF from the work site before work activities begin.

- If CRLF tadpoles are found, the activity will be delayed until the tadpoles metamorphose, at which time, they may be moved in accordance with the previous bullet.

- The project sponsor shall designate a person, which may or may not be the ECC, to monitor on-site compliance as long as that individual has undergone training in CRLF site identification. The monitor shall coordinate with the supervisor to halt any action that might result in more than incidental take of CRLF. If work is stopped, the Corps and USFWS shall be notified immediately by the ECC.

- If a maintenance activity site is to be temporarily dewatered by pumping, intakes shall be completely screened with wire mesh no larger than five millimeters to prevent CRLF from entering the pump system.

**AMP-2 – California tiger salamander (CTS)**

When conducting maintenance activities in the project area (except vegetation management), qualified personnel shall conduct habitat assessments per the following criteria:

- channel morphology;
- type of vegetation community;
- presence of pools; and,
- presence of small mammal burrows.

Following this assessment, each maintenance site shall be ranked using the following criteria:

- habitat assessment;
- proximity of known CTS sites;
- other biologically relevant factors (e.g., presence/absence of predators).

Potential rankings are:

- Rank 1 – natural channel, substantial riparian vegetation, presence of aquatic predators, no pools, and no adjacent grasslands;
- Rank 2 – non-natural or natural channel, riparian vegetation providing shade, few to some pools, and some grassland habitat;
- Rank 3 – non-natural channel or basin, managed bank vegetation (e.g., annual grasses), few (if any) deep pools, and presence of small mammal burrows (e.g., gopher and ground squirrel burrows);
• Rank 4 – non-natural channel or basin, managed bank vegetation, presence of deep pools and no aquatic predators, active, small mammal burrows and adjacent grasslands.

For projects ranked 1 or 2, no further studies or CTS protection measures would be required and the maintenance activity would proceed.

In areas ranked 3 or 4, the following shall apply:

• A qualified biologist will excavate small mammal burrows (which would be disturbed by the activity), and inspect all upland habitat features including, debris piles, or other suitable habitat before the maintenance activity begins. Use of an endoscope is recommended for burrows which be destroyed.
• If CTS are not found, no further studies or CTS protection measures would be required and the maintenance activity would proceed.
• If CTS are present, a qualified biologist shall move the CTS to an area outside of the maintenance site. The ECC shall contact the USFWS and CDFG and provide them with a map showing where the CTS was found and where it was relocated.

For areas west of Interstate 680 and north of Interstate 580, no measures are required because CTS are likely locally extirpated in this area. For areas east of Interstate 680 and south of Interstate 580, a qualified personnel will conduct the habitat assessment as described above and for areas ranked 3 and 4, the following measures shall be implemented:

• A qualified biologist will inspect all upland habitat features including small mammal burrows, debris piles, or other suitable habitat before maintenance activities to identify and relocate adult CTS, if present. The excavation of burrows will not be required. The ECC shall contact the USFWS and CDFG and provide them with a map showing where the CTS was found and where it was relocated.
• Work activities within suitable aquatic breeding habitat shall be completed between July 1 through October 15, or when the feature is dry.

When conducting maintenance activities in SMA 6 (see Zone 2A in Figure 8), the Sonoma County Water Agency shall follow the agreement with the USFWS.

4.3.7 AMMs for Birds and Mammals

BIR-1 – Swainson’s hawk

When working in SMA 2 (generally east of a line drawn between Fairfield in Solano County and Cedar Mountain in Alameda County, see Figure 3), the ECC shall conduct a pre-construction survey no more than two weeks before the start of work for any given maintenance activity during the months of March through August and report whether or not there are nesting Swainson’s hawks within 100 feet (access permitting) of the maintenance activity. However, if burrows and/or burrowing owls are observed, then the following apply:

4 No surveys are necessary from September to March.
• If there are nesting Swainson’s hawks present within the 100-foot buffer area, maintenance activities will be delayed until the adult and/or juvenile hawks are no longer using the nest as the center of their activity.

**BIR-2 – Burrowing owl**

In grasslands throughout the combined service areas and no more than two weeks before a maintenance activity, the ECC will conduct a survey for burrows and burrowing owls within 100 feet of the maintenance activity. If no burrows or burrowing owls are observed, then no further measures are necessary. However, if burrows and/or burrowing owls are observed, then the following apply:

• A determination shall be made by a qualified biologist whether or not maintenance activities will impact the occupied burrows or disrupt reproductive behavior.

• If it is determined that a maintenance activity will not impact occupied burrows or disrupt breeding behavior, maintenance will proceed without any restrictions.

• If it is determined that a maintenance activity will directly impact occupied burrows during August through February, the subject owls will be passively relocated from the occupied burrow(s) using one-way doors. There shall be at least two unoccupied burrows suitable for burrowing owls within 300 feet of the occupied burrow before one-way doors are installed. Artificial burrows shall be in place at least one-week before one-way doors are installed on occupied burrows. One-way doors will be in place for a minimum of 48 hours before burrows are excavated.

• If it is determined that maintenance activities will physically impact occupied burrows or disrupt reproductive behavior during the nesting season (February 1 through July), then the maintenance activity will be allowed only if it is implemented 250 feet away from occupied burrows.

**BIR-3 – California black rail and California clapper rail**

When working within 100 feet of salt or brackish marshland, presume presence for either species during the period February 1 through August 31 and schedule maintenance work to begin no earlier than September 1.

**BIR-4 – Snowy plover**

When conducting maintenance activities in SMA 3 (west of the line shown on Figure 5), after September 1, no AMMs are necessary; however, between March 15 through August 31 the following AMMs shall be observed:

• Schedule the maintenance activity to begin no earlier than September 1; or,

• A qualified biologist will conduct pre-construction surveys two weeks and one week before and the day of start of work. If western snowy plovers or their nests are not observed, then the maintenance activity may proceed; or,
• If a western snowy plover is observed within a 50-foot perimeter of the location of the maintenance activity two weeks or one week before, a qualified biologist will observe the activities of the bird(s) to determine if nesting behavior is exhibited. If either nesting behavior or a nest is observed within a 50-foot perimeter of the location of the maintenance activity, then the maintenance activity will be delayed until either nesting is abandoned or completed. If nesting behavior or the nest is observed more than the 50-foot perimeter away, the maintenance activity may proceed; or,

• If western snowy plover is observed within a 50-foot perimeter the day of the start of work, work will be delayed until the bird leaves the area. If a western snowy plover comes within the 50-foot perimeter once work has started, work will stop until the plover leaves; or,

• If a nest is observed within a 50-foot perimeter, work may proceed in two hour intervals with one hour breaks, for no more than four hours per day.

MAM-1 – Salt marsh harvest mouse and salt marsh wandering shrew

When implementing maintenance activities in uplands adjacent to salt or brackish marshland in SMA 7 (see Figure 9), vehicles will be confined to existing roads where possible and disturbed areas revegetated with brackish marsh species. Crews will use matting, pontoon boards or other comparable methods whenever feasible to minimize impacts to the existing vegetation. The placement of mats will be verified by a qualified biologist before their placement to minimize habitat impacts. Crews will work exclusively from mat boards and boardwalks to minimize trampling of vegetation. A qualified biologist will be available during the course of the maintenance work.

4.3.8 General AMMs

The General AMMs listed herein are to be applied to all of the routine flood control maintenance activities as described in this RBA.

GEN-15 – Environmental Compliance Coordinator

Participating members of the OPC (the ‘project sponsors’) will each designate an Environmental Compliance Coordinator (ECC)6. Before commencement of a maintenance activity as described in Section 2.5, the ECC will review project-specific information on the type, location and extent of the activity and associated areas of disturbance (e.g., proposed staging, stockpile and sediment disposal areas, etc.7). Using both the best management practices as detailed in the BMP Manual, the Activity Specific Conditions and the AMMs described in this section, the ECC will determine the appropriate measures, if any, to implement. The ECC will complete and distribute a brief form, the Minimal Threat Activity Worksheet (Worksheet)8 to flood control maintenance staff.

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5 GEN-1 shall be the first avoidance and minimization measure implemented for all activities covered under the Regional General Permit and described in this Biological Assessment.

6 The ECC need not be a biologist, but shall have an understanding of biological resources, missions of regulatory agencies and regulations as they may affect species within the context of the Regional Biological Assessment and any permits issued.

7 Where reference is made to the maintenance activity and/or work area, it is understood that the work area includes not only the actual area of maintenance but access to the site, staging areas, etc.

8 This worksheet is to be developed by the project sponsors.
before beginning the maintenance activity. The Worksheet will contain a list of the BMPs and AMMs as well as referring maintenance staff to the documents where these measures are described in detail (e.g., BMP Manual or RGP Terms and Conditions).

Since some maintenance activities require pre-construction surveys, the Worksheet must be finished in a timely manner to allow surveys to be completed before beginning the maintenance activity. The Worksheet shall be retained as part of the monitoring and reporting program described in GEN-2.

**GEN-2 – Monitoring and Reporting Program**

Each ECC will implement a monitoring and reporting program, which shall include, but not be limited to, the Worksheets, construction monitoring field forms, photo documentation and post-construction restoration/revegetation evaluation, if necessary. Reporting will be performed in accordance with the terms and conditions of the Biological Opinions. See also the discussion of monitoring (Section 2.5.8) and reporting (Section 2.5.9).

**GEN-3 – Buffer Areas**

The ECC shall establish sensitive species buffer areas around maintenance activities, if necessary.

**GEN-4 – Stop Work Order**

The ECC shall coordinate with the Maintenance Supervisor to stop any activity the ECC deems may result in take or destruction beyond what would be considered incidental. Work would not be allowed to resume until appropriate corrective measures have been completed. The ECC shall immediately report any unauthorized impacts to the Corps, USFWS, NMFS, CDFG, BCDC and SFBRWQCB.

**GEN-5 – Training**

All on-site maintenance activity personnel will receive instruction regarding the presence of listed species and the importance of avoiding impacts to these species and their habitat before the start of work.

**4.4 Summary Tables**

The Activity Specific Conditions (see Section 2.5), BMPs (OPC, 2000), and the AMMS represent the full range of OPC commitments to protected listed plants and wildlife. Table 3 combines all of these into a single reference display, along with SMAs where these are applicable. Tables 4 and 5 contain the same information, but for clarity, Table 4 lists only AMMs and BMP, and Table 5 provides AMMs and BMP information by species and habitat type. The project sponsors will incorporate Tables 4 and 5 into their maintenance programs as reference guides for maintenance crews.
### TABLE 3
MINIMAL THREAT ACTIVITIES, REQUIREMENTS, BEST MANAGEMENT PRACTICES,
AVOIDANCE AND MINIMIZATION MEASURES, AND SPECIAL MANAGEMENT AREAS

<table>
<thead>
<tr>
<th>EVENT</th>
<th>II. MAINTENANCE, REPAIR, REHAB, AND REPLACEMENT OF STRUCTURES</th>
<th>IV. BANK STABILIZATION</th>
<th>V. TEMPORARY WATER DIVERSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. Enhancement Projects</td>
<td>A. Maintenance, Repair, or Rehab of Weirs and Gates</td>
<td>B. In-kind Replacement of Weirs or Gates</td>
<td>C. Replacement of Culverts</td>
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<td>1 – 15</td>
<td>1 – 30</td>
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</tbody>
</table>

1) Vegetate bare soils with native species; use erosion control methods following removal of invasive or exotic species.
2) Use watershed specific and appropriate California native species.

- 1) No increase in facility footprint.
- 2) Develop and implement corrective action plan for improper operating culverts; activities in connection action plan are not covered.
- 1) Replacement is limited to currently serviceable structures.
- 2) Develop and implement corrective action plan for improper operating culverts; activities in connection action plan are not covered.
- 3) Minor deviations in configuration or filled area which are necessary for replacement are allowed. Adverse impacts are minimal.
- 1) Arched culvert must have an earthen bottom.
- 2) Concrete must be allowed to cure before restoring stream flow.
- 1) Replacement must be consistent with Corps NWP 14 conditions.
- 2) Minimal impact on riparian and aquatic habitats.
- 1) No treatment with creosote or possibly pressure treated wood (e.g., ACZMA); consult with appropriate agencies for current regulatory standards.
- 1) Minimize discharge of sediment or other pollutants downstream.
- 1) Delimit work area. Retain woody material unless it is compromised.
- 2) No grooved rip-rap, sackrete, concrete, concrete blocks and mattresses, gabions, and gunnite for new construction.
- 1) Conduct an analysis of the failure and justifications for use of hardcape.
- 2) Incorporate native riparian vegetation where channel design allow.

- No monitoring.

- 1) Before and after photo documentation.
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- 2) Identify implemented site specific BMPs.
- 3) Statement of BMPs effectiveness.
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- 2) Identify implemented site specific BMPs.
- 3) Statement of BMPs effectiveness.

Prepared – Subject to Revision

[Source: ESA / 2006 May 2006]
**TABLE 3 (Continued)**

MINIMAL THREAT* ACTIVITIES, REQUIREMENTS, BEST MANAGEMENT PRACTICES, AVOIDANCE AND MINIMIZATION MEASURES, AND SPECIAL MANAGEMENT AREAS

<table>
<thead>
<tr>
<th>A. Maintenance, Repair, or Rehab of Weirs and Gates</th>
<th>B. In-kind Replacement of Weirs or Gates</th>
<th>C. Replacement of Culverts</th>
<th>D. Bridge Replacement</th>
<th>E. Maintenance, Repair or In-kind Replacement of Piers and Pilings</th>
<th>F. Maintenance or Repair of Basins</th>
<th>G. Debris Removal in Front of Structures</th>
<th>A. Repair or Replacement with In-kind Structures; B. New Stabilization</th>
<th>C. Installation of Hardscape</th>
<th>A. Temporary Water Diversions</th>
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<tr>
<td>SMA 1 through SMA 7</td>
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*Best Management Practices: A Manual for Minimizing Environmental Impacts from Stream and Channel Maintenance Activities, June 2000. Not all of the BMPs will apply to each of the routine flood control maintenance activities or under all routine conditions.**
### TABLE 4
**Routine Maintenance Activities, Avoidance and Minimization Measures and Best Management Practices**

<table>
<thead>
<tr>
<th>C. Enhancement Projects</th>
<th>A. Maintenance, Repair, or Rehab of Weirs and Gates</th>
<th>B. In-kind Replacement of Weirs or Gates</th>
<th>C. Replacement of Culverts</th>
<th>D. Bridge Replacement</th>
<th>E. maintenance, Repair or In-kind Replacement of Piers and Piling</th>
<th>F. Maintenance or Repair of Bridges</th>
<th>G. Debris Removal in Front of Structures</th>
<th>H. Repair or Replacement with In-kind Structures; B. New Stabilization</th>
<th>C. Installation of Hardcape</th>
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**Notes:**
- Preliminary – Subject to Revision
- May 2006
4. Effects and Avoidance and Minimization Measures to Minimize Effects

Regional Biological Assessment for 'Minimal Threat'

Flood Control Routine Maintenance Activities

May 2006

Preliminary - Subject to Revision

TABLE 4 (Continued)

ROUTINE MAINTENANCE ACTIVITIES, AVOIDANCE AND MINIMIZATION MEASURES AND BEST MANAGEMENT PRACTICES

<table>
<thead>
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<th>C. Enhancement Projects</th>
<th>A. Maintenance, Repair, or Rehab of Weirs and Gates</th>
<th>B. In-kind Replacement of Weirs and Gates</th>
<th>C. Replacement of Culverts</th>
<th>D. Bridge Replacement</th>
<th>E. Maintenance, Repair or In-kind Replacement of Piers and Piling</th>
<th>F. Maintenance or Repair of Basins</th>
<th>G. Debris Removal in Front of Structures</th>
<th>A. Repair or Replacement with B. In-kind Structures, New Stabilization</th>
<th>C. Installation of Hardscape</th>
<th>A. Temporary Water Diversions</th>
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Specific avoidance and minimization measures (AMMs) are described in detail in Section 4.3.

Best management practices (BMPs) are from the BASMAA Operational Permits Committee Flood Control Facility Maintenance Best Management Practices: A Manual for Minimizing Environmental Impacts from Stream and Channel Maintenance Activities, June 2000. Not all of the marked BMPS will apply to each of the routine flood control maintenance activities or under all circumstances of implementation. The ECC will select the appropriate BMPs for activity specific locations.

Key to Abbreviations:

Best Management Practices

CU = Chemical Use
EV = Equipment and Vehicles
NR = Natural Resource Protection and Restoration
SC = Sediment Control
SS = Soil Stabilization
VDM = Vegetation and Debris Management
VR = Velocity Reduction
WD = Water Diversion

Avoidance and Minimization Measures

GEN = General
AMP = Amphibian
BIR = Bird
FIS = Fish
INV = Invertebrate
MAM = Mammal
PLA = Plant

EA/202193
May 2006

Preliminary – Subject to Revision
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<tr>
<th>Species/Behavior</th>
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**TABLE 5**
AVOIDANCE AND MINIMIZATION MEASURES, ACTIVITIES, AND SPECIAL MANAGEMENT AREAS FOR SPECIAL STATUS SPECIES POTENTIALLY OCCURRING WITHIN THE PROJECT AREA OF FLOOD CONTROL DISTRICTS

**MUDFLAT**

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<th>Nature Area</th>
<th>California beanstalk</th>
<th>California bdge</th>
<th>California clapper rail</th>
<th>California freshwater shrimp</th>
<th>Clapper rail</th>
<th>Snowy plover</th>
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**UPLAND AREAS**

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May 2006

Preliminary – Subject to Revision
TABLE 5 (Continued)  

AVOIDANCE AND MINIMIZATION MEASURES, ACTIVITIES, AND SPECIAL MANAGEMENT AREAS FOR SPECIAL STATUS SPECIES POTENTIALLY OCCURRING WITHIN THE PROJECT AREA OF FLOOD CONTROL DISTRICTS

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INSERT FIG 3
SMA #1
Figure 3
Special Management Area #1
Vernal Pool Fairy Shrimp
Palmate-Bracted Bird’s Beak

SOURCE: USGS

REVISED MAY 2006
4. Effects and Avoidance and Minimization Measures to Minimize Effects

INSERT FIG 4
SMA #2
Special Management Area #2
Vernal Pool Fairy Shrimp
Vernal Pool Tadpole Shrimp
Valley Elderberry Longhorn Beetle
Swainson’s Hawk
Contra Costa Goldfields

Regional Biological Assessment / 202193

Figure 4
See Figure 6, SMA #5
For Vernal Pool Tadpole Shrimp
and Contra Costa Goldfields

SOURCE: USGS
REVISED MAY 2006
INSERT FIG 6
SMA #4
Figure 7
Special Management Area #5
California Freshwater Shrimp
REVISED MAY 2006
4.0 Effects and Avoidance and Minimization Measures to Minimize Effects

INSERT FIG 7
SMA #5
Figure 6
Special Management Area #4
Vernal Pool Tadpole Shrimp
Contra Costa Goldfields

SOURCE: USGS
REVISED MAY 2006
INSERT FIG 8
SMA #6
Figure 8
Special Management Area #6
California Tiger Salamander

SOURCE: Sonoma County Water Agency

REVISED MAY 2006
INSERT FIG 9
SMA #7
Figure 9
Special Management Area #7
Salt Marsh Harvest Mouse
Suisun Ornate Shrew
Salt Marsh Wandering Shrew

SOURCE: USGS
REVISED MAY 2006
SECTION 5

References


California Department of Fish and Game (CDFG), California Natural Diversity Data Base for 7.5-minute Topographic Quadrangles in OPC Action Area, 2004.


______, Letter from NMFS to Vick Germany, ESA, regarding the presence of listed species or proposed for listing, 151422-SWR-02-SR-8273:ME, August 21, 2002.


______, *Programmatic Formal Endangered Species Act Consultation on Issuance of Permits under Section 404 of the Clean Water Act or Authorization under the Nationwide Permit Program for Projects that May affect the California Red-legged Frog*, 1999b.


______, Letter from USFWS to Christine O’Rourke, ESA, regarding the presence of listed species or proposed for listing, 1-1-02-SP-2531, July 12, 2002.

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