



**ADDENDUM NO. 1
TO THE
CONTRACT DOCUMENTS**

FOR

**BRACKISH WATER DESALINATION PROJECT
P.W. 694**

**ISSUED
October 14, 2020**

Bidders shall acknowledge receipt of this Addendum and all other Addenda issued by the City in Article II of the Bid Form, Section 00400. A Bid may be deemed non-responsive if receipt of all Addenda issued by the City are not acknowledged.

SEE ATTACHED ADDENDUM ITEMS

Approved By: _____

Scott Buenting, P.E.



ADDENDUM NO. 1
Brackish Water Desalination Project
PW 694

Issued October 14, 2020

- 1) Section 00200, Instructions to Bidders, change the first sentence of Paragraph 39.11 to read as follows:

"The Escrow Bid Documents shall be submitted in a sealed container no later than four (4) business days after receipt of bids."

- 2) Section 00232, SRF Disadvantage Business Enterprise Requirements, "Six Good Faith Efforts (GFE)" Item no. 2 shall be replaced with the following:

"Make information on forthcoming opportunities available to DBEs by advertising for a minimum of one day in a local newspaper in the area at least 30 days prior to bid opening. For the remaining 29 days advertisement can be placed in trade journals, web sites, building exchanges, or other ways."

- 3) Section 00400, Bid Forms, delete the last two pages of the Section following Attachment P.
- 4) Appendix C, Environmental Permits and MMRP, insert the attached copies of permits and fly sheet as Appendix C.

SELECTED RESPONSES TO REQUESTS FOR INFORMATION

- 1) Question: Due to ongoing pandemic, would the City consider accepting bids electronically or through email?

Answer: No.

- 2) Question: Would the City consider accepting Forms F, G, or G-1 in Section 00400 following the bid submittal?

Answer: No. The SWRCB and City requires these forms to be submitted with bids.

Appendix C

Environmental Permits and MMRP



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

July 17, 2020

Regulatory Division (SPK-2019-00499)

City of Antioch
Attn: Mr. Scott Buenting
200 H Street
Antioch, California 94509
SBuenting@ci.Antioch.ca.us

Dear Mr. Buenting:

We are responding to your July 1, 2019, pre-construction notification for a Department of the Army (DA) Nationwide permit for the Antioch Desalination Intake project. The approximately 1.67-acre project site is located on the Lower San Joaquin River, at the end of Fulton Shipyard Road, Latitude 38.01743°, Longitude -121.80260°, Antioch, Contra Costa County, California.

Based on the information you provided to this office, the Antioch Desalination Intake project involves work/structures in navigable waters and the discharge of fill material into approximately 0.05 acre of waters of the U.S. (WOUS) for demolition of the existing San Joaquin River intake pump station and construction of a new intake pump station, intake, and fish screen, subject to Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act (CWA). The specific activities that require DA authorization are the installation of a sheet piling cofferdam, two 42 inch high-density polyethylene (HDPE) intake pipelines, and the 10-foot by 36-foot concrete foundation which will support the intake pipes. These activities will result in the permanent effects to, and permanent loss of, approximately 0.05 acre of riverine habitat. The proposed activities would be conducted in accordance with the *City of Antioch Brackish Water Desalination Project: Section 404 Nationwide Permit Application* dated July, 2019.

We have determined that activities in WOUS associated with the project are authorized by Nationwide Permit (NWP) 7, *Outfall Structures and Associated Intake Structures*.

You must comply with all terms and conditions of the NWP and applicable regional conditions. Enclosed is information about the NWP terms and conditions and Sacramento District regional conditions for California, excluding the Lake Tahoe Basin (Enclosure 1). You should pay particular attention to General Conditions 1, 2, 3, 6, 12, 21, and Regional Conditions 3, 4, 7, and 8. In addition, your work must comply with the following special conditions:

1. This Corps permit does not authorize you to take an endangered species, in particular delta smelt (*Hypomesus transpacificus*), Lange's metalmark butterfly (*Apodemia mormo langei*), Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*Oncorhynchus mykiss*), or North American green sturgeon (*Acipenser medirostris*). In order to legally take a listed species, you must have separate authorization under the Endangered Species Act (ESA) (e.g., an ESA Section 10 permit, or a Biological Opinion (BO) under ESA Section 7, with "incidental take" provisions with which you must comply). The enclosed U.S. Fish and Wildlife Service (USFWS) BO (Number 08FBDT00-2020-F-0094, dated July 2, 2020) and National Marine Fisheries Service (NMFS) BO (Number WCRO-2019-03441, dated July 8, 2020), contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that is also specified in the BOs. Your authorization under this Corps permit is conditional upon your compliance with all of the mandatory terms and conditions associated with "incidental take" of the attached BOs, which terms and conditions are incorporated by reference in this permit. Failure to comply with the terms and conditions associated with incidental take of the BOs, where a take of the listed species occurs, would constitute an unauthorized take, and it would also constitute non-compliance with your Corps permit. The USFWS and the NMFS are the appropriate authority to determine compliance with the terms and conditions of their BOs, and with the ESA.

To ensure your project complies with the Magnuson-Stevens Fishery Conservation and Management Act, you must implement all of the mitigating measures and Essential Fish Habitat Recommendations identified in the above NMFS document, including those ascribed to the Corps therein.

2. Incidents where any individual fish listed by National Oceanic and Atmospheric Administration (NOAA) Fisheries under the ESA appear to be injured or killed as a result of discharges of dredged or fill material into WOUS or structures or work in navigable WOUS authorized by this NWP shall be reported to NOAA Fisheries, Office of Protected Resources at (301) 713-1401 and the Regulatory Office of the Sacramento District of the U.S. Army Corps of Engineers at (916) 557-5250. The finder should leave the plant or animal alone, make note of any circumstances likely causing the death or injury, note the location and number of individuals involved and, if possible, take photographs. Adult animals should not be disturbed unless circumstances arise where they are obviously injured or killed by discharge exposure, or some unnatural cause. The finder may be asked to carry out instructions provided by NOAA Fisheries, Office of Protected Resources, to collect specimens or take other measures to ensure that evidence intrinsic to the specimen is preserved.

Within 30 days after completion of the authorized work, you must sign the enclosed Compliance Certification and return it to this office with the information required by Sacramento District Regional Condition C(9) for California.

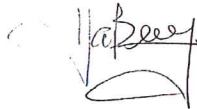
This verification is valid until March 18, 2022, when the existing NWPs are scheduled to be modified, reissued, or revoked. Furthermore, if you commence or are

under contract to commence this activity before the date the NWP is modified, reissued, or revoked, you will have 12 months from the date of the modification, reissuance or revocation to complete the activity under the present terms and conditions. Failure to comply with the general and regional conditions of this NWP, or the project-specific special conditions of this authorization, may result in the suspension or revocation of your authorization.

We would appreciate your feedback on this permit action including your interaction with our staff and processes. For more information about our program or to complete our Regulatory Program national customer service survey, visit our website at www.spk.usace.army.mil/Missions/Regulatory.aspx.

Please refer to identification number SPK-2019-00499 in any correspondence concerning this project. If you have any questions, please contact Thomas Faughnan by email at Thomas.J.Faughnan@usace.army.mil, or telephone at (916) 557-5263.

Sincerely,

A handwritten signature in black ink, appearing to read 'Peck Ha', with a stylized flourish at the end.

Peck Ha
Senior Project Manager
CA Delta Section
Regulatory Division

Enclosures

cc: (w/o encls)

Ms. Jordan Hensley, CVRWQCB, Jordan.Hensley@Waterboards.ca.gov

Mr. Doug Hampton, NMFS, Douglas.Hampton@NOAA.gov

Mr. Brian Hansen, USFWS, Brian.Hansen@FWS.gov

Mr. Jesse Halstead, ESA, JHalstead@ESAssoc.com

COMPLIANCE CERTIFICATION

Permit File Name: Antioch Desalination Intake

Action ID: SPK-2019-00499

Nationwide Permit Number: 7 - *Outfall Structures and Associated Intake Structures.*

Permittee: City of Antioch
Attn: Scott Buenting
200 H Street
Antioch, California 94509

County: Contra Costa County

Date of Verification: July 17, 2020

Within 30 days after completion of the activity authorized by this permit, sign this certification and return it to the following address:

U.S. Army Corps of Engineers
Sacramento District
DLL-CESPK-RD-Compliance@usace.army.mil

Please note that your permitted activity is subject to a compliance inspection by a U.S. Army Corps of Engineers representative. If you fail to comply with the terms and conditions of the permit your authorization may be suspended, modified, or revoked. If you have any questions about this certification, please contact the U.S. Army Corps of Engineers.

* * * * *

I hereby certify that the work authorized by the above-referenced permit, including all the required mitigation, was completed in accordance with the terms and conditions of the permit verification.

Permittee Signature

Date



U S Army Corps of
Engineers
Sacramento District

Nationwide Permit Summary

33 CFR Part 330; Issuance of Nationwide
Permits – March 19, 2017

7. Outfall Structures and Associated Intake Structures.

Activities related to the construction or modification of outfall structures and associated intake structures, where the effluent from the outfall is authorized, conditionally authorized, or specifically exempted by, or otherwise in compliance with regulations issued under the National Pollutant Discharge Elimination System Program (section 402 of the Clean Water Act). The construction of intake structures is not authorized by this NWP, unless they are directly associated with an authorized outfall structure.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. (See general condition 32.) (Authority: Sections 10 and 404)

A. Regional Conditions

1. Regional Conditions for California, excluding the Tahoe Basin

http://www.spk.usace.army.mil/Portals/12/documents/regulatory/nwp/2017_nwps/Final_SPK_Regional_Conditions_for_California.pdf?ver=2017-03-23-120307-207

2. Regional Conditions for Nevada, including the Tahoe Basin

http://www.spk.usace.army.mil/Portals/12/documents/regulatory/nwp/2017_nwps/Final_SPK_Regional_Conditions_for_Nevada.pdf?ver=2017-03-23-120306-910

3. Regional Conditions for Utah

http://www.spk.usace.army.mil/Portals/12/documents/regulatory/nwp/2017_nwps/Final_SPK_Regional_Conditions_for_Utah.pdf?ver=2017-03-23-120303-503

4. Regional Conditions for Colorado.

http://www.spk.usace.army.mil/Portals/12/documents/regulatory/nwp/2017_nwps/Final_2017_Regional_Conditions_in_Colorado.pdf?ver=2017-03-23-133821-047

B. Nationwide Permit General Conditions

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as applicable, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer.

Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Clean Water Act Section 401 water quality certification and/ or Coastal Zone Management Act consistency for an NWP. Every person who may wish to obtain permit authorization under one or more NWPs, or who is currently relying on an existing or prior permit authorization under one or more NWPs, has been and is on notice that all of the provisions of 33 CFR 330.1 through 330.6 apply to every NWP authorization. Note especially 33 CFR 330.5 relating to the modification, suspension, or revocation of any NWP authorization.

☐ 1. Navigation.

☐ (a) No activity may cause more than a minimal adverse effect on navigation.

☐ (b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.

☐ (c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

☐ 2. **Aquatic Life Movements.** No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species. If a bottomless culvert cannot be used, then the crossing should be designed and constructed to minimize adverse effects to aquatic life movements.

☐ 3. **Spawning Areas.** Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

BUILDING STRONG®

U.S. ARMY CORPS OF ENGINEERS – SACRAMENTO DISTRICT

1325 J ST. – SACRAMENTO, CA 95814

www.spk.usace.army.mil
www.facebook.com/sacramentodistrict
www.youtube.com/sacramentodistrict
www.twitter.com/USACEsacramento
www.flickr.com/photos/sacramentodistrict

- ☐ 4. **Migratory Bird Breeding Areas.** Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.
- ☐ 5. **Shellfish Beds.** No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWP 4 and 48, or is a shellfish seeding or habitat restoration activity authorized by NWP 27.
- ☐ 6. **Suitable Material.** No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see section 307 of the Clean Water Act).
- ☐ 7. **Water Supply Intakes.** No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.
- ☐ 8. **Adverse Effects From Impoundments.** If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.
- ☐ 9. **Management of Water Flows.** To the maximum extent practicable, the preconstruction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the preconstruction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).
- ☐ 10. **Fills Within 100-Year Floodplains.** The activity must comply with applicable FEMA-approved state or local floodplain management requirements.
- ☐ 11. **Equipment.** Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.
- ☐ 12. **Soil Erosion and Sediment Controls.** Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow, or during low tides.
- ☐ 13. **Removal of Temporary Fills.** Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.
- ☐ 14. **Proper Maintenance.** Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.
- ☐ 15. **Single and Complete Project.** The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.
- ☐ 16. **Wild and Scenic Rivers.**
- ☐ (a) No NWP activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a “study river” for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status.
- ☐ (b) If a proposed NWP activity will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a “study river” for possible inclusion in the system while the river is in an official study status, the permittee must submit a pre-construction notification (see general condition 32). The district engineer will coordinate the PCN with the Federal agency with direct management responsibility for that river. The permittee shall not begin the NWP activity until notified by the district engineer that the Federal agency with direct management responsibility for that river has determined in writing that the proposed NWP activity will not adversely affect the Wild and Scenic River designation or study status.
- ☐ (c) Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: <http://www.rivers.gov/>.
- ☐ 17. **Tribal Rights.** No NWP activity may cause more than minimal adverse effects on tribal rights (including treaty rights), protected tribal resources, or tribal lands.
- ☐ 18. **Endangered Species.**
- ☐ (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which “may affect” a listed species or critical habitat, unless ESA section 7 consultation addressing the effects of the proposed activity has been completed. Direct effects are the immediate effects on listed species and critical habitat caused by the NWP activity. Indirect effects are those effects on listed species and critical habitat that are caused by the NWP activity and are later in time, but still are reasonably certain to occur.
- ☐ (b) Federal agencies should follow their own procedures for complying with the requirements of the ESA. If preconstruction notification is required for the proposed activity, the Federal permittee must provide the

district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA.

☐ (c) Non-federal permittees must submit a pre-construction notification to the district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species or designated critical habitat, the pre-construction notification must include the name(s) of the endangered or threatened species that might be affected by the proposed activity or that utilize the designated critical habitat that might be affected by the proposed activity. The district engineer will determine whether the proposed activity “may affect” or will have “no effect” to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps’ determination within 45 days of receipt of a complete pre-construction notification. In cases where the non-Federal applicant has identified listed species or critical habitat that might be affected or is in the vicinity of the activity, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification that the proposed activity will have “no effect” on listed species or critical habitat, or until ESA section 7 consultation has been completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

☐ (d) As a result of formal or informal consultation with the FWS or NMFS the district engineer may add species specific permit conditions to the NWP.

☐ (e) Authorization of an activity by an NWP does not authorize the “take” of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with “incidental take” provisions, etc.) from the FWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where “take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word “harm” in the definition of “take” means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

☐ (f) If the non-federal permittee has a valid ESA section 10(a)(1)(B) incidental take permit with an

approved Habitat Conservation Plan for a project or a group of projects that includes the proposed NWP activity, the non-federal applicant should provide a copy of that ESA section 10(a)(1)(B) permit with the PCN required by paragraph (c) of this general condition. The district engineer will coordinate with the agency that issued the ESA section 10(a)(1)(B) permit to determine whether the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation conducted for the ESA section 10(a)(1)(B) permit. If that coordination results in concurrence from the agency that the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation for the ESA section 10(a)(1)(B) permit, the district engineer does not need to conduct a separate ESA section 7 consultation for the proposed NWP activity. The district engineer will notify the non-federal applicant within 45 days of receipt of a complete pre-construction notification whether the ESA section 10(a)(1)(B) permit covers the proposed NWP activity or whether additional ESA section 7 consultation is required.

☐ (g) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the FWS and NMFS or their world wide Web pages at <http://www.fws.gov/> or <http://www.fws.gov/ipac> and <http://www.nmfs.noaa.gov/pr/species/esa/> respectively.

☐ 19. **Migratory Birds and Bald and Golden Eagles.** The permittee is responsible for ensuring their action complies with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The permittee is responsible for contacting appropriate local office of the U.S. Fish and Wildlife Service to determine applicable measures to reduce impacts to migratory birds or eagles, including whether “incidental take” permits are necessary and available under the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act for a particular activity.

☐ 20. **Historic Properties.**

☐ (a) In cases where the district engineer determines that the activity may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

☐ (b) Federal permittees should follow their own procedures for complying with the requirements of section 106 of the National Historic Preservation Act. If pre-construction notification is required for the proposed NWP activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation is not submitted, then additional consultation under section 106 may be necessary. The respective federal agency is responsible for fulfilling its obligation to comply with section 106.

☐ (c) Non-federal permittees must submit a pre-construction notification to the district engineer if the

NWP activity might have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the preconstruction notification must state which historic properties might have the potential to be affected by the proposed NWP activity or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of, or potential for, the presence of historic properties can be sought from the State Historic Preservation Officer, Tribal Historic Preservation Officer, or designated tribal representative, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted in the PCN and these identification efforts, the district engineer shall determine whether the proposed NWP activity has the potential to cause effects on the historic properties. Section 106 consultation is not required when the district engineer determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR 800.3(a)). Section 106 consultation is required when the district engineer determines that the activity has the potential to cause effects on historic properties. The district engineer will conduct consultation with consulting parties identified under 36 CFR 800.2(c) when he or she makes any of the following effect determinations for the purposes of section 106 of the NHPA: no historic properties affected, no adverse effect, or adverse effect. Where the non-Federal applicant has identified historic properties on which the activity might have the potential to cause effects and so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects to historic properties or that NHPA section 106 consultation has been completed.

☐ (d) For non-federal permittees, the district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA section 106 consultation is required. If NHPA section 106 consultation is required, the district engineer will notify the non-Federal applicant that he or she cannot begin the activity until section 106 consultation is completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

☐ (e) Prospective permittees should be aware that section 110k of the NHPA (54 U.S.C. 306113) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of section 106 of the NHPA, has intentionally significantly

adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/ THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

☐ **21. Discovery of Previously Unknown Remains and Artifacts.** If you discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by this permit, you must immediately notify the district engineer of what you have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal, and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

☐ **22. Designated Critical Resource Waters.** Designated Critical Resource Waters. Critical resource waters include, NOAA-managed marine sanctuaries and marine monuments, and National Estuarine Research Reserves. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as outstanding national resource waters or state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment.

☐ (a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51, and 52 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.

☐ (b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, 38, and 54, notification is required in accordance with general condition 32, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

☐ **23. Mitigation.** The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal:

☐ (a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).

☐ (b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal.

☐ (c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10-acre and require preconstruction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. For wetland losses of 1/10-acre or less that require preconstruction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects.

☐ (d) For losses of streams or other open waters that require pre-construction notification, the district engineer may require compensatory mitigation to ensure that the activity results in no more than minimal adverse environmental effects. Compensatory mitigation for losses of streams should be provided, if practicable, through stream rehabilitation, enhancement, or preservation, since streams are difficult-to-replace resources (see 33 CFR 332.3(e)(3)).

☐ (e) Compensatory mitigation plans for NWP activities in or near streams or other open waters will normally include a requirement for the restoration or enhancement, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, the restoration or maintenance/protection of riparian areas may be the only compensatory mitigation required. Restored riparian areas should consist of native species. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. If it is not possible to restore or maintain/protect a riparian area on both sides of a stream, or if the waterbody is a lake or coastal waters, then restoring or maintaining/protecting a riparian area along a single bank or shoreline may be sufficient. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of minimization or compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.

☐ (f) Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332.

☐ (1) The prospective permittee is responsible for proposing an appropriate compensatory mitigation option if compensatory mitigation is necessary to ensure that the activity results in no more than minimal adverse environmental effects. For the NWPs, the preferred mechanism for providing compensatory mitigation is mitigation bank credits or in-lieu fee program credits (see 33 CFR 332.3(b)(2) and (3)). However, if an appropriate number and type of mitigation bank or in-lieu credits are not available at the time the PCN is submitted to the district engineer, the district engineer may approve the use of permittee-responsible mitigation.

☐ (2) The amount of compensatory mitigation required by the district engineer must be sufficient to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see 33 CFR 330.1(e)(3)). (See also 33 CFR 332.3(f)).

☐ (3) Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, aquatic resource restoration should be the first compensatory mitigation option considered for permittee-responsible mitigation.

☐ (4) If permittee-responsible mitigation is the proposed option, the prospective permittee is responsible for submitting a mitigation plan. A conceptual or detailed mitigation plan may be used by the district engineer to make the decision on the NWP verification request, but a final mitigation plan that addresses the applicable requirements of 33 CFR 332.4(c)(2) through (14) must be approved by the district engineer before the permittee begins work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)).

☐ (5) If mitigation bank or in-lieu fee program credits are the proposed option, the mitigation plan only needs to address the baseline conditions at the impact site and the number of credits to be provided.

☐ (6) Compensatory mitigation requirements (e.g., resource type and amount to be provided as compensatory mitigation, site protection, ecological performance standards, monitoring requirements) may be addressed through conditions added to the NWP authorization, instead of components of a compensatory mitigation plan (see 33 CFR 332.4(c)(1)(ii)).

☐ (g) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2-acre, it cannot be used to authorize any NWP activity resulting in the loss of greater than 1/2-acre of

waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that an NWP activity already meeting the established acreage limits also satisfies the no more than minimal impact requirement for the NWPs.

☐ (h) Permittees may propose the use of mitigation banks, in-lieu fee programs, or permittee-responsible mitigation. When developing a compensatory mitigation proposal, the permittee must consider appropriate and practicable options consistent with the framework at 33 CFR 332.3(b). For activities resulting in the loss of marine or estuarine resources, permittee-responsible mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee-responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation and performance of the compensatory mitigation project, and, if required, its long-term management.

☐ (i) Where certain functions and services of waters of the United States are permanently adversely affected by a regulated activity, such as discharges of dredged or fill material into waters of the United States that will convert a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse environmental effects of the activity to the no more than minimal level.

☐ **24. Safety of Impoundment Structures.** To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has been independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.

☐ **25. Water Quality.** Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA section 401, individual 401 Water Quality Certification must be obtained or waived (see 33 CFR 330.4(c)). The district engineer or State or Tribe may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

☐ **26. Coastal Zone Management.** In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). The district engineer or a State may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

☐ **27. Regional and Case-By-Case Conditions.** The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with

any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

☐ **28. Use of Multiple Nationwide Permits.** The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the United States authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.

☐ **29. Transfer of Nationwide Permit Verifications.** If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature:

When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(Transferee)

(Date)

☐ **30. Compliance Certification.** Each permittee who receives an NWP verification letter from the Corps must provide a signed certification documenting completion of the authorized activity and implementation of any required compensatory mitigation. The success of any required permittee-responsible mitigation, including the achievement of ecological performance standards, will be addressed separately by the district engineer. The Corps will provide the permittee the certification document with the NWP verification letter. The certification document will include:

☐ (a) A statement that the authorized activity was done in accordance with the NWP authorization, including any general, regional, or activity-specific conditions;

☐ (b) A statement that the implementation of any required compensatory mitigation was completed in accordance with the permit conditions. If credits from a mitigation bank or in-lieu fee program are used to satisfy the compensatory mitigation requirements, the certification must include the documentation required by 33 CFR 332.3(l)(3) to confirm that the permittee secured the appropriate number and resource type of credits; and

☐ (c) The signature of the permittee certifying the completion of the activity and mitigation. The completed certification document must be submitted to the district engineer within 30 days of completion of the authorized activity or the implementation of any required compensatory mitigation, whichever occurs later.

☐ **31. Activities Affecting Structures or Works Built by the United States.** If an NWP activity also requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers (USACE) federally authorized Civil Works project (a "USACE project"), the prospective permittee must submit a preconstruction notification. See paragraph (b)(10) of general condition 32. An activity that requires section 408 permission is not authorized by NWP until the appropriate Corps office issues the section 408 permission to alter, occupy, or use the USACE project, and the district engineer issues a written NWP verification.

☐ **32. Pre-Construction Notification.**

☐ (a) **Timing.** Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, if the PCN is determined to be incomplete, notify the prospective permittee within that 30 day period to request the additional information necessary to make the PCN complete. The request must specify the information needed to make the PCN complete. As a general rule, district engineers will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

☐ (1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or

☐ (2) 45 calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 18 that listed species or critical habitat might be affected or are in the vicinity of the activity, or to notify the Corps pursuant to general condition 20 that the activity might have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that there is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the

Endangered Species Act (see 33 CFR 330.4(f)) and/or section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)) has been completed. Also, work cannot begin under NWPs 21, 49, or 50 until the permittee has received written approval from the Corps. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee may not begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

☐ (b) Contents of Pre-Construction Notification: The PCN must be in writing and include the following information:

☐ (1) Name, address and telephone numbers of the prospective permittee;

☐ (2) Location of the proposed activity;

☐ (3) Identify the specific NWP or NWP(s) the prospective permittee wants to use to authorize the proposed activity;

☐ (4) A description of the proposed activity; the activity's purpose; direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands, other special aquatic sites, and other waters expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; a description of any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed activity; and any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings for linear projects that require Department of the Army authorization but do not require pre-construction notification. The description of the proposed activity and any proposed mitigation measures should be sufficiently detailed to allow the district engineer to determine that the adverse environmental effects of the activity will be no more than minimal and to determine the need for compensatory mitigation or other mitigation measures. For single and complete linear projects, the PCN must include the quantity of anticipated losses of wetlands, other special aquatic sites, and other waters for each single and complete crossing of those wetlands, other special aquatic sites, and other waters. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the activity and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed activity (e.g.,

a conceptual plan), but do not need to be detailed engineering plans);

☐ (5) The PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. Furthermore, the 45 day period will not start until the delineation has been submitted to or completed by the Corps, as appropriate;

☐ (6) If the proposed activity will result in the loss of greater than 1/10-acre of wetlands and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse environmental effects are no more than minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

☐ (7) For non-Federal permittees, if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat, the PCN must include the name(s) of those endangered or threatened species that might be affected by the proposed activity or utilize the designated critical habitat that might be affected by the proposed activity. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with the Endangered Species Act;

☐ (8) For non-Federal permittees, if the NWP activity might have the potential to cause effects to a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, the PCN must state which historic property might have the potential to be affected by the proposed activity or include a vicinity map indicating the location of the historic property. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with section 106 of the National Historic Preservation Act;

☐ (9) For an activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, the PCN must identify the Wild and Scenic River or the "study river" (see general condition 16); and

☐ (10) For an activity that requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, the pre-construction notification must include a statement confirming that the project proponent has submitted a written request for section 408 permission from the Corps office having jurisdiction over that USACE project.

☐ (c) **Form of Pre-Construction Notification:** The standard individual permit application form (Form ENG 4345) may be used, but the completed application form must clearly indicate that it is an NWP PCN and must include all of the applicable information required in paragraphs (b)(1) through (10) of this general condition. A letter containing the required information may also be used. Applicants may provide electronic files of PCNs and supporting materials if the district engineer has established tools and procedures for electronic submittals.

☐ (d) **Agency Coordination:**

☐ (1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the activity's adverse environmental effects so that they are no more than minimal.

☐ (2) Agency coordination is required for: (i) All NWP activities that require pre-construction notification and result in the loss of greater than 1/2-acre of waters of the United States; (ii) NWP 21, 29, 39, 40, 42, 43, 44, 50, 51, and 52 activities that require pre-construction notification and will result in the loss of greater than 300 linear feet of stream bed; (iii) NWP 13 activities in excess of 500 linear feet, fills greater than one cubic yard per running foot, or involve discharges of dredged or fill material into special aquatic sites; and (iv) NWP 54 activities in excess of 500 linear feet, or that extend into the waterbody more than 30 feet from the mean low water line in tidal waters or the ordinary high water mark in the Great Lakes.

☐ (3) When agency coordination is required, the district engineer will immediately provide (e.g., via email, facsimile transmission, overnight mail, or other expeditious manner) a copy of the complete PCN to the appropriate Federal or state offices (FWS, state natural resource or water quality agency, EPA, and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will have 10 calendar days from the date the material is transmitted to notify the district engineer via telephone, facsimile transmission, or email that they intend to provide substantive, site-specific comments. The comments must explain why the agency believes the adverse environmental effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the preconstruction notification. The district engineer will fully consider agency comments

received within the specified time frame concerning the proposed activity's compliance with the terms and conditions of the NWP, including the need for mitigation to ensure the net adverse environmental effects of the proposed activity are no more than minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

☐ (4) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.

☐ (4) Applicants are encouraged to provide the Corps with either electronic files or multiple copies of preconstruction notifications to expedite agency coordination.

C. District Engineer's Decision

☐ 1. In reviewing the PCN for the proposed activity, the district engineer will determine whether the activity authorized by the NWP will result in more than minimal individual or cumulative adverse environmental effects or may be contrary to the public interest. If a project proponent requests authorization by a specific NWP, the district engineer should issue the NWP verification for that activity if it meets the terms and conditions of that NWP, unless he or she determines, after considering mitigation, that the proposed activity will result in more than minimal individual and cumulative adverse effects on the aquatic environment and other aspects of the public interest and exercises discretionary authority to require an individual permit for the proposed activity. For a linear project, this determination will include an evaluation of the individual crossings of waters of the United States to determine whether they individually satisfy the terms and conditions of the NWP(s), as well as the cumulative effects caused by all of the crossings authorized by NWP. If an applicant requests a waiver of the 300 linear foot limit on impacts to streams or of an otherwise applicable limit, as provided for in NWPs 13, 21, 29, 36, 39, 40, 42, 43, 44, 50, 51, 52, or 54, the district engineer will only grant the waiver upon a written determination that the NWP activity will result in only minimal individual and cumulative adverse environmental effects. For those NWPs that have a waivable 300 linear foot limit for losses of intermittent and ephemeral stream bed and a 1/2-acre limit (i.e., NWPs 21, 29, 39, 40, 42, 43, 44, 50, 51, and 52), the loss of intermittent and ephemeral

stream bed, plus any other losses of jurisdictional waters and wetlands, cannot exceed 1/2- acre.

☐ 2. When making minimal adverse environmental effects determinations the district engineer will consider the direct and indirect effects caused by the NWP activity. He or she will also consider the cumulative adverse environmental effects caused by activities authorized by NWP and whether those cumulative adverse environmental effects are no more than minimal. The district engineer will also consider site specific factors, such as the environmental setting in the vicinity of the NWP activity, the type of resource that will be affected by the NWP activity, the functions provided by the aquatic resources that will be affected by the NWP activity, the degree or magnitude to which the aquatic resources perform those functions, the extent that aquatic resource functions will be lost as a result of the NWP activity (e.g., partial or complete loss), the duration of the adverse effects (temporary or permanent), the importance of the aquatic resource functions to the region (e.g., watershed or ecoregion), and mitigation required by the district engineer. If an appropriate functional or condition assessment method is available and practicable to use, that assessment method may be used by the district engineer to assist in the minimal adverse environmental effects determination. The district engineer may add case-specific special conditions to the NWP authorization to address site-specific environmental concerns.

☐ 3. If the proposed activity requires a PCN and will result in a loss of greater than 1/10-acre of wetlands, the prospective permittee should submit a mitigation proposal with the PCN. Applicants may also propose compensatory mitigation for NWP activities with smaller impacts, or for impacts to other types of waters (e.g., streams). The district engineer will consider any proposed compensatory mitigation or other mitigation measures the applicant has included in the proposal in determining whether the net adverse environmental effects of the proposed activity are no more than minimal. The compensatory mitigation proposal may be either conceptual or detailed. If the district engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse environmental effects are no more than minimal, after considering mitigation, the district engineer will notify the permittee and include any activity-specific conditions in the NWP verification the district engineer deems necessary. Conditions for compensatory mitigation requirements must comply with the appropriate provisions at 33 CFR 332.3(k). The district engineer must approve the final mitigation plan before the permittee commences work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation. If the prospective permittee elects to submit a compensatory mitigation plan with the PCN, the district engineer will expeditiously review the proposed compensatory mitigation plan. The district engineer must review the proposed compensatory mitigation plan within 45 calendar days of receiving a complete PCN and determine whether the proposed mitigation would ensure the NWP activity results in no more than minimal adverse environmental effects. If the net adverse environmental effects of the NWP activity (after consideration of the mitigation proposal) are determined by

the district engineer to be no more than minimal, the district engineer will provide a timely written response to the applicant. The response will state that the NWP activity can proceed under the terms and conditions of the NWP, including any activity-specific conditions added to the NWP authorization by the district engineer.

☐ 4. If the district engineer determines that the adverse environmental effects of the proposed activity are more than minimal, then the district engineer will notify the applicant either: (a) That the activity does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an individual permit; (b) that the activity is authorized under the NWP subject to the applicant's submission of a mitigation plan that would reduce the adverse environmental effects so that they are no more than minimal; or (c) that the activity is authorized under the NWP with specific modifications or conditions. Where the district engineer determines that mitigation is required to ensure no more than minimal adverse environmental effects, the activity will be authorized within the 45-day PCN period (unless additional time is required to comply with general conditions 18, 20, and/or 31, or to evaluate PCNs for activities authorized by NWPs 21, 49, and 50), with activity-specific conditions that state the mitigation requirements. The authorization will include the necessary conceptual or detailed mitigation plan or a requirement that the applicant submit a mitigation plan that would reduce the adverse environmental effects so that they are no more than minimal. When compensatory mitigation is required, no work in waters of the United States may occur until the district engineer has approved a specific mitigation plan or has determined that prior approval of a final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation.

D. Further Information

1. District Engineers have authority to determine if an activity complies with the terms and conditions of an NWP.
2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.
3. NWPs do not grant any property rights or exclusive privileges.
4. NWPs do not authorize any injury to the property or rights of others.
5. NWPs do not authorize interference with any existing or proposed Federal project (see general condition 31).

E. Definitions

Best management practices (BMPs): Policies, practices, procedures, or structures implemented to mitigate the adverse environmental effects on surface water quality resulting from development. BMPs are categorized as structural or non-structural.

Compensatory mitigation: The restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.

Currently serviceable: Useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.

Direct effects: Effects that are caused by the activity and occur at the same time and place.

Discharge: The term "discharge" means any discharge of dredged or fill material into waters of the United States.

Ecological reference: A model used to plan and design an aquatic habitat and riparian area restoration, enhancement, or establishment activity under NWP 27. An ecological reference may be based on the structure, functions, and dynamics of an aquatic habitat type or a riparian area type that currently exists in the region where the proposed NWP 27 activity is located. Alternatively, an ecological reference may be based on a conceptual model for the aquatic habitat type or riparian area type to be restored, enhanced, or established as a result of the proposed NWP 27 activity. An ecological reference takes into account the range of variation of the aquatic habitat type or riparian area type in the region.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Ephemeral stream: An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area.

High Tide Line: The line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.

Historic Property: Any prehistoric or historic district, site (including archaeological site), building, structure, or other object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural

importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR part 60).

Independent utility: A test to determine what constitutes a single and complete non-linear project in the Corps Regulatory Program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

Indirect effects: Effects that are caused by the activity and are later in time or farther removed in distance, but are still reasonably foreseeable.

Intermittent stream: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

Loss of waters of the United States: Waters of the United States that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the United States is a threshold measurement of the impact to jurisdictional waters for determining whether a project may qualify for an NWP; it is not a net threshold that is calculated after considering compensatory mitigation that may be used to offset losses of aquatic functions and services. The loss of stream bed includes the acres or linear feet of stream bed that are filled or excavated as a result of the regulated activity. Waters of the United States temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the United States. Impacts resulting from activities that do not require Department of the Army authorization, such as activities eligible for exemptions under section 404(f) of the Clean Water Act, are not considered when calculating the loss of waters of the United States. Navigable waters: Waters subject to section 10 of the Rivers and Harbors Act of 1899. These waters are defined at 33 CFR part 329.

Non-tidal wetland: A non-tidal wetland is a wetland that is not subject to the ebb and flow of tidal waters. Nontidal wetlands contiguous to tidal waters are located landward of the high tide line (i.e., spring high tide line).

Open water: For purposes of the NWPs, an open water is any area that in a year with normal patterns of precipitation has water flowing or standing above ground to the extent that an ordinary high water mark can be determined. Aquatic vegetation within the area of flowing or standing water is either non-emergent, sparse, or absent. Vegetated shallows are considered to be open waters. Examples of "open waters" include rivers, streams, lakes, and ponds.

Ordinary High Water Mark: An ordinary high water mark is a line on the shore established by the fluctuations of water and indicated by physical characteristics, or by other appropriate means that consider the characteristics of the surrounding areas.

Perennial stream: A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

Pre-construction notification: A request submitted by the project proponent to the Corps for confirmation that a particular activity is authorized by nationwide permit. The request may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Preconstruction notification may be required by the terms and conditions of a nationwide permit, or by regional conditions. A pre-construction notification may be voluntarily submitted in cases where preconstruction notification is not required and the project proponent wants confirmation that the activity is authorized by nationwide permit.

Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

Protected tribal resources: Those natural resources and properties of traditional or customary religious or cultural importance, either on or off Indian lands, retained by, or reserved by or for, Indian tribes through treaties, statutes, judicial decisions, or executive orders, including tribal trust resources.

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Reestablishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: Reestablishment and rehabilitation.

Riffle and pool complex: Riffle and pool complexes are special aquatic sites under the 404(b)(1) Guidelines. Riffle and

pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a coarse substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

Riparian areas: Riparian areas are lands next to streams, lakes, and estuarine-marine shorelines. Riparian areas are transitional between terrestrial and aquatic ecosystems, through which surface and subsurface hydrology connects riverine, lacustrine, estuarine, and marine waters with their adjacent wetlands, non-wetland waters, or uplands. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality. (See general condition 23.)

Shellfish seeding: The placement of shellfish seed and/or suitable substrate to increase shellfish production. Shellfish seed consists of immature individual shellfish or individual shellfish attached to shells or shell fragments (i.e., spat on shell). Suitable substrate may consist of shellfish shells, shell fragments, or other appropriate materials placed into waters for shellfish habitat.

Single and complete linear project: A linear project is a project constructed for the purpose of getting people, goods, or services from a point of origin to a terminal point, which often involves multiple crossings of one or more waterbodies at separate and distant locations. The term “single and complete project” is defined as that portion of the total linear project proposed or accomplished by one owner/developer or partnership or other association of owners/developers that includes all crossings of a single water of the United States (i.e., a single waterbody) at a specific location. For linear projects crossing a single or multiple waterbodies several times at separate and distant locations, each crossing is considered a single and complete project for purposes of NWP authorization. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately.

Single and complete non-linear project: For non-linear projects, the term “single and complete project” is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete non-linear project must have independent utility (see definition of “independent utility”). Single and complete non-linear projects may not be “piecemealed” to avoid the limits in an NWP authorization.

Stormwater management: Stormwater management is the mechanism for controlling stormwater runoff for the purposes of reducing downstream erosion, water quality degradation, and flooding and mitigating the adverse effects of changes in land use on the aquatic environment.

Stormwater management facilities: Stormwater management facilities are those facilities, including but not limited to, stormwater retention and detention ponds and best management practices, which retain water for a period of time to control runoff and/or improve the quality (i.e., by reducing

the concentration of nutrients, sediments, hazardous substances and other pollutants) of stormwater runoff.

Stream bed: The substrate of the stream channel between the ordinary high water marks. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the stream bed, but outside of the ordinary high water marks, are not considered part of the stream bed.

Stream channelization: The manipulation of a stream’s course, condition, capacity, or location that causes more than minimal interruption of normal stream processes. A channelized stream remains a water of the United States.

Structure: An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.

Tidal wetland: A tidal wetland is a jurisdictional wetland that is inundated by tidal waters. Tidal waters rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by other waters, wind, or other effects. Tidal wetlands are

Tribal lands: Any lands title to which is either: (1) Held in trust by the United States for the benefit of any Indian tribe or individual; or (2) held by any Indian tribe or individual subject to restrictions by the United States against alienation.

Tribal rights: Those rights legally accruing to a tribe or tribes by virtue of inherent sovereign authority, unextinguished aboriginal title, treaty, statute, judicial decisions, executive order or agreement, and that give rise to legally enforceable remedies.

Vegetated shallows: Vegetated shallows are special aquatic sites under the 404(b)(1) Guidelines. They are areas that are permanently inundated and under normal circumstances have rooted aquatic vegetation, such as seagrasses in marine and estuarine systems and a variety of vascular rooted plants in freshwater systems.

Waterbody: For purposes of the NWPs, a waterbody is a jurisdictional water of the United States. If a wetland is adjacent to a waterbody determined to be a water of the United States, that waterbody and any adjacent wetlands are considered together as a single aquatic unit (see 33 CFR 328.4(c)(2)). Examples of “waterbodies” include streams, rivers, lakes, ponds, and wetlands.



United States Department of the Interior

FISH AND WILDLIFE SERVICE

San Francisco Bay-Delta Fish and Wildlife Office
650 Capitol Mall, Suite 8-300
Sacramento, California 95814



In Reply Refer To:

08FBDT00-2020-F-0094

July 2, 2020

Mr. Peck Ha
Senior Project Manager
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Subject: Formal Consultation on the Brackish Water Desalination Facility Project, Contra Costa County, California (U.S. Army Corps of Engineers File No.: SPK-2019-00499)

Dear Mr. Ha:

This letter is in response to the U.S. Army Corps of Engineers' (Corps) January 29, 2019, request to initiate formal consultation with the U.S. Fish and Wildlife Service (Service) on the proposed Brackish Water Desalination Facility Project (project) located in Contra Costa County, California. The Corps' consultation initiation letter was received by the Service's San Francisco Bay-Delta Fish and Wildlife Office on February 3, 2020. The Service verified with the Corps that the initiation letter was incorrectly dated for 2019 instead of 2020. The Corps has determined that the proposed project may affect and is likely to adversely affect the federally threatened delta smelt (*Hypomesus transpacificus*) and its critical habitat. The Corps also determined that the project may affect, but is not likely to adversely affect the federally endangered Lange's metalmark butterfly (*Apodemia mormo langeri*) (LMB). This response is issued under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act), and in accordance with the implementing regulations pertaining to interagency cooperation (50 CFR 402).

In reviewing this project, the Service has relied upon: (1) the Corps' January 29, 2020 (incorrectly dated 2019), letter requesting consultation; (2) the August 2019, revised September 2019 *Brackish Water Desalination Facility, Biological Assessment* (BA), *Essential Fish Habitat Assessment*, and *Incidental Take Permit Application* prepared by ESA (consultant for the City of Antioch (City)); (3) the January 15, 2020, memorandum from ESA to the Corps; (4) the April 3, 2020, memorandum from ESA to the Corps; (5) the April 17, 2020, memorandum from ESA to the Corps; (6) electronic mail (email) and telephone communication between the Corps, ESA, and the Service; and (7) other information available to the Service.

The project site for the proposed new intake diversion and pump station is located approximately 650 feet west from the edge of the designated "Stamm Unit" within Antioch Dunes National

Wildlife Refuge (ADNWR). No habitat for the LMB or its host plant, the naked-stemmed buckwheat (*Eriogonum nudum*), occurs within the project site; therefore, no direct effects to the LMB, its host plant, or its habitat are anticipated to occur. However, potential habitat within the Stamm Unit that could support the LMB and its host plant is located approximately 1,210 feet to 1,585 feet away from the project site and effects from construction-generated noise (specifically pile driving) may occur. Noise levels were measured near the ADNWR and fluctuate between 50 decibels (dB) up to 80 dB. The ADNWR is located in an actively used industrial area with the Fulton Shipyard and the Georgia Pacific Gypsum Plant nearby, and is also adjacent to an active Union Pacific rail line. The Federal Transit Administration reports that maximum sound levels for an at-grade rail transit pass-by at 50 miles per hour (mph) is approximately 80 dB at 50 feet (FTA, 2018). This translates to a range of noise levels of approximately 80 dB at the southern boundary of ADNWR to approximately 61 dB at a distance of 900 feet at the northern boundary of ADNWR. Based on anticipated sound levels, proposed noise reducing measures, and natural sound attenuation between the pile driving area and LMB habitat located approximately 1,210 feet to 1,585 feet away; sound levels within LMB habitat are anticipated to be near lower ambient levels (53 dB) during pile driving. Given the current baseline sound levels at the ADNWR and the low likelihood of pile driving sound effects exceeding background levels near suitable habitat for the LMB, the Service concurs with the Corps that the project may affect, but is not likely to adversely affect the LMB.

The Service has reviewed the proposed project and its effects to the delta smelt's designated critical habitat. In designating critical habitat for the delta smelt, the Service identified the following Primary Constituent Elements (PCEs) essential to the conservation of the species:

PCE #1 is physical habitat for spawning. Reduction in overall spawning substrate is not expected to occur. The reduction is not expected because the new intake diversion and fish screen is not expected to remove substrate from the river bed. Open water spawning habitat is not expected to be adversely affected because construction of the new intake diversion is proposed to be near a small enclosed marina with a current intake diversion, pre-existing structures and in an area of high human activity where delta smelt are not expected to spawn. Delta smelt tend to avoid in-water structure or places of high disturbance where predators or other threats may occur.

PCE #2 is suitable water quality for all life stages. Water quality in the Action Area will be temporarily affected by pile-driving activities. Pile driving may affect water quality surrounding the area through the creation of the sediment plumes. Pile driving activities are short in duration (approximately 2 weeks). The sediment plumes would be temporary in nature and typically dissipate within the same day of activity. The proposed cofferdam installation for the construction of the new intake diversion is considered to be small in size (< 1 acre) and sediment plumes created from the cofferdam would also be discountable in size in relation to the Delta and would not be expected to affect the overall water quality of the Delta ecosystem.

PCE #3 is river flow. Future operations of the new intake diversion will not increase the total volume of water that is being removed through the City's current operation; therefore, the new intake diversion is not expected to diminish the river's current volume or flow.

PCE #4 is salinity for rearing. Brine waste discharge is not expected to have any significant effect on the overall salinity within the Delta. Since the river flows will not be affected, the position of X2 is not anticipated to be affected. Brine waste discharge at the diffuser will have a localized effect of increased salinity at the point of discharge. In a high salinity and low river

flow conditions scenario, the brine waste discharge with a minimal dilution of 24:1 has been modeled to be no greater than 11 parts per thousand (ppt) at a 5-foot zone of initial dilution. The receiving water in the San Joaquin River can range from < 1 ppt to upwards of 9 ppt depending on water year type and tidal conditions. Given that the flow rates and flow velocities in the vicinity of the diffuser are strongly tidal, mixing and dilution of the brine waste is expected to occur quickly. There is a large volume of receiving water in the San Joaquin River surrounding the diffuser and salinity conditions would be expected to return to near ambient levels quickly.

After reviewing the potential effects to the PCEs for the delta smelt critical habitat, the Service concludes that the project may affect, but is not likely to adversely affect the delta smelt critical habitat.

The remainder of this document represents the Service's biological opinion on the effects of the proposed project on the delta smelt.

CONSULTATION HISTORY

April 4, 2019	The Corps held a pre-application meeting with the consultant for the City, the Service, National Marine Fisheries Service (NMFS), and the California Department of Fish and Wildlife (CDFW).
September 18, 2019	The applicant held a meeting with the Service, NMFS, and CDFW to discuss contents of the BA which resulted in an additional measure to further reduce potential for entrainment of fish into the proposed intake and fish screen.
February 3, 2020	The Service received the Corps' consultation initiation letter.
April 3, 2020	The Service received an email from the Corps with an attached addendum to the BA.
April 22, 2020	The Service received an email from the City's consultant with an attached letter that was sent to the Corps which provided further technical information on the project.

BIOLOGICAL OPINION

Description of the Proposed Action

The project consists of the following components:

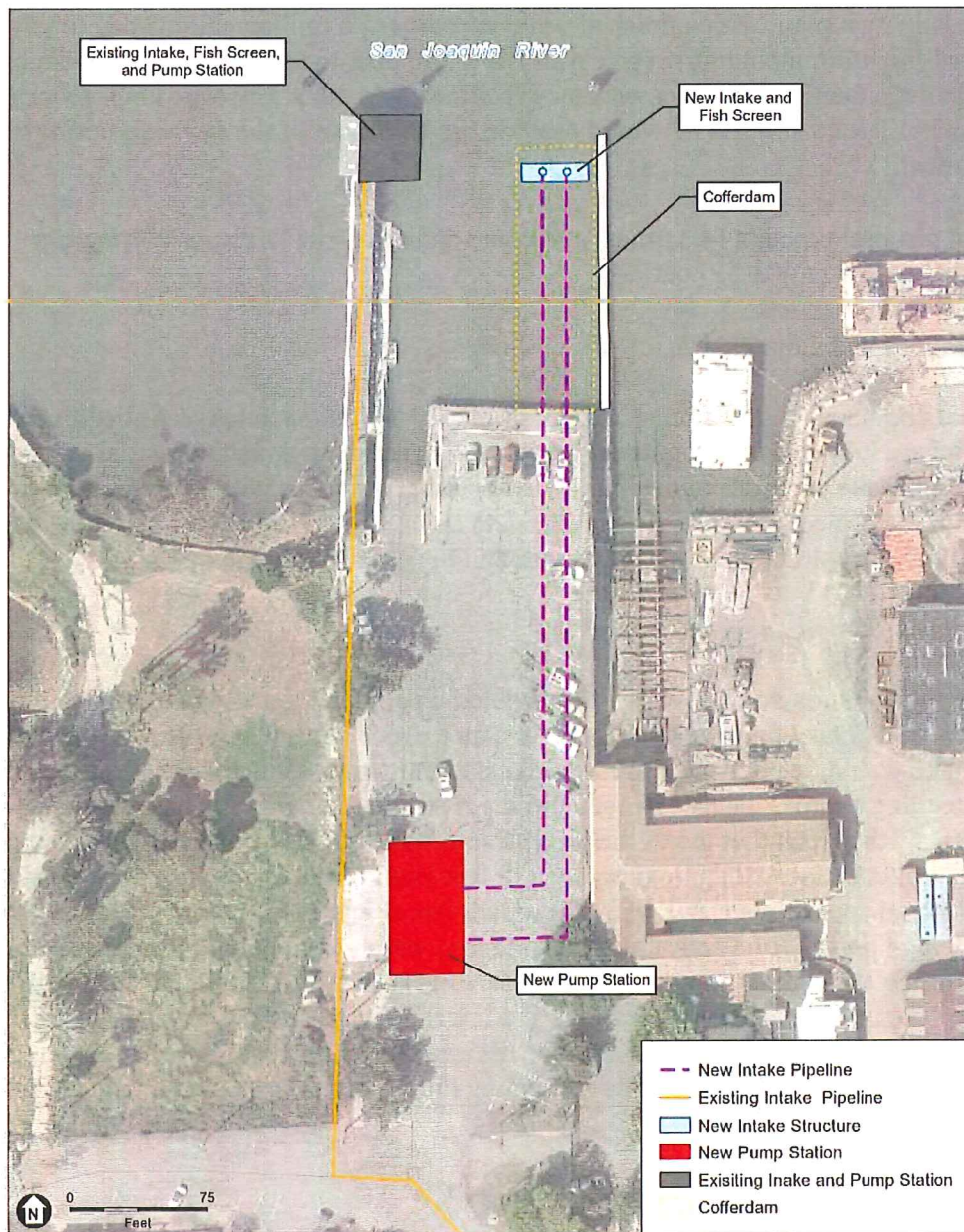
- New intake pump station and fish screen to replace existing river intake facilities.
- New raw water pipeline connection to the City's existing raw water pipeline to allow water to be conveyed directly from the river to the water treatment plant (WTP).

- A desalination plant with a finished water capacity of 6 million gallons/day (mgd) and related facilities, including reverse osmosis (RO); post-treatment systems; chemical feed and storage facilities; brine conveyance facilities; and other associated non-process facilities. The existing WTP would provide pre-treatment of the raw water prior to RO treatment.
- Brine disposal pipeline (4.3 miles) and connection to Delta Diablo's Wastewater Treatment Plant (WWTP) outfall.
- Operations and maintenance.

The terrestrial components of the project occur primarily within the cities of Antioch and Pittsburgh and are located in predominately commercial, residential, and industrial developments. For the purposes of this biological opinion, the focus will be on the aquatic components of the project description as it relates to delta smelt. Please refer to the BA for descriptions of the construction of new pipelines and the new desalination plant.

New Intake Pump Station and Fish Screen

The existing pump station and intake pipeline would be demolished and replaced. The intake capacity of the new intake pump station for river water would remain at a firm capacity of 16 mgd. The intake would be connected to the pump station by two 42-inch diameter submerged pipelines extending approximately 135 feet into the river. Each of the pipelines would be equipped with a fish screen that meets the protective criteria of CDFW and NMFS. The new pump station would be located approximately 225 feet inland from shore within the existing parking lot with an approximate area of 3,500 square feet (Figure 1). The pump station would house three 8 mgd pumps (two active and one standby) which would allow the pump station to continue operating at 16 mgd if one of the pumps are out of service for maintenance. The variable speed pumps would allow operations at a lower speed if needed, providing flexibility in operations. The pump station building would be designed to allow for sea level rise by the year 2100 without mechanical or electrical room flooding during high river flow coincident with the highest estimated tide.



SOURCE: Sacramento County, 2018; ESRI, 2012; City of Antioch, 2019; Corallo, 2109; ESA, 2019

City of Antioch Desalination Project

Figure 1

Construction activities for the new intake pump station would involve excavation, pouring concrete footing for foundations; assembling and installing piping, pumps, and electrical equipment; building concrete enclosures and roofs; and performing finish work such as paving, and fencing the perimeter of the pump station site on City property. Additionally, a cofferdam may be temporarily installed in the river by the construction contractor to facilitate installation of the intake pipelines and fish screens and minimize turbulence and sediment disturbance during construction. The cofferdam would consist of interlocking sheet piles forming a watertight corridor approximately 42 feet wide that would extend into the river approximately 143 feet from the shore. A barge-mounted or land-based crane will position the sheet piles for the coffer dam vertically in place. Once in place, the pile-driving machinery will be mounted to the sheet pile

and the pile-driver will proceed to drive the pile into the substrate with either a vibratory attachment or impact hammer attachment if needed. This will continue for the next sheet piles until the cofferdam is completed. Installation of the cofferdam is expected to take approximately 2 weeks. Pipelines and fish screens would be installed within the watertight corridor. The cofferdam would be removed following construction.

The existing pump station would remain in operation while the new pump station is constructed. Once the new pump station is operational, the existing pump station would be demolished. Only minor clearing or grubbing is expected for the new river intake pump station as it would be constructed on pre-developed areas. Construction access would be provided via existing access roads and roadways. Construction of the new river pump station would result in approximately 4,000 square feet of temporary disturbance and 3,500 square feet of permanent disturbance in the existing parking lot of the City's marina.

Brine Disposal

The RO process would generate approximately 2 mgd of brine. Brine from the RO system would be conveyed through an approximately 4.3-mile long, 12-inch-diameter dedicated pipeline from the desalination facility to the existing Delta Diablo WWTP. The brine disposal pipeline would be constructed of high-density polyethylene or polyvinyl chloride and would connect to the WWTP effluent channel at the north end of the plant. The brine would be mixed with treated wastewater from the WWTP prior to discharge through the existing WWTP outfall/diffuser. The majority of the brine disposal pipeline would be constructed within roadway rights-of way in the cities of Antioch and Pittsburg along Elizabeth Court/D Street, Tregallas Road, Fitzuren Road, Contra Loma Boulevard/L Street, West 10th Street/Pittsburg Antioch Highway, and Arcy Lane. The existing Delta Diablo WWTP outfall pipeline ends approximately 500 feet offshore between Dowest Slough to the south and Winter Island to the north (Figure 2). The outfall is at an elevation depth of 26 feet. The diffuser port diameter is approximately 42 inches, with 50 3-inch diameter ports spaced 8 feet apart in alternating directions. No construction or modifications to the Delta Diablo WWTP outfall/diffuser would be required.

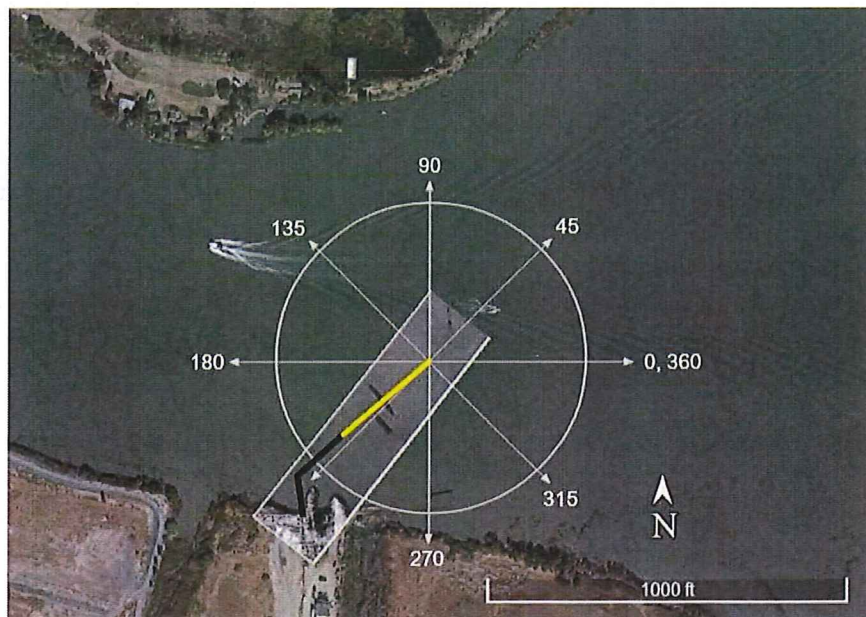


Figure 2

Operations and Maintenance

The City's current water supply operations cease river diversions when salinity at the intake is above the City's salinity target. The timing of this varies by water year type. With the proposed project, the City would continue to divert water from the river for conventional treatment until salinity increases and then it would begin using the brackish desalination facility. This would enable the new intake pump station to potentially operate year round.

The new 16 mgd pump station equipment would include three vertical variable speed turbine pumps (8 mgd and 600 horsepower each). Two of the pumps would be active and one on standby, allowing the pump station to continue operating if one of the pumps are out of service for maintenance. The variable speed pumps would allow variable diversion rates, providing the City flexibility in operations. The extended river intake pump station operational period would improve the City's ability to use its existing water right. When the desalination facility is operating, 8 mgd would be diverted to the desalination facility and the City would have the ability to divert up to an additional 8 mgd to the conventional WTP or municipal reservoir to be used for blending depending on demands and water quality.

The desalination plant's operation schedule would vary each year depending on when chloride concentrations increase at the City's river intake. In general, the plant would be operated seasonally, turning on when river salinity increases and operating at full capacity until salinity at the City's intake returns to a suitable level for conventional treatment.

The facility would operate at an overall recovery rate of approximately 75 percent (%). Approximately 8 mgd of river water would be needed to produce 6 mgd of desalinated product water. When operated, the desalination facility would operate at its full capacity. Intermittent or partial operation of desalination facilities is typically not advised and a minimum of 2 mgd flow is needed for operations. Steady flow velocity through the membranes at its rated capacity prevents the buildup of precipitates on the membranes which can reduce treatment efficiency and capacity of the system. The RO process would generate up to 2 mgd of brine. The RO brine total dissolved solids is expected to range between 400 milligrams per liter (mg/L) and 30,000 mg/L (Carollo 2018) and will vary with the source water quality.

Under current conditions, the City diverts water through its existing San Joaquin River intake when the source water salinity is suitable for use. If the City diverts 6 mgd, it delivers 6 mgd to its service area – which results in a net removal of 6 mgd from the Delta. The desalination facility would operate with an overall recovery rate of approximately 75%. Therefore, when the desalination project is in operation in the future, the City will divert 8 mgd at its intake in order to deliver 6 mgd to its customers and return 2 mgd of brine to the river via Delta Diablo's existing outfall diffuser resulting in a total of 6 mgd removed from the Delta. Thus, the total volume of water removed from the Delta would not increase as a result of the project.

The desalination plant would be used to produce between roughly 2600 acre-feet/year – 5,500 acre-feet/year (800 – 1800 MG) depending on year type. The plant would operate seasonally for a longer period of time during drier years than in wetter years. The brine volume would vary, ranging from approximately 0 MG to 62 MG depending on how much the plant was operated in the month.

Conservation Measures

Please refer to the project BA for standard best management practices, spill prevention plans, storm water pollution prevention plans, and other general conservation measures. The following conservation measures are with regard to delta smelt.

1. A worker awareness training program shall be conducted for construction crews before the start of construction activities at the river intake pump station site. The program shall include a brief overview of sensitive fisheries, aquatic resources, and water quality on the project site, measures to minimize impacts on those resources, and conditions of relevant regulatory permits.
2. Any in-water construction activities (e.g., construction of the sheet-pile cofferdam, pile driving) shall be conducted during months when special-status fish species/sensitive life stages are least likely to be present or less susceptible to disturbance (August 1 to October 31). If any in-water work is to be conducted, a qualified biologist or resource specialist shall be present during such work to monitor construction activities and ensure compliance with terms and conditions of permits issued by regulatory agencies.
3. To reduce the potential for fish stranding or minimize the potential for harm during cofferdam dewatering activities, the City or its contractor shall develop and implement a fish rescue plan. Prior to the closure of the cofferdam in the Delta, seining by a qualified fisheries biologist shall be conducted within the cofferdam using a small-mesh seine to direct and move fish out of the cofferdam area. Upon completion of seining, the entrance to the cofferdam shall be blocked with a net to prevent fish from entering the cofferdam isolation area before the cofferdam is completed. Once the cofferdam is completed and the area within the cofferdam is closed and isolated, additional seining shall be conducted within the cofferdam to remove any remaining fish, if present. Once all noticeable fish have been removed from the isolated area, portable pumps with intakes equipped with 1.75 mm mesh screen shall be used to dewater to a depth of 1.5-2 feet. A qualified biologist shall implement further fish rescue operations using electrofishing and dip nets. All fish that are captured shall be placed in clean 5-gallon buckets and/or coolers filled with Delta water, transported downstream of the construction area, and released back into suitable habitat in the Delta with minimal handling. After all fish have been removed using multiple seine passes, electrofishing, and dip nets (as necessary), portable pumps with screens (see above) shall be used for final dewatering. The Service, NMFS, and CDFW shall be notified at least 48 hours prior to the fish rescue.
4. The City shall develop a plan for pile-driving activities to minimize impacts on fish and will allow sufficient time in the schedule for coordination with regulatory agencies. Measures will be implemented to minimize underwater sound pressure to levels below thresholds for peak pressure and accumulated sound exposure levels. Underwater sound monitoring shall be performed during pile-driving activities. A qualified acoustician, biologist, and/or natural resource specialist shall be present during such work to monitor construction activities and compliance with terms and conditions of permits. Sheet piling shall be driven by vibratory or nonimpact methods (i.e., hydraulic) that result in sound pressures below threshold levels, to the extent feasible. Pile driving activities may occur during periods of reduced currents as needed to meet the threshold limits. Pile-driving activities shall be monitored and if any stranding, injury, or mortality to fish is observed,

CDFW, NMFS, and/or the Service shall be immediately notified and in-water pile driving shall cease. Pile driving shall be conducted only during daylight hours and initially will be used at low energy levels and reduced impact frequency. Applied energy and frequency shall be gradually increased until the force and frequency necessary to advance the pile is achieved. If it is determined that impact hammers are required and/or underwater sound monitoring demonstrates that thresholds are being exceeded, the contractor shall implement sound dampening or attenuation devices to reduce levels to the extent feasible; these may include use of a water bladder cofferdam or a confined/unconfined air bubble curtain.

5. To offset the permanent loss of shallow water habitat associated with the new intake, the City shall compensate for the loss at a ratio of 3:1 through one of the following methods:
 - The City will remove debris (e.g., concrete, the existing pipeline, and piers) and structures from the work area in an amount 3 times greater than the area of new facilities that will be introduced into the water; or,
 - Alternatively, credits shall be purchased at a conservation bank approved by the Service for selling delta smelt credits.
6. The City will confirm, through field monitoring, that the modeling analysis (summarized in the BA [Chapter 6] and described in detail in Attachment A, Brine Waste Discharge Plume Modeling Report) provides reasonable characterization of the plume, both in quality and spatial extent. If it is determined that the measured plume exceeds modeled conditions in spatial extent and/or quality, adaptive management options will be explored to address any potential adverse impacts. Reinitiation of consultation may be required. Confirmation that the model is representative of project conditions is anticipated to be accomplished within a single monitoring year timed with the start-up and commissioning phase of the project.
7. During sensitive fisheries periods (i.e., December through June period when early life stage delta smelt are potentially present in the vicinity of the intake), the City shall operate both fish screens simultaneously, to the extent feasible (e.g., whenever one screen is not being cleaned or otherwise maintained), to reduce approach velocities by 50 % (i.e., from 0.2 feet per second to 0.1 foot per second). This operational measure will provide additional protection for those early life stages that have limited swimming capabilities and may be most vulnerable to entrainment.

Action Area

The Action Area is defined as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action,” (50 Code of Federal Regulations [CFR] 402.02). For the purposes of the effects assessment where aquatic construction and project operations (i.e., diversions and brine waste discharge) have the potential to affect delta smelt, the Action Area is located in portions of the lower San Joaquin River near the cities of Antioch and Pittsburg, California (Figures 1 and 2). The river intake pump station is located at the City marina near McElheny Road and Fulton Shipyard Road. The project footprint includes approximately 514 acres of in-water hydroacoustic effects from sheet-pile driving activities for the cofferdam at the new fish screen construction and approximately 8.63 acres of a maximum zone of dilution in the cross channel from the brine discharge in the San Joaquin River at the Delta Diablo WWTP

outfall/diffuser. The zone of initial dilution is not static and can change with river flow and tidal conditions over the course of the day. It can be as small 0.5 acre to as large as 8.63 acres.

ANALYTICAL FRAMEWORK for the JEOPARDY DETERMINATION

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. “Jeopardize the continued existence of” means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02).

The jeopardy analysis in this biological opinion considers the effects of the proposed Federal action, and any cumulative effects, on the range wide survival and recovery of the listed species. It relies on four components: (1) the *Status of the Species*, which describes the current range wide condition of the species, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which analyzes the current condition of the species in the Action Area without the consequences to the listed species caused by the proposed action, the factors responsible for that condition, and the relationship of the Action Area to the survival and recovery of the species; (3) the *Effects of the Action*, which includes all effects that are caused by the proposed Federal action; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the Action Area on the species. The *Effects of the Action* and *Cumulative Effects* are added to the *Environmental Baseline* and in light of the status of the species, the Service formulates its opinion as to whether the proposed action is likely to jeopardize the continued existence of listed species.

Status of the Species for Delta Smelt

The Service conducted a recent review of the status of the delta smelt beyond what was analyzed in the last 5-year review for the species, and therefore, the current status of the species for delta smelt is replicated here for this biological opinion.

Species Legal Status and Life Cycle Summary

The Service proposed to list the delta smelt as threatened with proposed critical habitat on October 3, 1991 (Service 1991). The Service listed the delta smelt as threatened on March 5, 1993 (Service 1993), and designated critical habitat for the species on December 19, 1994 (Service 1994). The delta smelt was one of eight fish species addressed in the *Recovery Plan for the Sacramento–San Joaquin Delta Native Fishes* (Service 1996). A 5-year status review of the delta smelt was completed on March 31, 2004 (Service 2004). The review concluded that delta smelt remained a threatened species. A subsequent 5-year status review recommended uplisting delta smelt from threatened to endangered (Service 2010a). A 12-month finding on a petition to reclassify the delta smelt as an endangered species was completed on April 7, 2010 (Service 2010b). After reviewing all available scientific and commercial information, the Service determined that re-classifying the delta smelt from a threatened to an endangered species was warranted but precluded by other higher priority listing actions (Service 2010c). The Service reviews the status and uplisting recommendation for delta smelt during its Candidate Notice of Review (CNOR) process. Each year it has been published, the CNOR has recommended the

uplisting from threatened to endangered. Electronic copies of these documents are available at <https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=321>.

The delta smelt is a small fish of the family Osmeridae. In the wild, very few individuals reach lengths over 3.5 inches (90 mm; Damon *et al.* 2016). At the time of its listing, only the basics of the species' life history were known (Moyle *et al.* 1992). In the intervening 26 years, it has become one of the most studied fishes in the United States. Enough has been learned about the delta smelt to support its propagation in captivity over multiple generations (Lindberg *et al.* 2013), to support the development of complex conceptual models of the species life history (Interagency Ecological Program (IEP) 2015), and mathematical simulation models of its life cycle (Rose *et al.* 2013a). Any synthesis of the now extensive literature on the delta smelt requires drawing conclusions across studies that had disparate objectives, but several syntheses have been compiled from existing information (Moyle *et al.* 1992; Bennett 2005; IEP 2015; Moyle *et al.* 2016). In this biological opinion, the Service relied on these previous syntheses where it remains appropriate to do so. We also relied on source study results and analyses of our own to synthesize across a rapidly growing body of scientific information.

The delta smelt has a fairly simple life history because a large majority of individuals live only one year (Bennett 2005; Moyle *et al.* 2016) and because it is an endemic species (Moyle 2002), comprising only one genetic population (Fisch *et al.* 2011), that completes its full life cycle in the northern reaches of the San Francisco Bay-Delta (Merz *et al.* 2011; Figure 3). The schematic of this simple life cycle developed by Moyle *et al.* (2016) and published again by Moyle *et al.* (2018) is shown in Figure 4. Most spawning occurs from February through May in various places from the Napa River and locations to the east including much of the Sacramento-San Joaquin Delta. Larvae hatch and enter the plankton primarily from March through May, and most individuals have metamorphosed into the juvenile life stage by June or early July. Most of the juvenile fish continue to rear in habitats from Suisun Bay and marsh and locations east principally along the Sacramento River-Cache Slough corridor (recently dubbed the 'North Delta Arc'; Moyle *et al.* 2010). The juvenile fish (or 'sub-adults') begin to develop into maturing adults in the late fall. Thereafter, the population spatial distribution expands with the onset of early winter storms and the first individuals begin to reach sexual maturity by January in some years, but most often in February (Damon *et al.* 2016; Kurobe *et al.* 2016). Delta smelt do not reach sexual maturity until they grow to at least 55 mm in length (~ 2 inches) and 50% of individuals are sexually mature at 60 to 65 mm in length (Rose *et al.* 2013b). In captivity delta smelt can survive to spawn at two years of age (Lindberg *et al.* 2013), but this appears to be rare in the wild (Bennett 2005; Damon *et al.* 2016; Figure 4). The spawning microhabitats of the delta smelt are unknown, but based on adult distribution data (Damon *et al.* 2016; Polansky *et al.* 2018) and the evaluation of otolith microchemistry (Hobbs *et al.* 2007a; Bush 2017), most delta smelt spawn in freshwater to slightly brackish-water habitats under tidal influence. Most individuals die after spawning, but as is typical for annual fishes, when conditions allow, some individuals can spawn more than once during their single spawning season (Damon *et al.* 2016). In a recent study spanning 2 to 3 months, captive males held at a constant water temperature of 12°C (54°F) spawned an average of 2.8 times and females spawned an average of 1.7 times (LaCava *et al.* 2015).



Figure 3. Delta smelt range map. Waterways colored in purple depict the delta smelt distribution described by Merz *et al.* (2011). The Service has used newer information to expand the transient range of delta smelt further up the Napa and Sacramento rivers than indicated by Merz *et al.* (2011). The red polygon depicts the boundary of delta smelt's designated critical habitat. The inset map shows the region known as the North Delta Arc shaded light green.

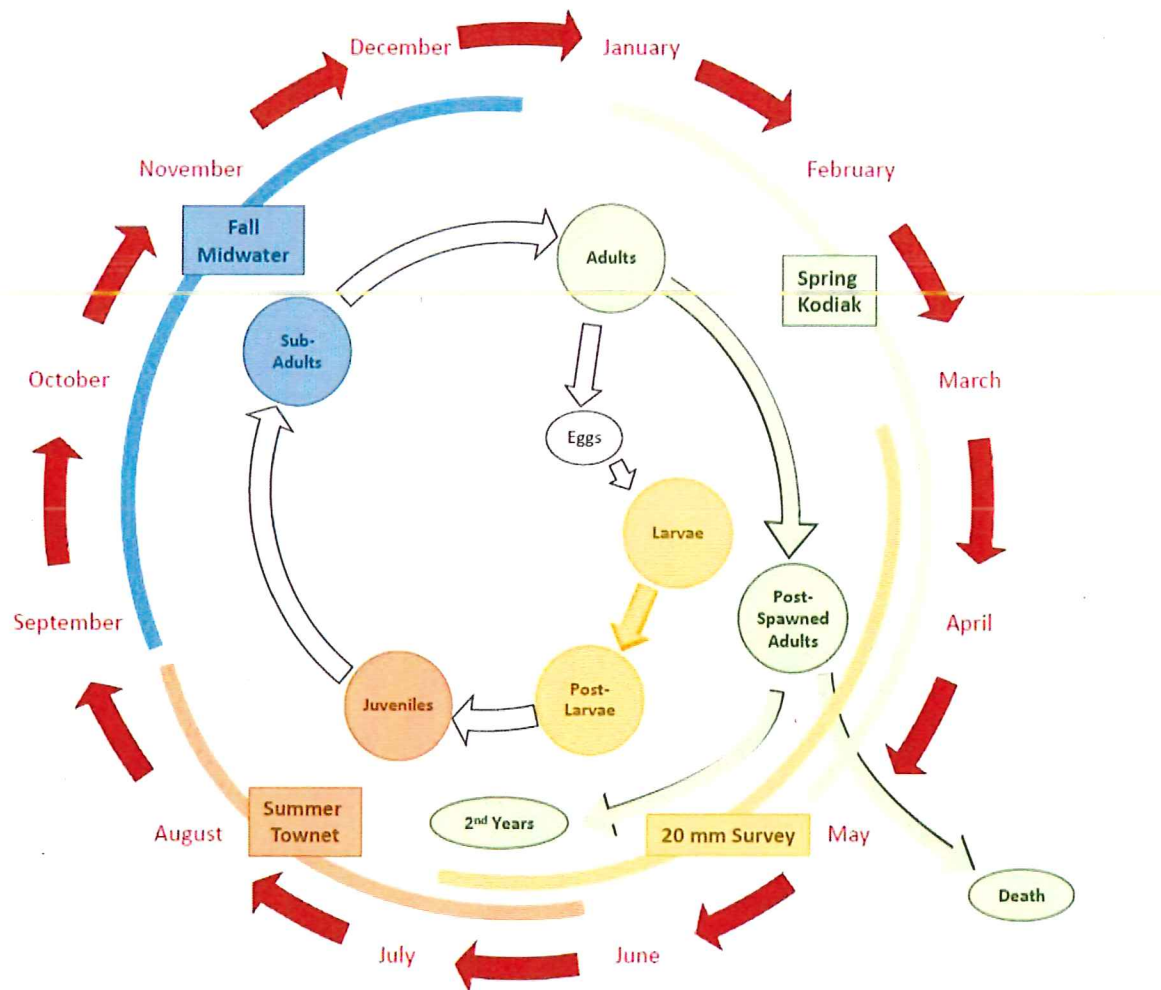


Figure 4. Schematic representation of the delta smelt life cycle. This conceptual model crosswalks delta smelt life stages with calendar months and current monitoring programs (prior to Enhanced Delta Smelt Monitoring) used to evaluate the species' status. Source: Moyle *et al.* 2016

Detailed Review of the Reproductive Biology of Delta Smelt

Delta smelt spawn in the estuary and have one spawning season for each generation, which makes the timing and duration of the spawning season important every year. Delta smelt are believed to spawn in fresh and low-salinity water (Hobbs *et al.* 2007a; Bush 2017). Therefore, freshwater flow affects how much of the estuary is available for delta smelt to spawn (Hobbs *et al.* 2007a). This is one mechanism in which interannual variation in Delta outflow could play a role in the population dynamics of delta smelt. Given the timing of delta smelt reproduction, Delta outflow during February through May would be most important for this mechanism. During this time of year, variation in Delta outflow is largely driven by weather variation and regulated by the California SWRCB Decision-1641 (D-1641).

The locations of delta smelt spawning are thought to be influenced by salinity (Hobbs *et al.* 2007a), but the duration of the spawning season is thought to be driven mainly by water temperature (Bennett 2005; Damon *et al.* 2016), which is largely a function of regional air temperature (Wagner *et al.* 2011). Thus, the spawning season duration does not appear to be a

freshwater flow mechanism, but rather, a climate-driven mechanism (Brown *et al.* 2016a). Delta smelt can start spawning when water temperatures reach about 10°C (50°F) and can continue until temperatures reach about 20°C (68°F; Bennett 2005; Damon *et al.* 2016). The ideal spawning condition occurs when water temperatures remain between 10°C and 20°C throughout February through May. Few delta smelt ≤ 55 mm in length are sexually mature and 50% of delta smelt reach sexual maturity at 60 to 65 mm in length (Rose *et al.* 2013b). During January and February, many delta smelt are still smaller than these size thresholds (Damon *et al.* 2016). Thus, if water temperatures rise much above 10°C in January, the “spawning season” can start before many individuals are mature enough to actually spawn. If temperatures continue to warm rapidly toward 20°C in early spring, that can end the spawning season with only a small fraction of ‘adult’ fish having had an opportunity to spawn, and perhaps only one opportunity to do so. Delta smelt were initially believed to spawn only once before dying (Moyle *et al.* 1992). It has since been confirmed that delta smelt can spawn more than once if water temperatures remain suitable for a long enough time, and if the adults find enough food to support the production of another batch of eggs (Lindberg *et al.* 2013; Damon *et al.* 2016; Kurobe *et al.* 2016). In a recent study spanning 2 to 3 months, captive males held at a constant water temperature of 12°C (54°F) spawned an average of 2.8 times and females spawned an average of 1.7 times (LaCava *et al.* 2015). As a result, the longer water temperatures remain cool, the more fish have time to mature and the more times individual fish can spawn. Most adults disappear from monitoring programs by May, suggesting they have died (Damon *et al.* 2016; Polansky *et al.* 2018).

The reproductive behavior of delta smelt is only known from captive specimens spawned in artificial environments and most of the information has never been published, but is currently being revisited in new research. Spawning likely occurs mainly at night with several males attending a female that broadcasts her eggs onto bottom substrate (Bennett 2005). Although preferred spawning substrate is unknown, spawning habits of delta smelt’s closest relative, the Surf smelt (*Hypomesus pretiosus*), are sand or small gravel (Hirose and Kawaguchi 1998; Quinn *et al.* 2012).

The duration of the egg stage is temperature-dependent and averages about 10 days before the embryos hatch into larvae (Bennett 2005). It takes the fish about 30-70 days to reach 20-mm in length (Bennett 2005; Hobbs *et al.* 2007b). Similarly, Rose *et al.* (2013b) estimated that it takes delta smelt an average of slightly over 60 days to reach the juvenile life stage. Metamorphosing “post-larvae” appear in monitoring surveys from April into July of most years. By July, most delta smelt have reached the juvenile life stage. Thus, subtracting 60 days from April and July indicates that most spawning occurs from February-May.

Hatching success is highest at temperatures of 15-16°C (59-61°F) and lower at cooler and warmer temperatures and hatching success nears zero percent as water temperatures exceed 20°C (Bennett 2005). Water temperatures suitable for spawning occur most frequently during the months of February-May, but ripe female delta smelt have been observed as early as January and larvae have been collected as late as July, suggesting that spawning itself may extend into June in years with exceptionally cool spring weather.

Detailed Review of the Habitat Use and Distribution of Delta Smelt

Because the delta smelt only lives in one part of one comprehensively monitored estuary, its general distribution and habitat use are well understood (Moyle *et al.* 1992; Bennett 2005; Hobbs *et al.* 2006; 2007b; Feyrer *et al.* 2007; Nobriga *et al.* 2008; Kimmerer *et al.* 2009; Merz *et al.*

2011; Murphy and Hamilton 2013; Sommer and Mejia 2013; Mahardja *et al.* 2017a; Simonis and Merz 2019). The delta smelt has been characterized as a semi-anadromous species (Bennett 2005; Hammock *et al.* 2017) and Sommer *et al.* (2011) characterized the species as a partial diadromous migrant, recognizing individual variation in its life-history. However, both terms emphasize a life cycle in which delta smelt spawn in freshwater and volitionally move ‘downstream’ into brackish water habitat, which is only one endpoint among several individual life cycle strategies that have recently been confirmed through the use of otolith microchemical analyses (Bush 2017). In addition, semi-anadromy and partial diadromy are scale-dependent terms which have caused confusion among researchers and managers alike. For instance, some individual delta smelt clearly migrate between fresh and brackish water during their lives (Bush 2017). Other individuals could appear to have done so based on otolith microchemistry but in reality have moved very little and simply experienced annual salinity variation, which can be very high in much of the range of delta smelt (see Hammock *et al.* 2019). Other individual delta smelt are clearly freshwater and brackish-water resident throughout their lives (Bush 2017). As a result, there are both location-based (*e.g.*, Sacramento River around Decker Island) and conditions-based (low-salinity zone) habitats that delta smelt permanently occupy. There are habitats that some delta smelt occupy seasonally (*e.g.*, for spawning), and there are habitats that a few delta smelt occupy transiently, which we define here as occasional use. Transient habitats include distribution extremes from which delta smelt have occasionally been collected, but were not historically collected every year or even in most years. Thus, the Service suggests the delta smelt may be best characterized as an upper estuary resident species with a population-scale distribution that expands and contracts as freshwater flow seasonally (and interannually) decreases and increases, respectively. This influence of freshwater flow inputs on delta smelt distribution could in turn influence mechanisms that affect the species’ population dynamics when those mechanisms are linked to where the fish reside or how they are distributed in the estuary. We note that water temperature, turbidity, water diversion rates, prey availability, and possibly other factors would also affect these spatial recruitment and survival mechanisms.

Delta smelt have been observed as far west as San Francisco Bay near the City of Berkeley, as far north as Knight’s Landing on the Sacramento River, as far east as Woodbridge on the Mokelumne River and Stockton on the Calaveras River, and as far south as Mossdale on the San Joaquin River (Merz *et al.* 2011; Figure 3). These extremes of the species’ distribution extend beyond the geographic boundaries specified in the critical habitat rule. However, most delta smelt have been collected from locations within the critical habitat boundaries. In other words, observations of delta smelt outside of the critical habitat boundaries reflect transient habitat use rather than permanent or seasonal habitat use. The Napa River is the only location outside of the critical habitat boundaries that may be used often enough to be considered a seasonal habitat rather than a transient one.

The fixed-location habitats that delta smelt permanently occupy span from the Cache Slough complex down into Suisun Bay and Suisun Marsh (Figure 5). The reasons delta smelt are believed to permanently occupy this part of the estuary are the presence of fresh- to low-salinity water year round that is comparatively turbid and of a tolerable water temperature. These appropriate water quality conditions overlap an underwater landscape featuring variation in depth, tidal current velocities, edge habitats, and food production (Nobriga *et al.* 2008; Feyrer *et al.* 2011; Murphy and Hamilton 2013; Sommer and Mejia 2013; Hammock *et al.* 2015; 2017; 2019; Bever *et al.* 2016; Mahardja *et al.* 2019; Simonis and Merz 2019). Field observations are increasingly being supported by laboratory research that explains how delta smelt respond physiologically and behaviorally to variation in water quality that can vary with changes in

climate, freshwater flow and estuarine bathymetry (e.g., Hasenbein *et al.* 2013; 2016b; Komoroske *et al.* 2014; 2016).

The principal variable-location habitat that delta smelt permanently occupy is the low-salinity zone (LSZ) (Moyle *et al.* 1992; Bennett 2005). The LSZ is a dynamic habitat with size and location that respond to changes in tidal and river flows (Jassby *et al.* 1995; Kimmerer *et al.* 2013; MacWilliams *et al.* 2015; 2016; Bever *et al.* 2016). The LSZ generally expands and moves downstream as river flows into the estuary increase, placing low-salinity water over a larger and more diverse set of nominal habitat types than occurs under lower flow conditions. As river flows decrease, the LSZ contracts and moves upstream. This is perhaps the most frequently assumed freshwater flow mechanism in discussions about X2 regulations, but as shown by Kimmerer *et al.* (2009; 2013), it does not appear to be a major explanatory mechanism for most fishes including the delta smelt.

The LSZ often encompasses many of the permanently occupied fixed locations discussed above. It is treated separately here because delta smelt distribution tracks the movement of the LSZ somewhat (Moyle *et al.* 1992; Dege and Brown 2004; Feyrer *et al.* 2007; 2011; Nobriga *et al.* 2008; Sommer *et al.* 2011; Bever *et al.* 2016; Manly *et al.* 2015; Polansky *et al.* 2018; Simonis and Merz 2019). Due to its historical importance as a fish nursery habitat, there is a long research history into the physics and biology of the LSZ. The LSZ is frequently defined as waters with a salinity range of about 0.5 to 6 ppt (Kimmerer 2004). This and similar salinity ranges reported by different authors were chosen based on analyses of historical peaks in chlorophyll concentration and zooplankton abundance. Most delta smelt collected in California Department of Fish and Wildlife's (CDFW) 20-mm Survey and Summer Towntown Survey (TNS) have been collected at salinities of near 0 ppt to 2 ppt and most of the (older) delta smelt in the Fall Midwater Trawl (FMWT) have been collected from a salinity range of about 1 to 5 ppt (Kimmerer *et al.* 2013). These fish of different life stages do not tend to be in dramatically different places (Murphy and Hamilton 2013; Figure 5), suggesting that some of the change in occupied salinity with age is due to the seasonal increases in salinity that accompany lower outflow in the summer and fall.

Each year, the distribution of delta smelt seasonally expands when adults disperse in response to winter flow increases that also coincide with seasonal increases in turbidity and decreases in water temperature (Sommer *et al.* 2011; Figure 5). The annual range expansion of adult delta smelt extends up the Sacramento River to about Garcia Bend in the Pocket neighborhood of Sacramento, up the San Joaquin River from Antioch to areas near Stockton, up the lower Mokelumne River system, and west throughout Suisun Bay and the larger sloughs of Suisun Marsh. Some delta smelt seasonally and transiently occupy Old and Middle rivers in the south Delta each year, but face a high risk of entrainment when they do (Kimmerer 2008; Grimaldo *et al.* 2009). The expanded adult distribution initially affects the distribution of the next generation because delta smelt eggs are adhesive and not believed to be highly mobile once they are spawned (Mager *et al.* 2004). Thus, the distribution of larvae reflects a combination of where spawning occurred and freshwater flow when the eggs hatch.

In summary, the delta smelt population spreads out in the winter and then retracts by summer into what is presently a bi-modal spatial distribution with a peak in the LSZ and a separate peak in the Cache Slough complex. Most individuals occur in the LSZ at some point in their life cycle and the use of the Cache Slough complex diminishes in years with warm summers (Bush 2017). *Microhabitat Use:* The delta smelt has been historically characterized as a pelagic fish, meaning one with a spatial distribution that is skewed away from shorelines (Moyle *et al.* 1992; Sommer

et al. 2007). This has led to some confusion among researchers and managers alike – usually perpetuating a strawman argument that delta smelt either occupy deep-water habitats or shallow-water habitats. Then, catch data from shallow habitats get used to refute the pelagic characterization, but catches in shallow-water say nothing more about a pelagic tendency than catches in deep water would say about a nearshore habitat tendency. The long-term monitoring programs used to characterize delta smelt status and trend are offshore sampling programs – meaning pelagic sampling programs, and surface-trawling appears to be particularly effective at capturing delta smelt away from shorelines (Mitchell *et al.* 2017). However, numerous studies have reported collecting delta smelt from nearshore environments using fishing gear like beach seines and fyke nets from locations that often had a water depth less than or equal to 1 meter (just over three feet) (e.g., Matern *et al.* 2002; Nobriga *et al.* 2005; Gewant and Bollens 2012; Mahardja *et al.* 2017b). Further, it has been established that onshore-offshore movements are one behavior option delta smelt and other fishes can use to maintain position or move upstream in a tidal-flow influenced estuary (Bennett *et al.* 2002; Feyrer *et al.* 2013; Bennett and Burau 2015). Captive delta smelt have been shown to avoid in-water structure like submerged aquatic vegetation (SAV) (Ferrari *et al.* 2014). SAV tends to grow where tidal current velocities are low, which is a habitat attribute that has also been associated with wild delta smelt (Hobbs *et al.* 2006; Bever *et al.* 2016). Thus, the proliferation of SAV in areas that might otherwise be attractive to delta smelt represents a significant habitat degradation, not only because it creates structure in the water column, but also because it is associated with higher water transparency (Hestir *et al.* 2016), and a fish fauna that delta smelt does not seem to be able to coexist with (Nobriga *et al.* 2005; Conrad *et al.* 2016). Based on our review, the Service suggests that the characterization of delta smelt as an open-water fish appears to be accurate and does not imply occupation of a particular water column depth. The species does appear to have some affinity for surface waters (Bennett and Burau 2015; Mitchell *et al.* 2017), but like any microhabitat descriptor, this is not intended to reflect the location of all individuals because delta smelt are not limited to surface waters (Feyrer *et al.* 2013).

Although the delta smelt is generally an open-water fish, depth variation of open-water habitats is an important habitat attribute (Moyle *et al.* 1992; Hobbs *et al.* 2006; Bever *et al.* 2016). In the wild, delta smelt are most frequently collected in water that is somewhat shallow (4-15 ft deep) where turbidity is often elevated and tidal currents exist, but are not excessive (Moyle *et al.* 1992; Bever *et al.* 2016). For instance, in Suisun Bay, the deep shipping channels are poor quality habitat because tidal velocity is very high (Hobbs *et al.* 2006; Bever *et al.* 2016), but in the Delta where tidal velocity is slower, offshore habitat in Cache Slough and the Sacramento Deepwater Shipping Channel is used to a greater extent (Feyrer *et al.* 2013; CDFW unpublished data).

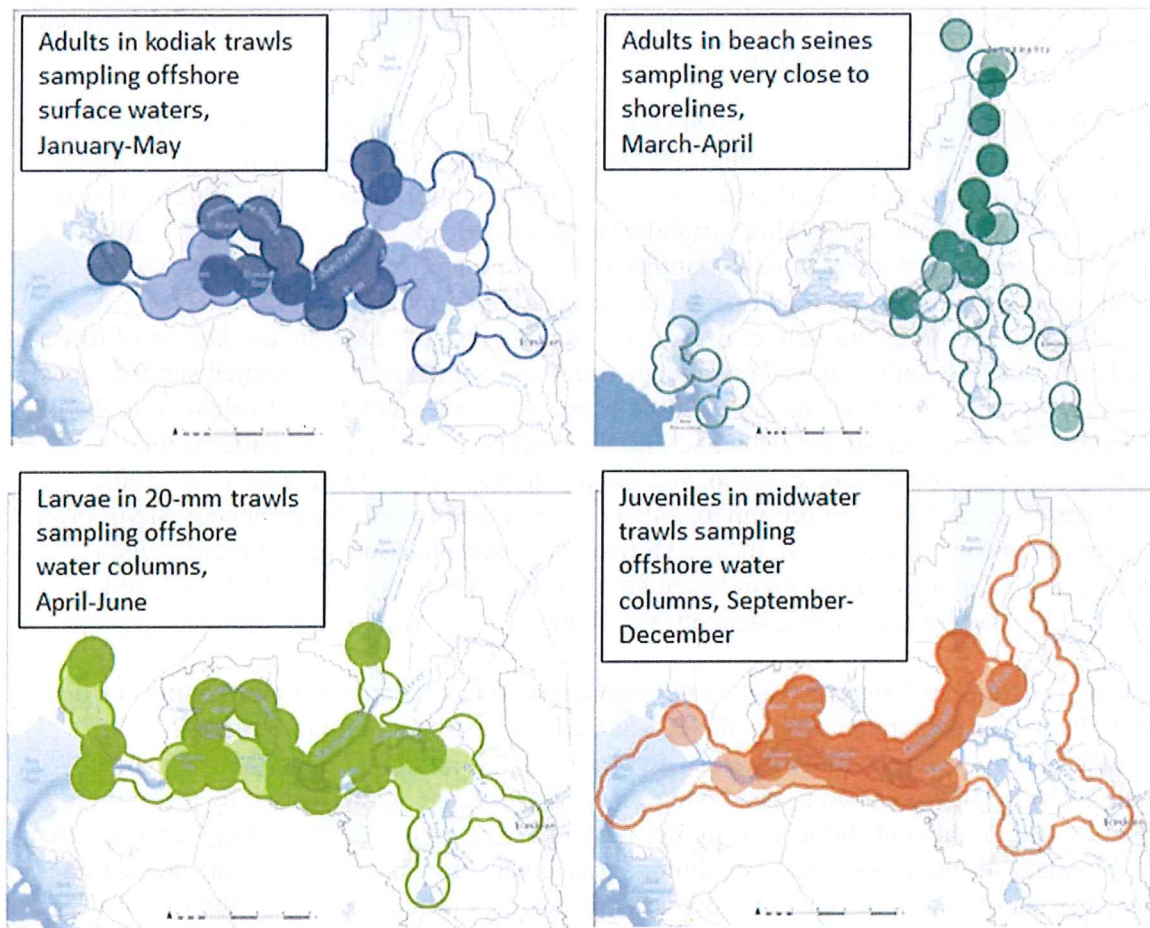


Figure 5. Maps of multi-year average distributions of delta smelt collected in four monitoring programs. The sampling regions covered by each survey are outlined. The areas with dark shading surround sampling stations in which 90 percent of the delta smelt collections occurred, the areas with light shading surround sampling stations in which the next 9 percent of delta smelt collections occurred. Note the lack of sampling sites in Suisun Bay and marsh for the beach seine (upper right panel). Source: Murphy and Hamilton (2013).

Environmental Setting and History of Ecological Change in the Bay-Delta

This section briefly reviews environmental changes that have occurred since 1850; i.e., the California Gold Rush to the present. This section is subdivided into three parts. The first describes the condition that is believed to have existed in 1850. The second covers a period from about 1920 to 1967, which is the year prior to the initiation of State Water Project (SWP) water exports from the Delta. The third sub-section covers 1968, the first year of Central Valley Project (CVP) and SWP dual operations, to the present.

Over the past few years, the scientific information developed to understand pre- and post-water project changes to the estuary's landscape and flow regime has grown substantially. However, as with most scientific endeavors, there are some discrepancies that may affect some conclusions. For instance, Whipple *et al.* (2012) showed the difference between contemporary estimates of unimpaired Delta outflow that were used in the modeling studies reviewed below and measured data from the latter 19th century. These discrepancies can affect the conclusions about the natural hydrograph of the Bay-Delta ecosystem and should be kept in mind when reviewing what

follows. The information on ecosystem changes that have accrued through time provides context for the current status of the delta smelt.

The 1850 Bay-Delta estuary: The historical Delta ecosystem was a large tidal marsh at the confluence of two floodplain river systems (Whipple *et al.* 2012; Andrews *et al.* 2017; Gross *et al.* 2018; Figure 6). The Delta itself experienced flooding over spring-neap tidal time scales and seasonal river runoff time scales. This variability in freshwater input to the estuary was likely important to seasonal and interannual variability in the productivity of the ecosystem for the same reasons that smaller-scale tidal marsh plain and floodplain inundation are today. Specifically, these flood cycles deliver organic carbon, but also increase the production of lower trophic levels due to lengthened water residence times and greater shallow, wetted surface areas (Sommer *et al.* 2004; Grosholz and Gallo 2006; Howe and Simenstad 2011; Enright *et al.* 2013). When freshwater flows out of the Delta and into the estuary, it can generate currents that aggregate particulate matter like sediment and phytoplankton (Monismith *et al.* 1996; 2002; MacWilliams *et al.* 2015) – and presumably also did so in the pre-development ecosystem. Prior to the invasion of the overbite clam, these sediment and phytoplankton aggregations, which occurred near the 2 ppt isohaline, demarcated an important fish nursery region (Turner and Chadwick 1972; Jassby *et al.* 1995; Bennett *et al.* 2002).

The estuary's natural hydrograph reached its annual base flows (annual minimum inputs of fresh water) in August or September toward the end of California's dry summers (Figure 7). Freshwater inputs would generally increase during the fall as precipitation in the watershed resumed. Delta outflow reached a broad winter through spring peak fueled first by precipitation followed by additional contributions from melting snow. The annual peak of Delta outflow often spanned January through May before declining back to base flow conditions by the late summer. The year-to-year variation in Delta outflow was considerable, often varying by about an order of magnitude during each month of the year. Water flowing from the Delta mixed into larger open-water habitats in Suisun and San Pablo bays, which themselves were fringed with marshes and tidal creeks. This pre-development ecosystem was shallower than the modern system. As a result, salinity responded more rapidly to changes in freshwater flow than it does now and less freshwater flow was needed to move salinity isohalines than is presently the case (Andrews *et al.* 2017; Gross *et al.* 2018). Like most native fish, the delta smelt evolved its life history to take advantage of this flow regime (Moyle 2002). In particular, its spawning period and early life stages overlap the months in which historical marsh-floodplain inundation and freshwater inputs to the estuary were highest, and water temperatures were cool, but not as cold as they are in the winter before spawning commences (see above for details of what is known about spawning and early life stages of delta smelt).

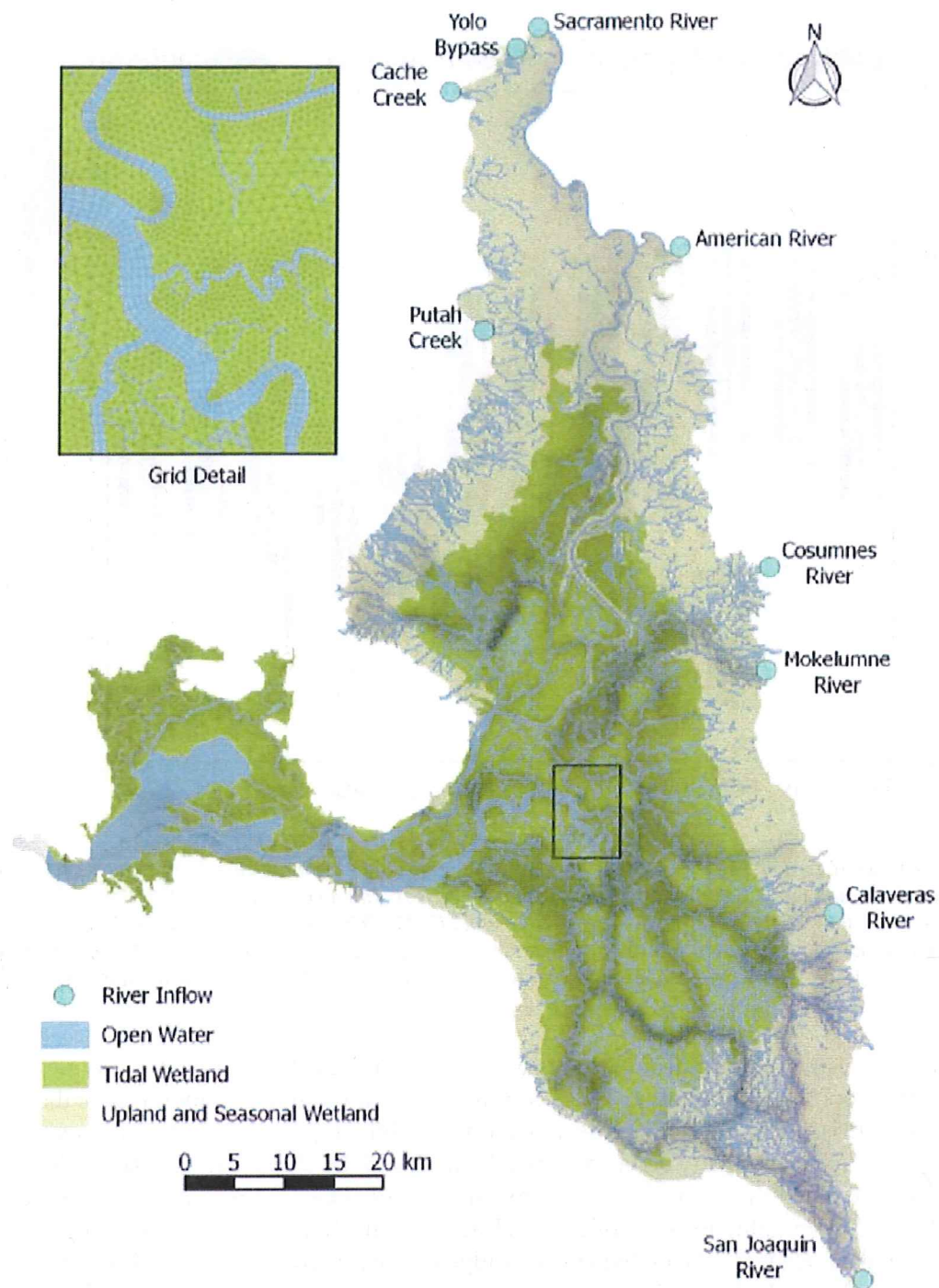


Figure 6. The circa 1850 Delta as depicted in the version of the UnTRIM 3-D hydrodynamic model described by Andrews *et al.* (2017). The model depicts an expansive tidal marsh area of approximately 2,200 square kilometers (km) or 850 square miles. Source: Andrews *et al.* (2017).

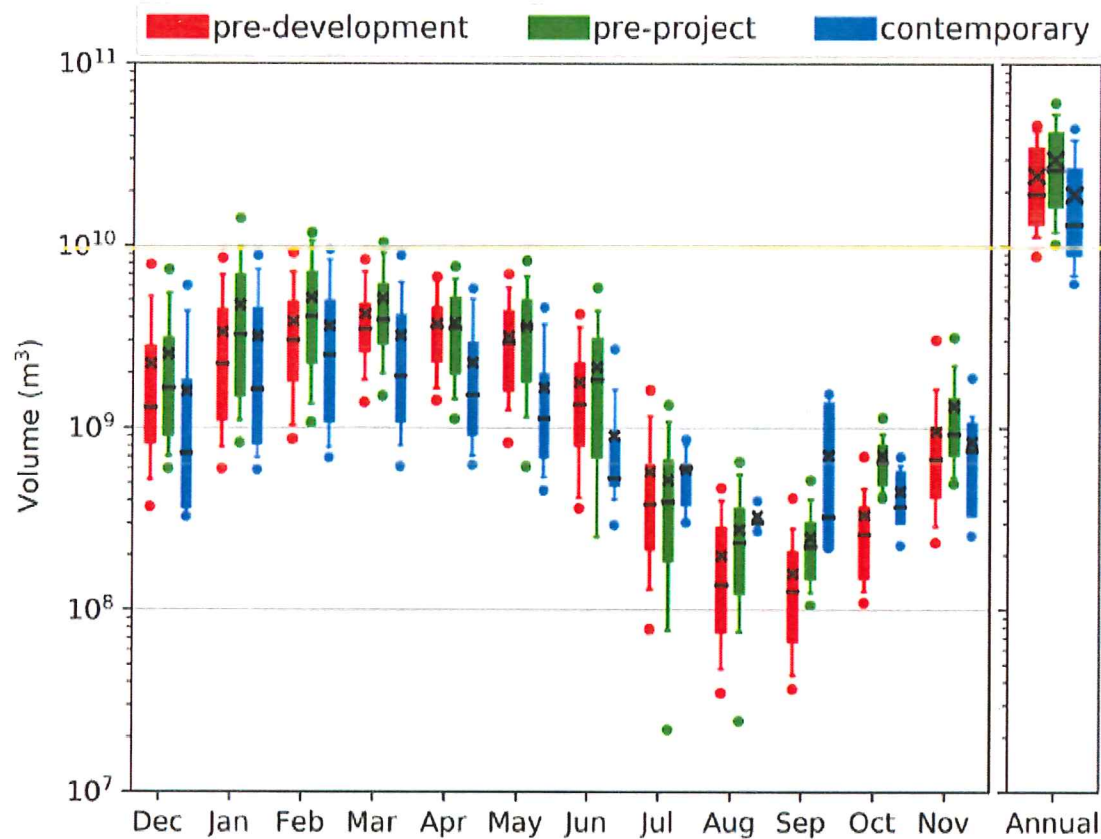


Figure 7. Boxplots of estimated Delta outflow by month for a pre-development Bay-Delta (circa 1850; red boxes), a pre-CVP and SWP Bay-Delta (circa 1920; green boxes), and a contemporary Bay-Delta (blue boxes; precise year not stated by the authors). Source: Gross *et al.* (2018). The inset labeled “Annual” on the x-axis is the boxplot summary of the sum of monthly outflows. Gross *et al.* (2018) attributed the higher outflow in the pre-project era relative to the pre-development era to the levees that had been constructed in the system by 1920.

Many tidal river estuaries form frontal zones where inflowing fresh water begins mixing with seawater (Peterson 2003). In the Bay-Delta, a frontal zone of biological importance is the LSZ (Jassby *et al.* 1995). The LSZ is a mobile and variable habitat region that frequently overlaps the parts of the estuary where many delta smelt reside (as described above). In the Bay-Delta the location and associated function of the LSZ have historically been indexed using a statistic called X2, which is the geographic location of 2 ppt salinity near the bottom of the water column measured as a distance from the Golden Gate Bridge (Jassby *et al.* 1995; MacWilliams *et al.* 2015; Figure 8). When Delta outflow is high, saline water is pushed closer to the Golden Gate, resulting in a smaller distance from the Golden Gate Bridge to X2. Conversely, when Delta outflow is low, salinity intrudes further into the estuary resulting in a larger distance from the Golden Gate Bridge to X2. These changes in how salinity is distributed affect numerous physical and biological processes in the estuary (Jassby *et al.* 1995; Kimmerer 2002a,b; Kimmerer 2004; MacWilliams *et al.* 2015).

X2, rather than another salinity isohaline, was chosen as the low-salinity zone habitat metric because it is a frontal zone or boundary upstream of which, salinity tends to be the same from the surface of the water to the bottom, and downstream of which, salinity varies from top to bottom

(Jassby *et al.* 1995). That variability in the vertical distribution of salinity is indicative of currents that help to aggregate sinking particles like sediment and phytoplankton, and as recently modeled, zooplankton (Kimmerer *et al.* 2014), near X2.

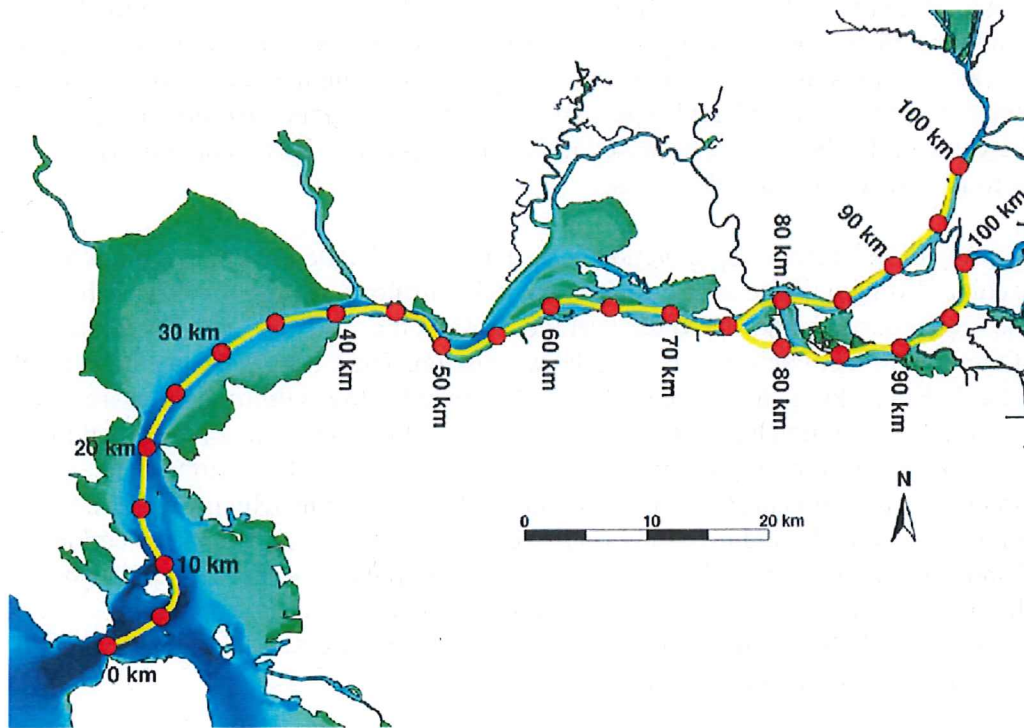


Figure 8. The northern reach of the Bay-Delta as depicted in the UnTRIM 3-D contemporary Bay-Delta model; greener colors represent shallower water and bluer colors represent deeper areas. The yellow lines depict the transect along which the location of X2 is estimated in the model and the associated red circles depict selected km distances from the Golden Gate Bridge along the northern axis of the estuary into the Sacramento and San Joaquin rivers for use in interpreting the variable locations of X2. Source: MacWilliams *et al.* (2015).

Pre-development outflows from the Delta were higher in the winter and spring than they are now while summer and fall outflows may have been lower (Andrews *et al.* 2017; Gross *et al.* 2018; Figure 7). Thus, X2 also varied more within years in the circa 1850 estuary than it now does. In the pre-development estuary, X2 would remain in San Pablo Bay for months at a time in the winter-spring of Above Normal and wetter water year types before retreating landward (upstream) in the summer-fall. In the contemporary estuary, X2 spends nearly all of its wet season time in Suisun Bay (landward or ‘upstream’ of historical) and dry season time between Collinsville and Rio Vista (~ 80 to 95 km; Figure 8). These contemporary dry season locations of X2 may be seaward or ‘downstream’ of historical locations (Gross *et al.* 2018).

There are no data on the timing and magnitude of biological productivity in the circa 1850 Bay-Delta, nor are we aware of any information on how delta smelt used the estuary at the time. However, inferences can be made based on general ecosystem function in the northern hemisphere temperate zone and contemporary information. The input of basal food web materials like nutrients and detritus likely co-varied with the timing, duration, and magnitude of freshwater flows (e.g., Delta inflow; Jassby and Cloern 2000), which would likewise have affected the timing, magnitude, and duration of inundation of the system’s expansive floodplains

(e.g., Whipple *et al.* 2012; Figure 6). The production of planktonic and epibenthic invertebrates from floodplains, tidal wetlands, and open-water habitats that fuel the production of juvenile fishes that feed in open waters may have generally increased during the spring and peaked during the summer in concert with seasonal variation in water temperature (e.g., Heubach 1969; Orsi and Mecum 1986; Merz *et al.* 2016). The summer months are the warmest months in the Bay-Delta region and thus, they support the highest *average* metabolic rates of invertebrates and fish, which rely on water temperature to control their body temperature and metabolic rates. However, there was likely to have been considerable species-specificity to this generalization (e.g., Ambler *et al.* 1985; Gewant and Bollens 2005) because the Bay-Delta's native biotic community includes numerous cold-water adapted species.

The seasonal timing of delta smelt reproduction (February-May; detailed below) would have more broadly coincided with the general timing of peak freshwater flow into the Bay-Delta (Figure 7). The higher outflow and shallower average depth of the system resulted in frequent occurrence of the LSZ in San Pablo Bay during the wet season. Thus, it is likely that delta smelt reared in San Pablo Bay, taking advantage of its greatly expanded low-salinity habitat area (see MacWilliams *et al.* 2015), to much greater extent prior to development of the system than they are able to now. Lower flows in the summer-fall likely caused delta smelt distribution to seasonally retract back into Suisun Bay/marsh and the Delta; ecosystems which were likely much more productive at the time due to the expansive tidal marshes and greater connection between land and water (Whipple *et al.* 2012). Delta smelt's population-level demand for prey annually peaks at some combination of water temperature and growth of the population's biomass. This timing could be estimated from the model developed by Rose *et al.* (2013a), but we are not aware that such a calculation exists.

1920-1967: By 1920, most of the Delta's tidal wetlands had been reclaimed (Whipple *et al.* 2012; Figure 9). The data provided by Gross *et al.* (2018; Figure 6) suggest that Delta outflow may have been a little higher circa 1920 than it had been circa 1850 due to levee construction. However, this may (Hutton and Roy 2019) or may not be consistent with historical observations (Whipple *et al.* 2012). Regardless, Delta outflow and several other net flow metrics from within the Delta did begin to decline between the early 1920s and 1967 (Hutton *et al.* 2017a; 2019). These changes occurred because of four factors: (1) water storage in the Bay-Delta watershed increased from about 4 million acre feet (MAF) to about 40 MAF because of the construction of dams upstream of the Delta, (2) the CVP began exporting water from the Delta in 1951, (3) non-project water diversions within and upstream of the Delta increased, and (4) shipping channels were dredged through the estuary and into the Sacramento and San Joaquin rivers. These changes facilitated a general water management strategy in California to store water during the wet season and re-distribute it during the dry season to provide a more reliable supply than was available naturally. In addition, the CVP and SWP have had to offset a considerable summertime water deficit to protect the quality of their exported water and to protect water quality for senior water rights holders in the Delta. These uses would be highly impaired without water released from CVP and SWP reservoirs during the summer and fall (Hutton *et al.* 2017b).

During the 1930s to 1960s, the navigation channels were dredged deeper (~12 meters) to accommodate shipping traffic from the Pacific Ocean and San Francisco Bay to ports in Sacramento and Stockton and to increase the capacity of the Delta to convey floodwaters. Channel deepening interacted with the simultaneously increasing water storage to change the Bay-Delta ecosystem into one in which Suisun Bay and the Sacramento-San Joaquin River confluence region became the largest and most depth-varying places in the typical range of the

LSZ. Even with these changes, the LSZ remained a highly productive fish nursery habitat for many decades (Stevens and Miller 1983; Moyle *et al.* 1992; Jassby *et al.* 1995).

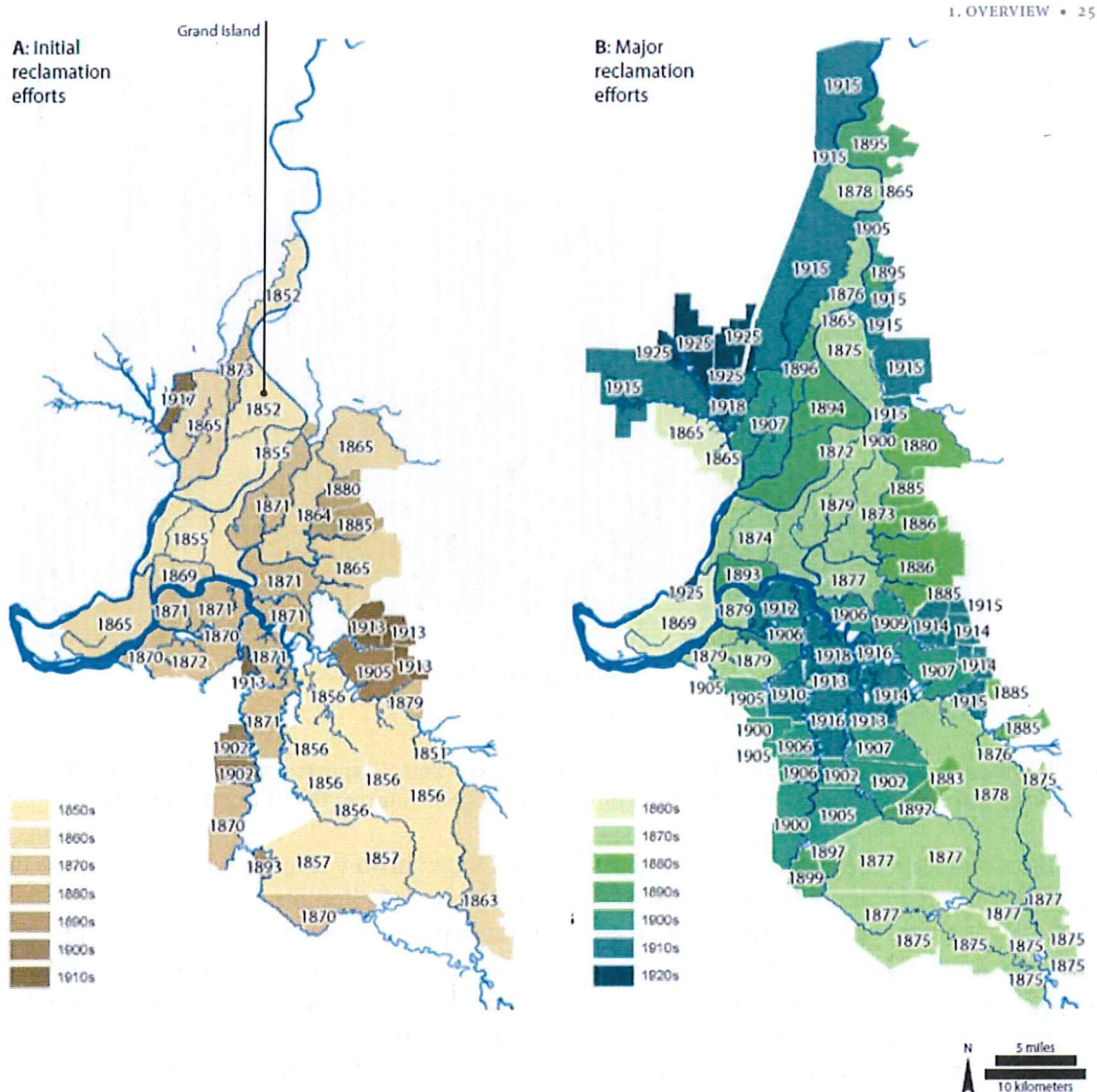


Figure 9. Maps of the Delta showing years of initial land reclamation attempts on the left and major land reclamation efforts on the right. Note that a large majority of the major reclamation efforts were underway by 1915 and the last efforts in the vicinity of Liberty Island began in 1925. Source: Whipple *et al.* (2012).

1968-present: The SWP began exporting water from the Delta in 1968 and its exports generally increased until about 1989 (Figure 10). CVP exports reached present-day levels by the end of the 1970s. During the 1980s water storage capacity in the Bay-Delta watershed reached its present-day level of a little over 50 MAF (Cloern and Jassby 2012; Hutton *et al.* 2017a). Thereafter, combined CVP-SWP exports began to increase in year-to-year variability, which increased the uncertainty about how much water would be supplied south of the Delta annually. This has combined with the increasing human demand for fresh water to result in a conflict between human water demand and environmental water uses, including the maintenance of the hydraulic salinity barrier needed to protect exported water and other in-Delta water users from salinity intrusion (Hutton *et al.* 2017b; Reis *et al.* 2019).

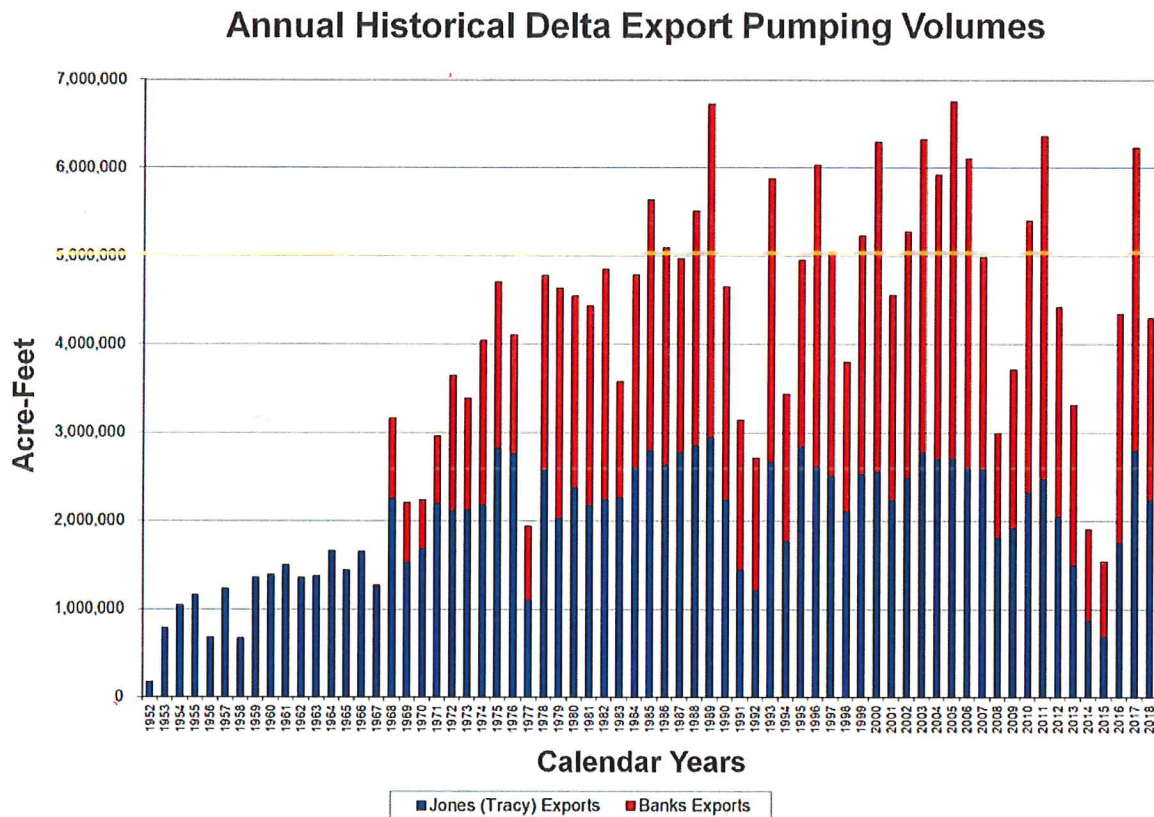


Figure 10. Time series of Central Valley Project and State Water Project exports from the Delta for 1952 through 2018. State Water Project exports began in water year 1968. Source: DAYFLOW data base.

The changes discussed above have continued to lower Delta outflow (Hutton *et al.* 2017a,b; Reis *et al.* 2019; Figures 11 and 12), though D-1641 appears to have halted the trend for years in which the eight river index is lower than 20 MAF (middle panel of Figure 11). In Figure 11, exports were modeled as depletions of water from the system, so the more negative the number on the y-axis of the middle panel, the higher the exports. Thus, the graphic shows that in years when the eight river index is more than 20 MAF, exports continue to increase, but in years when the eight river index is lower than 20 MAF, exports have been trending lower. Both of these trends cause the higher year-to-year variability in water exports shown in Figure 10.

In general, major changes to the flow regime of an aquatic ecosystem are expected to be accompanied by ecological change (Benson 1981; Bunn and Arthington 2002; Poff and Zimmerman 2010; Gillson 2011), and that is what has been observed over time in the Bay and Delta (e.g., Matern *et al.* 2002; Moyle and Bennett 2008; Winder *et al.* 2011; Feyrer *et al.* 2016; Conrad *et al.* 2016). Delta outflow is a driver of many ecological mechanisms in the Bay-Delta and an indicator of several others (Kimmerer 2002a). Thus, the changes to the estuary's freshwater flow regime have likely interacted with the changes to the estuary's landscape, specifically its deeper channels and greatly reduced land-water connections (Andrews *et al.* 2017), to lower the total biological productivity of the estuary. In addition, changes to the freshwater flow regime detailed above appear to have affected the reproductive success of fishes that use the Delta and Suisun Bay as rearing habitats. The evidence for this is that the native fish assemblage had reproductive seasons timed to winter-spring peak flows, whereas currently

dominant non-native species generally spawn later in the spring and into the summer when inflows to the Delta are generally high to support human water use, but outflow from the Delta is generally low (Moyle 2002; Moyle and Bennett 2008). Reis *et al.* (2019) recently described super-critical water years with respect to Delta outflow. Several studies have indicated that low flow years and droughts in particular result in low native fish production in the Bay-Delta (Meng *et al.* 1994; Jassby *et al.* 1995; Kimmerer 2002b; Feyrer *et al.* 2016). Droughts recur and may contribute to cumulative impacts to native fishes like delta smelt. For instance, recent droughts have been particularly problematic for delta smelt (Moyle *et al.* 2018). Thus, the frequency of these super-critical water years, which has been much higher since 1968 than it was from 1920-1967 (Figure 12), is a conservation challenge that the Service and its partners have to contend with.

There are several fish species in the Bay-Delta that have historically been shown to have demonstrable positive population responses to freshwater flows into or out of the Delta. These include the well-described relationships for the survival of emigrating Sacramento basin Chinook salmon (*Oncorhynchus tshawytscha*) smolts with Sacramento River inflows (Kjelson and Brandes 1989; Perry *et al.* 2010), the relationship of Sacramento splittail (*Pogonichthys macrolepidotus*) production to Yolo Bypass flow (Moyle *et al.* 2004; Feyrer *et al.* 2006), and the 'fish-X2' relationships for striped bass (*Morone saxatilis*), longfin smelt (*Spirinchus thaleichthys*), and starry flounder (*Platichthys stellatus*) (Turner and Chadwick 1972; Jassby *et al.* 1995; Kimmerer 2002b). The life-history of delta smelt with its affinity for fresh and low-salinity waters seems consistent with that of a fish one could expect to respond similarly to variation in Delta outflow or X2. Researchers searched for some form of analogous relationship for the delta smelt for several decades, but no persistent relationship was found (Stevens and Miller 1983; Moyle *et al.* 1992; Jassby *et al.* 1995; Kimmerer 2002b; Bennett 2005; Mac Nally *et al.* 2010; Thomson *et al.* 2010; Miller *et al.* 2012). Further, Rose *et al.* (2013a,b) did not find salinity variation *per se* to have much impact on predictions of delta smelt population growth rate. The larger predicted impact in their individual-based model related to flow was due to simulated entrainment in exported water (Rose *et al.* 2013b; Kimmerer and Rose 2018). Although entrainment was predicted to lower the population growth rate, in and of itself, it could not convert a strongly positive growing population into a declining one without at least one additional factor impacting survival at the same time.

The IEP (2015) reported a correlation between February-May X2 and ratios of the 20-mm Survey index for delta smelt and either the Spring Kodiak Trawl (SKT) or FMWT indices of the parental stock that produced the 20-mm fish. This relationship emerged in data beginning at the time of the pelagic organism decline (POD) in 2002. This relationship is stronger when considered in terms of salinity at Chipps Island (He and Nobriga 2018), possibly because salinity can be measured more accurately than Delta outflow when net freshwater flow is very low (Monismith 2016). Castillo *et al.* (2018) used a simulation based on SKT data to suggest a link between Delta outflow and adult delta smelt abundance. In addition, several teams have reported statistical associations of delta smelt spatial distribution and salinity that imply the population spatial distribution co-varies with Delta outflow, X2, or similar indices of freshwater input to the estuary (Feyrer *et al.* 2007; 2011; Nobriga *et al.* 2008; Kimmerer *et al.* 2009; 2013; Bever *et al.* 2016; Polanksy *et al.* 2018; Simonis and Merz 2019). The strength of this covariation and its management utility have been contested (e.g., Murphy and Hamilton 2013; Manly *et al.* 2015; Latour 2016; Polanksy *et al.* 2018) and supported (Sommer *et al.* 2011; Bever *et al.* 2016; Feyrer *et al.* 2016; Mahardja *et al.* 2017a) in several recently published papers.

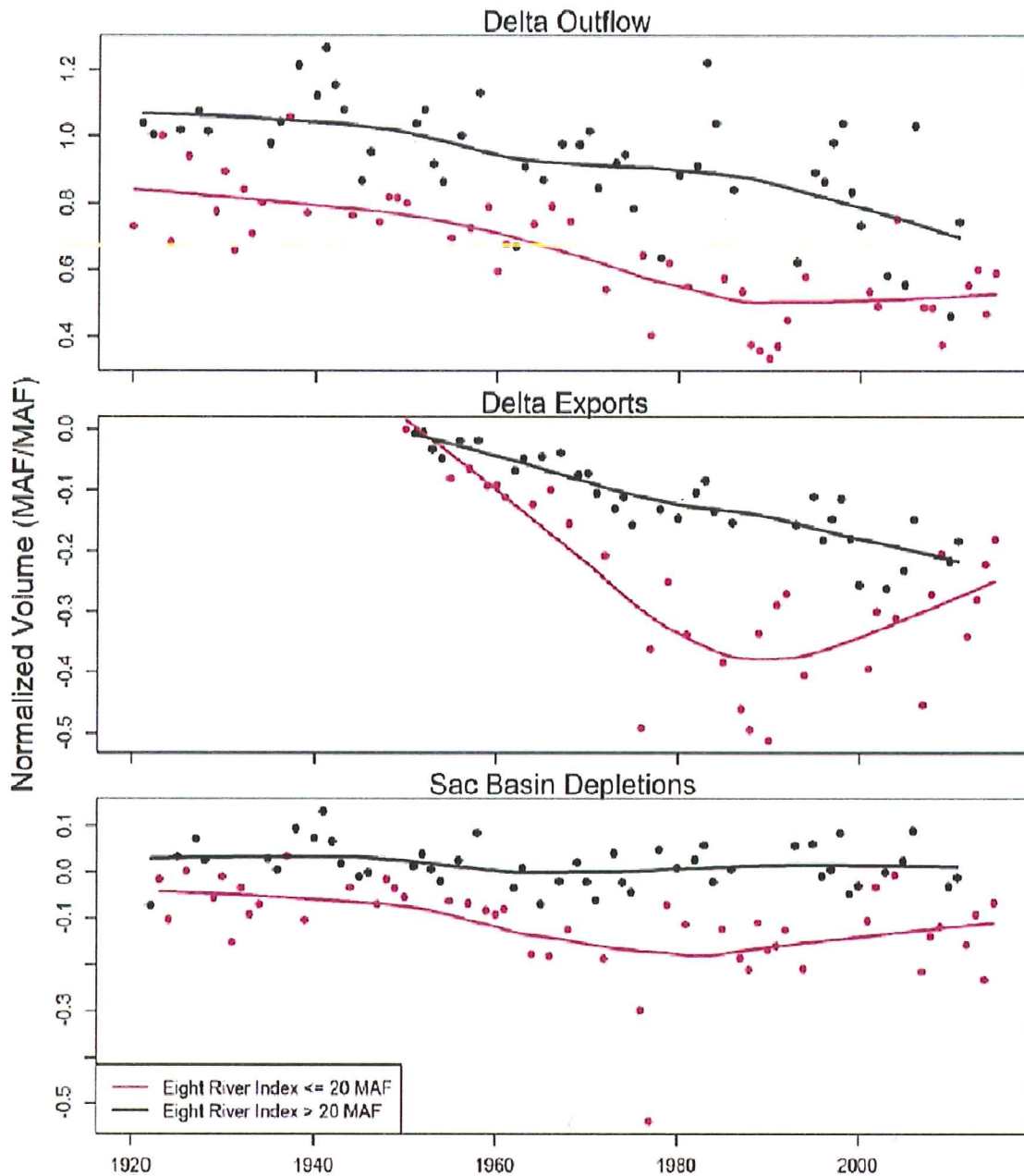


Figure 11. Time series (1922-2015) of statistical trend outputs of annual Delta outflow (top panel), Delta exports treated as depletions so increasing exports are represented by more negative values (middle panel), and water diversions from the Sacramento River basin upstream of the Delta (bottom panel). Black symbols and lines are for years in which the eight river index, a measure of water availability in the Bay-Delta watershed, was greater than 20 MAF. Red symbols and lines are for years in which the eight river index was less than or equal to 20 MAF. Source: Hutton *et al.* (2017b).

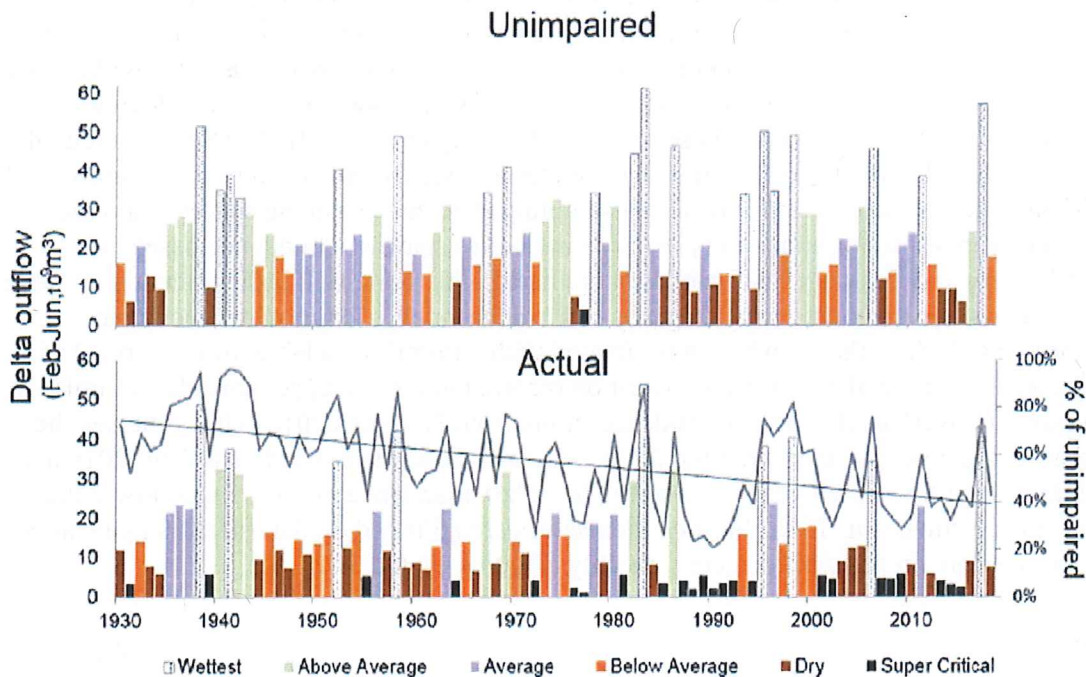


Figure 12. Time series of estimates of unimpaired (upper panel) and actual (lower panel) Delta outflow (February-June) color-coded according to six water year types, 1930-2018. The water year types based on basin precipitation are shown in the upper panel. In the lower panel, the water year types were re-assessed based on their fraction of the estimated unimpaired outflow. The long-term trend in this fraction as “% of unimpaired” is shown on the second y-axis of the bottom panel. Source: Reis *et al.* (2019).

Delta Smelt Population Trend

The CDFW’s TNS (<http://www.dfg.ca.gov/delta/data/townet/indices.asp?species=3>) and FMWT Survey (<http://www.dfg.ca.gov/delta/data/fmwt/indices.asp>) are the two longest running indicators of the delta smelt’s abundance trend. Indices of delta smelt relative abundance from these surveys date to 1959 and 1967, respectively (Figures 13 and 14). The FMWT index has traditionally been the primary indicator of delta smelt trend because it samples later in the life cycle, providing a better indicator of annual recruitment than the TNS (Service 1996). It has also sampled more consistently and more intensively than the TNS. The FMWT deploys more than 400 net tows per year over its four-month sampling season (September through December). The highest FMWT index for delta smelt (1,673) was recorded in 1970 and a comparably high index (1,654) was reported in 1980 (Figure 14). The last FMWT index exceeding 1,000 was reported in 1993. The last FMWT indices exceeding 100 were reported in 2003 and 2011. In 2018, the FMWT index was zero for the first time. The TNS index for delta smelt has been zero four times since 2015. Thus, the TNS and FMWT have recorded a 40-50 year decline in which delta smelt went from a minor (but common) species to essentially undetectable by these long-term surveys (Figures 13 and 14).

Following the listing of the delta smelt, the CDFW launched a 20-mm Survey (1995) and a SKT Survey (SKT; 2002) to monitor the distribution and relative abundance of late larval stage and adult delta smelt, respectively. These newer indices have generally corroborated the trends implied by the TNS and the FMWT (Figures 13 and 14). The CDFW methods generate abundance indices from each survey but each index is on a different numeric scale. This means

the index number generated by a given survey only has quantitative meaning relative to other indices generated by the same survey. Further, the CDFW indices lack estimates of uncertainty (variability) which limits interpretation of abundance changes from year to year even within each sampling program. The Service recently completed a new delta smelt abundance indexing procedure using data from all four of these surveys (Polansky *et al.* 2019). The Service method improves upon the CDFW method because it generates abundance indices in units of numbers of fish, including attempts to correct for different sampling efficiencies among surveys, and the method includes measures of uncertainty. Service indices of spawner abundance based on combined January and February SKT sampling are listed with their confidence intervals in Table 1. The estimates show the most recent 19 years of the delta smelt's longer-term decline in numbers of fish as best as they can be approximated with currently available information. The 2020 abundance estimate of 5,213 is the lowest on record, though the upper confidence limit for the 2020 estimate overlaps the lower confidence limits from 2016 and 2018. This indicates there is more than a five percent chance that the 2020 abundance index is not different from 2016 and 2018. Regardless of this recent year uncertainty, the 2020 abundance index is much lower than peak abundance estimates in Table 1 which themselves are all based on data streams that started after the species had already declined considerably (Figures 13 and 14).

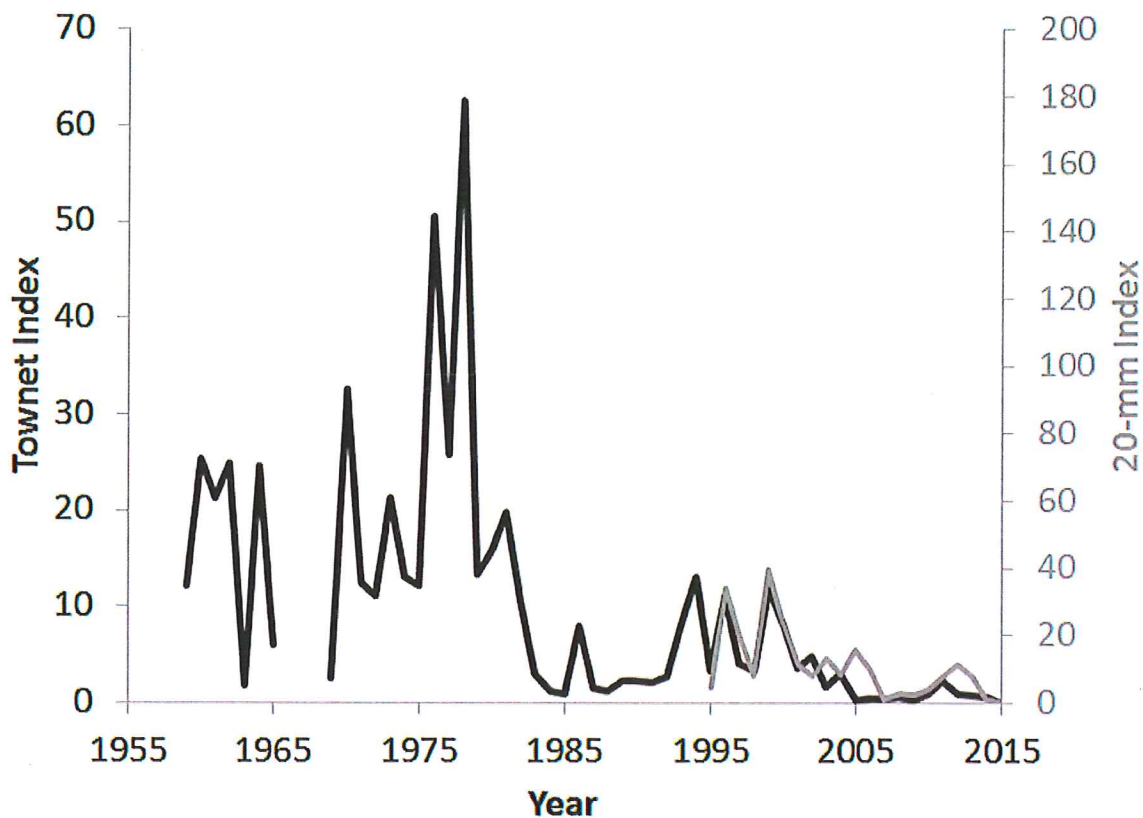


Figure 13. Time series of juvenile and larval delta smelt relative abundance as depicted by the California Department of Fish and Wildlife's TNS and 20-mm Survey, respectively. The TNS began in 1959 and the 20-mm Survey began in 1995. The second y-axis was scaled to better align the indices which are calculated on different numeric scales.

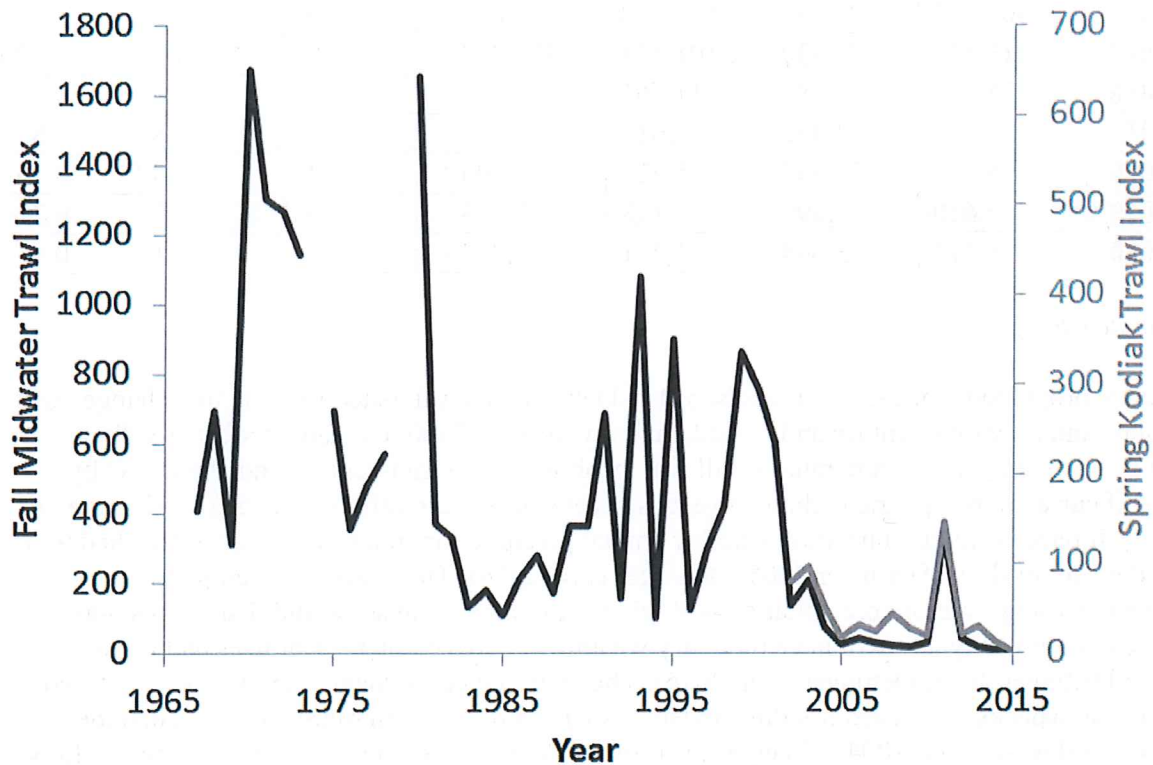


Figure 14. Time series of juvenile and larval delta smelt relative abundance as depicted by the California Department of Fish and Wildlife's FMWT and SKT Survey, respectively. The FMWT survey began in 1967 and the SKT trawl survey began in 2002. The second y-axis was scaled to better align the indices which are calculated on different numeric scales.

Table 1. Estimates of adult delta smelt population size during January-February of 2002 through 2020 with 95% confidence intervals.

Year	Abundance Estimate	Standard Error	95% Confidence Interval		Number of Delta Smelt Caught in the SKT Survey		Year-to-Year Ratio
			Lower Bound	Upper Bound	January	February	
2002	1,093,244	195,329	760,332	1,523,294	262	394	NA
2003	996,055	261,205	581,197	1,597,198	NA	232	0.91
2004	966,981	262,190	553,729	1,573,002	380	300	0.97
2005	715,858	147,190	470,572	1,044,828	220	218	0.74
2006	272,327	42,400	198,681	364,438	44	84	0.38
2007	449,466	128,731	249,216	749,168	109	107	1.65
2008	509,428	188,396	236,859	963,839	132	36	1.13
2009	1,166,145	523,856	459,083	2,464,804	579	61	2.29
2010	251,863	54,580	161,753	374,582	88	57	0.22
2011	461,599	202,547	185,712	962,088	177	128	1.83
2012	1,177,201	328,682	662,728	1,939,836	320	287	2.55
2013	333,682	89,809	191,886	541,064	100	125	0.28

2014	308,972	91,474	167,858	522,884		148	55	0.93
2015	213,345	76,639	101,434	397,439		21	68	0.69
2016	25,445	9,584	11,661	48,622		7	6	0.12
2017	73,331	23,342	38,010	128,459		18	8	2.88
2018	26,649	21,397	5,215	82,805		10	4	0.36
2019	5,610	4,395	1,138	17,135		1	1	0.21
2020	5,213	3,644	1,241	14,710		1	1	0.93

Climate Change

Climate projections for the San Francisco Bay-Delta and its watershed indicate that changes will be substantial by mid-century and considerable by the year 2100. Climate models broadly agree that average annual air temperatures will rise by about 2°C at mid-century and about 4°C by 2100 if current atmospheric carbon emissions accelerate as currently forecasted (Dettinger *et al.* 2016). It remains highly uncertain whether annual precipitation in the Bay-Delta watershed will trend wetter or drier (Dettinger 2005; Dettinger *et al.* 2016). The warmer air temperature projections suggest more precipitation will fall as rain rather than snow and that storms may increase in intensity, but will have more dry weather in between them (Knowles and Cayan 2002; Dettinger 2005; Dettinger *et al.* 2016). The expected consequences are less water stored in spring snowpacks, increased flooding and an associated decrease in runoff for the remainder of the year (Hayhoe *et al.* 2004). Changes in storm tracks may lead to increased frequency of flood and drought cycles during the 21st century (Dettinger *et al.* 2015).

As of 2009, sea level rise had not had much effect on X2 (Hutton *et al.* 2017b). However, additional sea level rise is another anticipated consequence of a warming global climate and if it is not mitigated, sea level rise will likely increase saltwater intrusion into the Bay-Delta (Rath *et al.* 2017). During the summer of 2015, variation in sea level interacted with very low Delta inflows to cause frequent recurrence of net negative Delta outflow (Monismith 2016).

Since the early 1980s, climate change is thought to have increased wind speed along the central California coast, resulting in a more frequent and longer lasting upwelling season (Garcia-Reyes and Largier 2010). Coastal upwelling causes colder deep water to rise to the ocean surface, bringing with it nutrients that stimulate the coastal food web. One effect of wind blowing over the estuary is that it resuspends sediment deposited in shallow areas like San Pablo Bay, Grizzly Bay, and Honker Bay (Ruhl *et al.* 2001). Thus, higher wind speeds blowing onto the coast might be expected to result in higher turbidity of the water in parts of the estuary. In contrast to this expectation, Bever *et al.* (2018) reported a recent reduction in wind speed over the Bay-Delta during 1995-2015, which these authors associated with lower turbidity in Suisun Bay. The Service notes these contrasting results for completeness but we cannot reconcile these opposing trends in wind speed at this time. We show below that Secchi disk depth (an indicator of water turbidity) have not increased since the mid-1980s near the (mobile) location of X2 even though suspended sediment concentrations in Suisun Bay have decreased since about 2000 (Schoellhamer 2011; Bever *et al.* 2018).

Central California's warm summers are already a source of energetic stress for delta smelt and warm springs can already severely compress the duration of their spawning season (Rose *et al.* 2013a,b). We expect warmer estuary temperatures to present a significant conservation challenge for delta smelt in the coming decades (Brown *et al.* 2013; 2016a; Figure 15). Feyrer *et al.* (2011)

and Brown *et al.* (2013; 2016a) have evaluated the anticipated effects of projected climate change on several delta smelt habitat metrics. Collectively, these studies indicate the future will bring chronically compressed fall habitat, fewer 'good' turbidity days (defined by the authors as a mean turbidity greater than or equal to 18 Nephelometric Turbidity Units (NTU)), a spawning window of similar duration but that is shifted 2 to 3 weeks earlier in the year, and a substantial increase in the number of days delta smelt will need to endure lethal or near lethal summer water temperatures.

The delta smelt lives at the southern limit of the inland distribution of the family Osmeridae along the Pacific coast of North America. The anticipated effects of a warming climate are expected to create increasing temperature related challenges for delta smelt at some future point. The amount of anticipated change to the regional climate expected in the near term is lower than it is for the latter half of the century (Figure 15). Therefore, it is less certain that any measurable change from current conditions will occur in the next approximately 10 years than by 2050 or 2100. For the time being, water temperatures are stressful to delta smelt, but not of themselves lethal in most of the upper estuary (Komoroske *et al.* 2015).

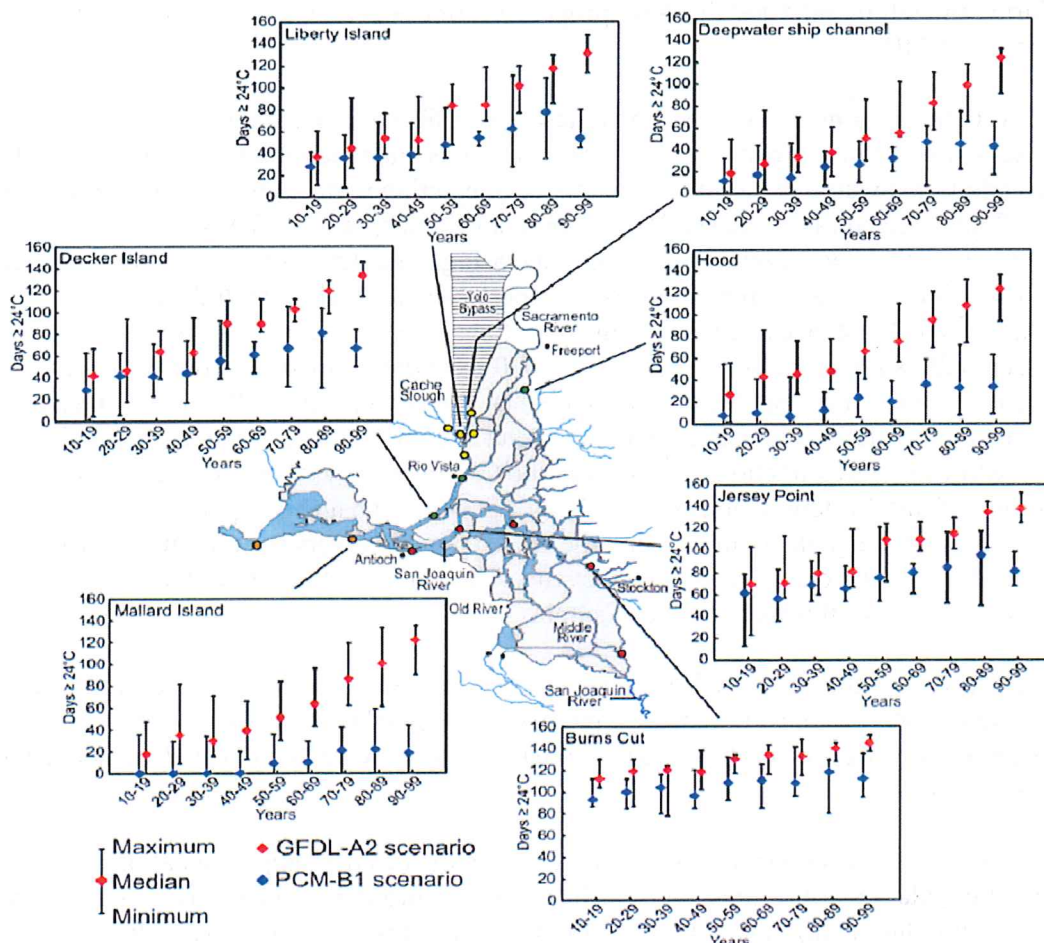


Figure 15. Plots of median, maximum, and minimum number of days each year with an estimated average daily water temperature greater than or equal to 24°C (75°F) at selected sites in the Delta by decade for the 21st century. The water temperature threshold reflects one chosen by the authors to represent near lethal conditions for delta smelt. Source: Brown *et al.* (2016a).

Recovery and Management

Following Moyle *et al.* (1992), the Service (1993) indicated that SWP and CVP exports were the primary factors contributing to the decline of delta smelt due to entrainment of larvae and juveniles and the effects of low flow on the location and function of the estuary mixing zone (now called the low-salinity zone). In addition, prolonged drought during 1987-1992, in-Delta water diversions, reduction in food supplies by nonindigenous aquatic species (specifically overbite clam and nonnative copepods), and toxicity due to agricultural and industrial chemicals were also factors considered to be threatening the delta smelt. In the Service's December 15, 2008 *Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP)* (2008 BO), the Reasonable and Prudent Alternative (RPA) required protection of all life stages from entrainment and augmentation of Delta outflow during the fall of Wet and Above-Normal years as classified by the State of California (Service 2008). The expansion of entrainment protection for delta smelt in the 2008 BO was in response to large increases in juvenile and adult salvage in the early 2000s (Kimmerer 2008; Brown *et al.* 2009). The fall X2 requirement in the 2008 RPA was in response to increased fall exports that had reduced variability in Delta outflow and lowered habitat suitability during the fall months and the 2008 proposed action was anticipated to reduce it further (Feyrer *et al.* 2011).

The Service's (2010c) recommendation to uplist delta smelt from threatened to endangered included a discussion of threats related to reservoir operations and water diversions upstream of the estuary as additional water operations mechanisms interacting with exports from the Delta to restrict the LSZ and concentrate delta smelt with competing and predatory fish species. In addition, Brazilian waterweed (*Egeria densa*) and increasing water transparency were considered new detrimental habitat changes. Predation was considered a low-level threat linked to increasing waterweed abundance and increasing water transparency. Additional threats considered potentially significant by the Service in 2010 were entrainment into power plant diversions, contaminants, and reproductive problems that can stem from small population sizes. Conservation recommendations included: establish Delta outflows proportionate to unimpaired flows to set outflow targets as fractions of runoff in the Central Valley watersheds; minimize reverse flows in Old and Middle rivers; and, establish a genetic management plan for captive-reared delta smelt with the goals of minimizing the loss of genetic diversity and limiting risk of extinction caused by unpredictable catastrophic events. The Service (2012) recently added climate change to the list of threats to the delta smelt.

Maintaining protection of the delta smelt from excessive entrainment, improving the estuary's flow regime, suppression of nonnative species, increasing zooplankton abundance, and improving water quality are among the actions the Service has previously indicated are needed to recover the delta smelt.

There have been several recent papers suggesting it is time to consider supplementation of the wild delta smelt population with captive-bred fish as part of a broad-based conservation strategy to avoid extinction in the wild, also known as extirpation (Moyle *et al.* 2016; 2018; Hobbs *et al.* 2017; Lessard *et al.* 2018). In 2019, pilot research conducted by the California Department of Water Resources (DWR) has demonstrated that captive-bred delta smelt held within steel enclosures can survive in the Delta for at least 30 days. This is long enough to show that the fish can feed themselves and did not die from acute water toxicity in either of two locations tested

thus far. The fish will be evaluated for chronic toxic exposure, but that work is not finished. These results are promising and similar research is planned this year.

The status of the delta smelt is poor. The current estimated delta smelt population sizes are so low that it seems unlikely the species can be habitat- or food-limited even though both physical and food web-related habitat attributes have degraded over time. It is more likely that delta smelt have been marginalized by non-native fishes and invertebrates that compete with and prey on them. When fish populations reach very low levels, they can fall victim to demographic problems (often termed Allee effects in the scientific literature). These include problems concentrating enough individuals in particular locations for successful spawning, successful feeding, or maintaining large enough egg supplies, or shoals and schools of juvenile and adult fish to provide effective protection from predators (Liermann and Hilborn 2001; Keith and Hutchings 2012).

Summary of the Status of Delta Smelt

The relative abundance of delta smelt has reached very low numbers for a small forage fish in an ecosystem the size of the Bay-Delta and the species is approaching extinction in the wild (Moyle *et al.* 2016; 2018; Hobbs *et al.* 2017). The extremely low 2018-2020 abundance indices reflect decades of habitat change and marginalization by non-native species that prey on and out-compete delta smelt. The anticipated effects of climate change on the Bay-Delta and its watershed such as warmer water temperatures, greater salinity intrusion, lower snowpack contribution to spring outflow, and the potential for frequent extreme drought, indicate challenges to delta smelt survival will increase.

Environmental Baseline in the Action Area

Environmental baseline refers to the condition of the listed species or its designated critical habitat in the Action Area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the Action Area, the anticipated impacts of all proposed Federal projects in the Action Area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

The environmental baseline for the terrestrial portions of the project occurs primarily within the cities of Antioch and Pittsburgh and are predominately commercial, residential, and industrial developments. For the purposes of this biological opinion, the focus will be on the aquatic environment as it relates to delta smelt.

Delta Smelt

The proposed project occurs within the San Joaquin River near the confluence of the Sacramento and San Joaquin Rivers and within the range of delta smelt. The San Joaquin River is surrounded by various forms of human development such as urban cities and islands of leveed agriculture. The San Joaquin River has some portions of tidal wetlands along its reach although most of the river's edges has been leveed or developed for human use. The San Joaquin River also serves as

a major shipping channel for California. Delta smelt are located in the confluence year-round and are known to utilize the San Joaquin River as habitat. The proposed project also occurs within the LSZ where smelt are known to rear, feed and breed. The Suisun Bay and the confluence of the Sacramento and San Joaquin Rivers are considered critical areas of delta smelt habitat in the San Francisco Bay Estuary for the survival of this species. Delta smelt are often observed in the highest densities in these areas (Merz *et al.* 2011). The marina near the Fulton Shipyard Facility, where the new intake diversion construction and cofferdam installation are proposed to occur, is a small semi-closed aquatic environment with in-water structures (see Figure 1) that experiences frequent human activity. The marina currently houses an existing pump station and an existing operational intake diversion for the City of Antioch. The WWTP diffuser is a pre-existing structure that discharges effluent at the base of the riverbed to mix with the receiving waters of the San Joaquin River and has been in operation for several decades (California Regional Water Quality Control Board 2003).

As detailed in the *Status of the Species* section of this biological opinion, the delta smelt abundance is at its historical low. The latest surveys to detect delta smelt within the confluence of the Sacramento and San Joaquin Rivers near the project were the Service's Enhanced Delta Smelt Monitoring Program, which encountered delta smelt mid-March in the lower Sacramento River above Kimball Island and below Collinsville, California (Service 2020). The CVP's Tracy Fish Collection Facility also encountered a larval smelt during fish salvage March 11, 2020 which suggests that delta smelt were spawning in the San Joaquin River or South Delta earlier in the year (CDFW 2020). Several studies monitor the juvenile and adult delta smelt distribution and relative abundance throughout their historical spring range in the Sacramento-San Joaquin Delta and San Francisco Estuary; however, most of the catch data for the delta smelt occurs in the Sacramento River from Cache Slough to Suisun Bay and occurrences in the San Joaquin River around the Action Area are rare which suggests that the probability of delta smelt occurring in the Action Area at the time of the action is anticipated to be low. The City proposes to conduct in-water work between August 1 and October 31 when delta smelt will be in the juvenile and sub-adult life stages and located in the Action Area during the duration of the proposed project.

Bever *et al.* (2016) combined long-term fish sampling data from the Suisun Bay and a detailed three-dimensional hydrodynamic modeling to investigate the relationship between historical fish catch and hydrodynamic complexity of the Suisun Bay. They concluded that delta smelt presence (i.e., delta smelt caught in the FMWT) during wetter years, in this area, overlaps with the regions of low salinity, low maximum velocity, and high turbidity. While Bever *et al.* (2016) concluded that the high maximum velocity of the navigation channels reduced the likelihood of delta smelt presence, it also demonstrated that delta smelt presence increases from west to east in the navigation channel. Thus, in low outflow years delta smelt are concentrated above the confluence of the Sacramento and San Joaquin rivers, whereas in higher outflow years the distribution extends through Suisun Bay (Sweetnam 1999).

Effects of the Proposed Action

Effects of the proposed action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action.

Delta Smelt

Consequences of the proposed project on delta smelt include the potential for wounding or killing of individuals through entrainment by the intake diversion, wounding or killing of individuals or behavioral changes from hydroacoustic effects through the pile driving installation of the sheet pile cofferdam, wounding or killing of individuals through physical handling during fish rescue operations, permanent shallow water habitat loss, the temporary deprivation of suitable habitat during in-water construction of the new diversion and fish screens, and continued deprivation of suitable habitat during discharge of the brine waste at the WWTP diffuser.

Intake Diversion Entrainment

The proposed new fish screen should be protective of sub-adult and adult delta smelt seasonally present in vicinity of the intake; however, delta smelt eggs, larvae, and juveniles could be present January through June and cannot be protected by the screen design or operational criteria because they are too small and have no (or very limited) swimming capabilities and will likely be entrained by the intake diversion. The distribution of early life stages (i.e., eggs, larvae, and juveniles) of delta smelt, is affected by changes in Delta flow patterns and diversions. Therefore, entrainment analyses often assume that eggs and larvae behave as passive particles and that water movement represents egg and larval movement (e.g., Kimmerer and Nobriga 2008). As a result, spreadsheet model-based particle tracking simulations were conducted to evaluate the potential entrainment of egg or larval delta smelt. Simulated Project intake operations developed by Carollo Engineers were applied to 16-year Delta Simulation Model II (DSM2) hydrologic conditions (net Delta outflow) to estimate the proportion of net Delta outflow diverted by the Antioch intake, with and without the project, across the 16-year period of record (water years 1976-1991) in DSM2. For each species, one billion eggs/larvae (represented by particles) were assumed to originate in the Delta during certain months of each year. The proportion of total eggs/larvae assigned to each month was based on known spawning and egg production distributions documented in literature and other regulatory documents (Moyle 2002; California Department of Fish and Game (CDFG) 2009). The total number of particles (representing eggs or larvae) assumed for the whole year (i.e., one billion) was multiplied by the monthly weights to give the number of particles at the start of each month (Table 2). The overall effect of the proposed project diversions was characterized in terms of the proportion of particles entrained (calculated for with and without-project) and the percentage point difference between with and without-project scenarios.

The primary assumptions of the egg and larval entrainment risk and vulnerability simulations are as follows:

- eggs and larvae are evenly distributed throughout the water column;
- entrainment of eggs and larvae into the intake can be estimated using proportional relationships between total flow volume in the channel and total diversion volume;
- the proportion of water diverted was calculated by dividing modeled diversion flows by net Delta outflow as estimated by DSM2 modeling;
- intake screening offers no protection to eggs and larvae; and
- eggs and larvae behave as passive particles and move with water flows.

Because most delta smelt spawning (and associated egg and larvae production) is typically centered in the north Delta (Moyle 2002; Bennett 2005; Feyrer *et al.* 2007; CDFG 2009; Merz *et al.* 2011; Moyle *et al.* 2016), it is likely that eggs and larvae are more densely distributed in the Sacramento River (north) side of the west Delta and; therefore, the assumptions that eggs and larvae are evenly distributed throughout the water column is likely a conservative assumption for the Antioch intake, which is located on the south bank of the San Joaquin River (south side of west Delta).

Table 2**Monthly Weights Used in the Analysis of Fish Egg and Larval Entrainment for the Project**

	Monthly weights						
	Dec	Jan	Feb	Mar	Apr	May	Jun
Delta Smelt	0	0	0.1	0.25	0.35	0.25	0.05

Of the simulated one billion eggs or larvae produced annually under the 1976–1991 model period, the annual mean percentage of loss of delta smelt was low, with 0.11% entrained under the with-project scenario across all years. Monthly mean percentage entrainment in particles under the with-project scenario varied between 0.07 and 0.14% across all years (Table 3). The differences in mean percentage entrainment between existing conditions and with-project scenarios was less than 0.09% across all months, ranging from 0.03 to 0.09% higher in the with-project scenario versus the existing conditions scenario. To minimize entrainment risk to the early life stage periods (i.e., December through June) for delta smelt, the City proposes to operate two fish screens in tandem to reduce approach velocities by 50% (i.e., from 0.2 foot per second to 0.1 foot per second) during these periods.

Table 3**Entrainment Vulnerability Modeling Simulation Results for Delta Smelt**

	Potential Entrainment (%)						Change from Existing Conditions (%)		
	No Project (Existing Conditions)			With-Project					
Month	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Jan	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Feb	0.033	0.000	0.128	0.092	0.008	0.205	0.060	0.008	0.077
Mar	0.036	0.000	0.096	0.072	0.006	0.165	0.035	0.006	0.069
Apr	0.087	0.000	0.151	0.118	0.017	0.201	0.032	0.017	0.049
May	0.070	0.000	0.156	0.137	0.030	0.227	0.067	0.030	0.071
Jun	0.049	0.000	0.158	0.135	0.032	0.168	0.086	0.032	0.010

Cofferdam Installation

Sub-adult and juvenile delta smelt within the influence of pile driving for installation of the cofferdam may be adversely affected. Fish may be stressed, exhibit alarm behaviors and/or increased swim speeds, compromising their physiological processes if they attempt to evade in-water construction equipment. In such situations, fish cannot optimally feed or shelter and may be susceptible to predation and/or reduced fitness.

Underwater sound pressure waves can harass and harm fish species (Reyff 2003; Abbott and Bing-Sawyer 2002; California Department of Transportation 2001; Longmuir and Lively 2001;

Stotz and Colby 2001). As the pressure wave passes through a fish, the swim bladder is rapidly squeezed due to the high pressure, and then rapidly expanded as the under-pressure component of the wave passes through the fish. This can cause adverse effects including: rupture of the swim bladder, rupture of capillaries, internal hemorrhage, neurological stress, and auditory damage. Extreme sound waves can cause instantaneous death, latent death within minutes after exposure, or can occur several days later.

Elevated noise levels can cause sub-lethal injuries affecting survival and fitness. Similarly, if injury does not occur, noise may modify fish behavior that may make them more susceptible to predation. Fish suffering damage to hearing organs may suffer equilibrium problems, and may have a reduced ability to detect predators and prey. Other types of sub-lethal injuries can place the fish at increased risk of predation and disease. Adverse effects on survival and fitness can occur even in the absence of overt injury. Exposure to elevated noise levels can cause a temporary shift in hearing sensitivity (referred to as a temporary threshold shift or TTS), decreasing sensory capability for periods lasting from hours to days (Turnpenny *et al.* 1994; Hastings *et al.* 1996).

The Fisheries Hydroacoustic Working Group, an interagency working group that includes the Service, has established interim criteria for evaluating underwater noise impacts from pile driving on fish. These criteria are defined in the document entitled “Agreement in Principal for Interim Criteria for Injury to Fish from Pile Driving Activities” dated June 12, 2008 (Fisheries Hydroacoustic Working Group 2008). This agreement identifies a peak sound pressure level of 206 decibels (dB) and an accumulated sound exposure level (ASEL)¹ of 187 dB as thresholds for injury to fish \geq to 2 grams (g). For fish less than 2g, the ASEL threshold is reduced to 183 dB. Although there has been no formal agreement on a “behavioral” threshold, NMFS uses 150 dB-root mean square (RMS) as the threshold for adverse behavioral effects. Pile driving with a vibratory hammer minimizes the amount of noise and turbidity generated by the activity and reduces traumas to fish. Compared to the standard impact driving method, vibratory driving reduces the distance that noise exceeds NMFS thresholds by almost 1,000 feet from the area of impact, substantially reducing or avoiding the potential to cause take of the listed species.

Distances of pile driving noise effects to fish less than 2 grams was calculated using the NMFS Underwater Noise Calculation Spreadsheet model (NMFS 2009a). The City proposes that the installation of the piles would not result in peak sounds greater than 206 dB. NMFS recommends using an underwater attenuation rate of 4.5 dB per doubling of distance (NMFS 2009a). It also supports the notion that sound levels of less than 150 dB do not contribute the ASEL for the purposes of assessing injury (NMFS 2009a). Using this assumption and attenuation rate the calculated distance to each of the applicable thresholds is as follows:

- Distance to 206 dB-peak = 10 meters (m)
- Distance to 150 dB-RMS = 1,585 m
- Distance to 183 dB-ASEL = 173 m (for fish < 2 g)

¹ SEL is defined as the constant sound level acting for one second, which has the same amount of acoustic energy as the original sound. Expressed another way, the sound exposure level is a measure of the sound energy in a single pile driver strike. Accumulated SEL ((ASEL) is the cumulative SEL resulting from successive pile strikes. ASEL is based on the number of pile strikes and the SEL per strike; the assumption is made that all pile strikes are of the same SEL. Peak sound pressure refers to the highest absolute value of a measured waveform (i.e., sound pressure pulse as a function of time).

A sub-adult or adult delta smelt would be injured if present for 300 pile strikes within a distance of 567.5 feet (173 meters). The behavioral effects threshold distances (using the NMFS calculation) are much larger at approximately 1 mile (1,585 meters). This is calculated for the largest proposed steel sheet pile driven with an impact hammer attenuated to a maximum of 183 dB with the cushion block. This calculation assumes an unimpeded open water propagation path which is the case for portions of the Action Area.

Based on the assumptions above (impact hammer) with an attenuated 150 dB RMS zone of influence, delta smelt found within approximately 514 aquatic habitat acres will be directly affected by pile construction noise. This area is limited to the radius from the cofferdam footprint and adjusted by the width of the San Joaquin River and the proximity of Winter Island.

In order to minimize underwater noise and reduce the incidences of harm, injury and barotrauma to delta smelt, the City proposes to utilize a vibratory hammer for sheet pile installation, as often as possible and limit pile driving to a two week period. If a vibratory hammer cannot be used, the City proposes to use a cushion block on the impact hammer to minimize driving noise and the extent of sound pressure waves from the point of origin. Further, the City will produce a hydroacoustic monitoring plan to ensure underwater pile-related construction noise does not exceed hydroacoustic thresholds that are detrimental to delta smelt. The City proposes to conduct construction within the Service's recommended work window for delta smelt to avoid the spawning period and larval stage of the species (the recommended work window for delta smelt is August 1 through November 30; however, the City is proposing a work window of August 1 through October 31 to minimize effects to listed salmonids also). Construction during the work window will likely have some adverse effect by discouraging juvenile and sub-adult delta smelt away from suitable habitat, reducing their ability to detect and capture prey, and exposing them to predation. The Action Area is within the southern shoreline of the San Joaquin River and delta smelt would be afforded a significant portion of aquatic habitat within the San Joaquin River in which to avoid the area during proposed project activities.

Fish Evacuation and Rescue

It is anticipated that most delta smelt will avoid the Action Area around the new intake diversion construction site once barges and construction equipment are present in the channel. The marina near the Fulton Shipyard Facility where the cofferdam installation is proposed to occur is a small semi-closed environment with in-water structures (see Figure 1). It is not likely that delta smelt would be in the vicinity of the construction area as delta smelt typically avoid in-water structures. However, as any fish or animal is not completely predictable, there is a low probability a delta smelt could be trapped within the cofferdam during installation. The City proposes to conduct a fish evacuation before full installation of the cofferdam and a fish rescue after full installation. If a delta smelt were trapped within the cofferdam after installation was complete, fish rescue efforts through seining and possible handling of delta smelt will likely induce enough stress to cause mortality. Delta smelt are extremely sensitive to handling. Attempts to collect, transport, and handle can have mortality rates in excess of 90 % (Swanson *et al.* 1996).

Loss of Shallow Water Habitat

Construction for the intake structure would result in the loss of approximately 0.04 acre of shallow water habitat. To compensate for loss of shallow water, the City is proposing to restore habitat in

the vicinity of the intake or to purchase credits at a 3:1 ratio at a conservation bank approved by the Service.

Habitat at the WWTP Diffuser

The aquatic habitat around the WWTP diffuser will be modified through the increase in salinity from the proposed 2 mgd of brine discharge. The chemical constituents and physical behavior of brine discharge have the potential to pose a threat to aquatic organisms (Cooley *et al.* 2006). Extensive brine discharge, as it constitutes an increased saline layer that sinks towards the seabed due to its greater density, has the potential to affect local marine biota (Ahmed and Anwar 2012). Certain habitat types, organisms, and organismal life stages are at greater risk than others. Early life stages of fish species such as the egg and larval stages, are particularly vulnerable due to their limited or total lack of mobility to avoid plumes of high salinity water. In particular, eggs and larval life stages of delta smelt have the potential to be present in the approximate 8.63 acres of the Action Area around the diffuser during winter and spring months and may be vulnerable to brine water discharge. Embryos of delta smelt are capable of surviving and developing across a wide distribution of salinities (0.4–20.0 ppt), yet they require conditions lower than 16.0 ppt to hatch successfully (Romney *et al.* 2019). The discharged brine salinity may be as high as 22.5 ppt directly at the diffuser; however, the City proposes (through independent modeling of the plume discharge) that the highest concentration of salinity at the zone of initial dilution is anticipated to be no greater than 11.0 ppt at a minimum distance of 5 feet from the diffuser (based on Scenario 3 of the modeled analysis; see BA). Delta smelt are generally tolerant of the various salinity levels of the Delta (0–14 ppt) and have an upper tolerance of approximately 19 ppt (Swanson *et al.* 2000); however, juvenile, sub-adult and adult delta smelt may find conditions within the zone of initial diffusion at the diffuser unfavorable due to encountering a sudden localized increase in salinity and discourage them from utilizing the area for foraging, spawning or other essential behaviors. Salinity concentrations decline over distance from the point of discharge, so although eggs and larvae may be present in the narrow band near the diffuser, this is not expected to occur consistently as the zone of initial dilution is not static and can change with river flow and tidal conditions over the course of the day. It can be as small 0.5 acre to as large as 8.63 acres and salinity concentrations will also be variable depending on water quality conditions and the amount of brine discharge. Given the relatively small area that could be subject to elevated salinity concentrations, adverse effects to delta smelt early stages are anticipated to be minimal. The adverse effect to behavior is anticipated to be low as brine water plumes are located near the channel bottom and delta smelt are pelagic and are generally believed to move primarily through the upper half of the water column (Mitchell *et al.* 2017; Polansky *et al.* 2019).

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the Action Area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. During this consultation, the Service did not identify any future non-federal actions that are reasonably certain to occur in the Action Area of the proposed project.

Conclusion

After reviewing the current *Status of the Species for the delta smelt*, the *Environmental Baseline in the Action Area*, the *Effects of the Proposed Action*, and the *Cumulative Effects*, it is the Service's biological opinion that the Brackish Water Desalination Facility Project, as proposed, is not likely to jeopardize the continued existence of the delta smelt. The Service reached this conclusion because the project-related effects to the species, when added to the environmental baseline and analyzed in consideration of all potential cumulative effects, will not rise to the level of appreciably reducing the likelihood of survival and recovery of the delta smelt. This is based on implementation of the *Conservation Measures* to minimize the adverse effects on individual delta smelt and its habitats during the construction, the small amount of permanent habitat loss and the proposal to compensate for that loss, and the short duration of temporary impacts to a localized area and the low numbers of delta smelt that are anticipated to be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by Service regulations at 50 CFR 17.3 as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the same regulations as an act which actually kills or injures wildlife. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require the City to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps or the City must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Amount or Extent of Take

Conservation measures proposed by the City and described in the *Description of the Proposed Action* will reduce, but not completely eliminate the potential for incidental taking of delta smelt. The Service anticipates incidental take of individual delta smelt will be difficult to detect or quantify because of their current historically low population, their turbid aquatic habitat makes them difficult to detect, and finding a dead or injured individual would be unlikely. Losses of delta

smelt may also be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in water regime, or additional environmental disturbances. Therefore the Service anticipates that all delta smelt within the Action Area will be subject to incidental take in the form of:

1. Harm, through permanent modification of suitable aquatic habitat within the approximately in-water 8.67 acres of the Action Area. This includes the 0.04 acres of the new intake diversion and approximate maximum of 8.63 acres of the zone of initial diffusion from discharge of brine at the diffuser.
2. Wounding or killing of all delta smelt within 567.5 feet of pile driving activities were the City to use an impact hammer for pile driving. The number of delta smelt wounded or killed from pile driving noise effects is anticipated to be low as the City proposes to conduct pile driving between August 1 and October 31 to avoid the early life stages of the delta smelt, limit pile driving to a short period of time and duration (2 weeks), use a vibratory hammer as the primary means of pile driving, utilize sound reduction techniques such as cushion blocks, and monitor peak sound levels during pile driving to ensure the reduction of sound levels.
3. Harm, by impairing essential behaviors such as foraging or predator evasion, of all delta smelt through the deprivation of suitable aquatic habitat within approximately 514 acres of the Action Area through use of an impact hammer during construction activities. This is assuming that the City would resort to the use of an impact hammer when vibratory methods are not effective. The total area affected will be up to approximately 514 acres if an impact hammer is used, although the size of the impacted area will be smaller if vibratory pile-driving methods are able to be used. The number of smelt affected is anticipated to be low as the City proposes to use a vibratory hammer as the primary means of pile driving, conduct pile driving between August 1 and October 31 to avoid the early life stages of the delta smelt, limit pile driving to a short in time and duration (2 weeks), and utilize sound reduction techniques such as cushion blocks, and monitor peak sound levels during pile driving to ensure the reduction of sound levels.
4. Wounding and killing of all delta smelt eggs and larva that are entrained at the new intake diversion. This is anticipated to be low as the City will reduce the approach velocity to 0.1 foot per second at the intake from December to June to minimize entrainment of the early life stages of delta smelt.
5. Wounding or killing of no more than 2 sub-adult or adult delta smelt during fish rescue activities. It is unlikely that delta smelt would be trapped within the cofferdam due to their rarity and typical avoidance behavior of in-water structures or disturbance; however, no animal is completely predictable and a delta smelt may attempt to "evade" in the wrong direction and become trapped.

Upon implementation of the following reasonable and prudent measures, incidental take of delta smelt associated with the Brackish Water Desalination Facility Project will become exempt from the prohibitions described in section 9 of the Act. No other forms of take are exempted under this opinion.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the delta smelt.

Reasonable and Prudent Measure

All necessary and appropriate measures to avoid or minimize effects on the delta smelt resulting from implementation of this project have been incorporated into the project's proposed conservation measures. Therefore, the Service believes the following reasonable and prudent measure is necessary and appropriate to minimize incidental take of the delta smelt:

1. All conservation measures, as described in the biological assessment and restated in the *Description of the Proposed Action* section of this biological opinion, shall be fully implemented and adhered to. Further, this reasonable and prudent measure shall be supplemented by the terms and conditions below.

Term and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps shall ensure that the city and its contractors comply with the following term and conditions, which implement their respective reasonable and prudent measure described above. These term and conditions are non-discretionary.

1. The Corps, through the City, shall require that all personnel associated with this project are made aware of the *Conservation Measures* and the responsibility to implement them fully.
2. The Corps shall ensure that the City and its contractors comply with the *Reporting Requirements* below.

Reporting Requirements

In order to monitor whether the amount or extent of incidental take anticipated from implementation of the project is approached or exceeded, the Corps, through the City, shall adhere to the following reporting requirements. Should this anticipated amount or extent of incidental take be exceeded, the Corps must reinitiate formal consultation as per 50 CFR 402.16.

1. The Service must be notified within 24 hours of the finding of any injured or dead listed species or any unanticipated damage to its habitat associated with the proposed project. Injured listed species shall be cared by a licensed veterinarian or other qualified person. Notification will be made to Jana Affonso, the Assistant Field Supervisor of the Endangered Species Division at: San Francisco Bay-Delta Fish and Wildlife Office, 650 Capitol Mall, Suite 8-300, Sacramento, California 95814 or by telephone at (916) 930-2664, and must include the date, time, and precise location of the individual/incident clearly indicated on a U.S. Geological Survey 7.5 minute quadrangle or other maps at a finer scale, as requested by the Service, and any other pertinent information. When an injured or dead individual of the listed species is found, the City through the Corps shall follow the steps outlined in the *Disposition of Individuals Taken* section below.

2. Sightings of any listed or sensitive animal species shall be reported to the Service and CNDDB (<https://www.wildlife.ca.gov/Data/BIOS>).

Disposition of Individuals Taken

Injured listed species must be cared for by a licensed veterinarian or other qualified person(s), such as the Service-approved biologist. Dead individuals must be sealed in a resealable plastic bag containing a paper with the date and time when the animal was found, the location where it was found, and the name of the person who found it, and the bag containing the specimen frozen in a freezer located in a secure site, until instructions are received from the Service regarding the disposition of the dead specimen. The Service contact persons are Jana Affonso, the Assistant Field Supervisor of the Endangered Species Division at: San Francisco Bay-Delta Fish and Wildlife Office, 650 Capitol Mall, Suite 8-300, Sacramento, California 95814 or by telephone at (916) 930-2664; and the Resident Agent-in-Charge of the Service's Office of Law Enforcement, 5622 Price Way, McClellan, California 95562, at (916) 569-8444.

REINITIATION – CLOSING STATEMENT

This concludes formal consultation on the Brackish Water Desalination Facility Project. As provided in 50 CFR §402.16,

(a) Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and:

- (1) If the amount or extent of taking specified in the incidental take statement is exceeded;
- (2) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;
- (3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or
- (4) If a new species is listed or critical habitat designated that may be affected by the identified action.

(b) An agency shall not be required to reinitiate consultation after the approval of a land management plan prepared pursuant to 43 U.S.C. 1712 or 16 U.S.C. 1604 upon listing of a new species or designation of new critical habitat if the land management plan has been adopted by the agency as of the date of listing or designation, provided that any authorized actions that may affect the newly listed species or designated critical habitat will be addressed through a separate action-specific consultation. This exception to reinitiation of consultation shall not apply to those land management plans prepared pursuant to 16 U.S.C. 1604 if:

- (1) Fifteen years have passed since the date the agency adopted the land management plan prepared pursuant to 16 U.S.C. 1604; and

- (2) Five years have passed since the enactment of Public Law 115-141 [March 23, 2018] or the date of the listing of a species or the designation of critical habitat, whichever is later.

Please address any questions or concerns regarding this response to Brian Hansen, Senior Fish and Wildlife Biologist, at Brian_Hansen@fws.gov or (916) 930-5653 or Kim Squires, Section 7 Division Chief, at Kim_Squires@fws.gov. Please refer to Service file number 08FBDT00-2020-F-0094 in any future correspondence regarding this project.

Sincerely,

Kaylee Allen
Field Supervisor

cc: Cathy Marcinkevage, National Marine Fisheries Service, Sacramento, CA
Jim Starr, California Department of Fish and Wildlife, Stockton, CA
Elizabeth Christian, Regional Water Quality Control Board, Oakland, CA
Ethan Levine, San Francisco Bay Conservation and Development Commission,
San Francisco, CA
Louis Terrazas, Antioch Dunes National Wildlife Refuge, Sonoma, CA

REFERENCES

- Abbott, R., and Bing-Sawyer, E. 2002. Assessment of pile driving impacts on the Sacramento blackfish (*Othodon microlepidotus*). Report prepared for Caltrans District 4.
- Ahmed, M., and R. Anwar, 2012. An assessment of the environmental impact of brine disposal in marine environment. *International Journal of Modern Engineering Research*, 2, 2756–2761
- Andrews, S.W., E.S. Gross and P. H. Hutton. 2017. Modeling salt intrusion in the Bay-Delta prior to anthropogenic influence. *Continental Shelf Research* 146:58-81.
- Bennett, W.A. 2005. Critical assessment of the delta smelt population in the San Francisco Estuary, California. *San Francisco Estuary and Watershed Science* 3(2). doi: <http://escholarship.org/uc/item/0725n5vk>
- Bennett, W.A. and J.R. Burau. 2015. Riders on the storm: selective tidal movements facilitate the spawning migration of threatened Delta Smelt in the San Francisco Estuary. *Estuaries and Coasts* 38(3):826-835. doi: <http://dx.doi.org/10.1007/s12237-014-9877-3>
- Bennett, W.A., W.J. Kimmerer and J.R. Burau. 2002. Plasticity in vertical migration by native and exotic estuarine fishes in a dynamic low-salinity zone. *Limnology and Oceanography* 47(5):1496-1507. doi: <http://dx.doi.org/10.4319/lo.2002.47.5.1496>
- Benson, N.G. 1981. The freshwater-inflow-to-estuaries issue. *Fisheries* 6(5):8-10.
- Bever, A.J., M.L. MacWilliams, and D.K. Fullerton. 2018. Influence of an observed decadal decline in wind speed on turbidity in the San Francisco Estuary. *Estuaries and Coasts* 41(7):1943-1967. <https://doi.org/10.1007/s12237-018-0403-x>
- Bever, A.J., M.L. MacWilliams, B. Herbold, L.R. Brown and F.V. Feyrer. 2016. Linking hydrodynamic complexity to delta smelt (*Hypomesus transpacificus*) distribution in the San Francisco Estuary, USA. *San Francisco Estuary and Watershed Science* 14(1). doi: <http://dx.doi.org/10.15447/sfews.2016v14iss1art3>
- Brown, L.R., W.A. Bennett, R.W. Wagner, T. Morgan-King, N. Knowles, F. Feyrer, D.H. Schoellhamer, M.T. Stacy, and M. Dettinger. 2013. Implications for future survival of Delta smelt from four climate change scenarios for the Sacramento-San Joaquin Delta, California. *Estuaries and Coasts* 36(4):754-774. doi: <http://dx.doi.org/10.1007/s12237-013-9585-4>
- Brown, L.R., W. Kimmerer and R. Brown. 2009. Managing water to protect fish: a review of California's environmental water account, 2001–2005. *Environmental management* 43(2):357-368.
- Brown, L.R., L.M. Komoroske, R.W. Wagner, T. Morgan-King, J.T. May, R.E. Cannon, R.E. and N.A. Fangue. 2016a. Coupled downscaled climate models and ecophysiological metrics forecast habitat compression for an endangered estuarine fish. *PloS one* 11(1):e0146724.

- Bunn, S.E., and A.H. Arthington. 2002. Basic principles and ecological consequences of altered flow regimes for aquatic biodiversity. *Environmental Management* 30:492-507.
- Bush, E.E. 2017. Migratory life histories and early growth of the endangered estuarine Delta Smelt (*Hypomesus transpacificus*). University of California, Davis.
- (CDFG) California Department of Fish and Game. 2009. Longfin smelt, California Endangered Species Act, Incidental Take Permit, Effects Analysis for the State Water Project, Sacramento, CA.
- (CDFW) California Department of Fish and Wildlife. 2020. Salvage index for delta smelt at the State Water Project webpage, accessed May 19, 2020.
ftp://ftp.wildlife.ca.gov/salvage/Daily_Smelt_Summary/
- California Department of Transportation. 2001. Fisheries Impact Assessment, Pile Installation Demonstration Project for the San Francisco - Oakland Bay Bridge, East Span Seismic Safety Project, August 2001. 59pp.
- California Regional Water Quality Control Board. 2003. California Regional Water Quality Control Board – San Francisco Bay Region Order No. R2-2003-0114 NPDES Permit No. CA0038547 Waste Discharge Requirements for: Delta Diablo Sanitation District Antioch, Contra Costa County
- Carallo. 2018. Near-field Modeling Study of Potential Future Discharge from the Delta Diablo Sanitation District Outfall, External Memorandum to Samantha Salvia.
- Castillo, G. C., Sandford, M. E., Hung, T. C., Tigan, G., Lindberg, J. C., Yang, W. R., and Van Nieuwenhuyse, E. E. 2018. Using natural marks to identify individual cultured adult Delta Smelt. *North American Journal of Fisheries Management* 38(3):698-705.
- Chesser, R.T., R.C. Banks, C. Cicero, J.L. Dunn, A.W. Kratter, I.J. Lovette, A.G. Navarro-Sigüenza, P.C. Rasmussen, J.V. Remsen, Jr., J.D. Rising, D.F. Stotz, and K. Winker. 2014. Fifty-fifth supplement to the American Ornithologists' Union *Check-list of North American Birds*. *Auk* 131: in press.
- Cloern, J.E., and A.D. Jassby. 2012. Drivers of change in estuarine-coastal ecosystems: Discoveries from four decades of study in San Francisco Bay. *Reviews of Geophysics*, 50(4).
- Connon, R. E., J. Geist, J. Pfeiff, A.V. Loguinov, L.S. D'Abronzio, H. Wintz, C.D. Vulpe and I. Werner. 2009. Linking mechanistic and behavioral responses to sublethal esfenvalerate exposure in the endangered delta smelt; *Hypomesus transpacificus* (Fam. Osmeridae). *BMC Genomics* 10:608. <http://bmcgenomics.biomedcentral.com/articles/10.1186/1471-2164-10-608>
- Conrad, J. L., A.J. Bibian, K.L. Weinersmith, D. De Carion, M.J. Young, P. Crain, E.L. Hestir, M.J. Santos and A. Sih. 2016. Novel Species Interactions in a Highly Modified Estuary: Association of Largemouth Bass with Brazilian Waterweed *Egeria densa*. *Transactions*

- of the American Fisheries Society 145(2):249-263.
doi:<http://dx.doi.org/10.1080/00028487.2015.1114521>
- Cooley, H., P. H. Gleick, G. Wolff, 2006. *Desalination, With a Grain of Salt: A California Perspective*. Pacific Institute for Studies in Development, Environment, and Security. Oakland, CA.
- Damon, L.J., S.B. Slater, R.D. Baxter and R.W. Fujimura. 2016. Fecundity and reproductive potential of wild female delta smelt in the upper San Francisco Estuary, California. *California Fish and Game* 102(4):188-210.
- Dege, M. and L.R. Brown. 2004. Effect of outflow on spring and summertime distribution and abundance of larval and juvenile fishes in the upper San Francisco estuary. Pages 49-66 In: Feyrer, F., Brown, L.R., Brown, R.L., Orsi J.J. (eds.). *Early life history of fishes in the San Francisco Estuary and Watershed*. American Fisheries Society Symposium 39.
- Dettinger, M.D. 2005. From Climate-change Spaghetti to Climate-change Distributions for 21st Century California. *San Francisco Estuary and Watershed Science* 3(1).
<http://repositories.cdlib.org/jmie/sfews/vol3/iss1/art4>
- Dettinger, M., J. Anderson, M. Anderson, L.R. Brown, D. Cayan and E. Maurer. 2016. Climate change and the Delta. *San Francisco Estuary and Watershed Science* 14(3)
<http://escholarship.org/uc/item/2r71j15r>
- Dettinger, M., B. Udall and A. Georgakakos. 2015. Western water and climate change. *Ecological Applications* 25(8):2069-2093. doi:<http://dx.doi.org/10.1890/15-0938.1>
- Dugdale, R., F. Wilkerson, A.E. Parker, A. Marchi, and K. Taberski. 2012. River flow and ammonium discharge determine spring phytoplankton blooms in an urbanized estuary. *Estuarine, Coastal and Shelf Science* 115:187-199.
- Dugdale, R. C., F.P. Wilkerson and A.E. Parker. 2016. The effect of clam grazing on phytoplankton spring blooms in the low-salinity zone of the San Francisco Estuary: A modelling approach. *Ecological Modelling* 340:1-16.
doi:<http://dx.doi.org/10.1016/j.ecolmodel.2016.08.018>
- Enright, C., S.D. Culberson, and J.R. Burau. 2013. Broad timescale forcing and geomorphic mediation of tidal marsh flow and temperature dynamics. *Estuaries and Coasts* 36(6): 1319-1339. DOI 10.1007/s12237-013-9639-7
- Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Impact Assessment Manual. Page 207, https://www.transit.dot.gov/sites/fta.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf
- Ferrari, M.C.O., L. Ranåker, K.L. Weinersmith, M.J. Young, A. Sih and J.L. Conrad. 2014. Effects of turbidity and an invasive waterweed on predation by introduced largemouth bass. *Environmental Biology of Fishes* 97(1):79-90.
doi: <http://dx.doi.org/10.1007/s10641-013-0125-7>

- Feyrer F., K. Newman, M. Nobriga, T. Sommer. 2011. Modeling the effects of future outflow on the abiotic habitat of an imperiled estuarine fish. *Estuaries and Coasts* 34(1):120-128. doi: <http://dx.doi.org/10.1007/s12237-010-9343-9>
- Feyrer, F., K. Newman, M. Nobriga and T. Sommer. 2016. Delta Smelt Habitat in the San Francisco Estuary: A Reply to Manly, Fullerton, Hendrix, and Burnham's "Comments on Feyrer *et al.* Modeling the Effects of Future Outflow on the Abiotic Habitat of an Imperiled Estuarine Fish". *Estuaries and Coasts* 39(1):287-289.
- Feyrer, F., M.L. Nobriga and T.R. Sommer. 2007. Multidecadal trends for three declining fish species: habitat patterns and mechanisms in the San Francisco Estuary, California, USA. *Canadian Journal of Fisheries and Aquatic Science* 64(4):723-734. doi: <http://dx.doi.org/10.1139/f07-048>
- Feyrer, F., D. Portz, D. Odum, K.B. Newman, T. Sommer, D. Contreras, R. Baxter, S. Slater, D. Sereno and E. Van Nieuwenhuysse. 2013. SmeltCam: Underwater video codend for trawled nets with an application to the distribution of the imperiled delta smelt. *PLoS ONE* 8(7). doi: <http://dx.doi.org/10.1371/journal.pone.0067829>
- Feyrer, F., T. Sommer and W. Harrell, W. 2006. Managing floodplain inundation for native fish: production dynamics of age-0 splittail (*Pogonichthys macrolepidotus*) in California's Yolo Bypass. *Hydrobiologia* 573(1):213-226.
- Fisch, K.M., J.M. Henderson, R.S. Burton and B. May. 2011. Population genetics and conservation implications for the endangered delta smelt in the San Francisco Bay-Delta. *Conservation genetics* 12(6):1421-1434.
- Fisheries Hydroacoustic Working Group. 2008 (June 12). *Agreement in Principal for Interim Criteria for Injury to Fish from Pile Driving Activities*. Memorandum to Applicable Agency Staff. NMFS, Northwest and Southwest Regions, USFWS Regions 1 and 8, California/Washington/Oregon Departments of Transportation, California Department of Fish and Game, and U.S. Federal Highway Administration.
- Garcia-Reyes, M., and J. Largier. 2010. Observations of increased wind-driven coastal upwelling off central California, *J. Geophys. Res.*, 115, C04011, doi:10.1029/2009JC005576.
- Gewant, D.S., and S.M. Bollens. 2005. Macrozooplankton and micronekton of the lower San Francisco Estuary: seasonal, interannual, and regional variation in relation to environmental conditions. *Estuaries* 28:473-485.
- Gewant, D. and S.M. Bollens. 2012. Fish assemblages of interior tidal marsh channels in relation to environmental variables in the upper San Francisco Estuary. *Environmental biology of fishes* 94(2):483-499. doi: <http://dx.doi.org/10.1007/s10641-011-9963-3>
- Gillson, J. 2011. Freshwater flow and fisheries production in estuarine and coastal systems: where a drop of rain is not lost. *Reviews in Fisheries Science* 19:168-186.

- Grimaldo, L. F., T. Sommer, N. Van Ark, G. Jones, E. Holland, P.B. Moyle, B. Herbold and P. Smith. 2009. Factors affecting fish entrainment into massive water diversions in a tidal freshwater estuary: can fish losses be managed? *North American Journal of Fisheries Management* 29(5):1253-1270. doi: <http://dx.doi.org/10.1577/M08-062.1>
- Grosholz, E., and E. Gallo. 2006. The influence of flood cycle and fish predation on invertebrate production on a restored California floodplain. *Hydrobiologia* 568(1):91-109.
- Gross, E.S., P.H. Hutton and A.J. Draper. 2018. A Comparison of Outflow and Salt Intrusion in the Pre-Development and Contemporary San Francisco Estuary. *San Francisco Estuary and Watershed Science* 16(3).
- Hamilton, S.A. and D.D. Murphy. 2018. Analysis of limiting factors across the life cycle of Delta smelt (*Hypomesus transpacificus*). *Environmental management* 62(2):365-382.
- Hammock, B.G., Hartman, R., Slater, S.B., Hennessy, A. and Teh, S.J., 2019. Tidal Wetlands Associated with Foraging Success of Delta Smelt. *Estuaries and Coasts*:1-11.
- Hammock, B.G., J.A. Hobbs, S.B. Slater, S. Acuña and S.J. Teh. 2015. Contaminant and food limitation stress in an endangered estuarine fish. *Science of the Total Environment* 532:316-326. doi: <http://dx.doi.org/10.1016/j.scitotenv.2015.06.018>
- Hammock, B.G., Slater, S.B., Baxter, R.D., Fangue, N.A., Cocherell, D., Hennessy, A., Kurobe, T., Tai, C.Y. and Teh, S.J., 2017. Foraging and metabolic consequences of semi-anadromy for an endangered estuarine fish. *PloS ONE* 12(3):p.e0173497. <https://doi.org/10.1371/journal.pone.0173497>
- Hasenbein, M., N.A. Fangue, J. Geist, L.M. Komoroske, J. Truong, R. McPherson R.E. and Connon. 2016b. Assessments at multiple levels of biological organization allow for an integrative determination of physiological tolerances to turbidity in an endangered fish species. *Conservation physiology* 4(1) cow004.
- Hasenbein, M., L.M. Komoroske, R.E. Connon, J. Geist and N.A. Fangue. 2013. Turbidity and salinity affect feeding performance and physiological stress in the endangered delta smelt. *Integrative and Comparative Biology* 53(4):620-634. doi: <http://dx.doi.org/10.1093/icb/ict082>
- Hayhoe, K., D. Cayan, C.B. Field, P.C. Frumhoff, E.P. Maurer, N.L. Miller, S.C. Moser, S.H. Schneideri, K.N. Cahill, E.E. Cleland, L. Dale, R. Drapek, R.M. Hanemann, L.S. Kalkstein, J. Lenihan, C.K. Lunch, R.P. Neilson, S.C. Sheridan and J.H. Verville. 2004. Emissions pathways, climate change, and impacts on California. *Proceedings of the National Academy of Sciences of the United States of America* 101(34):12422-12427. doi: <http://dx.doi.org/10.1073/pnas.0404500101>
- He, L., and M. Nobriga. 2018. Revisiting relationships between salinity and delta smelt abundance. Presentation at the 2018 San Francisco Bay Delta Science Conference, Sacramento, CA.

- Hestir, E. L., D.H. Schoellhamer, J. Greenberg, T. Morgan-King and S.L. Ustin. 2016. The effect of submerged aquatic vegetation expansion on a declining turbidity trend in the Sacramento-San Joaquin River Delta. *Estuaries and Coasts* 1-13. doi: <http://dx.doi.org/10.1007/s12237-015-0055-z>
- Heubach, W. 1969. *Neomysis awatschensis* in the Sacramento-San Joaquin River Estuary. *Limnology and Oceanography* 14: 533-546.
- Hirose, T. and K. Kawaguchi. 1998. Spawning ecology of Japanese surf smelt, *Hypomesus pretiosus japonicus* (Osmeridae), in Otsuchi Bay, northeastern Japan. *Environmental biology of fishes* 52(1-3):213-223.
- Hobbs, J.A., W.A. Bennett and J.E. Burton. 2006. Assessing nursery habitat quality for native smelts (Osmeridae) in the low-salinity zone of the San Francisco estuary. *Journal of Fish Biology* 69(3):907-922. doi: <http://dx.doi.org/10.1577/T06-087.1>
- Hobbs, J. A., Bennett, W. A., Burton, J., & Baskerville-Bridges, B. 2007b. Modification of the biological intercept model to account for ontogenetic effects in laboratory-reared delta smelt (*Hypomesus transpacificus*). *U.S. Fishery Bulletin* 105(1):30-38.
- Hobbs, J.A., W.A. Bennett, J. Burton and M. Gras. 2007a. Classification of larval and adult delta smelt to nursery areas by use of trace elemental fingerprinting. *Transactions of the American Fisheries Society* 136(2):518-527. doi: <http://dx.doi.org/10.1577/T06-087.1>
- Hobbs, J., P.B. Moyle, N. Fangue and R.E. Connon. 2017. Is extinction inevitable for Delta Smelt and Longfin Smelt? An opinion and recommendations for recovery. *San Francisco Estuary and Watershed Science* 15(2).
- Howe, E. R., & Simenstad, C. A. 2011. Isotopic determination of food web origins in restoring and ancient estuarine wetlands of the San Francisco Bay and Delta. *Estuaries and Coasts* 34:597-617. DOI 10.1007/s12237-011-9376-8
- Hutton, P.H., Chen, L., Rath, J.S. and Roy, S.B., 2019. Tidally-averaged flows in the interior Sacramento–San Joaquin River Delta: Trends and change attribution. *Hydrological Processes* 33(2):230-243.
- Hutton, P.H., J.S. Rath, S.B. Roy. 2017a. Freshwater flow to the San Francisco Bay-Delta estuary over nine decades (Part 1): Trend evaluation. *Hydrological Processes* 31(14):2500-2515.
- Hutton, P. H., Rath, J. S., and Roy, S. B. 2017b. Freshwater flow to the San Francisco Bay-Delta estuary over nine decades (Part 2): Change attribution. *Hydrological processes* 31(14):2516-2529.
- Hutton, P.H. and S.B. Roy. 2019. Characterizing Early 20th Century Outflow and Salinity Intrusion in the San Francisco Estuary. *San Francisco Estuary and Watershed Science* 17(2). <https://escholarship.org/content/qt5jn0f55k/qt5jn0f55k.pdf>

- (IEP) Interagency Ecological Program. 2015. An updated conceptual model of Delta Smelt biology: our evolving understanding of an estuarine fish. IEP Management, Analysis and Synthesis Team. Interagency Ecological Program for the San Francisco Bay/Delta Estuary. Technical Report 90. California Department of Water Resources. http://www.water.ca.gov/iep/docs/Delta_Smelt_MAST_Synthesis_Report_January%202015.pdf
- Jassby, A.D. and J.E. Cloern. 2000. Organic matter sources and rehabilitation of the Sacramento-San Joaquin Delta (California, USA). *Aquatic Conservation: Marine and Freshwater Ecosystems* 10(5):323-352. https://sfbay.wr.usgs.gov/publications/pdf/jassby_2000_organic.pdf
- Jassby, A.D., J.E. Cloern and B.E. Cole. 2002. Annual primary production: Patterns and mechanisms of change in a nutrient-rich tidal ecosystem. *Limnology and Oceanography* 47(3):698-712. doi: <http://dx.doi.org/10.4319/lo.2002.47.3.0698>
- Jassby, A.D., W.J. Kimmerer, S.G. Monismith, C. Armor, J.E. Cloern, T.M. Powell, J.R. Schubel, and T.J. Vendlinski. 1995. Isohaline position as a habitat indicator for estuarine populations. *Ecological Applications* 5(1): 272-289. doi:<http://dx.doi.org/10.2307/1942069>
- Keith, D.M., and J.A. Hutchings. 2012. Population dynamics of marine fishes at low abundance. *Canadian Journal of Fisheries and Aquatic Sciences* 69:1150-1163.
- Kimmerer, W.J. 2002a. Physical, biological, and management responses to variable freshwater flow into the San Francisco Estuary. *Estuaries* 25(6):1275-1290. doi: <http://dx.doi.org/10.1007/BF02692224>
- Kimmerer, W.J. 2002b. Effects of freshwater flow on abundance of estuarine organisms: physical effects or trophic linkages? *Marine Ecology Progress Series* 243:39-55. doi: <http://dx.doi.org/10.3354/meps243039>
- Kimmerer, W.J. 2004. Open water processes of the San Francisco Estuary: from physical forcing to biological responses. *San Francisco Estuary and Watershed Science* 2(1). <http://escholarship.org/uc/item/9bp499mv>
- Kimmerer, W.J. 2008. Losses of Sacramento River Chinook salmon and delta smelt to entrainment in water diversions in the Sacramento-San Joaquin Delta. *San Francisco Estuary and Watershed Science* 6(2). <http://escholarship.org/uc/item/7v92h6fs>
- Kimmerer, W.J., E.S. Gross and M.L. MacWilliams. 2014. Tidal migration and retention of estuarine zooplankton investigated using a particle-tracking model. *Limnology and Oceanography* 59(3):901-916.
- Kimmerer, W. J., E.S. Gross and M.L. MacWilliams. 2009. Is the response of estuarine nekton to freshwater flow in the San Francisco Estuary explained by variation in habitat volume? *Estuaries and Coasts* 32(2):375. <http://www.jstor.org/stable/40663547>

- Kimmerer, W.J., M.L. MacWilliams and E.S. Gross. 2013. Variation of fish habitat and extent of the low-salinity zone with freshwater flow in the San Francisco Estuary. *San Francisco Estuary and Watershed Science* 11(4). <http://escholarship.org/uc/item/3pz7x1x8>
- Kimmerer, W.J. and M.L. Nobriga. 2008. Investigating Particle Transport and Fate in the Sacramento–San Joaquin Delta Using a Particle-Tracking Model. *San Francisco Estuary and Watershed Science* 6(1). <https://escholarship.org/uc/item/547917gn>
- Kimmerer, W.J. and K.A. Rose. 2018. Individual-Based Modeling of Delta Smelt Population Dynamics in the Upper San Francisco Estuary III. Effects of Entrainment Mortality and Changes in Prey. *Transactions of the American Fisheries Society* 147(1):223-243.
- Kjelson, M.A., and P.L. Brandes. 1989. The use of smolt survival estimates to quantify the effects of habitat changes on salmonid stocks in the Sacramento-San Joaquin rivers, California. Canadian special publication of fisheries and aquatic sciences/Publication speciale canadienne des sciences halieutiques et aquatiques.
- Knowles, N. and D.R. Cayan. 2002. Potential effects of global warming on the Sacramento/San Joaquin watershed and the San Francisco estuary. *Geophysical Research Letters* 29(18). doi: <http://dx.doi.org/10.1029/2001GL014339>
- Komoroske, L.M., R.E. Connon, K.M. Jeffries and N.A. Fangue. 2015. Linking transcriptional responses to organismal tolerance reveals mechanisms of thermal sensitivity in a mesothermal endangered fish. *Molecular ecology* 24(19):4960-4981.
- Komoroske, L.M., R.E. Connon, J. Lindberg, B.S. Cheng, G. Castillo, M. Hasenbein, and N. A. Fangue. 2014. Ontogeny influences sensitivity to climate change stressors in an endangered fish. *Conservation Physiology* 2. <http://conphys.oxfordjournals.org/content/2/1/cou008.short>
- Komoroske, M., K.M. Jeffries, R.E. Connon, J. Dexter, M. Hasenbein, C. Verhille and N.A. Fangue. 2016. Sublethal salinity stress contributes to habitat limitation in an endangered estuarine fish. *Evolutionary Applications*. doi: <http://dx.doi.org/10.1111/eva.12385>
- Kurobe, T., M.O. Park, A. Javidmehr, F.C. Teh, S.C. Acuña, C.J. Corbin, A.J. Conley, W.A. Bennett and S.J. Teh. 2016. Assessing oocyte development and maturation in the threatened Delta Smelt, *Hypomesus transpacificus*. *Environmental Biology of Fishes* 99(4):423-432. doi: <http://dx.doi.org/10.1007/s10641-016-0483-z>
- LaCava, M., K. Fisch, M. Nagel, J.C. Lindberg, B. May, and A.J. Finger. 2015. Spawning behavior of cultured delta smelt in a conservation hatchery. *North American Journal of Aquaculture* 77:255-266. <http://dx.doi.org/10.1080/15222055.2015.1007192>
- Latour, R.J. 2016. Explaining Patterns of Pelagic Fish Abundance in the Sacramento-San Joaquin Delta. *Estuaries and Coasts* 39(1):233-247. doi: <http://dx.doi.org/10.1007/s12237-015-9968-9>
- Lessard, J., B. Cavallo, P. Anders, T. Sommer, B. Schreier, D. Gille, A. Schreier, A. Finger, T-C. Hung, J. Hobbs, B. May, A. Schultz, O. Burgess, and R. Clarke. 2018. Considerations for

- the use of captive-reared delta smelt for species recovery and research. *San Francisco Estuary and Watershed Science* 16(3): <https://doi.org/10.15447/sfews.2018v16iss3art3>
- Liermann, M., and R. Hilborn. 2001. Depensation: evidence, models, and implications. *Fish and Fisheries* 2:33-58.
- Lindberg, J.C., G. Tigan, L. Ellison, T. Rettinghouse, M.M. Nagel and K.M. Fisch. 2013. Aquaculture methods for a genetically managed population of endangered Delta Smelt. *North American Journal of Aquaculture* 75(2):186-196. doi:<http://dx.doi.org/10.1080/15222055.2012.751942>
- Longmuir, C., and T. Lively. 2001. Bubble curtain systems for use during marine pile driving. Report by Fraser River Pile and Dredge Ltd., New Westminster, BC, Canada.
- Mac Nally, R., J.R. Thomson, W.J. Kimmerer, F. Feyrer, K.B. Newman, A. Sih, W.A. Bennett, L. Brown, E. Fleishman, S.D. Culberson and G. Castillo. 2010. Analysis of pelagic species decline in the upper San Francisco Estuary using multivariate autoregressive modeling (MAR). *Ecological Applications* 20(5):1417-1430.
- MacWilliams, M., A.J. Bever and E. Foresman. 2016. 3-D simulations of the Bay-Delta with subgrid bathymetry to explore long-term trends in salinity distribution and fish abundance. *Bay-Delta and Watershed Science* 14(2).
- MacWilliams, M.L., A.J. Bever, E.S. Gross, G.S. Ketefian, W.J. Kimmerer. 2015. Three-dimensional modeling of hydrodynamics and salinity in the Bay-Delta: An evaluation of model accuracy, X2, and the low-salinity zone. *Bay-Delta and Watershed Science* 13(1).
- Mager, R.C., S.I. Doroshov, J.P. Van Eenennaam and R.L. Brown. 2004. Early life stages of delta smelt. Pages 169-180 in Feyrer, F., Brown, L.R., Brown, R.L., and Orsi, J.J. (eds.). *Early life history of fishes in the San Francisco Estuary and Watershed*. American Fisheries Society Symposium 39, Bethesda, MD.
- Mahardja, B., J.A. Hobbs, N. Ikemiyagi, A. Benjamin and A.J. Finger. 2019. Role of freshwater floodplain-tidal slough complex in the persistence of the endangered delta smelt. *PloS ONE* 14(1):e0208084.
- Mahardja, B., M.J. Young, B. Schreier, and T. Sommer. 2017a. Understanding imperfect detection in a San Francisco Estuary long-term larval and juvenile fish monitoring programme. *Fisheries Management and Ecology* 24:488-503.
- Mahardja, B., M.J. Farruggia, B. Schreier, and T. Sommer. 2017b. Evidence of a shift in the littoral fish community in the Sacramento-San Joaquin Delta. *PLOS One* 12(1):e0170683. doi:10.1371/journal.pone.0170683
- Maley, J.M. and R.T. Brumfield. 2013. Mitochondrial and next-generation sequence data used to infer phylogenetic relationships and species limits in the Clapper/King rail complex. *Condor* 115:316-329.

- Manly, B.F.J., D. Fullerton, A.N. Hendrix and K.P. Burnham. 2015. Comments on Feyrer *et al.* “modeling the effects of future outflow on the abiotic habitat of an imperiled estuarine fish”. *Estuaries and coasts* 38(5):1815-1820.
- Matern, S.A., P.B. Moyle and L.C. Pierce. 2002. Native and alien fishes in a California estuarine marsh: twenty-one years of changing assemblages. *Transactions of the American Fisheries Society* 131(5):797-816.
doi: [http://dx.doi.org/10.1577/1548-8659\(2002\)131<0797:NAAFIA>2.0.CO;2](http://dx.doi.org/10.1577/1548-8659(2002)131<0797:NAAFIA>2.0.CO;2)
- Meng, L., P.B. Moyle, and B. Herbold. 1994. Changes in abundance and distribution of native and introduced fishes of Suisun Marsh. *Transactions of the American Fisheries Society* 123:498-507.
- Merz, J.E., P.S. Bergman, J.L. Simonis, D. Delaney, J. Pierson, and P. Anders. 2016. Long-term seasonal trends in the prey community of delta smelt (*Hypomesus transpacificus*) within the Sacramento-San Joaquin Delta, California. *Estuaries and Coasts* 39:1526-1536.
- Merz, J.E., S. Hamilton, P.S. Bergman and B. Cavallo. 2011. Spatial perspective for delta smelt: a summary of contemporary survey data. *California Fish and Game* 97(4):164-189.
<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=46489>
- Miller, W.J., B.F.J. Manly, D.D. Murphy, D. Fullerton and R.R. Ramey. 2012. An investigation of factors affecting the decline of delta smelt (*Hypomesus transpacificus*) in the Sacramento-San Joaquin Estuary. *Reviews in Fisheries Science* (20)1:1-19.
doi: <http://dx.doi.org/10.1080/10641262.2011.634930>
- Mitchell, L., Newman, K., & Baxter, R. 2017. A Covered Cod-End and Tow-Path Evaluation of Midwater Trawl Gear Efficiency for Catching Delta Smelt (*Hypomesus transpacificus*). *San Francisco Estuary and Watershed Science* 15(4).
- Monismith, S.G. 2016. A note on Delta outflow. *San Francisco Estuary and Watershed Science* 14(3).
- Monismith, S., J.R. Burau, and M. Stacey. 1996. Stratification dynamics and gravitational circulation in northern San Francisco Bay. Pages 123-153 In: Hollibaugh, J.T. (ed). *San Francisco Bay: The ecosystem*. Pacific Division, American Association for the Advancement of Science.
- Monismith, S.G., W. Kimmerer, J.R. Burau, and M.T. Stacey. 2002. Structure and flow-induced variability of the subtidal salinity field in northern San Francisco Bay. *Journal of Physical Oceanography* 32(11):3003-3019.
- Moyle, P.B., 2002. *Inland fishes of California: revised and expanded*. Univ of California Press.
- Moyle, P.B., Baxter, R.D., Sommer, T., Foin, T.C. and Matern, S.A., 2004. Biology and population dynamics of Sacramento splittail (*Pogonichthys macrolepidotus*) in the San Francisco Estuary: a review. *San Francisco Estuary and Watershed Science* 2(2).

- Moyle, P.B., and W.A. Bennett. 2008. The future of the Delta ecosystem and its fish. Technical Appendix D in Hanak, E., W. Fleenor, and J. Lund, Comparing futures for the Sacramento-San Joaquin Delta. University of California Press.
- Moyle, P.B., L.R. Brown and J.R. Durand and J.A. Hobbs. 2016. Delta smelt: life history and decline of a once-abundant species in the San Francisco Estuary. *San Francisco Estuary and Watershed Science* 14(2). <http://escholarship.org/uc/item/09k9f76s>
- Moyle, P.B., B. Herbold, D.E. Stevens and L.W. 1992. Life history and status of delta smelt in the Sacramento-San Joaquin Estuary, California. *Transactions of the American Fisheries Society* 121(1):67-77. doi: [http://dx.doi.org/10.1577/1548-8659\(1992\)121<0067:LHASOD>2.3.CO;2](http://dx.doi.org/10.1577/1548-8659(1992)121<0067:LHASOD>2.3.CO;2)
- Moyle, P. B., Hobbs, J. A., & Durand, J. R. 2018. Delta Smelt and water politics in California. *Fisheries* 43(1):42-50.
- Moyle, P. B., Lund, J. R., Bennett, W. A., and W.E. Fleenor. 2010. Habitat variability and complexity in the upper San Francisco Estuary. *San Francisco Estuary and Watershed Science* 8(3).
- Murphy, D.D. and S.A. Hamilton. 2013. Eastern migration or marshward dispersal: exercising survey data to elicit an understanding of seasonal movement of delta smelt. *San Francisco Estuary and Watershed Science* 11(3). <https://escholarship.org/uc/item/4jf862qz>
- (NMFS) National Marine Fisheries Service. 2009. Pile driving analysis spreadsheet. <http://www.dot.ca.gov/hq/env/bio/files/NMFS%20Pile%20Driving%20Calculations.xls>
- Nobriga, M.L., F. Feyrer, R.D. Baxter and M. Chotkowski. 2005. Fish community ecology in an altered river delta: spatial patterns in species composition, life history strategies, and biomass. *Estuaries* 28(5):776-785. doi: <http://dx.doi.org/10.1007/BF02732915>
- Nobriga, M.L., T.R. Sommer, F. Feyrer and K. Fleming. 2008. Long-term trends in summertime habitat suitability for delta smelt. *San Francisco Estuary and Watershed Science* 6(1). <http://escholarship.org/uc/item/5xd3q8tx>
- Orsi, J.J. 1986. Interaction between diel vertical migration of a mysidacean shrimp and two-layered estuarine flow. *Hydrobiologia* 137(1):79-87.
- Orsi, J.J. and W.L. Mecum. 1986. Zooplankton distribution and abundance in the Sacramento-San Joaquin Delta in relation to certain environmental factors. *Estuaries* 9(4):326-339. doi: <http://dx.doi.org/10.2307/1351412>
- Orsi, J.J. and W.L. Mecum. 1996. Food limitation as the probable cause of a long-term decline in the abundance of *Neomysis mercedis* the opossum shrimp in the Sacramento-San Joaquin estuary. *San Francisco Bay: the ecosystem*. American Association for the Advancement of Science, San Francisco, pp.375-401.

- Parker, A.E., W.J. Kimmerer, and U.U. Lidström. 2012. Reevaluating the generality of an empirical model for light-limited primary production in the San Francisco Estuary. *Estuaries and Coasts* 35(4):930-942.
- Parker, A.E., R.C. Dugdale and F.P. Wilkerson. 2012. Elevated ammonium concentrations from wastewater discharge depress primary productivity in the Sacramento River and the Northern San Francisco Estuary. *Marine Pollution Bulletin* 64(3):574-586.
- Perry, R.W., J.R. Skaiski, P.L Brandes, P.T. Sandstrom, A.P. Klimley, A. Ammann and B. MacFarlane. 2010. Estimating survival and migration route probabilities of juvenile Chinook salmon in the Sacramento–San Joaquin River Delta. *North American Journal of Fisheries Management* 30(1):142-156.
- Peterson, M.S. 2003. A conceptual view of environment-habitat-production linkages in tidal river estuaries. *Reviews in Fisheries science* 11(4):291-313.
doi: <https://doi.org/10.1080/10641260390255844>
- Poff, N.L., and J.K.H. Zimmerman. 2010. Ecological responses to altered flow regimes: a literature review to inform the science and management of environmental flows. *Freshwater Biology* 55:194-205.
- Polansky, L., Mitchell, L., and Newman, K.B. 2019. Using multistage design-based methods to construct abundance indices and uncertainty measures for delta smelt. *Transactions of the American Fisheries Society* 148:710-724.
<https://afspubs.onlinelibrary.wiley.com/doi/full/10.1002/tafs.10166>
- Polansky, L., K.B. Newman, M.L. Nobriga and L. Mitchell. 2018. Spatiotemporal models of an estuarine fish species to identify patterns and factors impacting their distribution and abundance. *Estuaries and Coasts* 41(2):572-581.
<http://dx.doi.org/10.1007/s12237-017-0277-3>
- Quinn, T., Krueger, K., Pierce, K., Penttila, D., Perry, K., Hicks, T. and Lowry, D., 2012. Patterns of surf smelt, *Hypomesus pretiosus*, intertidal spawning habitat use in Puget Sound, Washington State. *Estuaries and Coasts* 35(5), pp.1214-1228.
- Rath, J. S., Hutton, P. H., Chen, L., & Roy, S. B. 2017. A hybrid empirical-Bayesian artificial neural network model of salinity in the San Francisco Bay-Delta estuary. *Environmental modelling and Software* 93:193-208.
- Reyff, J. A. 2003. Underwater sound levels associated with construction of the Benicia-Martinez Bridge, acoustical evaluation of an unconfined air-bubble curtain system at Pier 13. Inc., Petaluma, Calif.
- Reis, G.J., Howard, J.K. and J.A. Rosenfield. 2019. Clarifying Effects of Environmental Protections on Freshwater Flows to—and Water Exports from—the San Francisco Bay Estuary. *San Francisco Estuary and Watershed Science* 17(1).

- Romney, A.L., Yanagitsuru, Y.R., Mundy, P.C., Fangue, N.A., Hung, T.C., Branderd, S.M., Connon, R.E. 2019. Developmental Staging and Salinity Tolerance in Embryos of the Delta Smelt, *Hypomesus transpacificus*. *Aquaculture* 511 (2019) 634191.
- Rose, K.A., W.J. Kimmerer, K.P. Edwards and W.A. Bennett. 2013a. Individual-based modeling of Delta Smelt population dynamics in the upper San Francisco Estuary: I. Model description and baseline results. *Transactions of the American Fisheries Society* 142(5):1238-1259. doi: <http://dx.doi.org/10.1080/00028487.2013.799518>
- Rose, K.A., W.J. Kimmerer, K.P. Edwards and W.A. Bennett. 2013b. Individual-based modeling of Delta Smelt population dynamics in the upper San Francisco Estuary: II. Alternative baselines and good versus bad years. *Transactions of the American Fisheries Society* 142(5):1260-1272. doi: <http://dx.doi.org/10.1080/00028487.2013.799519>
- Ruhl, C.A., D.H. Schoellhamer, R.P. Stumpf, and C.L. Lindsay. 2001. Combined use of remote sensing and continuous monitoring to analyse the variability of suspended-sediment concentrations in San Francisco Bay, California. *Estuarine, Coastal, and Shelf Science* 53:801-812.
- Schoellhamer, D.H. 2011. Sudden clearing of estuarine waters upon crossing the threshold from transport to supply regulation of sediment transport as an erodible sediment pool is depleted: San Francisco Bay, 1999. *Estuaries and Coasts* 34(5):885-899. doi: <http://dx.doi.org/10.1007/s12237-011-9382-x>
- (Service) U.S. Fish and Wildlife Service. 1991. Endangered and threatened wildlife and plants; proposed threatened status for the delta smelt. *Federal Register* 56:50075-50082. http://ecos.fws.gov/docs/federal_register/fr1938.pdf
- (Service) U.S. Fish and Wildlife Service. 1993. Endangered and threatened wildlife and plants; determination of threatened status for the delta smelt; final rule. *Federal Register* 58(42):12854-12864. https://ecos.fws.gov/docs/federal_register/fr2235.pdf
- (Service) U.S. Fish and Wildlife Service. 1996. Recovery Plan for the Sacramento-San Joaquin Delta Native Fishes. http://ecos.fws.gov/docs/recovery_plan/961126.pdf
- (Service) U.S. Fish and Wildlife Service. 2004. 5-year review of the delta smelt. http://ecos.fws.gov/docs/five_year_review/doc3570.pdf
- (Service) U.S. Fish and Wildlife Service. 2008. Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP). United States Fish and Wildlife Service, Sacramento, CA. https://www.fws.gov/sfbaydelta/documents/SWP-CVP_OPs_BO_12-15_final_OCR.pdf
- (Service) U.S. Fish and Wildlife Service. 2010a. 5-year review delta smelt (*Hypomesus transpacificus*). http://ecos.fws.gov/docs/five_year_review/doc3570.pdf
- (Service) U.S. Fish and Wildlife Service. 2010b. Endangered and threatened wildlife and plants; 12-month finding on a petition to reclassify the delta smelt from threatened to endangered

- throughout its range. Federal Register 75:17667-17680.
<https://www.gpo.gov/fdsys/pkg/FR-2010-04-07/pdf/2010-7904.pdf>
- (Service) U.S. Fish and Wildlife Service. 2010c. Notice of Findings on Delta Smelt uplisting. Federal Register 75:69222-69294.
<https://www.gpo.gov/fdsys/pkg/FR-2010-11-10/pdf/2010-27686.pdf#page=2>
- (Service) U.S. Fish and Wildlife Service. 2012. Candidate Notice of Review (CNOR) for Delta Smelt. November 21, 2012. Federal Register 77:69994-70060.
<https://www.gpo.gov/fdsys/pkg/FR-2012-11-21/pdf/2012-28050.pdf>
- (Service) U.S. Fish and Wildlife Service. 2020. The Service's Delta Juvenile Fish Monitoring Program website, accessed May, 19, 2020.
https://www.fws.gov/lodi/juvenile_fish_monitoring_program/jfmp_index.htm
- Simonis, J.L., and Merz, J.E. 2019. Prey availability, environmental constraints, and aggregation dictate population distribution of an imperiled fish. *Ecosphere* 10(3)
info: doi/10.1002/ecs2.2634.
- Slater, S.B. and R.D. Baxter. 2014. Diet, prey selection, and body condition of age-0 delta smelt, in the Upper San Francisco Estuary. *San Francisco Estuary Watershed Science* 12(3).
doi:<http://dx.doi.org/10.15447/sfew.s.2014v12iss3art1>
- Sommer, T.R., W.C. Harrell, A. Mueller-Solger, B. Tom, and W.J. Kimmerer. 2004. Effects of flow variation on channel and floodplain biota and habitats of the Sacramento River, California, USA. *Aquatic Conservation: Marine and Freshwater Ecosystems* 14(3):247-261.
- Sommer, T.R., C. Armor, R. Baxter, R. Breuer, L. Brown, M. Chotkowski, S. Culberson, F. Feyrer, M. Gingras, B. Herbold. 2007. The collapse of pelagic fishes in the upper San Francisco Estuary. *Fisheries* 32:270–277.
- Sommer, T. and F. Mejia. 2013. A place to call home: a synthesis of Delta Smelt habitat in the upper San Francisco Estuary. *San Francisco Estuary and Watershed Science* 11(2).
<https://escholarship.org/uc/item/32c8t244>
- Sommer, T., F.H. Mejia, M. Nobriga, F. Feyrer, and L. Grimaldo. 2011. The spawning migration of delta smelt in the upper San Francisco Estuary. *San Francisco Estuary and Watershed Science* 9(2). <https://escholarship.org/uc/item/86m0g5sz>
- Stevens, D.E., L.W. Miller. 1983. Effects of river flow on abundance of young Chinook salmon, American shad, longfin smelt, and delta smelt in the Sacramento-San Joaquin River system. *North American Journal of Fisheries Management* 3(4):425-437.
doi: [http://dx.doi.org/10.1577/1548-8659\(1983\)3<425:EORFOA>2.0.CO;2](http://dx.doi.org/10.1577/1548-8659(1983)3<425:EORFOA>2.0.CO;2)
- Stotz, T. and J. Colby. 2001. January 2001 dive report for Mukilteo wingwall replacement Project. Washington State Ferries Memorandum. 5 pp.+ appendices.
- Sweetnam, D.A. 1999. Status of delta smelt in the Sacramento-San Joaquin Estuary. *California Fish and Game* 85(1):22-27. <https://www.wildlife.ca.gov/Publications/Journal>

- Swanson, C., Mager, R.C., Doroshov, S.I., and Cech Jr., J.J. 1996. Use of Salts, Anesthetics, and Polymers to Minimize Handling and Transport Mortality in Delta Smelt, Transactions of the American Fisheries Society, 125:2, 326-329, DOI: 10.1577/1548-8659(1996)125<0326:UOSAAP>2.3.CO;2
- Swanson, C., Reid, T., Young, P., Cech Jr, J.J. 2000. Comparative environmental tolerances of threatened delta smelt (*Hypomesus transpacificus*) and introduced wakasagi (*H. nipponensis*) in an altered California estuary. *Oecologia* 123, 384–390 (2000).
<https://doi.org/10.1007/s004420051025>
- Thomson, J. R., W.J. Kimmerer, L.R. Brown, K.B. Newman, R. Mac Nally, W.A. Bennett, F. Feyrer and E. Fleishman. 2010. Bayesian change point analysis of abundance trends for pelagic fishes in the upper San Francisco Estuary. *Ecological Applications* 20(5):1431-1448. doi: <http://dx.doi.org/10.1890/09-0998.1>
- Turner, J.L. and H.K. Chadwick. 1972. Distribution and abundance of young-of-the-year striped bass, *Morone saxatilis*, in relation to river flow in the Sacramento-San Joaquin estuary. *Transactions of the American Fisheries Society* 101(3):442-452.
doi: [http://dx.doi.org/10.1577/1548-8659\(1972\)101<442:DAAOYS>2.0.CO;2](http://dx.doi.org/10.1577/1548-8659(1972)101<442:DAAOYS>2.0.CO;2)
- Wagner, R.W., M. Stacey, L.R. Brown and M. Dettinger. 2011. Statistical models of temperature in the Sacramento–San Joaquin Delta under climate-change scenarios and ecological implications. *Estuaries and Coasts* 34(3):544-556. doi: <http://dx.doi.org/10.1007/s12237-010-9369-z>
- Whipple, A.A., R.M. Grossinger, D. Rankin, B. Stanford and R.A. Askevold. 2012. Sacramento-San Joaquin Delta historical ecology investigation: Exploring pattern and process. Prepared for the California Department of Fish and Game and Ecosystem Restoration Program. A report of SFEIASC's Historical Ecology Program, publication# 672, San Francisco Estuary Institute-Aquatic Science Center, Richmond, CA.
http://www.sfei.org/sites/default/files/biblio_files/Delta_HistoricalEcologyStudy_SFEI_ASC_2012_lowres.pdf
- Wilkerson, F.P., R.C. Dugdale, A.E. Parker, S.B. Blaser and A. Pimenta. 2015. Nutrient uptake and primary productivity in an urban estuary: using rate measurements to evaluate phytoplankton response to different hydrological and nutrient conditions. *Aquatic Ecology* 49(2):211-233.
- Winder, M., Jassby, A.D. and Mac Nally, R., 2011. Synergies between climate anomalies and hydrological modifications facilitate estuarine biotic invasions. *Ecology letters* 14(8):749-757.



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

Refer to NMFS No: WCRO-2019-03441

July 8, 2020

Chandra Jenkins
Senior Project Manager
California Delta Section, Regulatory Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95814-2922

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens
Fishery Conservation and Management Act Essential Fish Habitat Response for the
Antioch Desalination Facility Intake Replacement Project.

Electronic only

Dear Ms. Jenkins:

Thank you for your letter of October 22, 2019, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the issuance of a Department of the Army permit under section 404 of the Clean Water Act to the City of Antioch. The City of Antioch proposes to implement the Antioch Desalination Facility Intake Replacement Project (Project). This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402; 84 FR 45016, August 27, 2019).

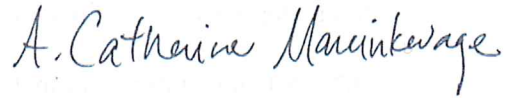
Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action. NMFS reviewed the likely effects of the proposed action on EFH and concluded that the action would adversely affect the EFH of Pacific Coast salmon. Therefore, we have included the results of that review in Section 3 of this document.

This biological opinion is based on the final biological assessment and other related environmental permitting documents prepared in support of the Project, and on the best available scientific and commercial information. NMFS concludes that the Project is not likely to adversely affect the federally listed as endangered, Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*) evolutionarily significant unit (ESU) or the threatened Central Valley spring-run Chinook salmon ESU (*O. tshawytscha*); not likely to jeopardize the continued existence of the threatened California Central Valley steelhead distinct population segment (DPS, *O. mykiss*), or the threatened southern DPS of the North American green sturgeon (*Acipenser medirostris*), and is not likely to destroy or adversely modify their designated critical habitats. NMFS has included an incidental take statement with reasonable and prudent measures and nondiscretionary terms and conditions that are necessary and appropriate to avoid, minimize, or monitor incidental take of listed species associated with the Project.



Please contact Doug Hampton in our California Central Valley Office at (916) 930-3610 or at douglas.hampton@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

A handwritten signature in cursive script that reads "A. Catherine Marcinkevage".

Cathy Marcinkevage
Acting Assistant Regional Administrator
California Central Valley Office

Enclosure

cc: 151422-WCR2019-SA00556

Electronic copy only:

Mr. Scott Buenting, City of Antioch, sbuenting@ci.antioch.ca.us

Mr. Jesse Halstead, Environmental Science Associates, jhalstead@esassoc.com



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

**Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens
Fishery Conservation and Management Act Essential Fish Habitat Response**

Antioch Desalination Facility Intake Replacement Project

NMFS Consultation Number: WCRO-2019-03441

Action Agency: U.S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Sacramento River winter-run Chinook salmon (<i>Oncorhynchus tshawytscha</i>)	Endangered	No	No	Yes	No
Central Valley spring-run Chinook salmon (<i>O. tshawytscha</i>)	Threatened	No	No	Yes	No
California Central Valley steelhead (<i>O. mykiss</i>)	Threatened	Yes	No	Yes	No
Southern distinct population segment of North American green sturgeon (<i>Acipenser medirostris</i>)	Threatened	Yes	No	Yes	No

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	No

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By: *A. Catherine Marcinkavage*
Cathy Marcinkavage
Acting Assistant Regional Administrator

Date: July 8, 2020



TABLE OF CONTENTS

1. INTRODUCTION	1
1.1. Background.....	1
1.2. Consultation History.....	1
1.3. Proposed Federal Action.....	2
2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE	
STATEMENT	8
2.1. Analytical Approach.....	8
2.2. Rangewide Status of the Species and Critical Habitat.....	9
2.2.1. Recovery Plans	14
2.2.2. Global Climate Change.....	15
2.3. Action Area.....	16
2.4. Environmental Baseline	16
2.5. Effects of the Action	17
2.6. Cumulative Effects	20
2.7. Integration and Synthesis.....	21
2.8. Conclusion	22
2.9. Incidental Take Statement	22
2.9.1. Amount or Extent of Take	22
2.9.2. Ecological Surrogates	23
2.9.3. Effect of the Take	23
2.9.4. Reasonable and Prudent Measures	23
2.9.5. Terms and Conditions.....	24
2.10. Conservation Recommendations	25
2.11. Reinitiation of Consultation.....	25
2.12. “Not Likely to Adversely Affect” Determinations	26
3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL	
FISH HABITAT RESPONSE	26
3.1. Essential Fish Habitat Affected by the Project.....	27
3.2. Adverse Effects on Essential Fish Habitat.....	27
3.3. Essential Fish Habitat Conservation Recommendations	27
3.4. Supplemental Consultation	27
4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW	27
4.1. Utility	28
4.2. Integrity.....	28
4.3. Objectivity	28
5. REFERENCES.....	29

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3, below.

1.1. Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), and implementing regulations at 50 CFR 402, as amended.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within two weeks at the NOAA Library Institutional Repository [<https://repository.library.noaa.gov/welcome>]. A complete record of this consultation is on file at the California Central Valley Office located in Sacramento, California.

1.2. Consultation History

On September 18, 2019, NMFS met with the U.S. Army Corps of Engineers (Corps), the U.S. Fish and Wildlife Service (FWS), the City of Antioch (City, applicant), and the permit applicant's consultants (Environmental Science Associates). This meeting served as a pre-application briefing to preview the project description and initiate early consultation.

On October 28, 2019, NMFS received a letter dated October 22, 2019, from the Corps requesting the initiation of formal consultation on the issuance of a Department of the Army permit to the applicant for the Antioch Desalination Facility Intake Replacement Project (Project). Attachments to the letter included a biological assessment (BA; Environmental Science Associates 2019) for the proposed Project, which was subsequently determined to be sufficient to initiate formal section 7 consultation under the ESA.

On March 4, 2020, NMFS met with the Corps, the FWS, the City, and their consultants, to discuss the scope of the project description and clarify the extent of the Federal action being consulted on by the Corps.

On March 6, 2020, NMFS sent an electronic mail (e-mail) to the Corps requesting a 90-day extension to the consultation period in order to accommodate further deliberations related to the scope and extent of the proposed action under consultation.

On March 9, 2020, the Corps sent an email to NMFS agreeing to the requested 90-day extension.

On March 27, 2020, the Central Valley Regional Water Quality Control Board (CVRWQCB) issued a Clean Water Act section 401 water quality certification order to the City for the City of Antioch Brackish Water Desalination Project.

On June 9, 2020, NMFS sent an email to the Corps requesting an additional two-week extension to the consultation period in order to accommodate challenges arising from recent stay-at-home orders issued in response to the recent spread of a global pandemic.

On June 12, 2020, the Corps sent an email to NMFS agreeing to the requested two-week extension.

1.3. Proposed Federal Action

“Action” means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). Federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910).

For the purposes of this consultation, the Corps proposes to issue a Department of the Army permit to the City in order to remove and replace the existing intake structure in the San Joaquin River with a new river intake facility as part of the planned construction of the new brackish water desalination facility in conjunction with its existing water treatment plant (WTP) facilities and operations in the cities of Antioch and Pittsburg, in Contra Costa County, California (Figure 1). The City’s current treated water system covers a water service area of approximately 29 square miles servicing approximately 31,800 connections including residential, commercial, and irrigation customers located within the City limits and adjacent lands to the northeast and west (Figure 2). The issuance of the Corps permit for this Project is limited to the construction activities occurring in association with the intake removal and replacement, and does not extend to future operations of the planned brackish water desalination facility following construction.

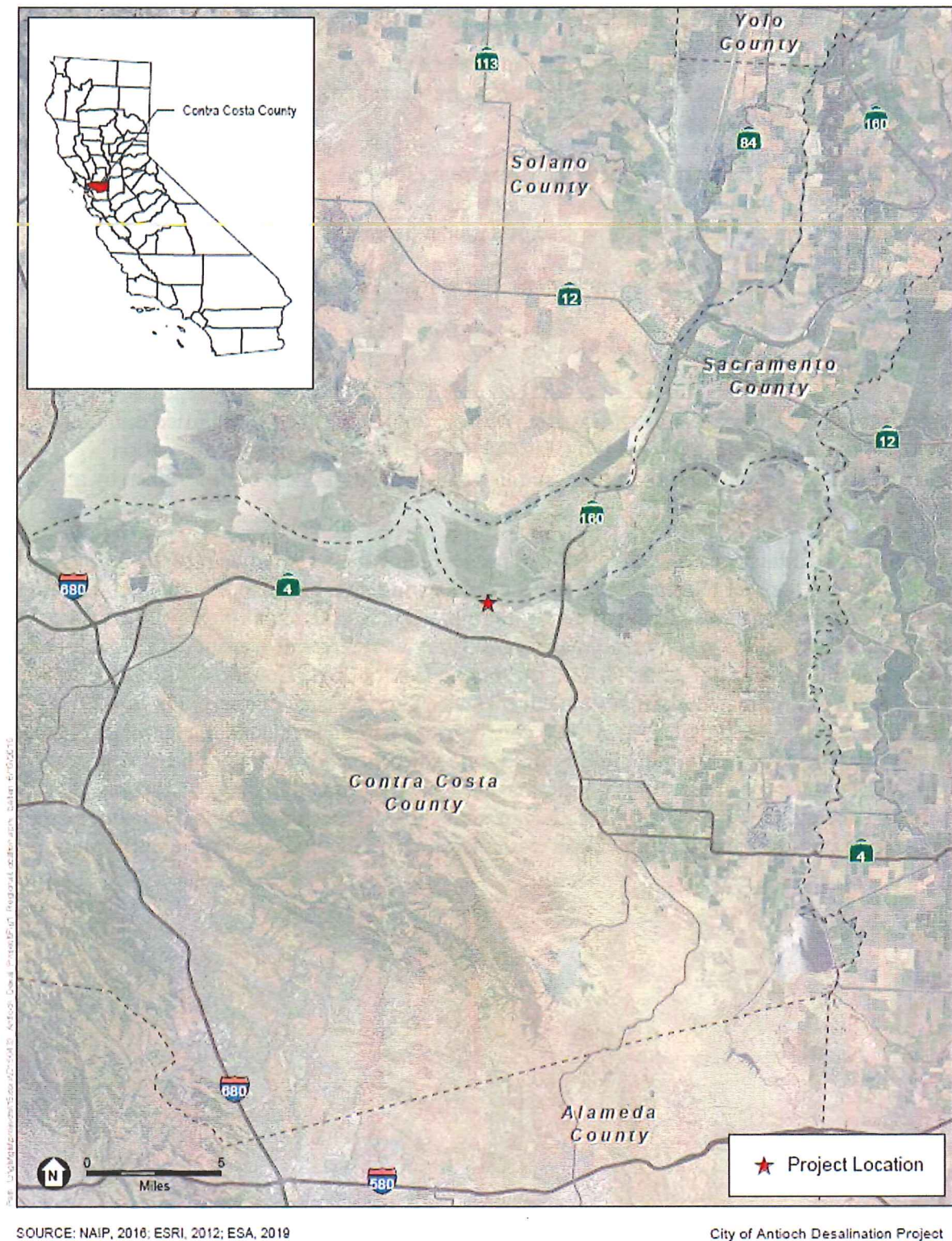
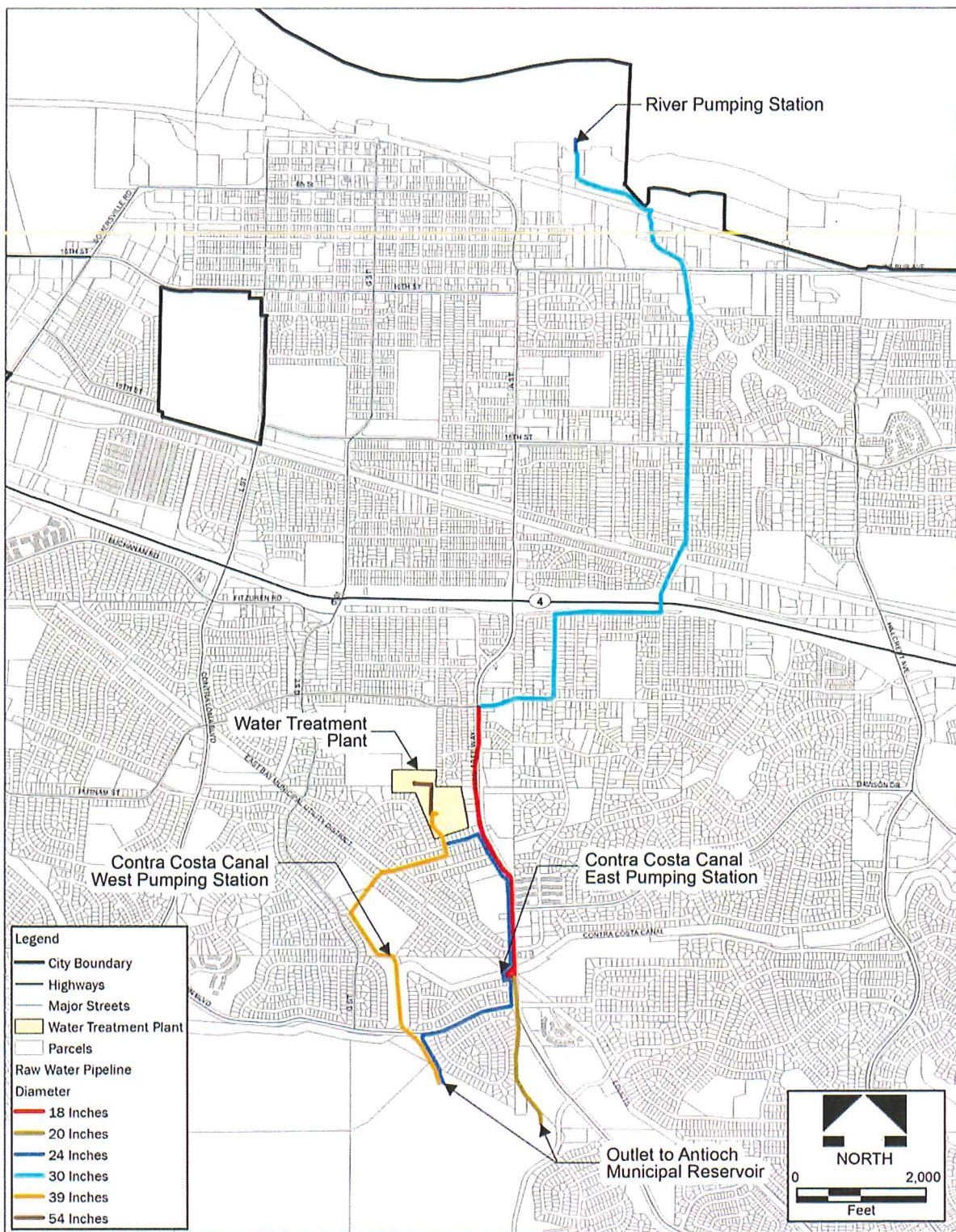


Figure 1. Antioch Desalination Facility Project Location (ESA 2019).



SOURCE: Brown and Caldwell, 2014

Brackish Water Desalination Facility

Figure 3. Existing Raw Water Collection System (ESA 2019).

The City's water treatment system currently collects raw water from two sources, the San Joaquin River and the Contra Costa Canal, and conveys it through a series of pumping stations and pipelines to the 240 million gallon (735 acre-foot) capacity Antioch Municipal Reservoir (Figure 3). The City has observed that the intake in the San Joaquin River typically experiences fresher conditions in winter and early spring, with salinity concentrations increasing in the late spring through the summer and into the fall as conditions become drier and regional water operations in the Delta change. This seasonal pattern also varies in response to hydrology, and the intake location is tidally influenced with salinity concentrations fluctuating throughout the day. During periods of drought, diversion from the San Joaquin River are extremely limited due to poor water quality caused by saline bay waters moving further upstream into the Delta. The City's ability to reliably utilize river water to meet the City's present and future water supply needs is, therefore, limited by the San Joaquin River's water quality and the inability of the existing WTP to remove salinity and other water quality constituents of concern (e.g., chlorides and bromides). Compounding these limitations is the reliance on a constant-speed pump operation at the river intake that diverts its full capacity of 16 mgd anytime it is in operation.

The construction of the proposed desalination facility is intended to improve water quality and water supply reliability from a drought resistant source that will help the City reduce its dependency on purchased water supplies, preserve and maximize the use of its pre-1914 water rights, and provide cost effective operational flexibility. The new desalination plant with appurtenant facilities would be constructed within the fence line of the City's existing WTP and would have the capacity to produce 6 mgd. In addition, the existing river intake would be removed and replaced with a new intake pump station on the San Joaquin River, and a new raw water pipeline connection allowing river water to be conveyed directly from the existing raw water pipeline to the WTP, as well as a brine concentrate disposal pipeline and connection to the Delta Diablo's Wastewater Treatment Plant outfall would also be constructed. Locating the new desalination facility at the WTP would allow the use of existing infrastructure as part of the overall treatment process. The existing wastewater treatment plant outfall pipeline extends approximately 500 feet offshore and discharges through a 42-inch diameter diffuser port with 50 3-inch diameter ports spaced 8 feet apart in alternating directions. No construction or modifications to the Delta Diablo Wastewater Treatment Plant or outfall would be required as part of the proposed Project.

The majority of the construction activities associated with the Project will occur on already developed or disturbed land in a predominantly urban setting characterized by residential, commercial, and industrial development, and any impacts to aquatic species or habitats would be determined by the nature of the construction activities and their proximity to neighboring waterways. The remainder of this section will focus, therefore, only on the aspects of the Project that will occur in, adjacent to, or over the water, where construction activities have the potential to adversely affect listed anadromous fish species or their designated critical habitats (e.g., the new river intake pump station). These activities include the construction of a temporary cofferdam in the San Joaquin River, removal of the existing intake structure, construction of the new intake structure facility within the confines of the temporary cofferdam, and removal of the temporary cofferdam following construction. These activities are further described below, and an assessment of the potential effects to listed species and their designated critical habitats that are anticipated to occur as a result of these activities is presented in section 2.5 (Effects of the Action), below.

Construction activities for the new river intake pump station would involve excavation, pouring concrete footings for foundations, assembling and installing piping, pumps, and electrical equipment, building concrete enclosures and roofs, and performing finish work, such as paving, and fencing the perimeter of the pump station site on City property. Construction of the new intake pump station would occur during normal working hours (between the hours of 8:00 AM and 5:00 PM) on weekdays, and require approximately 12 months to complete. In order to accommodate this work schedule and minimize the potential construction-related effects to aquatic life, a temporary cofferdam would be installed in the San Joaquin River to facilitate installation of the intake pipelines and fish screens. The cofferdam would consist of up to 300 interlocking 24-inch thick steel sheet piles being driven into the channel bottom with a barge-mounted impact hammer to form a watertight corridor approximately 42 feet wide that would extend into the river approximately 143 feet from the shore, and would take approximately 2 weeks to complete. Once the cofferdam construction has been completed, any fish still remaining in the now enclosed area will be encouraged to exit the area on their own volition, or they will be captured and removed through the implementation of a dewatering and fish rescue plan, before the coffer-dammed area is dewatered. Following the completion of construction of the new river intake pump station and demolition and removal of the existing pump station, it will take approximately two weeks to remove the temporary cofferdam. The City has committed to implementing several conservation measures and best management practices (BMP) to minimize the potential adverse effects associated with the Project. These include conducting worker awareness training prior to the start of construction activities, and developing and adhering to a stormwater pollution prevention plan, a hazardous materials management and spill response plan, and a fish rescue plan. In addition, all in-water work associated with the Project, including cofferdam construction and removal, will be restricted to the period from August 1 through October 31.

The new intake pump station would connect to and convey San Joaquin River water through the City's existing 30-inch diameter raw water pipeline for the majority of the distance between the pump station and the WTP. The existing raw water conveyance pipeline is located within road rights-of-way and connects the intake pump station to the Antioch Municipal Reservoir. As part of Project construction, a new 30-inch diameter pipeline, constructed of ductile iron and up to 3,000 feet long, would tee off of the existing pipeline and provide a direct connection between the new intake pump station and the WTP. Valves would be installed at the tee to allow flow from the San Joaquin River to be directed to either the Antioch Municipal Reservoir or the WTP.

We considered whether or not the proposed action would cause any other activities and determined that operation of the desalination facility and brine disposal system would not be able to occur but for completion of the Project, which will facilitate the continued operation of the WTP with an enhanced flexibility and increased capacity to divert water from the San Joaquin River during all months of the year, whereas those operations have previously been restricted to a seasonal diversion schedule based on the technical specifications and functional limitations of the current pumping apparatus at the San Joaquin River intake.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

The Corps determined that the proposed Project is likely to result in adverse effects to Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley spring-run Chinook salmon (*O. tshawytscha*), California Central Valley (CCV) steelhead (*O. mykiss*), Southern distinct population segment (sDPS) of North American green sturgeon (*Acipenser medirostris*), and their designated critical habitats. Based on the timing and location of the action taken, however, NMFS has independently determined, that the proposed Project is not likely to adversely affect either of the two Chinook salmon runs as a result of limiting in-water construction activities to the period from August 1 through October 31 during a season of the year when these fish are least likely to be present in the action area. The rationale supporting our determinations is documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.12) of this opinion. NMFS otherwise agrees with the Corps' determinations that CCV steelhead and sDPS green sturgeon could experience or be exposed to negative impacts associated with the construction and removal of the cofferdam, and therefore have the potential to be adversely affected by it. NMFS agrees with the Corps' determinations that the designated critical habitat for all of the above listed species will likely be adversely affected by the proposed Project. The remainder of this opinion will therefore focus on the analysis of effects to CCV steelhead, sDPS green sturgeon, and the portions of the designated critical habitats that have been identified in the action area.

2.1. Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02).

The designations of critical habitat for some listed species use the term primary constituent element (PCE) or essential features. The 2016 critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a “destruction or adverse modification” analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The 2019 regulations define effects of the action using the term “consequences” (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition does not change the scope of our analysis and in this opinion we use the terms “effects” and “consequences” interchangeably.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their habitat using an exposure-response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species, or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species’ likelihood of both survival and recovery. The species status section also helps to inform the description of the species’ “reproduction, numbers, or distribution” as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated areas, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated areas, and discusses the function of the essential PBFs that help to form that

conservation value. This opinion considers the potential effects of the Project to the following evolutionarily significant units (ESUs) and distinct population segments (DPS): the endangered Sacramento River (SR) winter-run Chinook salmon ESU (*Oncorhynchus tshawytscha*), the threatened Central Valley (CV) spring-run Chinook salmon ESU (*O. tshawytscha*), California Central Valley (CCV) steelhead DPS (*O. mykiss*), and Southern DPS (sDPS) of North American green sturgeon (*Acipenser medirostris*). The current status of the above listed species and their designated critical habitats are summarized in Tables 1 and 2, respectively.

Table 1. Description of species, current Endangered Species Act (ESA) listing classifications, and summary of species status.

Species	Listing Classification and Most Recent Federal Register Notice	Status Summary
California Central Valley steelhead DPS	Threatened, 71 FR 834; January 5, 2006	According to the NMFS (2016) 5-year species status review, the status of CCV steelhead appears to have remained unchanged since the 2011 status review that concluded that the DPS was in danger of extinction. Most natural-origin CCV populations are very small, are not monitored, and may lack the resiliency to persist for protracted periods if subjected to additional stressors, particularly widespread stressors such as climate change. The genetic diversity of CCV steelhead has likely been impacted by low population sizes and high numbers of hatchery fish relative to natural-origin fish. The life-history diversity of the DPS is mostly unknown, as very few studies have been published on traits such as age structure, size at age, or growth rates in CCV steelhead.
Southern DPS of North American green sturgeon	Threatened, 71 FR 17757; April 7, 2006	According to the NMFS (2015) 5-year species status review and the 2018 final recovery plan (NMFS 2018), some threats to the species have recently been eliminated, such as take from commercial fisheries and removal of some passage barriers. Also, several habitat restoration actions have occurred in the Sacramento River Basin, and spawning was documented on the Feather River. However, the species viability continues to face a moderate risk of extinction because many threats have not been addressed, and the majority of spawning occurs in a single reach of the main stem Sacramento River. Current threats include

Species	Listing Classification and Most Recent Federal Register Notice	Status Summary
		poaching and habitat degradation. A recent method has been developed to estimate the annual spawning run and population size in the upper Sacramento River so species can be evaluated relative to recovery criteria (Mora et al. 2017).

Table 2. Description of critical habitat, Listing, and Status Summary.

Critical Habitat	Designation Date and Federal Register Notice	Description
Sacramento River winter-run Chinook salmon (SR winter-run) critical habitat	June 16, 1993; 58 FR 33212	<p>Designated critical habitat includes the Sacramento River from Keswick Dam (river mile (RM) 302) to Chipps Island (RM 0) at the westward margin of the Sacramento-San Joaquin Delta (Delta); all waters from Chipps Island westward to the Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and the Carquinez Strait; all waters of San Pablo Bay westward of the Carquinez Bridge; and all waters of San Francisco Bay north of the San Francisco-Oakland Bay Bridge from San Pablo Bay to the Golden Gate Bridge. The designation includes the river water, river bottom and adjacent riparian zones used by fry and juveniles for rearing.</p> <p>PBFs considered essential to the conservation of the species include: access from the Pacific Ocean to spawning areas; availability of clean gravel for spawning substrate; adequate river flows for successful spawning, incubation of eggs, fry development and emergence, and downstream transport of juveniles; water temperatures at 5.8–14.1°C (42.5–57.5°F) for successful spawning, egg incubation, and fry development; riparian and floodplain habitat that provides for successful juvenile development and survival; and access to downstream areas so that juveniles can migrate from spawning grounds to the San Francisco Bay and the Pacific Ocean.</p> <p>Although the current conditions of PBFs for SR winter-run critical habitat are significantly limited and degraded, the habitat remaining is considered highly valuable.</p>

Critical Habitat	Designation Date and Federal Register Notice	Description
Central Valley spring-run Chinook salmon (CV spring-run) critical habitat	September 2, 2005; 70 FR 52488	<p>Designated critical habitat includes stream reaches of the Feather, Yuba and American rivers, Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear creeks, the Sacramento River, as well as portions of the northern Delta. Critical habitat includes the stream channels in the designated stream reaches and the lateral extent as defined by the ordinary high-water line. In areas where the ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation.</p> <p>PBFs considered essential to the conservation of the species include: spawning habitat; freshwater rearing habitat; freshwater migration corridors; and estuarine areas.</p> <p>Although the current conditions of PBFs for CV spring-run critical habitat are significantly limited and degraded, the habitat remaining is considered highly valuable.</p>
California Central Valley steelhead (CCV steelhead) critical habitat	September 2, 2005; 70 FR 52488	<p>Designated critical habitat includes stream reaches of the Feather, Yuba and American rivers, Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear creeks, the Sacramento River, as well as portions of the northern Delta. Critical habitat includes the stream channels in the designated stream reaches and the lateral extent as defined by the ordinary high-water line. In areas where the ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation.</p> <p>PBFs considered essential to the conservation of the species include: spawning habitat; freshwater rearing habitat; freshwater migration corridors; and estuarine areas.</p> <p>Although the current conditions of PBFs for CCV steelhead critical habitat are significantly limited and degraded, the habitat remaining is considered highly valuable.</p>

Critical Habitat	Designation Date and Federal Register Notice	Description
Southern DPS of North American (sDPS) green sturgeon critical habitat	October 9, 2009; 74 FR 52300	<p>Designated critical habitat includes the stream channels and waterways in the Delta to the ordinary high water line. Critical habitat also includes the main stem Sacramento River upstream from the I Street Bridge to Keswick Dam, the Feather River upstream to the fish barrier dam adjacent to the Feather River Fish Hatchery, and the Yuba River upstream to Daguerre Dam. Critical habitat in coastal marine areas include waters out to a depth of 60 fathoms, from Monterey Bay in California, to the Strait of Juan de Fuca in Washington. Coastal estuaries designated as critical habitat include San Francisco Bay, Suisun Bay, San Pablo Bay, and the lower Columbia River estuary. Certain coastal bays and estuaries in California (Humboldt Bay), Oregon (Coos Bay, Winchester Bay, Yaquina Bay, and Nehalem Bay), and Washington (Willapa Bay and Grays Harbor) are included as critical habitat for sDPS green sturgeon.</p> <p>PBFs considered essential to the conservation of the species for freshwater and estuarine habitats include: food resources, substrate type or size, water flow, water quality, migration corridor; water depth, sediment quality. In addition, PBFs include migratory corridor, water quality, and food resources in nearshore coastal marine areas.</p> <p>Although the current conditions of PBFs for sDPS green sturgeon critical habitat are significantly limited and degraded, the habitat remaining is considered highly valuable.</p>

2.2.1. Recovery Plans

In July 2014, NMFS released a final Recovery Plan for SR winter-run, CV spring-run, and CCV steelhead (NMFS 2014, Recovery Plan). The Recovery Plan outlines actions to restore habitat, access, and improve water quality and quantity conditions in the Sacramento River to promote the recovery of listed salmonids. Key actions from the Recovery Plan include conducting landscape-scale restoration throughout the Delta, incorporating ecosystem restoration into Central Valley flood control plans that includes breaching and setting back levees, and restoring flows throughout the Sacramento and San Joaquin River basins and the Delta.

In August 2018, NMFS released a final Recovery Plan for the sDPS green sturgeon (NMFS 2018), which focuses on fish screening and passage projects, floodplain and river restoration, and riparian habitat protection in the Sacramento River Basin, the Delta, San Francisco Estuary, and nearshore coastal marine environment as strategies for recovery.

2.2.2. Global Climate Change

One major factor affecting the rangewide status of the listed anadromous fish species in the Central Valley (CV) and aquatic habitat at large is climate change. Warmer temperatures associated with climate change reduce snowpack and alter the seasonality and volume of seasonal hydrograph patterns (Cohen et al. 2000). Central California has shown trends toward warmer winters since the 1940s (Dettinger and Cayan 1995). Projected warming is expected to affect CV Chinook salmon. Because the runs are restricted to low elevations as a result of impassable rim dams, if climate warms by 5°C (9°F), it is questionable whether any CV Chinook salmon populations can persist (Williams 2006).

SR winter-run Chinook salmon embryonic and larval life stages that are most vulnerable to warmer water temperatures occur during the summer, which makes the species particularly at risk from climate warming. The only remaining population of SR winter-run Chinook salmon relies on the cold water pool in Shasta Reservoir, which buffers the effects of warm temperatures in most years. The exception occurs during drought years, which are predicted to occur more often with climate change (Yates et al. 2008). The long-term projection of how the Central Valley Project (CVP) and State Water Project (SWP) will operate incorporates the effects of climate change in three possible forms: less total precipitation; a shift to more precipitation in the form of rain rather than snow; or, earlier spring snow melt (Reclamation 2019). Additionally, air temperature appears to be increasing at a greater rate than what was previously analyzed (Beechie et al. 2012, Dimacali 2013). These factors will compromise the quantity and/or quality of SR winter-run Chinook salmon habitat available downstream of Keswick Dam. It is imperative for additional populations of SR winter-run Chinook salmon to continue to be re-established into historical habitat in Battle Creek and above Shasta Dam for long-term viability of the ESU (NMFS 2014).

CV spring-run Chinook salmon adults are vulnerable to climate change because they over summer in freshwater streams before spawning in autumn (Thompson et al. 2011). CV spring-run Chinook salmon spawn primarily in the tributaries to the Sacramento River, and those tributaries without cold water refugia (usually input from springs) will be more susceptible to impacts of climate change.

CCV steelhead will experience similar effects of climate change to Chinook salmon, as they are also blocked from the vast majority of their historic spawning and rearing habitat, the effects may be even greater in some cases, as juvenile CCV steelhead need to rear in the stream for one to two summers prior to emigrating as smolts. In the Central Valley, summer and fall temperatures below the dams in many streams already exceed the recommended temperatures for optimal growth of juvenile CCV steelhead, which range from 14°C to 19°C (57°F to 66°F).

The Anderson Cottonwood Irrigation District (ACID) Dam is considered the upriver extent of sDPS green sturgeon passage in the Sacramento River. The upriver extent of sDPS green

sturgeon spawning, however, is approximately 19 miles downriver of the ACID Dam where water temperature is warmer than at the ACID Dam during late spring and summer. Thus, if water temperatures increase with climate change, spawning locations lower in the river may be more affected.

In summary, observed and predicted climate change effects are generally detrimental to these listed species (McClure 2011, Wade et al. 2013), so unless offset by improvements in other factors, the status of the species and critical habitat is likely to decline over time. The climate change projections referenced above cover the time period between the present and approximately 2100. While the uncertainty associated with these projections increases over time, the direction of climate change is relatively certain (McClure 2011).

2.3. Action Area

“Action area” means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For the purposes of this consultation, the action area encompasses all areas affected by the proposed Project’s construction, both on land and in water, including those portions of the San Joaquin River that will be impacted by the construction and removal of the coffer dam, including the area confined within it, associated with the replacement and removal of the existing intake structure located at Latitude 38.017431°, Longitude -121.802699°, in Contra Costa County, California. Centered on this location, the action area extends for a distance of approximately three miles in all directions [i.e., upstream, downstream, and laterally across the entire width of the San Joaquin River (approximately 2,483 feet at the Project location)] from the site where the temporary cofferdam will be installed. This area was selected because it is reflective of the maximum extent to which the anticipated adverse effects associated with the proposed construction activities (i.e., acoustic disturbances and temporarily degraded habitat quality) are likely to be experienced in the aquatic environment.

2.4. Environmental Baseline

The “environmental baseline” refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency’s discretion to modify are part of the environmental baseline (50 CFR 402.02).

The segment of the San Joaquin River located within the action area is heavily channelized and leveed and bordered primarily by agricultural, industrial, and municipal land uses, although much of the surrounding landscape is also being considered or secured for several current and planned tidal habitat restoration projects. This segment of the San Joaquin River is characterized primarily by slow moving deep water which is tidally influenced and predominantly depositional

in nature. This section of the river is hydrologically influenced by the confluence of the Sacramento and San Joaquin rivers where they converge to form the Delta. As such, it has generally lower water clarity and habitat diversity relative to the upper reaches of either river.

The action area is considered an important rearing and migratory corridor for all ESA-listed anadromous fish species. Juvenile sDPS green sturgeon utilize the waters of the Delta for rearing habitat for a period of up to 3 years as they acclimate to higher concentrations of salinity prior to ocean entry. As such, they have the potential to be present in the action area during every month of the year, and would therefore also have the potential to be exposed to the effects of the Project. Adult CCV steelhead begin to migrate into the watersheds of the Central Valley during the late summer or early fall months (i.e., September through November), particularly when early winter rains create increased flows in the system. NMFS does not expect them to be present in the action area in any significant numbers, however, until the months of December through February, which is the peak of their spawning migration. The peak of juvenile CCV steelhead emigration from the tributaries in the Sacramento and San Joaquin river basins to the ocean occurs from February through May. Therefore, conducting in-water construction activities from August 1 through October 31 should avoid impacts to the majority of outmigrating juvenile steelhead smolts. There are larger steelhead smolts that migrate at other times of the year, including the fall and early winter period, that may be exposed to the direct effects of the Project during their passage through the action area, albeit in very small numbers. As with adults, however, NMFS expects the most likely period for them to be present is during the month of December.

Baseline and cumulative effects from activities such as continued municipal, industrial, and agricultural practices, bank and levee stabilization projects, and both commercial shipping traffic and recreational boating and fishing will continue to negatively affect the federally listed species in the action area. Runoff from municipal, industrial, and agricultural activities may contain contaminants such as pesticides, sediments, and nutrients that may affect listed species through lethal and sublethal impacts. Levee construction and bank protection can reduce floodplain connectivity, change substrate size, and decrease riparian habitat and shaded riverine aquatic cover. However, NMFS expects the species and their designated critical habitats to improve with the implementation of both ongoing and planned habitat restoration efforts incorporating and advancing progress on recovery actions identified in NMFS (2014, 2018).

2.5. Effects of the Action

Under the ESA, “effects of the action” are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b).

Equipment mobilization and staging to prepare the site for cofferdam installation will require general excavation and earth moving activities both in the water and on the nearby bank. These activities generate noise and a physical disturbance in the aquatic environment, which could

displace fish into adjacent habitats, and also have the potential to transfer kinetic energy through the adjoining substrates and temporarily generate increased turbulence and turbidity in the river. Migrating fish generally react to this disturbance with a startle response in which they are likely to suddenly disperse in random directions (Carlson et al. 2001). This displacement can lead them into predator-occupied habitat where opportunistic predators can take advantage of behavioral changes to target and prey on juvenile salmonids. Carlson et al. (2001) observed this behavior occurring in response to routine channel maintenance activities in the Columbia River. Some of the fish that did not immediately recover from the disorientation of turbidity and noise from channel dredges and pile driving swam directly into the point of contact with predators.

Disturbances to the substrate on the channel bottom during construction will resuspend sediments in the water column, resulting in increased turbidity in the action area. The action area typically exhibits relatively high concentrations of suspended sediments as a natural background condition due to its position at the confluence of two large rivers forming the Sacramento San Joaquin Delta. Nevertheless, short-term increases in turbidity and suspended sediment concentrations in the water column from in-water construction disturbances may disrupt feeding activities of fish or result in their temporary displacement from preferred habitats. Numerous studies show that suspended sediment and turbidity levels moderately elevated above natural background values can result in non-lethal detrimental effects to salmonids, such as decreasing reproductive success, reducing feeding success and growth, causing avoidance of rearing habitats, and disrupting migration cues (Bash et al. 2001). NMFS expects turbidity to affect CCV steelhead in much the same way that it affects the other salmonids used in these studies because of similar physiological and life history requirements between species. The disturbance of the channel banks and bottom during construction and removal of the coffer dam will increase suspended sediments locally, which will produce turbidity plumes that will extend up and down the river from the construction activity in accordance with the prevailing tide. The duration of turbidity plumes resulting from in-water construction-related activities is expected to last throughout the time the disturbance is occurring and for several hours after the work has ceased each day, including during the early evening hours, before gradually dissipating and returning to natural background levels.

Both migrating and rearing fish are expected to move through, rather than hold position or remain in the immediate vicinity of ongoing construction activities for more than a few hours or days. Although CCV steelhead are highly migratory and capable of moving freely throughout the action area, a substantial increase in turbidity may injure fish by temporarily disrupting normal behaviors that are essential to their growth and survival, such as feeding, sheltering, and migrating. Disrupting these behaviors increases the likelihood that individual fish will face increased competition for food and space, and experience reduced growth rates or possibly weight loss resulting in harm to individuals and increased risk to the affected species. Turbidity increases may also affect the sheltering abilities of some fish and may decrease their likelihood of survival by increasing their susceptibility to predation. Conversely, some turbidity is helpful in reducing predation by shielding individual fish from visual predators in a turbid field (Gregory and Levings 1998). Adherence to erosion control measures and BMPs, such as the use of silt fences, straw bales, and straw wattles as described in the BA (ESA 2019), will minimize the amount of suspended sediment generated by construction activities and will minimize the potential for post-construction turbidity changes should precipitation events occur after construction has been completed. In addition, in-water construction activities will adhere to

CVRWQCB turbidity objectives for the Sacramento and San Joaquin River basins that stipulate where natural turbidity is between 5 and 50 nephelometric turbidity units (NTUs), turbidity levels may not be elevated by 20 percent above ambient conditions; where ambient conditions are between 50 and 100 NTUs, conditions may not be increased by more than 10 NTUs; and where natural turbidity is greater than 100 NTUs, increases will not exceed 10 percent above ambient conditions (CVRWQCB 2018). NMFS expects that most fish will actively avoid the elevated turbidity plumes. For those fish that do not or cannot avoid the turbid water, exposure is expected to be brief (i.e., minutes to hours) and not likely to cause injury or death from reduced growth or physiological stress. This expectation is based on the general avoidance behaviors of salmonids. However, some juveniles that are exposed to turbidity plumes may be injured or killed by predatory fish that take advantage of disrupted normal behavior. Once fish migrate past the turbid water, normal feeding and migration behaviors are expected to resume.

Construction activities are also expected to generate underwater noise from both terrestrial and in-water sources, occasionally reaching intense levels. Intense noise will be produced in the aquatic environment primarily by pile driving operations to install the cofferdam, but also by heavy machinery operating in close proximity to the river. Feist et al. (1992) found that noise from pile driving activities in Puget Sound affected the general behavior of juvenile salmon by temporarily displacing them from active construction areas. Nearly twice as many fish were observed at construction sites on non-pile driving days compared to days when pile driving occurred. The level of noise generated from impact pile driving the sheet piles during cofferdam installation is expected to reach levels that have the potential to either cause instantaneous mortality (>206 decibels peak, referenced to $1\mu\text{Pa}$) to fish swimming within 29.5 feet (9 meters) of the source of the acoustic signal, or incur tissue injury (>187 decibels accumulated sound exposure level, re: $1\mu\text{Pa}$) to fish swimming within 1,119 feet (341 meters) of the source of the acoustic signal. Greater than 150 decibels root mean square (re: $1\mu\text{Pa}$) is also likely to cause altered behavioral responses of fish swimming within 3 miles (4.82 kilometers) of the source of the acoustic signal.

NMFS expects both juvenile and adult life stages of fish to be at some risk of exposure to these construction activities. Typically, smaller fry- and larval-sized fish would have the highest potential risk of exposure due to their near shore orientation and slower swimming speeds. However, fry- and larval-sized fish are unlikely to be present in the action area due to the season and the location of the construction site, which is downstream of the natal reaches of CCV steelhead and sDPS green sturgeon. Juvenile green sturgeon may be present in the action area throughout the year, and would therefore be exposed to the effects of the action. In contrast to this, adult CCV steelhead do not begin to migrate into the watersheds of the Central Valley until the late summer or early fall months (i.e., September through November) when early winter rains create increased flows in the system. NMFS, therefore, does not expect them to be present in the action area in any significant numbers until the months of December through February, which is the peak of their spawning migration. Similarly, the peak of juvenile CCV steelhead emigration from the tributaries in the Sacramento and San Joaquin river basins to the ocean occurs from February through May. Therefore, conducting in-water construction activities from August 1 through October 31 should also avoid impacts to the majority of outmigrating juvenile steelhead smolts. NMFS generally expects most migrating and rearing fish to avoid entering the zone of active construction activity, or to have a startle response when construction activity begins. Although behavioral reactions of fish to in-water disturbances vary greatly between species,

many studies have also demonstrated that avoidance behavior is not limited to a simple startle response, but that directional changes and shifting stratification within the water column also exhibit deflective movement directly in response to, and away from, the source signal in an attempt to selectively avoid the disturbance (Shafiei Sabet et al. 2015). These behavioral modifications may delay migration for several hours or more. When construction activity is curtailed or paused, such as when crews take breaks or suspend activities overnight, fish are generally expected to continue their migration. Migratory movement is generally thought to occur under low light conditions, which is when construction activity would not be occurring. However, individual fish may mobilize at any time and would consequently face a higher level of risk of exposure to construction-related effects.

In-water construction activities additionally have the potential to temporarily negatively affect the designated critical habitat PBFs of migratory corridors and rearing habitat for all of the listed anadromous fish. This includes increased exposure to noise, turbidity, and suspended sediments as described above, as well as by precluding access to approximately 0.15 acres of aquatic habitat that will be dewatered for a period of up to one year while the proposed coffer dam is in place. Increased turbidity, used as an indicator of increased suspended sediments, also is correlated with a decline in primary productivity, a decline in the abundance of periphyton, and reductions in the abundance and diversity of invertebrate fauna in the affected area (Lloyd 1987, Newcombe and MacDonald 1991). Reduction in prey/food for anadromous fish may result in short term localized degradation of the rearing habitat PBFs. However, these effects on critical habitat would be minimized by implementing the previously described BMPs and conservation measures such as implementing spill and stormwater prevention plans and adhering to regional water quality standards. In addition to the temporary construction-related effects to designated critical habitat, the proposed Project, once completed, will also permanently displace approximately 0.02 acres of currently available habitat due to the presence of the newly installed intake structure in the San Joaquin River.

2.6. Cumulative Effects

“Cumulative effects” are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02 and 402.17(a)). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area’s future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4).

Non-Federal actions that occur in the action area include ongoing municipal, industrial, and agricultural activities and increased urbanization. Agricultural practices throughout the San Joaquin Delta hydrologic unit (hydrologic unit code 18040003) may negatively affect riparian and wetland habitats. Unscreened agricultural diversions along the San Joaquin and Sacramento

rivers entrain fish, including juvenile salmonids and sDPS green sturgeon. Grazing activities from dairy and cattle operations can degrade or reduce suitable critical habitat for listed salmonids and sturgeon by increasing erosion and sedimentation as well as introducing nitrogen, ammonia, and other nutrients into the watershed, which then flow into the Delta. Stormwater and irrigation discharges related to both agricultural and urban activities contain numerous pesticides and herbicides that may negatively affect salmonid and sturgeon reproductive success and survival rates (Dubrovsky et al. 1998, Daughton 2003).

Increases in urbanization and housing developments can impact habitat by altering watershed characteristics, and changing both water use and stormwater runoff patterns. Increased anthropogenic growth will place additional burdens on resource allocations, including natural gas, electricity, and water, as well as on infrastructure such as wastewater sanitation plants, roads and highways, and public utilities. Some of these actions, particularly those which are situated away from waterbodies, will not require Federal permits, and thus will not undergo review through the ESA section 7 consultation process with NMFS. Increased urbanization is also expected to result in an expansion of increased recreational activities throughout the action area. Among the activities expected to increase in both volume and frequency is recreational boating, which typically results in greater increased wave action and propeller wash in waterways. These activities will potentially degrade riparian and wetland habitat by eroding channel banks and mid-channel islands, thereby causing an increase in siltation and turbidity in hydrologically connected waters. Wakes and propeller wash also disturb benthic sediments and, thereby, potentially re-suspend contaminated sediments and further degrading areas of submerged vegetation. This disturbance, in turn, would reduce habitat quality for the invertebrate forage base required for the survival of juvenile salmonids and sDPS green sturgeon entering and moving throughout the action area. Expanded recreational boat operation is also expected to result in elevated concentrations of contaminants from the operation of gasoline and diesel powered engines on watercraft entering the streams and waterways of the action area.

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

The proposed action is scheduled to occur during a period of time that corresponds with the recommended in-water work window for the Sacramento-San Joaquin River Delta, from August 1 through October 31, in a reach of the river where there is historically no spawning habitat present. Despite being the major migratory corridor for all of the Sacramento River Basin populations of listed species considered in this opinion, the numbers of individuals from those populations present at the time of construction are expected to be very low, and impacts to those individuals are not likely to translate into population level effects. Specifically, a few CCV

steelhead adults and juveniles have the potential to be migrating through the action area during the in-water work window when it overlaps with the rising and falling limbs of their migration and emigration seasons, respectively, as do juvenile sDPS green sturgeon, which are present year round in the action area. In contrast, however, adult and juvenile Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon are not anticipated to be present at all. In addition, the action area represents a very small proportion of the adjacent habitat available for fish to disperse into, and the effects from the action are expected to dissipate rapidly within the context of the larger surrounding habitat as well. Therefore, construction effects to listed species are expected to be temporary and limited to behavioral responses and injury or death to a very few individual adult and juvenile CCV steelhead and juvenile sDPS green sturgeon migrating through the action area for approximately two weeks during the period from August 1 through October 31 in two successive years. In addition, the Project will result in the permanent loss of up to 0.02 acres of designated critical habitat displaced by the presence of the new intake structure, and the temporary disturbance of up to 0.15 acres of designated critical habitat for all of the species for a period of one year while the cofferdam is in place.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of California Central Valley steelhead DPS, the southern DPS of North American green sturgeon, or destroy or adversely modify the designated critical habitats of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, California Central Valley steelhead, or the southern DPS of North American green sturgeon.

2.9. Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1. Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

NMFS anticipates incidental take of CCV steelhead and sDPS green sturgeon through construction-related impacts in the action area is reasonably certain to occur. Specifically, NMFS anticipates that juvenile and adult CCV steelhead and juvenile sDPS green sturgeon may be killed, injured, or harassed during construction activities.

Using the best available information, NMFS cannot specifically quantify the anticipated amount of incidental take of individual CCV steelhead and sDPS green sturgeon because of the variability and uncertainty associated with the response of listed species to the effects of the action, uncertainty with regard to the varying population size of the two DPSs, annual variations in the timing of migration and emigration, and individual habitat use within the action area. However, it is possible to designate ecological surrogates for the extent of incidental take anticipated to be caused by the proposed Project, and to monitor those surrogates to determine the level of incidental take that is occurring. The most appropriate ecological surrogate for the extent of incidental take caused by the proposed Project is the amount and duration of pile driving conducted during cofferdam construction and removal.

2.9.2. Ecological Surrogates

- The analysis of the effects of the Project anticipates that the installation of up to 300 interlocking 24-inch thick steel sheet piles will require the use of an impact pile driving hammer operating for approximately 2 weeks between August 1 and October 31 during daylight hours resulting in acoustic effects exceeding:
 - 150 decibels (dB) out to a distance of 4,642 meters (2.88 miles) from the source,
 - 187 dB at a distance of 341 meters (0.21 miles) from the source, and
 - 206 dB at a distance of 9 meters (29.5 feet) from the source.

If any specific parameter of this ecological surrogate is exceeded, the anticipated incidental take levels are also exceeded, triggering the need to reinitiate consultation on the proposed Project.

2.9.3. Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.9.4. Reasonable and Prudent Measures

“Reasonable and prudent measures” are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

NMFS has determined that the following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize take of CCV steelhead and southern DPS of North American green sturgeon resulting from construction of the proposed Project.

1. Measures shall be taken to minimize the amount and duration of pile driving and its potential impacts on listed anadromous fish.
2. Measures shall be taken to monitor and report the amount or extent of incidental take that occurs in connection with implementation of the proposed Project.

2.9.5. Terms and Conditions

The terms and conditions described below are non-discretionary, and the Corps or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The Corps or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

The terms and conditions described below are non-discretionary, and the Corps and the applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The Corps and the applicant have a continuing duty to monitor the impacts of incidental take and must report the progress of the Project and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following term and condition implements RPM 1:
 - a. The permit applicant, including all employees contracted by the applicant to carry out the permitted work, shall ensure that all in-water pile driving activity commences during a period of low tide each day.
2. The following term and condition implements RPM 2:
 - a. Any Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, California Central Valley steelhead, or sDPS green sturgeon found dead or injured within the action area during construction shall be reported within 48 hours to NMFS via fax or by phone:

Attention: Cathy Marcinkevage, Acting Assistant Regional Administrator
NMFS California Central Valley Office
Fax: (916) 930-3629
Phone: (916) 930-3600

A follow-up written notification shall also be submitted to NMFS which includes the date, time, and location that the carcass or injured specimen was found, a color photograph, the cause of injury or death, if known, and the name and affiliation of the person who found the specimen. Written notification shall be submitted to:

Cathy Marcinkevage, Acting Assistant Regional Administrator
California Central Valley Office
National Marine Fisheries Service

650 Capitol Mall, Suite 5-100
Sacramento, California 95814

Any dead specimen(s) should be placed in a cooler with ice, then sent to:

NMFS, Southwest Fisheries Science Center, Fisheries Ecology Division
110 Shaffer Road
Santa Cruz, California 95060

2.10. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

- (1) The Corps and the permit applicant/holder should support and promote aquatic and riparian habitat restoration in the Sacramento and San Joaquin river basins for listed aquatic species. Practices that avoid or minimize negative impacts to listed species should be encouraged.
- (2) The Corps and the permit applicant/holder should continue to work cooperatively with other State and Federal agencies, private landowners, governments, and local watershed groups to identify opportunities for cooperative analysis and funding to support salmonid habitat restoration projects.
- (3) The Corps should use species recovery plans to help ensure that their actions will address the underlying processes that limit fish recovery, and to identify key actions in the action area when prioritizing project sites each year.

In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, NMFS requests notification of the implementation of any conservation recommendations.

2.11. Reinitiation of Consultation

This concludes formal consultation for the Antioch Desalination Intake Replacement Project.

As 50 CFR 402.16 states, reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

2.12. “Not Likely to Adversely Affect” Determinations

Exposure of both Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon to the direct effects of the Project is expected to be entirely avoided largely because in-water work will occur during the summer and fall months when these species are typically not present in the action area. A brief discussion of the likelihood of exposure of listed fish by time of year, species, and life stage follows:

For Sacramento River winter-run Chinook salmon, the proposed work window for construction of the cofferdam in the San Joaquin River (August 1 through October 31) should preclude most, if not all, instances of exposure to the direct effects of the Project. Adult Sacramento River winter-run Chinook salmon may begin to enter the action area in November, but are most likely to be migrating through the action area in December. Similarly, juveniles may be present in the action area as early as November and December, especially if significant rainfall events occur to trigger their outmigration behavior.

Adult Central Valley spring-run Chinook salmon are not expected to be present in the action area during the in-water work window from August 1 through October 31. Yearling fish may appear in the action area as early as late October, but are not likely to occur in any substantial numbers until after February when the bulk of yearling and young-of-year spring-run Chinook salmon begin to enter the Delta.

Based on the timing of Sacramento River winter-run Chinook salmon or Central Valley spring-run Chinook salmon movements in and through the action area described above, NMFS does not anticipate the proposed Project will result in adverse effects to Sacramento River winter-run Chinook salmon or Central Valley spring-run Chinook salmon. NMFS reached these conclusions based on the timing of the in-water work, and pile driving activity in particular, associated with the construction of the cofferdam being limited to the period from August 1 to October 31, during the time of year when Chinook salmon are not expected to be present in the action area.

3. MAGNUSON-STEVENSON FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the Corps and descriptions of EFH for Pacific Coast salmon [Pacific Fishery Management Council (PFMC) 2014] contained in

the fishery management plans developed by the PFMC and approved by the Secretary of Commerce.

3.1. Essential Fish Habitat Affected by the Project

The PFMC has identified and described EFH, Adverse Impacts and Recommended Conservation Measures for salmon in Amendment 14 to the Pacific Coast Salmon FMP (PFMC 2000). The action area is within the region identified as EFH for Pacific salmon in Amendment 14 of the Pacific Coast Salmon FMP. Freshwater EFH for Pacific salmon in the California Central Valley includes waters currently or historically accessible to salmon within the Central Valley ecosystem as described in Myers et al. (1998), and includes the San Joaquin Delta (Delta) hydrologic unit (i.e., number 18040003). Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CV fall-/late fall-run Chinook salmon are species managed under the Pacific Coast Salmon FMP that occur in the Delta unit.

The San Joaquin River within the action area provides upstream migratory habitat for adult Chinook salmon, and downstream migratory and rearing habitat for all Chinook salmon runs. Chinook salmon juveniles may rear throughout the action area; however, spawning does not occur in the action area, as Chinook salmon spawning occurs well upstream.

3.2. Adverse Effects on Essential Fish Habitat

Temporary adverse construction impacts of the Project include pile driving noise and increased turbidity. The full impacts of the Project on Chinook salmon habitat are the same as those described in section 2.5 of this opinion and are generally expected to apply to Pacific salmon EFH.

3.3. Essential Fish Habitat Conservation Recommendations

The Project includes adequate measures described in Section 1.3 of this opinion to avoid, minimize, or otherwise offset the adverse effects to EFH. Therefore, additional EFH Conservation Recommendations are not being provided at this time.

3.4. Supplemental Consultation

The Corps must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the U.S. Army Corps of Engineers and the City of Antioch. Other interested users could include the Central Valley Regional Water Quality Control Board, the U.S. Fish and Wildlife Service, the California Department of Fish and Wildlife, and the California Department of Water Resources. Individual copies of this opinion were provided to the Corps. The document will be available within two weeks at the NOAA Library Institutional Repository. The format and naming adheres to conventional standards for style.

4.2. Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3. Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

5. REFERENCES

- Bash, J., C. Berman, and S. Bolton. 2001. Effects of Turbidity and Suspended Solids on Salmonids University of Washington Water Center.
- Beechie, T., H. Imaki, J. Greene, A. Wade, H. Wu, G. Pess, P. Roni, J. Kimball, J. Stanford, P. Kiffney, and N. Mantua. 2012. Restoring Salmon Habitat for a Changing Climate. *River Research and Applications* 29(8):939-960.
- California Department of Fish and Wildlife (CDFW). 2018. California Central Valley Chinook Population Database Report, Fisheries Branch Anadromous Assessment, Grandtab.
- Carlson, T. J., G. R. Ploskey, R. Johnson, R. P. Mueller, M. A. Weiland, and P. Johnson. 2001. Observations of the Behavior and Distribution of Fish in Relation to the Columbia River Navigation Channel and Channel Maintenance Activities. Pacific Northwest National Lab.(PNNL), Richland, WA (United States).
- Central Valley Regional Water Quality Control Board. 2018. The Water Quality Control Plan for the California Regional Water Quality Control Board Central Valley Region, Fifth Edition; The Sacramento River Basin and San Joaquin River Basin. May, 2018. 201 pp.
- Cohen, S. J., K. A. Miller, A. F. Hamlet, and W. Avis. 2000. Climate Change and Resource Management in the Columbia River Basin. *Water International* 25(2):253-272.
- Daughton, C. G. 2003. Cradle-to-Cradle Stewardship of Drugs for Minimizing Their Environmental Disposition While Promoting Human Health. Ii. Drug Disposal, Waste Reduction, and Future Directions. *Environmental Health Perspectives* 111(5):775-785.
- Dettinger, M. D. and D. R. Cayan. 1995. Large-Scale Atmospheric Forcing of Recent Trends toward Early Snowmelt Runoff in California. *Journal of Climate* 8(3):606-623.
- Dimacali, R. L. 2013. A Modeling Study of Changes in the Sacramento River Winter-Run Chinook Salmon Population Due to Climate Change. Master's Thesis. California State University, Sacramento.
- Dubrovsky, N. M., D.L. Knifong, P.D. Dileanis, L.R. Brown, J.T. May, V. Connor, and C.N. Alpers. 1998. Water Quality in the Sacramento River Basin. U.S. Geological Survey Circular 1215. United States Geological Survey.
- Environmental Science Associates. 2019. Brackish Water Desalination Facility; Biological Assessment, Essential Fish Habitat Assessment, and Incidental Take Permit Application. Prepared for the City of Antioch. September. 393 pp.
- Feist, B. E., J. J. Anderson, and R. Miyamoto. 1992. Potential Impacts of Pile Driving on Juvenile Pink (*Oncorhynchus gorbusha*) and Chum (*O. keta*) Salmon Behavior and Distribution. University of Washington.

- Gregory, R. S. and C. D. Levings. 1998. Turbidity Reduces Predation on Migrating Juvenile Pacific Salmon. *Transactions of the American Fisheries Society* 127(2):275-285.
- Lloyd, D. S. 1987. Turbidity as a Water Quality Standard for Salmonid Habitats in Alaska. *North American Journal of Fisheries Management* 7(1):34-45.
- McClure, M. M. 2011. Status Review Update for Pacific Salmon and Steelhead Listed under the Endangered Species Act: Pacific Northwest. NOAA Tech. Memo. NMFS-NWFSC-113. 281 pp.
- Mora, E. A., R. D. Battleson, S. T. Lindley, M. J. Thomas, R. Bellmer, L. J. Zarri, A. P. Klimley. 2017. Estimating the Annual Spawning Run Size and Population Size of the Southern Distinct Population Segment of Green Sturgeon. *Transactions of the American Fisheries Society* 147:195-203.
- Myers, J. M., R. G. Kope, G. J. Bryant, D. Teel, L. J. Lierheimer, T. C. Wainwright, W. S. Grant, F. W. Waknitz, K. Neely, S. Lindley, and R. S. Waples. 1998. Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California., U.S. Department of Commerce Report No. NOAA Tech. Memo. NMFS-NWFSC-35.
- National Marine Fisheries Service. 2014. Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-Run Chinook Salmon and Central Valley Spring-Run Chinook Salmon and the Distinct Population Segment of California Central Valley Steelhead. California Central Valley Area Office. 428 pp.
- National Marine Fisheries Service. 2015. 5-Year Summary and Evaluation: Southern Distinct Population Segment of the North American Green Sturgeon. U.S. Department of Commerce, National Marine Fisheries Service, West Coast Region, California Central Valley Office, Sacramento, California. 42 pp.
- National Marine Fisheries Service. 2016. Central Valley Recovery Domain 5-Year Review: Summary and Evaluation of California Central Valley Steelhead Distinct Population Segment. U.S. Department of Commerce, National Marine Fisheries Service, West Coast Region, California Central Valley Office, Sacramento, California. 44 pp.
- National Marine Fisheries Service. 2018. Recovery Plan for the Southern Distinct Population Segment of North American Green Sturgeon (*Acipenser medirostris*). U.S. Department of Commerce, National Marine Fisheries Service, West Coast Region, California Central Valley Office, Sacramento, California. 95 pp.
- Newcombe, C. P. and D. D. MacDonald. 1991. Effects of Suspended Sediments on Aquatic Ecosystems. *North American Journal of Fisheries Management* 11:72-82.
- Pacific Fishery Management Council (PFMC). 2000. Incorporating the Regulatory Impact Review/Initial Regulatory Flexibility Analysis and Final Supplemental Environmental Impact Statement. Amendment 14, Appendix A: Identification and Description of Essential Fish Habitat, Adverse Impacts, and Recommended Conservation Measures for Salmon. Pacific Fishery Management Council, Portland, Oregon. May.

- PFMC. 2014. Appendix A to the Pacific Coast Salmon Fishery Management Plan, as modified by Amendment 18. Identification and description of essential fish habitat, adverse impacts, and recommended conservation measures for salmon.
- Shafiei Sabet, S., E. Neo, and H. Slabbekoorn. 2015. Impact of Anthropogenic Noise on Aquatic Animals: From Single Species to Community-Level Effects. *In: The Effects of Noise on Aquatic Life II*. Springer, New York, NY. 957-961.
- Thompson, L. C., M. I. Escobar, C. M. Mosser, D. R. Purkey, D. Yates, and P. B. Moyle. 2011. Water Management Adaptations to Prevent Loss of Spring-Run Chinook Salmon in California under Climate Change. *Journal of Water Resources Planning and Management*: 138:465-478.
- United States Bureau of Reclamation. 2019. Reinitiation of Consultation on the Coordinated Long-Term Operation of the Central Valley Project and State Water Project; Final Biological Assessment. October, 2019.
- Wade, A. A., T. J. Beechie, E. Fleishman, N. J. Mantua, H. Wu, J. S. Kimball, D. M. Stoms, and J. A. Stanford. 2013. Steelhead Vulnerability to Climate Change in the Pacific Northwest. *Journal of Applied Ecology* 50:1093-1104.
- Williams, J. G. 2006. Central Valley Salmon: A Perspective on Chinook and Steelhead in the Central Valley of California. *San Francisco Estuary and Watershed Science* 4:416.
- Yates, D., H. Galbraith, D. Purkey, A. Huber-Lee, J. Sieber, J. West, S. Herrod-Julius, and B. Joyce. 2008. Climate Warming, Water Storage, and Chinook Salmon in California's Sacramento Valley. *Climatic Change* 91(3-4):335-350.

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
BAY DELTA REGION
2825 CORDELIA ROAD, STE. 100
FAIRFIELD, CA 94534



STREAMBED ALTERATION AGREEMENT
NOTIFICATION NO. 1600-2019-0247-R3
CITY OF ANTIOCH BRACKISH WATER DESALINATION PROJECT
SAN JOAQUIN RIVER, WEST ANTIOCH CREEK, AND LOS MEDANOS WASTEWAY
CONTRA COSTA COUNTY, CA

SCOTT BUENTING
CITY OF ANTIOCH
200 H STREET
ANTIOCH, CA 94509
SBUENTING@CI.ANTIOCH.CA.US

This Streambed Alteration Agreement (Agreement) is entered into between the California Department of Fish and Wildlife (CDFW) and City of Antioch (Permittee), as represented by Scott Buenting.

RECITALS

WHEREAS, pursuant to Fish and Game Code (FGC) section 1602, Permittee notified CDFW on July 10, 2019 that Permittee intends to complete the Project described herein.

WHEREAS, pursuant to FGC section 1603, CDFW has determined that the Project could substantially adversely affect existing fish or wildlife resources and has included measures in the Agreement necessary to protect those resources.

WHEREAS, Permittee has reviewed the Agreement and accepts its terms and conditions, including the measures to protect fish and wildlife resources.

NOW THEREFORE, Permittee agrees to complete the Project in accordance with the Agreement.

PROJECT LOCATION

The Project is located on the San Joaquin River, New York Slough, West Antioch Creek and Los Medanos Wasteway within the cities of Antioch and Pittsburg in Contra Costa County, State of California; United States Geological Survey 7.5 Minute Quad Map Antioch North, Township 2N, Range 2E, Section 18, ¼ Section SW (Exhibit A and Exhibit B).

PROJECT DESCRIPTION

The Project covered under this Agreement is limited to the following activities:

- (1) Demolition of an existing diversion intake and pump station on the San Joaquin River;
- (2) construction of a new diversion intake with fish screens and pump station at the same location;
- (3) construction of three pipeline stream under crossings by way of horizontal directional drilling for the 12-inch diameter brine discharge pipeline between the desalination plant and the Delta Diablo Wastewater Treatment Plant (WWTP) at Crossings

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 2 of 22

3, 4 and 5 in Exhibit C; (4) construction of two pipeline stream under crossings by way of jack and bore for the 12-inch diameter brine discharge pipeline at Crossings 2 and 6 in Exhibit C; (5) ongoing operation of the water diversion; and (6) ongoing brine discharge from the WWTP outfall diffuser pipe in New York Slough.

Demolition and Reconstruction of the Intake and Pump Station

Demolition of the existing intake pump station will occur over a 12-month period. In-water work will occur either by underwater divers during August through October, or by coffer dam installation around the existing intake and support piers and dewatering of the coffer dam area. Cofferdam installation will occur during the in-water work window and work will continue inside the isolated area throughout the next year and the coffer dam will be removed during the following in-water work window. The existing pump will be removed through the roof of the existing building on the pier using a crane that will be stationed either onshore or on a barge. The new intake will be connected to the new pump station by two 42-inch diameter submerged pipelines extending approximately 135 feet into the river. Each of the pipelines will be equipped with a fish screen that meets the protective criteria of California Department of Fish and Wildlife and National Marine Fisheries Service. The new pump station will be located approximately 225 feet inland from shore within an existing parking lot. The pump station will house three 8 million gallon per day (mgd) pumps (two active and one standby) which would allow the pump station to continue operating at 16 mgd if one of the pumps is out of service for maintenance. The variable speed pumps will allow operations at a lower speed if needed, providing flexibility in operations. The pump station building will be designed to allow for sea level rise by the year 2100 without mechanical or electrical room flooding during high river flow coincident with the highest estimated tide. The new pump station would connect to and convey river water through the City's existing 30-inch-diameter raw water pipeline for most of the distance between the pump station and the WWTP.

Brine Disposal Pipeline Stream Crossings

Crossings 3, 4 and 5 - West Antioch Creek at L Street

Crossing 3 will be under a 6-foot by 3-foot concrete culvert in the intersection of L Street and Fitzuren Road. Crossing 4 will be under a 10-foot by 5-foot concrete culvert that crosses underneath L Street and the Highway 4 Interchange. Crossing 5 will be under two 10-foot by 8-foot concrete culverts underneath L Street. These three crossings all occur across L Street in a relatively short distance and the brine disposal pipeline alignment will go underneath all three structures in a single undercrossing that will be installed using a horizontal direction drilling (HDD) construction method. The HDD segment of the pipe will be approximately 984 feet long and installed approximately 30 feet below existing grade. The HDD alignment will be approximately 18 feet below the Crossing 3 culvert. The HDD alignment will be approximately 18 feet below the Crossing 4 culvert and 10 feet below the larger Crossing 5 culvert. The HDD alignment is approximately 70 feet away from the joint outlet location of the Crossing 4 and 5 structure.

Crossings 2- West Antioch Creek at Fitzuren Road

At Crossing 2 the pipe alignment will go under three 60-inch by 42-inch oval corrugated metal pipes using a jack-and-bore construction method. Jack-and-bore construction involves digging a jacking pit and receiving pit on either side of the crossing. A machine in the jacking pit then

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 3 of 22

pushes a 24-inch steel casing pipe horizontally through the soil while an auger removes the material inside the casing pipe. The portion of the pipe alignment installed in this manner would be 110 feet long and located 12-14 deep. The jack-and-bore method proposed at this location will not require the use of drilling fluids.

Crossing 6 – West Antioch Creek at West 10th Street

The new pipeline will cross under four, seven-foot by 14 -foot concrete box culverts. This crossing will utilize a jack-and-bore construction technique similar to Crossing 2. This portion of the pipe alignment will be approximately five feet below the existing culvert structure and approximately 215 feet long. Several other utilities including a water and sewer main have been installed in a similar fashion at this crossing and would run parallel to the proposed pipeline. The jack-and-bore method proposed at this this under crossing will not require the use of drilling fluids.

Ongoing Diversion

The City's current water supply operations cease river diversions when salinity at the intake is above the City's salinity target. The timing of this varies by water year type. With the proposed Project, the City will continue to divert water from the river for conventional treatment until salinity increases and then it will begin using the brackish desalination facility. This will enable the new intake pump station to potentially operate year-round. When the desalination facility is operating, 8 mgd would be diverted to the desalination facility and the City would have the ability to divert up to an additional 8 mgd to the conventional WTP or municipal reservoir to be used for blending depending on demands and water quality.

The desalination facility will operate at an overall recovery rate of approximately 75 percent. Approximately 8 mgd of river water would be needed to produce 6 mgd of desalinated product water. When operated, the desalination facility would operate at its full capacity. Intermittent or partial operation of desalination facilities is typically not advised and a minimum of 2 mgd flow is needed for operations. Steady flow velocity through the membranes at its rated capacity prevents the buildup of precipitates on the membranes which can reduce treatment efficiency and capacity of the system. The desalination plant will be used to produce between roughly 2,600 – 5,500-acre feet per year (AFY) depending on water year type.

Ongoing Brine Discharge

The desalination process would generate approximately 2 mgd of brine. Brine from the desalination system will be conveyed through an approximately 4.3-mile long, 12-inch-diameter dedicated pipeline from the desalination facility to the existing Delta Diablo WWTP. The brine disposal pipeline will be constructed of high-density polyethylene (HDPE) or polyvinyl chloride (PVC) and would connect to the WWTP effluent channel at the north end of the plant. The brine would then be mixed with treated wastewater from the WWTP prior to discharge through the existing WWTP outfall in New York Slough.

The WWTP outfall pipeline ends approximately 500 feet offshore and is at an elevation depth of 26 feet. The diffuser port diameter is approximately 42 inches, with 50 3-inch diameter ports spaced 8 feet apart in alternating directions. No construction or modifications to the Delta Diablo WWTP outfall will be required.

Notification #1600-2019-0247-R3
 Streambed Alteration Agreement
 July 15, 2020
 Page 4 of 22

The following activities are not authorized under this Agreement: take of any species listed under the California Endangered Species Act; modification or removal of trees or aquatic vegetation; installation of non-biodegradable filter fabric, and; use of grout or other cementitious materials in wetted portions of rivers or streams, with the exception of within the cofferdam with secondary containment casing, that fully isolates the concrete pour work area from the surrounding waterway.

PROJECT IMPACTS

Existing fish or wildlife resources the Project could substantially adversely affect include:

Affected Natural Resources	Status ¹
Invertebrates	
Lange's metalmark butterfly (<i>Apodemia mormo langei</i>)	FE
Conservancy fairy shrimp (<i>Branchinecta conservation</i>)	FE
Longhorn fairy shrimp (<i>Branchinecta longiantenna</i>)	FE
Vernal pool fairy shrimp (<i>Branchinecta lynchi</i>)	FT
Vernal pool tadpole shrimp (<i>Lepidurus packardii</i>)	FE
Fish	
Pacific Lamprey (<i>Entosphenus tridentatus</i>)	SSC
River Lamprey (<i>Lampetra ayresii</i>)	SSC
North American Green Sturgeon (<i>Acipenser medirostris</i>)	FT, SSC
Central Valley Fall-/Late Fall Run Chinook Salmon (<i>Oncorhynchus tshawytscha</i>)	SSC, SC, EFH
Central Valley Spring-Run Chinook Salmon (<i>Oncorhynchus tshawytscha</i>)	ST, FT, EFH
Sacramento River Winter Run Chinook Salmon (<i>Oncorhynchus tshawytscha</i>)	SE, FE, EFH
Central Valley Steelhead (<i>Oncorhynchus mykiss irideus</i>)	FT
Delta Smelt (<i>Hypomesus transpacificus</i>)	SE, FT

¹ FE = Listed as Endangered by the Federal Government

FT = Listed as Threatened by the Federal Government

FC = Candidate for Federal Listing

CE = Listed as Endangered by the State of California

CT = Listed as Threatened by the State of California

CR = Listed as Rare by the State of California

3511 = Fully Protected Species

* = Special Animals

CSC = California Species of Special Concern

Rank 1B.1 = Plants rare, threatened, or endangered in California and elsewhere. Seriously endangered in California.

Rank 1B.2 = Plants rare, threatened, or endangered in California and elsewhere. Fairly endangered in California.

Rank 2B.1 = Plants rare, threatened, or endangered in California, but more common elsewhere. Seriously endangered in California

Rank 2B.2 = Plants rare, threatened, or endangered in California, but more common elsewhere. Fairly endangered in California

Notification #1600-2019-0247-R3
 Streambed Alteration Agreement
 July 15, 2020
 Page 5 of 22

Affected Natural Resources	Status ¹
Longfin Smelt (<i>Spirinchus thaleichthys</i>)	ST
Northern Anchovy	EFH
Pacific Sardine	EFH
Starry Flounder	EFH
Amphibians	
California tiger salamander (<i>Ambystoma californiense</i>)	FT, CT, WL
California red-legged frog (<i>Rana draytonii</i>)	FT, SSC
Reptiles	
Giant gartersnake (<i>Thamnophis gigas</i>)	FT, CT
Western pond turtle (<i>Actinemys marmorata</i>)	SSC
Northern California legless lizard (<i>Anniella pulchra</i>)	SSC
California glossy snake (<i>Arizona elegans occidentalis</i>)	SSC
San Joaquin coachwhip (<i>Masticophis flagellum ruddocki</i>)	SSC
Coast horned lizard (<i>Phrynosoma blainvillii</i>)	SSC
Birds	
Swainson's hawk (<i>Buteo swainsoni</i>)	CT, BCC
California black rail (<i>Laterallus jamaicensis coturniculus</i>)	CT, FP, BCC
Ridgway's rail (<i>Rallus obsoletus obsoletus</i>)	FE, CE, FP
Bank swallow (<i>Riparia riparia</i>)	CT
California least tern (<i>Sterna antillarum browni</i>)	FE, CE, FP
Short-eared owl (<i>Asio flammeus</i>)	SSC
Cooper's hawk (<i>Accipiter cooperii</i>)	WL
Tricolored blackbird (<i>Agelaius tricolor</i>)	CE, BCC
Grasshopper sparrow (<i>Ammodramus savannarum</i>)	SSC
Golden eagle (<i>Aquila chrysaetos</i>)	FP, BCC
Burrowing owl (<i>Athene cunicularia</i>)	SSC, BCC
Ferruginous hawk (<i>Buteo regalis</i>)	BCC
Northern harrier (<i>Circus cyaneus</i>)	SSC

Notification #1600-2019-0247-R3
 Streambed Alteration Agreement
 July 15, 2020
 Page 6 of 22

Affected Natural Resources	Status ¹
Yellow rail (<i>Coturnicops noveboracensis</i>)	SSC, BCC
White-tailed kite (<i>Elanus leucurus</i>)	FP
California horned lark (<i>Eremophila alpestris actia</i>)	WL
Prairie falcon (<i>Falco mexicanus</i>)	WL/BCC
American peregrine falcon (<i>Falco peregrinus anatum</i>)	FP/BCC
Loggerhead shrike (<i>Lanius ludovicianus</i>)	SSC, BCC
Suisun song sparrow (<i>Melospiza melodia maxillaris</i>)	SCC
Song sparrow "Modesto" population (<i>Melospiza melodia</i>)	SCC
Salt marsh common yellowthroat (<i>Geothlypis trichas sinuosa</i>)	SSC, BCC
Mammals	
Pallid bat (<i>Antrozous pallidus</i>)	SSC
Townsend's big-eared bat (<i>Corynorhinus townsendii</i>)	SSC
Western red bat (<i>Lasiurus blossevillei</i>)	SSC
Hoary bat	SSC
San Francisco dusky-footed woodrat (<i>Neotoma fuscipes annectens</i>)	SSC
Marine mammals	
Plants	
Antioch Dunes evening primrose (<i>Oenothera deltoides</i> ssp. <i>howellii</i>)	FE, CE, 1B.1
Keck's checkerbloom (<i>Sidalcea keckii</i>)	FE, 1B.1
Alkali milk-vetch (<i>Astragalus tener</i> var. <i>tener</i>)	1B.2
Heartscale (<i>Atriplex cordulata</i> var. <i>cordulata</i>)	1B.2
Brittlescale (<i>Atriplex depressa</i>)	1B.2
Big tarplant (<i>Blepharizonia plumose</i>)	1B.1
Round-leaved filaree (<i>California macrophylla</i>)	1B.2
Mt. Diablo fairy-lantern (<i>Calochortus pulchellus</i>)	1B.2
Congdon's tarplant (<i>Centromadia parryi</i> ssp. <i>congdonii</i>)	1B.1
Bolander's water-hemlock (<i>Cicuta maculata</i> var. <i>bolanderi</i>)	2B.1
Recurved larkspur (<i>Delphinium recurvatum</i>)	1B.2

Notification #1600-2019-0247-R3
 Streambed Alteration Agreement
 July 15, 2020
 Page 7 of 22

Affected Natural Resources	Status ¹
Dwarf downingia (<i>Downingia pusilla</i>)	2B.2
Jepson's coyote thistle (<i>Eryngium jepsonii</i>)	1B.2
Spiny-sepaed button-celery (<i>Eryngium spinosepalum</i>)	1B.2
Diamond-petaled California poppy (<i>Eschscholzia rhombipetala</i>)	1B.1
San Joaquin spearscale (<i>Extriplex joaquinana</i>)	1B.2
Fragrant fritillary (<i>Fritillaria liliacea</i>)	1B.2
Diablo helianthella (<i>Helianthella castanea</i>)	1B.2
Woolly rose-mallow (<i>Hibiscus lasiocarpus</i> var. <i>occidentalis</i>)	1B.2
Carquinez goldenbush (<i>Isocoma argute</i>)	1B.1
Delta tule pea (<i>Lathyrus jepsonii</i> var. <i>jepsonii</i>)	1B.2
Mason's lilaeopsis (<i>Lilaeopsis masonii</i>)	CR, 1B.1
Delta mudwort (<i>Limosella australis</i>)	2B.1
Showy golden madia (<i>Madia radiata</i>)	1B.1
Eel-grass pondweed (<i>Potamogeton zosteriformis</i>)	2B.2
Sanford's arrowhead (<i>Sagittaria sanfordii</i>)	1B.2
Slender-leaved pondweed (<i>Stuckenia filiformis</i> ssp. <i>alpina</i>)	2B.2
Suisun Marsh aster (<i>Symphyotrichum lentum</i>)	1B.2
Natural Resources (General)	
In-stream water quality	
Benthic macroinvertebrate communities	
Stream beds and banks	
Nesting birds	
California native fish	

The adverse effects the Project could have on the fish or wildlife resources identified above without implementation of the Measures to Protect Fish and Wildlife Resources specified below, include:

- Entrainment, impingement and subsequent mortality of larval and/or juvenile Delta and Longfin Smelt;
- Entrainment, impingement and subsequent mortality of other aquatic organisms in

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 8 of 22

- water diversion facilities;
- Mortality of, or injury to fish from dewatering activities;
- Displacement and/or take of special status plant and animal species;
- Reduction in water quality (increased salinity or inadvertent return from HDD);
- Reduction in quality of aquatic habitat for fish and wildlife;
- Disruption to nesting birds;
- Harassment of fish and wildlife;
- Special status plant mortalities;
- Permanent loss of approximately 0.008 acres of shallow water habitat from concrete pad construction.

MEASURES TO PROTECT FISH AND WILDLIFE RESOURCES

1. Administrative Measures

Permittee shall meet each administrative requirement described below.

- 1.1 Documentation at Project Site. Permittee shall make the Agreement, any extensions and amendments to the Agreement, and all related notification materials and California Environmental Quality Act (CEQA) documents, readily available at the Project site at all times and shall be presented to CDFW personnel, or personnel from another state, federal, or local agency upon request.
- 1.2 Providing Agreement to Persons at Project Site. Permittee shall provide copies of the Agreement and any extensions and amendments to the Agreement to all persons who will be working on the Project at the Project site on behalf of Permittee, including but not limited to contractors, subcontractors, inspectors, and monitors.
- 1.3 Notification of Conflicting Provisions. Permittee shall notify CDFW if Permittee determines or learns that a provision in the Agreement might conflict with a provision imposed on the Project by another local, state, or federal agency. In that event, CDFW shall contact Permittee to resolve any conflict.
- 1.4 Project Site Entry. Permittee agrees that CDFW personnel may enter the Project site at any time to verify compliance with the Agreement and Permittee shall make available the necessary safety equipment for CDFW staff to enter the site.
- 1.5 Access to Property Not Owned by Permittee. This Agreement does not grant the Permittee authority to enter, use, or otherwise encroach upon on the property rights of individuals or organizations not party to this Agreement. Permittee shall obtain written authorization from outside parties, in accordance with applicable laws, if access to property not owned by Permittee is necessary.
- 1.6 Unauthorized Take. This Agreement does not authorize the take of any State or federal endangered or threatened species. Liability for any take or incidental take of such listed species remains the responsibility of Permittee for the duration of the Project. Any unauthorized take of such listed species may result in prosecution and nullification of the Agreement.

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 9 of 22

- 1.7 Qualified Biologist, Biological Monitor and Construction Monitor. A Qualified Biologist is defined under this Agreement as an individual who shall have a minimum of five years of academic training and professional experience in biological sciences and related resource management activities with a minimum of two years conducting surveys for each species that may be present within the Project area. Under this Agreement, a Biological Monitor is an individual experienced with construction level Biological Monitoring and who is able to recognize species in the Project area and who is familiar with the habits and behavior of those species. Biological monitors shall have academic and professional experience in biological sciences and related resource management activities as it pertains to this Project. A Construction Monitor under this Agreement is an individual trained by the Qualified Biologist to identify special-status species, which may be in the area, their general behavior, how they may be encountered in the work area, and procedures to follow when they are encountered and approved by CDFW. Within a minimum of seven (7) days prior to initiating fish and wildlife surveys within the Project area, Permittee shall submit the names and resumes of all biologists, biological monitors and construction monitors involved in conducting survey and/or monitoring work to CDFW for review and written approval.
- 1.8 Notification of Project Commencement/Completion. Permittee shall notify CDFW Bay Delta Region in writing, at least five (5) calendar days prior to initiation of Project activities and at least five (5) calendar days post completion of Project activities. Initial notification shall include the name(s) and contact information of the person(s) overseeing the Project site as well as a Project schedule that includes the start date and estimated end date, weekly workdays, and hours of operation. Notification shall be emailed to melissa.farinha@wildlife.ca.gov with the Notification number in the subject line.
- 1.9 Frac-out or Inadvertent Return Monitoring and Contingency Plan. At least 14-days prior to commencing project activities related to construction of the brine discharge pipeline, Permittee shall submit a Frac-out Monitoring and Contingency Plan to CDFW. Any comments brought up by CDFW shall be addressed prior to CDFW's acceptance of the plan. Written acceptance by CDFW is required prior to commencement of boring or pipe installation under watercourses.
- 1.10 Emergency Spill Contingency Plan Required. Permittee shall submit for acceptance an emergency spill response plan to CDFW prior to commencement of construction. The plan shall identify the location of containment and abatement materials on site, the actions which shall be taken in the event of a spill of hazardous or other material harmful to aquatic or plant life, the emergency materials which shall be kept at the Project Area to allow the rapid containment and clean-up of any spilled material, and the notification and cleanup procedures to be followed by Permittee in the event of a spill.
- 1.11 Acceptance of Outstanding Fish Screen Design Evaluation Requirements. Prior to screen fabrication, Permittee shall submit:
 - 1.11.1 Shop fabrication drawings with design details.
 - 1.11.2 Preliminary operation and maintenance plan which includes preventive and corrective maintenance procedures, inspection and reporting requirements,

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 10 of 22

- 1.11.3 maintenance logs, etc.
- 1.11.3 Post-construction evaluation and monitoring plan with allocated money in the construction budget to make need corrections to bring the fish screen within operational compliance.

2. Avoidance and Minimization Measures

To avoid or minimize adverse impacts to fish and wildlife resources identified above, Permittee shall implement each measure listed below.

Construction Measures

- 2.1. Conduct Project Activities and Construct Project According to Accepted Plans. Permittee and their consultants, contractors, and subcontractors shall adhere to and implement CDFW-accepted or approved plans and project designs (see Measures 1.9, 1.10, and 1.11).
- 2.2. Seasonal Work Restrictions on Covered Activities. All project-related in-stream work, excluding dewatered areas, shall be limited to the period between August 1 to November 30. Use of vibratory and impact (as necessary) drivers is restricted to the period between August 1 to November 30. HDD activities shall be limited to the period between June 15 through October 15. Covered activities in dewatered areas shall be done in a manner so that any hazardous substances or equipment and loose construction materials that could be washed away in an overtopping event can be removed within a 72-hours outside of period from October 15th to May 15th period. For purposes of this measure, in-stream work does not include equipment mobilization, materials transport, and cofferdam maintenance, dewatering, discharge or leak inspection.
- 2.3. Weather Work Restriction. The Permittee shall monitor the National Weather Service (NWS) 72-hour forecast for the Project Area. If 0.10 inches or more rain is predicted in the 24-hour forecast, no ground-disturbing activities shall occur on the Project site on the day the rain is predicted to occur. Unless otherwise authorized by CDFW, no work shall occur until 24 hours after rain has ceased.
- 2.4. Time of Day Work Restriction. Permittee shall terminate all Covered Activities 30 minutes before sunset and shall not resume Covered Activities until 30 minutes after sunrise unless otherwise authorized in writing by CDFW. Permittee shall use sunrise and sunset times established by the U.S. Naval Observatory Astronomical Applications Department for the geographic area where the project is located.
- 2.5. On-Site Specialist. Permittee shall have on site a person professionally trained in spill containment/clean up to implement spill control devices in the event a spill occurs.
- 2.6. Spill of Material Deleterious to Fish and Wildlife. In the event of a hazardous materials spill into a stream (e.g., concrete), Permittee shall immediately notify the California Office of Emergency Services State Warning Center by calling (800) 852-7550 and immediately provide written notification to CDFW by email at melissa.farinha@wildlife.ca.gov. Permittee shall take all reasonable measures to document the extent of the impacts and affected areas including photographic

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 11 of 22

documentation of affected areas, injured fish and wildlife. If dead fish or wildlife are found in the affected area, Permittee shall collect carcasses and immediately deliver them to CDFW. Permittee shall meet with CDFW within ten days of the reported spill in order to develop a resolution including: site clean-up, site remediation and compensatory mitigation for the harm caused to fish, wildlife and the habitats on which they depend as a result of the spill. The Permittee shall be responsible for all spill clean-up, site remediation and compensatory mitigation costs. Spill of materials to waters of the state that are deleterious to fish and wildlife are in violation of Fish and Game Code Section 5650 et. seq. and are subject to civil penalties for each person responsible. CDFW reserves the right to refer the matter to the District Attorney's Office if a resolution cannot be agreed upon and achieved within a specified timeframe, generally six months from the date of the incident.

- 2.7. Wet or Uncured Concrete within a non-dewatered Cofferdam. Permittee shall not allow wet or uncured concrete to enter into rivers or stream at any time. This Measure applies to "cofferdams" that have not been completely dewatered, with the exception of within the cofferdam with secondary containment casing, that fully isolates the concrete being poured from the surrounding waterway. If wet or uncured concrete is placed within non-dewatered cofferdam with secondary containment, water within the cofferdam will not be released into and/or allowed to intermingle with San Joaquin River without water quality testing to demonstrate that pH levels and dissolved oxygen concentrations are within acceptable range, consistent with background conditions (pH between 6 and 8 [pH units]; dissolved oxygen greater than 6 mg/L). If water quality within cofferdam exceeds these ranges, water will be pumped and treated and/or disposed of consistent with federal, State, and/or local regulations.
- 2.8. Seasonal Work Period. Construction activities within a lake or stream and associated wetlands and riparian corridors shall be conducted after August and before November 30. If Permittee needs more time to complete Project activities, work may be authorized outside of the work period and extended on a week-by-week basis by CDFW representative, Melissa Farinha, or if unavailable, through contact with the CDFW Bay Delta Regional Office by mail or phone (707-428-2002). Authorization shall be in the form of written communication. If Permittee requests a work period variance, Permittee shall submit such a request in writing to the CDFW Bay Delta Office. The request shall: 1) describe the extent of work already completed; 2) detail the activities that remain to be completed; 3) detail the time required to complete each of the remaining activities; and 4) provide photographs of both the current work completed and the proposed site for continued work. The work period variance shall be issued at the discretion of CDFW. CDFW reserves the right to require additional measures to protect biological resources as a condition for granting the variance. CDFW shall have 10 business days to review the proposed work period variance.
- 2.9. Cofferdam Work Area. Precipitation forecasts and potential increases of river flow (i.e., San Joaquin River) shall be considered when planning construction activities within the cofferdam work area to avoid the potential for the release of materials or equipment into the river. Prior to departing the cofferdam work area each day, Contractor shall remove all non-fixed equipment and/or materials (not including pumps used for dewatering, as necessary) from the cofferdam work area and place in secured area.

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 12 of 22

- 2.10. Storm Event Inspection. After any storm event, Permittee shall inspect all sites scheduled to begin or continue construction within the next 72 hours. Corrective action for erosion and sedimentation shall be taken as needed.
- 2.11. No Equipment in Channel. With the exception of river barge, work vessels, and ancillary equipment for work in the San Joaquin River, no equipment shall be operated from within a flowing stream (including flowing or ponded water) at any time.
- 2.12. Hollow Open-ended Posts or Pipes. No exposed hollow open-ended posts or pipes in a vertical, skyward orientation shall be installed as part of the Project or stored/staged on the Project site. All pipes or posts on the Project site during construction that are exposed to the environment shall be capped, screened or filled with material by Permittee.
- 2.13. Posts with Exposed Perforations. Any post with exposed perforations installed on the Project site and exposed to the environment shall have the holes permanently filled within the top six inches of the post upon installation by Permittee.
- 2.14. No Monofilament Netting. Permittee shall not use erosion control materials containing plastic monofilament netting (erosion control matting) or similar material containing netting within the Project area due to documented evidence of amphibians and reptiles becoming entangled or trapped in such material. Acceptable substitutes include coconut coir matting or tackified hydroseeding compounds.
- 2.15. No New Project Phase without Erosion Control. No phase of the Project may be started if that phase and its associated erosion control measures cannot be completed prior to the onset of a storm event if that construction phase may cause the introduction of sediments into the stream. Erosion control measures shall be inspected frequently to minimize failure and conduct any necessary repairs. All non-structural related and non-biodegradable erosion control measures shall be removed from the Project area upon cessation of construction activities.
- 2.16. Stabilize Exposed Areas. Permittee shall stabilize all exposed/disturbed areas within the Project site to the greatest extent possible to reduce erosion potential, both during and following construction. Erosion control measures, such as, silt fences, straw hay bales, gravel, or rock-lined ditches, water check bars, and broadcasted straw shall be used wherever silt-laden water has the potential to leave the work site and enter State waters. Erosion control measures shall be monitored during and after each storm event. Modifications, repairs, and improvements to erosion control measures shall be made whenever they are needed.
- 2.17. Staging and Storage Areas. Construction equipment, building materials, fuels, lubricants, and solvents shall not be stockpiled or stored where they may be washed into State waters or where they will cover aquatic or riparian vegetation.
- 2.18. Equipment over Drip Pans. Stationary equipment such as motors, pumps, generators, compressors and welders, located within or adjacent to the stream and riparian areas shall be positioned over drip-pans.
- 2.19. Check Equipment for Leaks. Any equipment or vehicles driven and/or operated

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 13 of 22

adjacent to the stream and riparian corridor shall be checked and maintained daily to prevent leaks of materials that if introduced to water could be deleterious to aquatic life, wildlife or riparian habitat. Vehicles shall be moved away from the stream prior to refueling and lubrication.

- 2.20. Hazardous Materials. Any hazardous or toxic materials that could be deleterious to aquatic life that could be washed into State waters or their tributaries shall be contained in watertight containers or removed from the Project site.
- 2.21. Imported Materials. Permittee shall not import, take from or move any rock, gravel, and/or other materials within the San Joaquin River, its streambeds or banks except as otherwise addressed in this Agreement.
- 2.22. Debris and Waste Disposal. Permittee shall not dump any litter or construction debris within the Project area. All such debris and waste shall be picked up daily and properly disposed of at an appropriate site. Upon completion of operations and/or onset of wet weather, all construction material and/or debris shall be removed from the Project work site to an area not subject to inundation. All removed vegetation and debris shall be disposed of according to State and local laws and ordinances.
- 2.23. Spoils. Permittee shall not place spoil where it could enter State waters or other sensitive habitat, such as riparian, or place over vegetation except as specifically noticed to and accepted by CDFW, in writing. Spoil shall be hauled offsite or stockpiled in an upland location where it shall be covered with plastic sheeting or visquine whenever it is evident that rainy conditions threaten to erode loose soils into sensitive habitats.
- 2.24. Vegetation Disturbance. No disturbance or removal of vegetation, other than that specified in the Project description shall occur because of Project activities. Vegetation outside the construction corridor shall not be removed or damaged without prior consultation and approval of CDFW. Vegetation may be disturbed only as specified in this measure.

Dewatering

- 2.25. Cofferdam Installation and Removal. The Qualified Biologist and a Fisheries Biologist approved by CDFW (can be the same person) shall direct the installation, removal and dewatering efforts of all cofferdam structures. A Fisheries Biologist is defined under this Agreement as someone that has a 4-year degree in fish biology or closely related field, has at least 2-years of experience in the handling of at least one of the special status fish species that may be on site, is in possession of appropriate State and Federal permits to handle the Covered Species, and has been provided written authorization from CDFW to act as a Fisheries Biologist under this Agreement. The cofferdam installation shall be limited to the period between August 1 and November 30. During the period of active dewatering, the CDFW-approved Fisheries Biologist shall check daily for stranded aquatic life as the water level in the dewatering area drops and until active dewatering ceases. All stranded aquatic life in the dewatered areas shall be immediately relocated to habitat outside of harm's way. Cofferdams shall remain in place and functional during Covered Activities. Cofferdams that fail for any reason shall

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 14 of 22

be repaired immediately. All materials used in cofferdam construction shall be removed from the project site once the coffer dams are no longer needed.

- 2.26. Daily Cofferdam Checks. The Qualified Biologist, Fisheries Biologist, or Biological Monitor shall check daily for stranded aquatic life in the dewatered areas prior to commencement of project activities each morning. If any fish is found within the dewatered area, then the biologist or monitor shall immediately stop work until the fish can be identified to species and relocated outside of harm's way by the Fisheries Biologist. Capture methods may include fish landing nets, dip nets, buckets and by hand.
- 2.27. Cofferdams and Work Area Seepage. If the area within a cofferdam requires periodic pumping of seepage, pumping will occur under direct supervision of qualified fisheries biologist approved by CDFW. Pumps will be located on barges adjacent to the areas being dewatered. Any turbid water pumped from dewatered areas will be discharged into an area protected by a turbidity curtain to prevent suspended sediment from being transported upstream or downstream. Alternatively, Permittee may place pumps in upland flat areas, away from the stream channel. Pumps placed in uplands shall be secured by tying off to a tree or staked in place to prevent movement by vibration. Pump intakes shall be fitted with fish screens meeting CDFW criteria to prevent entrainment or impingement of fish. CDFW fish screen criteria can be found online in Appendix S of the California Salmonid Stream Habitat Restoration Manual. Pump intakes shall be periodically checked for impingement of fish or amphibians that shall be relocated according to the approved measures outlined for each species below. Any turbid water pumped from the work site itself to maintain it in a dewatered state shall be disposed of in an upland location where it will not drain directly into any stream channel.
- 2.28. Fish Relocation Plan. A plan to relocate fishes and other sensitive aquatic organisms from the de-watering associated with the coffer dam must be developed by the Permittee and approved in writing by CDFW prior to initiation of project activities. An electronic copy of the draft plan shall be transmitted via email to melissa.farinha@wildlife.ca.gov two weeks prior to expectation of feedback.

Diversion

- 2.29. Maximum Diversion Rate from the San Joaquin River. Instantaneous rate of diversion from the new intakes shall not exceed 11,111 gallons per minute at any time and shall be limited to the minimum magnitude and duration to meet water demands.
- 2.30. No Diversion without Fish Screens. Permittee shall not divert water at any time without the CDFW-approved fish screen installed and fully operational.
- 2.31. Implement Fish Screen Operations and Evaluation Plans. Permittee shall implement the operation and maintenance plan and the post-construction evaluation plan according to the plans as approved by CDFW (see Measure 1.11).

Biological Measures

- 2.32. Training Session for Personnel. Prior to any Project construction work, the Qualified

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 15 of 22

Biologist shall provide a training session for all work personnel to identify special-status species that may be in the area, their general behavior, how they may be encountered in the work area, and procedures to follow when they are encountered. Interpretation shall be provided for non-English speaking workers. Any personnel joining the work crew later shall receive the same training before beginning work. Following the training, all participants shall sign an attendance sheet and this sheet shall be kept on site and made available upon request.

- 2.33. Preconstruction Swainson's Hawk Survey and Avoidance. If Project activities will occur during the bird nesting season (February 15 through September 1) then the Qualified Biologist shall conduct pre-construction nesting survey for Swainson's hawk within a ¼-mile radius of the Project site. Surveys shall follow the Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley (2000), available online here: <https://www.wildlife.ca.gov/Conservation/Survey-Protocols#377281284-birds>. No Project activities shall occur within ¼ mile of a nest occupied by Swainson's hawks.
- 2.34. Preconstruction Bird Nest Surveys. If equipment staging, site preparation, grading, excavation or other project-related construction activities are scheduled during the nesting season (February 15 through September 15) of protected raptors and other avian species, a focused survey for active nests of such birds shall be conducted by a Qualified Biologist within 15 days prior to the beginning of project-related activities at each project site. Surveys shall be conducted in all suitable habitat located at project work sites, in staging, storage, and soil stockpile areas, and along transportation routes. The minimum survey radii surrounding the work area shall be the following: i) 250 feet for passerines; ii) 500 feet for small raptors such as accipiters; iii) 1,000 feet for larger raptors such as buteos. Surveys shall be conducted at the appropriate times of day, and during appropriate nesting times and shall concentrate on areas of suitable habitat. If a lapse in project-related activities of 15 days or longer occurs at any of the project sites then another focused survey, and if required, consultation with CDFW shall be required before Project activities can be reinitiated. If an active nest is found, Permittee shall consult with CDFW regarding appropriate action to comply with the Fish and Game Code. CDFW reserves the right to provide additional provisions to this Agreement designed to protect nesting birds.
- 2.35. Active Bird Nest Buffers. If an active nest is found during surveys, the active nest site shall be designated as "Ecologically Sensitive Areas" (ESA) and protected (while occupied) during Project construction with the establishment of a fence barrier surrounding the nest site. CDFW recommends that the minimum distances of the protective buffers surrounding each identified nest site be the following: i) 1,000 feet for other large raptors such as buteos; ii) 500 feet for small raptors such as accipiters; iii) 250 feet for passerines. Buffers under these recommended minimums shall first be submitted to CDFW for written concurrence prior to project activities taking place at each project site. A Qualified Biologist shall monitor the behavior of the birds (adults and young, when present) at the nest site to ensure that they are not disturbed by project-related activities. Nest monitoring shall continue during project-related construction work until the young have fully fledged, are no longer being fed by the parents, and have left the nest site, as determined by a Qualified Biologist.

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 16 of 22

- 2.36. Special-Status Fish and Wildlife Surveys. Within 48 hours prior to each stage of the project, a Qualified Biologist shall survey the Project site at the appropriate time of day for presence of special-status fish and wildlife species that may be present. Only a Qualified Biologist with the necessary agency permits and/or approvals may handle any State Species of Special Concern. This Agreement does not authorize the take or disturbance of any species listed under the CESA. All wildlife species encountered during surveys shall be recorded. CDFW reserves the right to provide additional provisions to this Agreement designed to protect special-status species.
- 2.37. Wildlife Inspection Prior to Construction Activities Each Day. The Qualified Biologist and Biological Monitor shall inspect the work area and areas adjacent to the work area that will support motorized equipment prior to mobilization into the work site each day. If the monitor determines the work site does not support sensitive species, equipment may be moved onto the site under the observation of the monitor.
- 2.38. Marine Mammal Protection. The Qualified Biologist or Biological Monitor shall be on-site during project sheet and pile driving activities in or near the San Joaquin River and shall maintain a 1,600-foot in-water buffer zone for marine mammal protection. All in-water project sheet and pile driving activities shall cease when a marine mammal enters the 1,600-foot buffer zone established around the project site and resume only after the animal has been gone from the area for a minimum of 15 minutes. The Qualified Biologist or Biological Monitor shall identify monitoring vantage points which allow full visibility to scan the buffer zone using binoculars.
- 2.39. Disinfect Equipment Prior to Entry into Watercourses. To prevent spread of invasive aquatics and diseases, equipment to be used in watercourses including, but not limited to, boots, waders, hand tools and nets must be decontaminated with a minimum 5 percent chlorine solution for 2 minutes prior to entry into a watercourse. In addition, if a piece of equipment has been exposed or is suspected to have been exposed to areas harboring New Zealand mud snails then that equipment must be dried out for two weeks, frozen for 48 hours, or placed in 55 degrees Celsius water for 5 minutes.
- 2.40. Harassment of Animals. No Project personnel or motorized equipment shall harass, herd, or drive any bird or mammal. Harass is defined as an intentional act which disrupts an animal's normal behavior patterns, which includes, but is not limited to, breeding, feeding or sheltering. Project personnel and equipment shall not cause displacement of waterbirds into roadways or open areas without cover from aerial predators. CDFW reserves the right to provide additional measures that shall be made part of this Agreement.
- 2.41. On-site Qualified Biologist, Biological Monitor or Construction Monitor with Stop Work Authorization. Permittee shall have the CDFW-approved Qualified Biologist or Biological Monitor onsite daily during Project activity to minimize impacts to plant, fish, and wildlife habitat. Qualified Biologists and Biological Monitors shall be authorized to stop construction if necessary, to protect fish and wildlife resources. If there is a threat of harm to any sensitive species, or other wildlife, the Qualified Biologist or Biological Monitor shall halt project activities that may harm the animal until the animal is out harm's way before re-commencing those activities

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 17 of 22

3. Compensatory Measures

To compensate for adverse impacts to fish and wildlife resources identified above that cannot be avoided or minimized, Permittee shall implement each measure listed below.

- 3.1. Compensatory Mitigation. To offset the impacts of the new concrete pad and associated infrastructure required for the project, Permittee shall purchase 0.02 acres of shallow water habitat (estimated to be \$175,000 per acre of credit) and 0.02 acres of floodplain mosaic habitat credits (estimated to be \$150,000 per acre of credit) from a CDFW-approved Mitigation Bank. To offset the impacts of ongoing operations and maintenance of diversion structures, Permittee shall purchase 1.53 acres of shallow water habitat. Permittee shall either complete the purchase of credits with written concurrence from CDFW and provide receipt of purchase prior to commencement of project activities or until a security for \$274,250, approved in form by CDFW in writing, is fully funded for CDFW to carry out any unmet compensatory mitigation obligations in the event Permittee fails to complete their compensatory mitigation requirements as specified in this Measure.

4. Reporting Measures

Permittee shall meet each reporting requirement described below.

- 4.1 Preconstruction Wildlife Survey(s). Results from wildlife survey(s) shall be sent to CDFW within 10 days of completion of each required survey.
- 4.2 Capture and Relocation. A report of capture and relocation activities associated with the coffer dam and construction activities shall be provided to CDFW within 5 days after initial coffer dam dewatering and within 5 days of any fish and wildlife relocations. The report shall include: species encountered, capture methods; methods used for handling; stress minimization; equipment cleaning and disinfection; sizes of holding facilities; descriptions of relocation sites; and all instances of mortality and injury.
- 4.3 Monthly Monitoring and Compliance Reports. The Qualified Biologist shall submit a monthly report electronically to CDFW that includes the following items:
- 1) Notification number;
 - 2) Begin and end times of daily worksite monitoring;
 - 3) Begin and end times of all activities associated with the project;
 - 4) Survey results;
 - 5) A summarized description of whether compliance for all avoidance and minimization measures has been met;
 - 6) Recommendations to achieve compliance of any avoidance and minimization measures that have not been met;
 - 7) Fish and wildlife species (and their sign) observed during monitoring;
 - 8) Any instances of capture and relocation of fish and wildlife;
 - 9) Any avoidance behaviors of fish and wildlife, and;
 - 10) Photo documentation of site conditions.

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 18 of 22

- 4.4 Final Construction Report. A final construction report shall be submitted to CDFW within 30 calendar days of the date of completion of all project construction-related activity. This report shall detail dates construction occurred, pertinent information concerning the success of the project in meeting avoidance and minimization measures, mitigation measures, conservation measures, detailed summaries of any deceased wildlife discovered at the site, and/or any detailed summaries required in the measures of this Agreement. An explanation of failure to meet such measures as specified in this Agreement shall also be included, if applicable. The report shall also include the as-built for the new intakes and fish screens.
- 4.5 Annual Fish Screen Maintenance and Effectiveness Monitoring. Permittee shall submit an annual report by December 31 in each year for the term of this Agreement. The report shall include all monitoring elements identified in the CDFW approved plans required under Measure 1.11.1 and Measure 1.11.2.
- 4.6 Notification to the California Natural Diversity Database (CNDDDB). If any listed, rare, or special status species are detected during Project surveys or on or around the Project site during Project activities, Permittee shall submit CNDDDB Field Survey Forms to CDFW in the manner described at the CNDDDB website (<http://www.dfg.ca.gov/biogeodata/cnddb/>) within 30 days of the sightings. Copies of such submittals shall also be submitted to the CDFW regional office as specified below.

CONTACT INFORMATION

Any communication that Permittee or CDFW submits to the other shall be in writing and any communication or documentation shall be delivered to the address below by U.S. mail, fax, or email, or to such other address as Permittee or CDFW specifies by written notice to the other.

To Permittee:

Scott Buenting
City of Antioch
200 H Street
Antioch, CA 94509
Telephone: (916) 779-6129
SBuenting@ci.antioch.ca.us

To CDFW:

California Department of Fish and Wildlife
Bay Delta Region
2825 Cordelia Road, Suite 100
Fairfield, CA 94534
Telephone (707) 428-2002
Fax (707) 428-2036
Attn: Lake and Streambed Alteration Program – Melissa Farinha
Notification #1600-2019-0247-R3
melissa.farinha@wildlife.ca.gov

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 19 of 22

LIABILITY

Permittee shall be solely liable for any violations of the Agreement, whether committed by Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents or contractors and subcontractors, to complete the Project or any activity related to it that the Agreement authorizes.

This Agreement does not constitute CDFW's endorsement of, or require Permittee to proceed with the Project. The decision to proceed with the Project is Permittee's alone.

SUSPENSION AND REVOCATION

CDFW may suspend or revoke in its entirety the Agreement if it determines that Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, is not in compliance with the Agreement.

Before CDFW suspends or revokes the Agreement, it shall provide Permittee written notice by certified or registered mail that it intends to suspend or revoke. The notice shall state the reason(s) for the proposed suspension or revocation, provide Permittee an opportunity to correct any deficiency before CDFW suspends or revokes the Agreement, and include instructions to Permittee, if necessary, including but not limited to a directive to immediately cease the specific activity or activities that caused CDFW to issue the notice.

ENFORCEMENT

Nothing in the Agreement precludes CDFW from pursuing an enforcement action against Permittee instead of, or in addition to, suspending or revoking the Agreement.

Nothing in the Agreement limits or otherwise affects CDFW's enforcement authority or that of its enforcement personnel.

OTHER LEGAL OBLIGATIONS

This Agreement does not relieve Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, from obtaining any other permits or authorizations that might be required under other federal, state, or local laws or regulations before beginning the Project or an activity related to it.

This Agreement does not relieve Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, from complying with other applicable statutes in the FGC including, but not limited to, FGC sections 2050 et seq. (threatened and endangered species), 3503 (bird nests and eggs), 3503.5 (birds of prey), 5650 (water pollution), 5652 (refuse disposal into water), 5901 (fish passage), 5937 (sufficient water for fish), and 5948 (obstruction of stream).

Nothing in the Agreement authorizes Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, to trespass.

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 20 of 22

AMENDMENT

CDFW may amend the Agreement at any time during its term if CDFW determines the amendment is necessary to protect an existing fish or wildlife resource.

Permittee may amend the Agreement at any time during its term, provided the amendment is mutually agreed to in writing by CDFW and Permittee. To request an amendment, Permittee shall submit to CDFW a completed CDFW "Request to Amend Lake or Streambed Alteration" form and include with the completed form payment of the corresponding amendment fee identified in CDFW's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5).

TRANSFER AND ASSIGNMENT

This Agreement may not be transferred or assigned to another entity, and any purported transfer or assignment of the Agreement to another entity shall not be valid or effective, unless the transfer or assignment is requested by Permittee in writing, as specified below, and thereafter CDFW approves the transfer or assignment in writing.

The transfer or assignment of the Agreement to another entity shall constitute a minor amendment, and therefore to request a transfer or assignment, Permittee shall submit to CDFW a completed CDFW "Request to Amend Lake or Streambed Alteration" form and include with the completed form payment of the minor amendment fee identified in CDFW's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5).

EXTENSIONS

In accordance with FGC section 1605(b), Permittee may request one extension of the Agreement, provided the request is made prior to the expiration of the Agreement's term. To request an extension, Permittee shall submit to CDFW a completed CDFW "Request to Extend Lake or Streambed Alteration" form and include with the completed form payment of the extension fee identified in CDFW's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5). CDFW shall process the extension request in accordance with FGC 1605(b) through (e).

If Permittee fails to submit a request to extend the Agreement prior to its expiration, Permittee must submit a new notification and notification fee before beginning or continuing the Project the Agreement covers (Fish & G. Code, § 1605, subd. (f)).

EFFECTIVE DATE

The Agreement becomes effective on the date of CDFW's signature, which shall be: 1) after Permittee's signature; 2) after CDFW complies with all applicable requirements under the California Environmental Quality Act (CEQA); and 3) after payment of the applicable FGC section 711.4 filing fee listed at http://www.wildlife.ca.gov/habcon/ceqa/ceqa_changes.html.

TERM

This Agreement shall expire on December 31, 2029 unless it is terminated or extended before then. All provisions in the Agreement shall remain in force throughout its term. Permittee shall

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 21 of 22

remain responsible for implementing any provisions specified herein to protect fish and wildlife resources after the Agreement expires or is terminated, as FGC section 1605(a)(2) requires.

EXHIBITS

- A. Figure 9. City of Antioch Water System, authored by ESA, 2019.
- B. Figure 8-1. Hydrography Overview, authored by ESA, 2019.
- C. Figure 8-2. Hydrography (detail #1), authored by ESA, 2019.

AUTHORITY

If the person signing the Agreement (signatory) is doing so as a representative of Permittee, the signatory hereby acknowledges that he or she is doing so on Permittee's behalf and represents and warrants that he or she has the authority to legally bind Permittee to the provisions herein.

Notification #1600-2019-0247-R3
Streambed Alteration Agreement
July 15, 2020
Page 22 of 22

AUTHORIZATION

This Agreement authorizes only the Project described herein. If Permittee begins or completes a Project different from the Project the Agreement authorizes, Permittee may be subject to civil or criminal prosecution for failing to notify CDFW in accordance with FGC section 1602.

CONCURRENCE

The undersigned accepts and agrees to comply with all provisions contained herein.

FOR CITY OF ANTIOCH

DocuSigned by:

Scott Buenting

11387279F9B5437

Scott Buenting

Date

FOR DEPARTMENT OF FISH AND WILDLIFE

James Starr

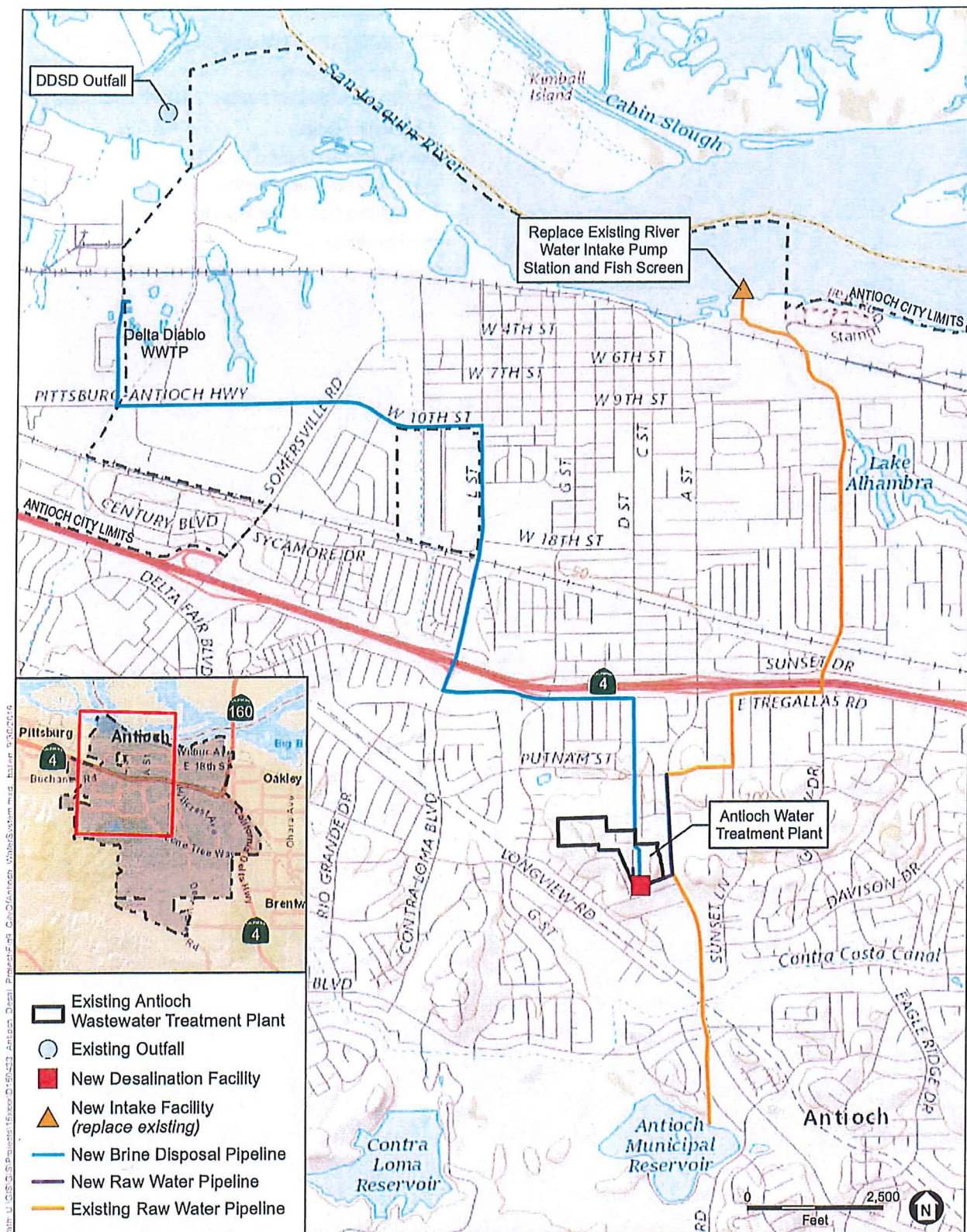
Environmental Program Manager

Date

Prepared by: Melissa Farinha
Senior Environmental Scientist (Supervisory)

Date of Draft Issuance: June 1, 2020

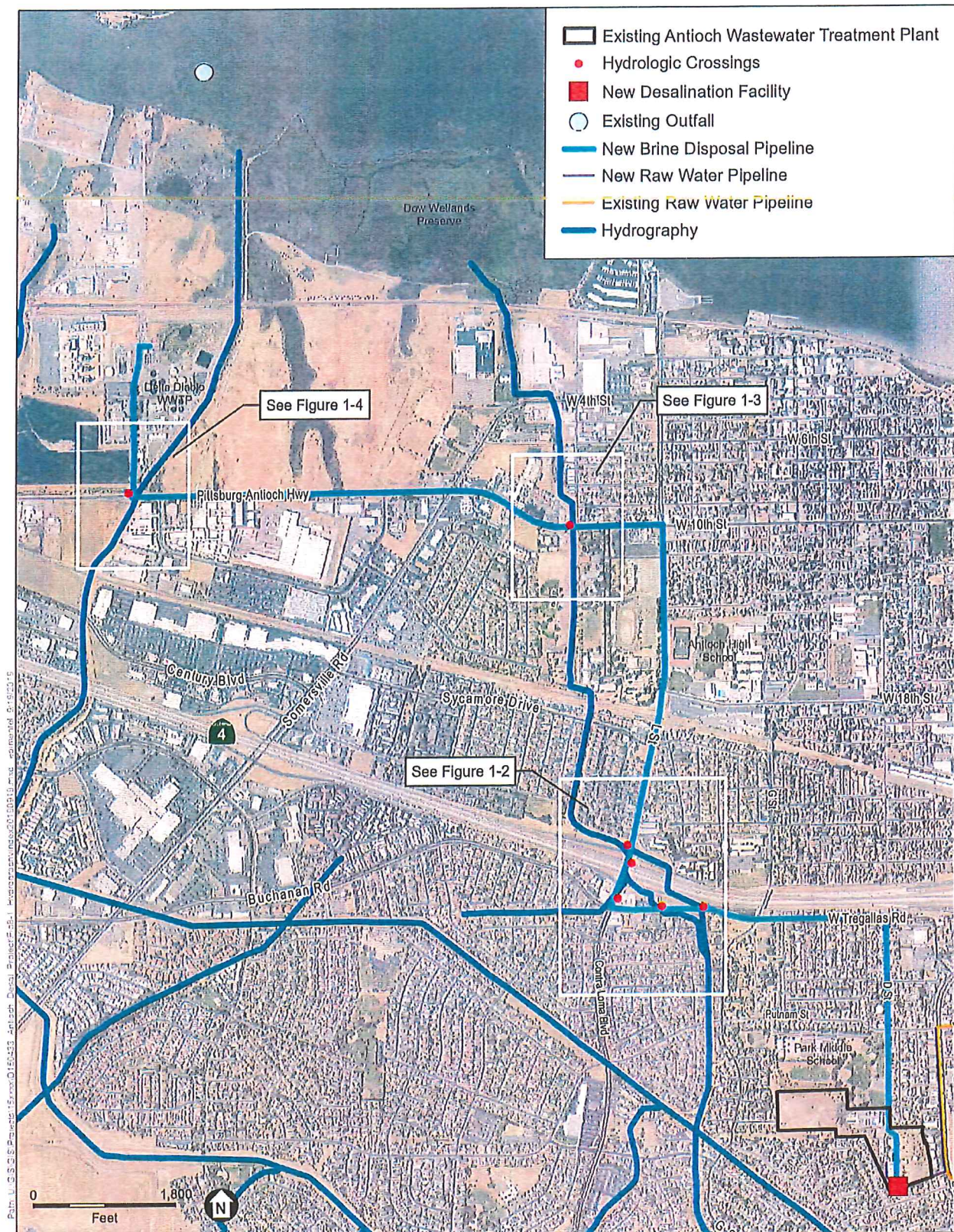
Date of First Revision Draft Issuance: July 2, 2020



SOURCE: USGS, 2019; Contra Costa Co., 2018; City of Antioch, 2019; Corollo, 2109; ESA, 2019

City of Antioch Desalination Project

Figure 9
City of Antioch Water System



SOURCE: USDA, 2018; ESRI, 2012; City of Antioch, 2019; Corollo, 2019; ESA, 2019

City of Antioch Desalination Project

Figure 8-1
Hydrography Overview



SOURCE: USDA, 2018; ESRI, 2012; City of Antioch, 2019; Corollo, 2109; ESA, 2019

City of Antioch Desalination Project

Figure 8-2
Hydrography (detail #1)



State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Bay Delta Region
2825 Cordelia Road, Suite 100
Fairfield, CA 94534
(707) 428-2002
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director



July 17, 2020

Mr. Scott Buenting
City of Antioch
Post Office Box 5007
Antioch, CA 94531-5007
SBuenting@ci.antioch.ca.us

Subject: Incidental Take Permit for Brackish Water Desalination Facility,
2081-2019-046-03, Contra Costa County

Dear Mr. Buenting:

Enclosed is the Incidental Take Permit for the above referenced project, which has been signed by the California Department of Fish and Wildlife (CDFW). Please read the permit carefully and sign the acknowledgement on the permit no later than 30 days from CDFW signature and prior to initiation of ground-disturbing activities. Alternatively, a signed hardcopy can be mailed to:

Habitat Conservation Planning Branch
California Department of Fish and Wildlife
Attention: CESA Permitting Program
Post Office Box 944209
Sacramento, CA 94244-2090

You are advised to keep a copy of the signed permit in a secure location and distribute copies to appropriate project staff responsible for ensuring compliance with the conditions of the permit. Note that you are required to comply with certain conditions of approval prior to continuation of ground-disturbing activities. Additionally, a copy of the permit must be maintained at the project work site and made available for inspection by CDFW staff when requested.

The permit will not take effect until the signed acknowledgment is received by CDFW. If you wish to discuss these instructions or have questions regarding the permit, please contact Ms. Melissa Farinha, Senior Environmental Scientist (Supervisory), at (707) 944-5579 or Melissa.Farinha@wildlife.ca.gov; or Mr. Jim Starr, Environmental Program Manager, at Jim.Starr@wildlife.ca.gov.

Sincerely,

DocuSigned by:
A handwritten signature in black ink that reads "Gregg Erickson".
BE74D4C93C804EA...
Gregg Erickson
Regional Manager
Bay Delta Region

Conserving California's Wildlife Since 1870



California Department of Fish and Wildlife
BAY DELTA REGION
2825 CORDELIA ROAD, SUITE 100
FAIRFIELD, CA 94534

California Endangered Species Act
Incidental Take Permit No. 2081-2019-045-03

BRACKISH WATER DESALINATION PROJECT

Authority:

This California Endangered Species Act (CESA) Incidental Take Permit (ITP) is issued by the California Department of Fish and Wildlife (CDFW) pursuant to Fish and Game Code section 2081, subdivisions (b) and (c), and California Code of Regulations, Title 14, section 783.0 et seq. CESA prohibits the take¹ of any species of wildlife designated by the California Fish and Game Commission as an endangered, threatened, or candidate species.² CDFW may authorize the take of any such species by permit if the conditions set forth in Fish and Game Code section 2081, subdivisions (b) and (c) are met. (See Cal. Code Regs., tit. 14, § 783.4).

Permittee:	City of Antioch
Principal Officer:	Mr. Scott Buenting, Project Manager
Contact Person:	Mr. Chris Fitzer, (916) 231-1254
Mailing Address:	Post Office Box 5007, Antioch, CA 94531-5007

Effective Date and Expiration Date of this ITP:

This ITP shall be executed in duplicate original form and shall become effective once a duplicate original is acknowledged by signature of the Permittee on the last page of this ITP and returned to CDFW's Habitat Conservation Planning Branch at the address listed in the Notices section of this ITP. Unless renewed by CDFW, this ITP's authorization to take the Covered Species shall expire on **December 31, 2029**.

Notwithstanding the expiration date on the take authorization provided by this ITP, Permittee's obligations pursuant to this ITP do not end until CDFW accepts as complete the Permittee's Final Mitigation Report required by Condition of Approval 6.7 of this ITP.

¹ Pursuant to Fish and Game Code section 86, "'take' means hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." (See also *Environmental Protection Information Center v. California Department of Forestry and Fire Protection* (2008) 44 Cal.4th 459, 507 [for purposes of incidental take permitting under Fish and Game Code section 2081, subdivision (b), "'take' ... means to catch, capture or kill"].)

² "The definition of an endangered, threatened, and candidate species for purposes of CESA are found in Fish and Game Code sections 2062, 2067, and 2068, respectively.

Project Location:

The Brackish Water Desalination Project (Project) is located within the cities of Antioch and Pittsburg, Contra Costa County (See Figure 1). The Project elements being permitted through this ITP are: the desalination facility located within the City of Antioch's (City) existing water treatment plant at 401 Putnam Street, the river intake pump station located at the City marina near McElheny Road and Fulton Shipyard Road, and the existing Delta Diablo Wastewater Treatment Plant (WWTP) outfall located in New York Slough in the City of Pittsburg.

Project Description:

The Project is limited to: (1) Demolition of an existing diversion intake and pump station on the San Joaquin River; (2) construction of a new diversion intake with fish screens and pump station at the same location; (3) construction of three pipeline stream under crossings by way of horizontal directional drilling (HDD) for the 12-inch diameter brine discharge pipeline between the desalination plant and the WWTP at Crossings 3, 4 and 5; (4) construction of two pipeline stream under crossings by way of jack and bore for the 12-inch diameter brine discharge pipeline at Crossings 2 and 6; (5) ongoing operation of the water diversion; and (6) ongoing brine discharge from the WWTP outfall diffuser pipe in New York Slough.

Intake Pump Station Replacement and Raw Water Pipeline Connection

The existing pump station and intake pipeline will be removed and replaced under the proposed Project. The existing pump station is in an upland parking lot area. The new pump station will be located approximately 225 feet inland from shore within the existing parking lot and will have an approximate area of 3,500 square feet. The pump station will house three 8-million gallons per day (mgd) pumps (two active and one standby) which will allow the pump station to continue operating at the existing facility capacity of 16 mgd if one of the pumps is out of service for maintenance. The pump station design, based on the anticipated sea level rise condition in 2100, prevents flooding of the mechanical or electrical room during high river flow coincident with the highest estimated tide.

The intake will be connected to the pump station by two 42-inch diameter submerged pipelines extending approximately 135 feet into the river (Figure 3 – Intake and Pump Station, Appendix B). Each of the pipelines will be equipped with a 48-inch diameter T-intake cylindrical fish screen that meets the protective criteria of CDFW and National Marine Fisheries Service (NMFS). The intake capacity of the new intake pump station for river water will remain at a firm capacity of 16 mgd.

The intake pipelines will be located within a 13-foot wide by 7.5-foot deep trench extending from the shoreline. The pipes will be surrounded by 2-inch minus sized bedding material with a 2-foot rip-rap layer on top. After extending into the river 135 feet the pipes will make a 90 degree bend up and extend 9 feet above the riverbed and be capped by the 48-inch diameter

fish screens. The intake will be supported by a 10-foot by 36-foot concrete foundation that will be 3 feet deep. The foundation slab will be supported on four 18-inch diameter steel pipe pilings that will be installed to a depth of 75 feet below the riverbed. The foundation slab will then have an additional 5 feet of riprap added on all sides. The 5 feet of riprap around the foundation slab and on top of the pipelines will be placed 12 inches below the grade of the riverbed and will be buried with clean, native earthen backfill material.

Installation of the intake pipes and foundations will involve the removal of approximately 700 cubic yards of material and the placement of 309 cubic yards of bedding material, 208 cubic yards of rip-rap, 40 cubic yards of concrete and 140 cubic yards of pipes and pile structures. Other than the intake pipe extending up to the fish screens all material will be placed so as to match the adjacent existing surface.

A cofferdam will be temporarily installed in the river by the construction contractor to facilitate installation of the intake pipelines and fish screens and minimize turbulence and sediment disturbance during construction. The cofferdam will consist of interlocking sheet piles forming a watertight corridor approximately 42 feet wide that will extend into the river approximately 143 feet from the shore corresponding to the edge of the rip-rap around the intake foundation. Once installed, the area inside the cofferdam may be dewatered to facilitate construction, to accommodate fish rescue and construction activities, as necessary. If the area inside the cofferdam is not dewatered, the pouring and/or placement of wet or uncured concrete will only occur within the cofferdam with secondary containment casing, that fully isolates the concrete being poured from the surrounding waterway. Additionally, if wet or uncured concrete is placed within the non-dewatered cofferdam with secondary containment, water within the cofferdam will not be released into and/or allowed to intermingle with San Joaquin River without water quality testing to demonstrate that pH levels and dissolved oxygen concentrations are within acceptable range, consistent with background conditions (pH between 6 and 8 [pH units]; dissolved oxygen greater than 6 mg/L). If water quality within cofferdam exceeds these ranges, water will be pumped and treated and/or disposed of consistent with State and local regulations. Installation of the cofferdam is expected to take approximately 2 weeks. The cofferdam will be removed following construction.

The new pump station will connect to and convey river water through the City's existing 30-inch-diameter raw water pipeline for the majority of the distance between the pump station and the WWTP (See Figure 2). At the intersection of Lone Tree Way and Putnam Street, a new 30-inch raw water pipeline will extend from the existing pipe approximately 3,000 feet to the location within the WWTP of the new desalination plant. This new pipeline will be located entirely within existing road rights-of-way or the WWTP property.

Brine Disposal Pipeline Stream Crossings

Crossings 3, 4 and 5 - West Antioch Creek at L Street: Crossing 3 will be under a 6-foot by 3-foot concrete culvert in the intersection of L Street and Fitzuren Road. Crossing 4 will be

Incidental Take Permit
No. 2081-2019-046-03
CITY OF ANTIOCH
BRACKISH WATER DESALINATION PROJECT

under a 10-foot by 5-foot concrete culvert that crosses underneath L Street and the Highway 4 Interchange. Crossing 5 will be under two 10-foot by 8-foot concrete culverts underneath L Street. These three crossings all occur across L Street in a relatively short distance and the brine disposal pipeline alignment will go underneath all three structures in a single undercrossing that will be installed using an HDD construction method. The HDD segment of the pipe will be approximately 984 feet long and installed approximately 30 feet below existing grade. The HDD alignment will be approximately 18 feet below the Crossing 3 culvert. The HDD alignment will be approximately 18 feet below the Crossing 4 culvert and 10 feet below the larger Crossing 5 culvert. The HDD alignment is approximately 70 feet away from the joint outlet location of the Crossing 4 and 5 structure.

Crossings 2 - West Antioch Creek at Fitzuren Road: At Crossing 2 the pipe alignment will go under three 60-inch by 42-inch oval corrugated metal pipes using a jack-and-bore construction method. Jack-and-bore construction involves digging a jacking pit and receiving pit on either side of the crossing. A machine in the jacking pit then pushes a 24-inch steel casing pipe horizontally through the soil while an auger removes the material inside the casing pipe. The portion of the pipe alignment installed in this manner will be 110 feet long and located 12-14 deep. The jack-and-bore method proposed at this location will not require the use of drilling fluids.

Crossing 6 - West Antioch Creek at West 10th Street: The new pipeline will cross under four 7-foot by 14-foot concrete box culverts. This crossing will utilize a jack-and-bore construction technique similar to Crossing 2. This portion of the pipe alignment will be approximately 5 feet below the existing culvert structure and approximately 215 feet long. Several other utilities including a water and sewer main have been installed in a similar fashion at this crossing and will run parallel to the proposed pipeline. The jack-and-bore method proposed at this this under crossing will not require the use of drilling fluids.

Ongoing Diversion

The City's current water supply operations cease river diversions when salinity at the intake is above the City's salinity target. The timing of this varies by water year type. With the proposed Project, the City will continue to divert water from the river for conventional treatment until salinity increases and then it will begin using the brackish desalination facility. This will enable the new intake pump station to potentially operate year-round. When the desalination facility is operating, 8 mgd will be diverted to the desalination facility and the City will have the ability to divert up to an additional 8 mgd to the conventional WWTP or municipal reservoir to be used for blending depending on demands and water quality.

The desalination facility will operate at an overall recovery rate of approximately 75 percent. Approximately 8 mgd of river water will be needed to produce 6 mgd of desalinated product water. When operated, the desalination facility will operate at its full capacity. Intermittent or partial operation of desalination facilities is typically not advised and a minimum of 2 mgd flow

Incidental Take Permit
No. 2081-2019-046-03
CITY OF ANTIOCH
BRACKISH WATER DESALINATION PROJECT

is needed for operations. Steady flow velocity through the membranes at its rated capacity prevents the buildup of precipitates on the membranes which can reduce treatment efficiency and capacity of the system. The desalination plant will be used to produce between roughly 2,600 – 5,500-acre feet per year (AF/Y) depending on water year type.

Ongoing Brine Discharge

The desalination process will generate approximately 2 mgd of brine. Brine from the desalination system will be conveyed through an approximately 4.3-mile long, 12-inch-diameter dedicated pipeline from the desalination facility to the existing WWTP. The brine disposal pipeline will be constructed of high-density polyethylene (HDPE) or polyvinyl chloride (PVC) and will connect to the WWTP effluent channel at the north end of the plant. The brine will then be mixed with treated wastewater from the WWTP prior to discharge through the existing WWTP outfall in New York Slough.

The WWTP outfall pipeline ends approximately 500 feet offshore and is at an elevation depth of 26 feet. The diffuser port diameter is approximately 42 inches, with 50 3-inch diameter ports spaced 8 feet apart in alternating directions. No construction or modifications to the WWTP outfall will be required.

Covered Species Subject to Take Authorization Provided by this ITP:

This ITP covers the following species:

Name	CESA Status
1. Longfin smelt (<i>Spirinchus thaleichthys</i>)	Threatened ³
2. Delta smelt (<i>Hypomesus transpacificus</i>)	Endangered ⁴

These species and only these species are the "Covered Species" for the purposes of this ITP.

Impacts of the Taking on Covered Species:

Project activities and their resulting impacts are expected to result in the incidental take of individuals of the Covered Species. The activities described above expected to result in incidental take of individuals of the Covered Species include coffer dam installation and dewatering, ongoing operations and maintenance of the diversion intakes and fish screens, and brine discharge at the Delta Diablo Outfall Diffuser (Covered Activities).

³See Cal. Code Regs. tit. 14 § 670.5, subd. (b)(2)(E).

⁴See *Id.*, subd. (a)(2)(O).

Incidental take of individuals of the Covered Species in the form of mortality ("kill") may occur as a result of Covered Activities such as stranding, capture, release of contaminants during construction activities, and entrainment, impingement, reduction in water quality or useable habitat from ongoing operations and maintenance of the diversion intakes and new source of brine concentration and discharge. Incidental take of individuals of the Covered Species may also occur from the Covered Activities in the form of disruption to movement and flow patterns, disruption to ecosystem processes and loss of food web resources for the Covered Species from caused by water diversion and brine discharge. The areas where authorized take of the Covered Species is expected to occur include portions of the lower San Joaquin River along the coast lines of the cities of Antioch and Pittsburg, (collectively, the Project Area; see Figure 1 and Figure 2).

The Project is expected to cause the temporary loss of 0.14 acres and permanent loss of 0.008 acres of shallow water habitat and permanent loss of 0.008 acres of floodplain mosaic habitat for the Covered Species, and ongoing take of egg and larval life stages, reduction in quality of aquatic habitat for the Covered Species. Impacts of the authorized taking also include adverse impacts to the Covered Species related to temporal losses, increased habitat fragmentation and edge effects, and the Project's incremental contribution to cumulative impacts (indirect impacts). These impacts include: increased salinity in stress resulting from noise and vibrations from boring and capture and relocation, and long-term effects due to increased pollution, displacement from preferred habitat, increased competition for food and space, and increased vulnerability to extinction and predation.

Incidental Take Authorization of Covered Species:

This ITP authorizes incidental take of the Covered Species and only the Covered Species. With respect to incidental take of the Covered Species, CDFW authorizes the Permittee, its employees, contractors, and agents to take Covered Species incidentally in carrying out the Covered Activities, subject to the limitations described in this section and the Conditions of Approval identified below. This ITP does not authorize take of Covered Species from activities outside the scope of the Covered Activities, take of Covered Species outside of the Project Area, take of Covered Species resulting from violation of this ITP, or intentional take of Covered Species except for salvage through the capture and relocation of Covered Species as authorized by this ITP.

Conditions of Approval:

Unless specified otherwise, the following measures apply to all Covered Activities within the Project Area, including areas used for barge ingress and egress, staging and parking, and noise and vibration generating activities that may/will cause take. CDFW's issuance of this ITP and Permittee's authorization to take the Covered Species are subject to Permittee's compliance with and implementation of the following Conditions of Approval:

Incidental Take Permit
No. 2081-2019-046-03
CITY OF ANTIOCH
BRACKISH WATER DESALINATION PROJECT

1. **Legal Compliance:** Permittee shall comply with all applicable federal, state, and local laws in existence on the effective date of this ITP or adopted thereafter.
2. **CEQA Compliance:** Permittee shall implement and adhere to the mitigation measures related to the Covered Species in the Biological Resources section of the Environmental Impact Report (SCH No.: 2017082044) certified by City of Antioch on January 22, 2020 as lead agency for the Project pursuant to the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.).
3. **LSA Agreement Compliance:** Permittee shall implement and adhere to the mitigation measures and conditions related to the Covered Species in the Lake and Streambed Alteration Agreement (LSAA) (Notification No. 1600-2019-0247-R3 for the Project executed by CDFW pursuant to Fish and Game Code section 1600 et seq.
4. **ITP Time Frame Compliance:** Permittee shall fully implement and adhere to the conditions of this ITP within the time frames set forth below and as set forth in the Mitigation Monitoring and Reporting Program (MMRP), which is included as Attachment 1 to this ITP.

5. General Provisions:

- 5.1 Designated Representative. Before starting Covered Activities, Permittee shall designate a representative (Designated Representative) responsible for communications with CDFW and overseeing compliance with this ITP. Permittee shall notify CDFW in writing before starting Covered Activities of the Designated Representative's name, business address, and contact information, and shall notify CDFW in writing if a substitute Designated Representative is selected or identified at any time during the term of this ITP.
- 5.2 Designated Biologist. Permittee shall submit to CDFW in writing the name, qualifications, business address, and contact information of a biological monitor (Designated Biologist) at least 30 days before starting Covered Activities. Permittee shall ensure that the Designated Biologist is knowledgeable and experienced in the biology, natural history, collecting and handling of the Covered Species. The Designated Biologist shall be responsible for monitoring Covered Activities to help minimize and fully mitigate or avoid the incidental take of individual Covered Species and to minimize disturbance of Covered Species' habitat. Permittee shall obtain CDFW approval of the Designated Biologist in writing before starting Covered Activities and shall also obtain approval in advance in writing if the Designated Biologist must be changed.
- 5.3 Designated Biologist Authority. To ensure compliance with the Conditions of Approval of this ITP, the Designated Biologist shall have authority to immediately stop any

Incidental Take Permit
No. 2081-2019-046-03
CITY OF ANTIOCH
BRACKISH WATER DESALINATION PROJECT

activity that does not comply with this ITP, and/or to order any reasonable measure to avoid the unauthorized take of an individual of the Covered Species.

- 5.4 Education Program. Permittee shall conduct an education program for all persons employed or otherwise working in the Project Area before performing any work. The program shall consist of a presentation from the Designated Biologist that includes a discussion of the biology and general behavior of the Covered Species, information about the distribution and habitat needs of the Covered Species, sensitivity of the Covered Species to human activities, its status pursuant to CESA including legal protection, recovery efforts, penalties for violations and Project-specific protective measures described in this ITP. Permittee shall provide interpretation for non-English speaking workers, and the same instruction shall be provided to any new workers before they are authorized to perform work in the Project Area. Permittee shall prepare and distribute wallet-sized cards or a fact sheet handout containing this information for workers to carry in the Project Area. Upon completion of the program, employees shall sign a form stating they attended the program and understand all protection measures. This training shall be repeated at least once annually for long-term and/or permanent employees that will be conducting work in the Project Area.
- 5.5 Construction Monitoring Notebook. The Designated Biologist shall maintain a construction-monitoring notebook on-site throughout the construction period, which shall include a copy of this ITP with attachments and a list of signatures of all personnel who have successfully completed the education program. Permittee shall ensure a copy of the construction-monitoring notebook is available for review at the Project Area upon request by CDFW.
- 5.6 Trash Abatement. Permittee shall initiate a trash abatement program before starting Covered Activities and shall continue the program for the duration of the Project. Permittee shall ensure that trash and food items are contained in animal-proof containers and removed at least once a week to avoid attracting opportunistic predators such as ravens, coyotes, and feral dogs.
- 5.7 Hazardous Waste. Permittee shall immediately stop and, pursuant to pertinent state and federal statutes and regulations, arrange for repair and clean up by qualified individuals of any fuel or hazardous waste leaks or spills at the time of occurrence, or as soon as it is safe to do so. Permittee shall exclude the storage and handling of hazardous materials from the Project Area and shall properly contain and dispose of any unused or leftover hazardous products off-site.
- 5.8 CDFW Access. Permittee shall provide CDFW staff with reasonable access to the Project and shall otherwise fully cooperate with CDFW efforts to verify compliance with or effectiveness of mitigation measures set forth in this ITP.

Incidental Take Permit
No. 2081-2019-046-03
CITY OF ANTIOCH
BRACKISH WATER DESALINATION PROJECT

- 5.9 Refuse Removal. Upon completion of Covered Activities, Permittee shall remove from the Project Area and properly dispose of all construction refuse, including, but not limited to, broken equipment parts, wrapping material, cords, cables, wire, rope, strapping, twine, buckets, metal or plastic containers, sheetpile walls, excess concrete on the riverbed that will result in more than 0.008 acres of permanent impact.
- 5.10 Conduct Project Activities and Construct Project According to Accepted Plans. Permittee and their consultants, contractors, and subcontractors shall adhere to and implement CDFW-accepted or approved plans and project designs.

6. Monitoring, Notification and Reporting Provisions:

- 6.1 Notification Before Commencement. The Designated Representative shall notify CDFW 14 calendar days before starting Covered Activities and shall document compliance with all pre-Project Conditions of Approval before starting Covered Activities.
- 6.2 Notification of Non-compliance. The Designated Representative shall immediately notify CDFW in writing if it determines that the Permittee is not in compliance with any Condition of Approval of this ITP, including but not limited to any actual or anticipated failure to implement measures within the time periods indicated in this ITP and/or the MMRP. The Designated Representative shall report any non-compliance with this ITP to CDFW within 24 hours.
- 6.3 Compliance Monitoring. The Designated Biologist shall be on-site daily when Covered Activities occur. The Designated Biologist shall conduct compliance inspections to (1) minimize incidental take of the Covered Species; (2) prevent unlawful take of species; (3) check for compliance with all measures of this ITP; (4) check all exclusion zones; (5) document and photograph site conditions and (6) ensure that signs, stakes, and fencing are intact, and that Covered Activities are only occurring in the Project Area. The Designated Representative or Designated Biologist shall prepare daily written observation and inspection records summarizing: oversight activities and compliance inspections, observations of Covered Species and their sign, survey results, and monitoring activities required by this ITP. The Designated Biologist shall conduct compliance inspections a minimum of once a day during periods of inactivity.
- 6.4 Monthly Compliance Report. The Designated Representative or Designated Biologist shall compile the observation and inspection records identified in Condition of Approval 6.3 into a Monthly Compliance Report and submit it to CDFW along with a copy of the MMRP table with notes showing the current implementation status of each mitigation measure. Monthly Compliance Reports shall be submitted to the CDFW offices listed in the Notices section of this ITP and via e-mail to CDFW's Regional Representative and Headquarters CESA Program. At the time of this ITP's approval,

Incidental Take Permit
No. 2081-2019-046-03
CITY OF ANTIOCH
BRACKISH WATER DESALINATION PROJECT

the CDFW Regional Representative is James Starr (Jim.Starr@wildlife.ca.gov) and Headquarters CESA Program email is CESA@wildlife.ca.gov. CDFW may at any time increase the timing and number of compliance inspections and reports required under this provision depending upon the results of previous compliance inspections. If CDFW determines the reporting schedule must be changed, CDFW will notify Permittee in writing of the new reporting schedule.

- 6.5 Annual Status Report. Permittee shall provide CDFW with an Annual Status Report (ASR) no later than January 31 of every year beginning with issuance of this ITP and continuing until CDFW accepts the Final Mitigation Report identified below. Each ASR shall include, at a minimum: (1) a summary of all Monthly Compliance Reports for that year identified in Condition of Approval 6.4; (2) a general description of the status of the Project Area and Covered Activities, including actual or projected completion dates, if known; (3) a copy of the table in the MMRP with notes showing the current implementation status of each mitigation measure; (4) an assessment of the effectiveness of each completed or partially completed mitigation measure in avoiding, minimizing and mitigating Project impacts; (5) all available information about Project-related incidental take of the Covered Species; (6) an accounting of the number of acres subject to both temporary and permanent disturbance, both for the prior calendar year, and a total since ITP issuance; and (7) information about other Project impacts on the Covered Species.
- 6.6 CNDDDB Observations. The Designated Biologist shall submit all observations of Covered Species to CDFW's California Natural Diversity Database (CNDDDB) within 60 calendar days of the observation and the Designated Biologist shall include copies of the submitted forms with the next Monthly Compliance Report or ASR, whichever is submitted first relative to the observation.
- 6.7 Final Mitigation Report. No later than 45 days after completion of all mitigation measures, Permittee shall provide CDFW with a Final Mitigation Report. The Designated Biologist shall prepare the Final Mitigation Report which shall include, at a minimum: (1) a summary of all Monthly Compliance Reports and all ASRs; (2) a copy of the table in the MMRP with notes showing when each of the mitigation measures was implemented; (3) all available information about Project-related incidental take of the Covered Species; (4) information about other Project impacts on the Covered Species; (5) beginning and ending dates of Covered Activities; (6) an assessment of the effectiveness of this ITP's Conditions of Approval in minimizing and fully mitigating Project impacts of the taking on Covered Species; (7) recommendations on how mitigation measures might be changed to more effectively minimize take and mitigate the impacts of future projects on the Covered Species; and (8) any other pertinent information.

- 6.8 Notification of Take or Injury. Permittee shall immediately notify the Designated Biologist if a Covered Species is taken or injured by a Project-related activity, or if a Covered Species is otherwise found dead or injured within the vicinity of the Project. The Designated Biologist or Designated Representative shall provide initial notification to CDFW by calling the Regional Office at (707) 428-2002. The initial notification to CDFW shall include information regarding the location, species, and number of animals taken or injured and the ITP Number. Following initial notification, Permittee shall send CDFW a written report within two calendar days. The report shall include the date and time of the finding or incident, location of the animal or carcass, and if possible provide a photograph, explanation as to cause of take or injury, and any other pertinent information.
- 6.9 Acceptance of Outstanding Fish Screen Design Evaluation Requirements. Prior to screen fabrication, Permittee shall submit:
- 6.9.1 Shop fabrication drawings with design details.
 - 6.9.2 Preliminary operation and maintenance plan which includes preventive and corrective maintenance procedures, inspection and reporting requirements, maintenance logs, etc.
 - 6.9.3 Post-construction evaluation and monitoring plan with allocated funds in the construction budget to make need corrections to bring the fish screen within operational compliance.
- 6.10 Annual Fish Screen Maintenance and Effectiveness Monitoring. Permittee shall submit an annual report by December 31 in each year for the term of this ITP. The report shall include all monitoring elements identified in the CDFW approved plans required under Conditions of Approval 6.9.2 and 6.9.3.

7. Take Minimization Measures:

The following requirements are intended to ensure the minimization of incidental take of Covered Species in the Project Area during Covered Activities. Permittee shall implement and adhere to the following conditions to minimize take of Covered Species:

- 7.1 Conduct Project Activities and Construct Project According to Accepted Plans. Permittee and their consultants, contractors, and subcontractors shall adhere to and implement CDFW-accepted or approved plans and project designs.
- 7.2 Maximum Diversion Rate from the San Joaquin River. Instantaneous rate of diversion from the new intakes shall not exceed 11,111 gallons per minute at any time and shall be limited to the minimum magnitude and duration to meet water demands.

Incidental Take Permit
No. 2081-2019-046-03
CITY OF ANTIOCH
BRACKISH WATER DESALINATION PROJECT

- 7.3 No Diversion without Fish Screens. Permittee shall not divert water at any time without the CDFW-approved fish screen installed and fully operational.
- 7.4 Implement Fish Screen Operations and Evaluation Plans. Permittee shall implement the operation and maintenance plan and the post-construction evaluation plan according to the plans as approved by CDFW.
- 7.5 Screen Monitoring Study Plan. By August 1, 2021, and every three years subsequently, Permittee shall submit an updated study plan to CDFW for approval. The purpose of the study plan shall be to monitor the diversion to determine its efficiency at screening screenable size fish and the potential diversion rate of all species, with an emphasis on Covered Species of fish, either adults, juveniles, and larvae at the current Permittee intake. CDFW shall provide written comments and requested changes, if any, regarding the adequacy of the submitted study plan and its elements by September 1 of each year in which an updated study plan is submitted. If CDFW has comments or requested changes, Permittee shall resubmit a revised study plan that addresses CDFW's comments and requests by October 1. This study plan must be acceptable to and must be approved by CDFW prior to November 1 of each year in which an updated study plan is submitted. Permittee shall not be in violation of this provision if CDFW does not respond in writing regarding the acceptability of the latest study plan in accordance with this schedule, provided Permittee is implementing and adhering to the latest study plan submitted to CDFW. This study shall begin by March 1 and shall continue until June 30 unless an alternative schedule is agreed to by CDFW. Permittee shall submit a summary of the results of each study to CDFW in accordance with the schedule contained within the approved study plan. Permittee shall conduct fish sampling techniques and handling procedures in a manner that minimizes mortality to the Covered Species. Permittee shall coordinate with ongoing Interagency Ecological Program (IEP) and make the Project monitoring data available to IEP upon IEP's request.
- 7.6 Altering of Screen Device. If there are any significant changes made to the fish screen device, the City of Antioch shall conduct two consecutive years of sampling data to evaluate if the proposed changes had any impact on the effectiveness of the fish screen device. This study plan shall be submitted to CDFW for our review and approval prior to implementation of the proposed monitoring. If you do not hear back from CDFW within 30 working days, you may proceed with your proposed monitoring plan as submitted.
- 7.7 Disinfect Equipment Prior to Entry into Watercourses. To prevent spread of invasive aquatics and diseases, equipment to be used in watercourses including, but not limited to, boots, waders, hand tools and nets must be decontaminated with a minimum 5 percent chlorine solution for 2 minutes prior to entry into a watercourse. In addition, if a piece of equipment has been exposed or is suspected to have been

Incidental Take Permit
No. 2081-2019-046-03
CITY OF ANTIOCH
BRACKISH WATER DESALINATION PROJECT

exposed to areas harboring New Zealand mud snails then that equipment must be dried out for two weeks, frozen for 48 hours, or placed in 55 degrees Celsius water for 5 minutes.

- 7.8 Seasonal Work Restrictions on Covered Activities. All project-related in-stream work, excluding dewatered areas, shall be limited to the period between August 1 to November 30. Use of vibratory and impact (as necessary) drivers is restricted to the period between August 1 to November 30. HDD activities shall be limited to the period between June 15 through October 15. Covered activities in dewatered areas shall be done in a manner so that any hazardous substances or equipment and loose construction materials that could be washed away in an overtopping event can be removed within a 72-hours outside of period from October 15 to May 15 period. For purposes of this measure, in-stream work does not include equipment mobilization, materials transport, and cofferdam maintenance, dewatering, discharge or leak inspection.
- 7.9 Weather Work Restriction. The Permittee shall monitor the National Weather Service (NWS) 72-hour forecast for the Project Area. If 0.10 inches or more rain is predicted in the 24-hour forecast, no ground-disturbing activities shall occur on the Project site on the day the rain is predicted to occur. Unless otherwise authorized by CDFW, no work shall occur until 24 hours after rain has ceased.
- 7.10 Time of Day Work Restriction. Permittee shall terminate all Covered Activities 30 minutes before sunset and shall not resume Covered Activities until 30 minutes after sunrise unless otherwise authorized in writing by CDFW. Permittee shall use sunrise and sunset times established by the U.S. Naval Observatory Astronomical Applications Department for the geographic area where the project is located.
- 7.11 On-Site Specialist. Permittee shall have on-site a person professionally trained in spill containment/clean up to implement spill control devices in the event a spill occurs.
- 7.12 Wet or Uncured Concrete within a non-dewatered Cofferdam. Permittee shall not allow wet or uncured concrete to enter into rivers or stream at any time. This Measure applies to "cofferdams" that have not been completely dewatered, with the exception of within the cofferdam with secondary containment casing, that fully isolates the concrete being poured from the surrounding waterway. If wet or uncured concrete is placed within non-dewatered cofferdam with secondary containment, water within the cofferdam will not be released into and/or allowed to intermingle with San Joaquin River without water quality testing to demonstrate that pH levels and dissolved oxygen concentrations are within acceptable range, consistent with background conditions (pH between 6 and 8 [pH units]; dissolved oxygen greater than 6 mg/L). If water quality within cofferdam exceeds these ranges, water will be pumped and treated and/or disposed of consistent with federal, State, and/or local regulations.

Incidental Take Permit
No. 2081-2019-046-03
CITY OF ANTIOCH
BRACKISH WATER DESALINATION PROJECT

- 7.13 Seasonal Work Period. Construction activities within a lake or stream and associated wetlands and riparian corridors shall be conducted after August 1 and before November 30. If Permittee needs more time to complete Project activities, work may be authorized outside of the work period and extended on a week-by-week basis by CDFW representative, Jim Starr, or if unavailable, through contact with the CDFW Bay Delta Regional Office by mail or phone (707) 428-2002. Authorization shall be in the form of written communication. If Permittee requests a work period variance, Permittee shall submit such a request in writing to the CDFW Bay Delta Office. The request shall: 1) describe the extent of work already completed; 2) detail the activities that remain to be completed; 3) detail the time required to complete each of the remaining activities; and 4) provide photographs of both the current work completed and the proposed site for continued work. The work period variance shall be issued at the discretion of CDFW. CDFW reserves the right to require additional measures to protect biological resources as a condition for granting the variance. CDFW shall have 10 business days to review the proposed work period variance.
- 7.14 Cofferdam Work Area. Precipitation forecasts and potential increases of river flow (i.e., San Joaquin River) shall be considered when planning construction activities within the cofferdam work area to avoid the potential for the release of materials or equipment into the river. Prior to departing the cofferdam work area each day, Contractor shall remove all non-fixed equipment and/or materials (not including pumps used for dewatering, as necessary) from the cofferdam work area and place in secured area.
- 7.15 Storm Event Inspection. After any storm event, Permittee shall inspect all sites scheduled to begin or continue construction within the next 72 hours. Corrective action for erosion and sedimentation shall be taken as needed.
- 7.16 No Equipment in Channel. With the exception of river barge, work vessels, and ancillary equipment for work in the San Joaquin River, no equipment shall be operated from within a flowing stream (including flowing or ponded water) at any time.
- 7.17 No New Project Phase without Erosion Control. No phase of the Project may be started if that phase and its associated erosion control measures cannot be completed prior to the onset of a storm event if that construction phase may cause the introduction of sediments into the stream. Erosion control measures shall be inspected frequently to minimize failure and conduct any necessary repairs. All non-structural related and non-biodegradable erosion control measures shall be removed from the Project area upon cessation of construction activities.
- 7.18 Stabilize Exposed Areas. Permittee shall stabilize all exposed/disturbed areas within the Project site to the greatest extent possible to reduce erosion potential, both during and following construction. Erosion control measures, such as, silt fences, straw hay

bales, gravel, or rock-lined ditches, water check bars, and broadcasted straw shall be used wherever silt-laden water has the potential to leave the work site and enter State waters. Erosion control measures shall be monitored during and after each storm event. Modifications, repairs, and improvements to erosion control measures shall be made whenever they are needed.

- 7.19 Staging and Storage Areas. Construction equipment, building materials, fuels, lubricants, and solvents shall not be stockpiled or stored where they may be washed into State waters or where they will cover aquatic or riparian vegetation.
- 7.20 Equipment over Drip Pans. Stationary equipment such as motors, pumps, generators, compressors and welders, located within or adjacent to the stream and riparian areas shall be positioned over drip-pans.
- 7.21 Check Equipment for Leaks. Any equipment or vehicles driven and/or operated adjacent to the stream and riparian corridor shall be checked and maintained daily to prevent leaks of materials that if introduced to water could be deleterious to aquatic life, wildlife or riparian habitat. Vehicles shall be moved away from the stream prior to refueling and lubrication.
- 7.22 Hazardous Materials. Any hazardous or toxic materials that could be deleterious to aquatic life that could be washed into State waters or their tributaries shall be contained in watertight containers or removed from the Project site.
- 7.23 Imported Materials. Permittee shall not import, take from or move any rock, gravel, and/or other materials within the San Joaquin River, its streambeds or banks except as otherwise addressed in this Permit.
- 7.24 Debris and Waste Disposal. Permittee shall not dump any litter or construction debris within the Project area. All such debris and waste shall be picked up daily and properly disposed of at an appropriate site. Upon completion of operations and/or onset of wet weather, all construction material and/or debris shall be removed from the Project work site to an area not subject to inundation. All removed vegetation and debris shall be disposed of according to State and local laws and ordinances.
- 7.25 Spoils. Permittee shall not place spoil where it could enter State waters or other sensitive habitat, such as riparian, or place over vegetation except as specifically noticed to and accepted by CDFW, in writing. Spoil shall be hauled off-site or stockpiled in an upland location where it shall be covered with plastic sheeting or visquine whenever it is evident that rainy conditions threaten to erode loose soils into sensitive habitats.

- 7.26 Vegetation Disturbance. No disturbance or removal of vegetation, other than that specified in the Project description shall occur because of Project activities. Vegetation outside the construction corridor shall not be removed or damaged without prior consultation and approval of CDFW. Vegetation may be disturbed only as specified in this measure.
- 7.27 Cofferdam Installation and Removal. The Qualified Biologist and a Fisheries Biologist approved by CDFW (can be the same person) shall direct the installation, removal and dewatering efforts of all cofferdam structures. A Fisheries Biologist is defined under this Permit as someone that has a 4-year degree in fish biology or closely related field, has at least 2-years of experience in the handling of at least one of the special-status fish species that may be on-site, is in possession of appropriate State and Federal permits to handle the Covered Species, and has been provided written authorization from CDFW to act as a Fisheries Biologist under this Permit. The cofferdam installation shall be limited to the period between August 1 and November 30. During the period of active dewatering, the CDFW-approved Fisheries Biologist shall check daily for stranded aquatic life as the water level in the dewatering area drops and until active dewatering ceases. All stranded aquatic life in the dewatered areas shall be immediately relocated to habitat outside of harm's way. Cofferdams shall remain in place and functional during Covered Activities. Cofferdams that fail for any reason shall be repaired immediately. All materials used in cofferdam construction shall be removed from the project site once the coffer dams are no longer needed.
- 7.28 Daily Cofferdam Checks. The Qualified Biologist, Fisheries Biologist, or Biological Monitor shall check daily for stranded aquatic life in the dewatered areas prior to commencement of project activities each morning. If any fish is found within the dewatered area, then the biologist or monitor shall immediately stop work until the fish can be identified to species and relocated outside of harm's way by the Fisheries Biologist. Capture methods may include fish landing nets, dip nets, buckets and by hand.
- 7.29 Cofferdams and Work Area Seepage. If the area within a cofferdam requires periodic pumping of seepage, pumping will occur under direct supervision of qualified fisheries biologist approved by CDFW. Pumps will be located on barges adjacent to the areas being dewatered. Any turbid water pumped from dewatered areas will be discharged into an area protected by a turbidity curtain to prevent suspended sediment from being transported upstream or downstream. Alternatively, Permittee may place pumps in upland flat areas, away from the stream channel. Pumps placed in uplands shall be secured by tying off to a tree or staked in place to prevent movement by vibration. Pump intakes shall be fitted with fish screens meeting CDFW criteria to prevent entrainment or impingement of fish. CDFW fish screen criteria can be found online in Appendix S of the California Salmonid Stream Habitat Restoration Manual.

Incidental Take Permit
No. 2081-2019-046-03
CITY OF ANTIOCH
BRACKISH WATER DESALINATION PROJECT

Pump intakes shall be periodically checked for impingement of fish or amphibians that shall be relocated according to the approved measures outlined for each species below. Any turbid water pumped from the work site itself to maintain it in a dewatered state shall be disposed of in an upland location where it will not drain directly into any stream channel.

- 7.30 Fish Relocation Plan. A plan to relocate fishes and other sensitive aquatic organisms from the de-watering associated with the coffer dam must be developed by the Permittee and approved in writing by CDFW prior to initiation of project activities. An electronic copy of the draft plan shall be transmitted via email to Jim.Starr@wildlife.ca.gov two weeks prior to expectation of feedback.

8. Habitat Management Land Acquisition:

CDFW has determined that permanent protection and perpetual management of compensatory habitat is necessary and required pursuant to CESA to fully mitigate Project-related impacts of the taking on the Covered Species that will result with implementation of the Covered Activities. This determination is based on factors including an assessment of the importance of the habitat in the Project Area, the extent to which the Covered Activities will impact the habitat, and CDFW's estimate of the acreage required to provide for adequate compensation.

To meet this requirement, the Permittee shall purchase 1.55 acres (0.02 acres for permanent impacts and 1.53 acres for operations) of Covered Species credits from a CDFW-approved mitigation or conservation bank and 0.02 acres of floodplain mosaic habitat credits (Condition of Approval 8.1)

Additional credits may be required if the CDFW-approved screen effectiveness monitoring do not support model results related to the "take" analysis submitted with the application for this ITP. Permittee shall provide CDFW with a copy of the credit purchase agreement for the required credits prior to commencing Covered Activities.

- 8.1 Covered Species and Habitat Credits. Permittee shall purchase 1.55 acres of Covered Species credits and 0.02 acres of floodplain mosaic habitat credits from a CDFW-approved mitigation or conservation bank prior to initiating Covered Activities, or no later than 18 months from the issuance of this ITP if Security is provided pursuant to Condition of Approval 9 below.
- 8.2 Cost Estimates. CDFW has estimated the cost of acquisition, protection, and perpetual management of the HM lands and the restoration of temporarily disturbed habitat as follows:

8.2.1 Purchase of 1.55 acres of Covered Species credits from a CDFW-approved mitigation or conservation bank calculated at \$175,000 per credit is estimated to be at **\$271,250**.

8.2.2 Purchase of 0.02 acres of floodplain mosaic credits from a CDFW-approved mitigation or conservation bank calculated at \$150,000 per credit is estimated to be at **\$3,000**.

9. Performance Security

The Permittee may proceed with Covered Activities only after the Permittee has ensured funding (Security) to complete any activity required by Condition of Approval 8 that has not been completed before Covered Activities begin. Permittee shall provide Security as follows:

- 9.1 Security Amount. The Security shall be in the amount of **\$274,250**. This amount is based on the cost estimates identified in Condition of Approval 8.2 above.
- 9.2 Security Form. The Security shall be in the form of an irrevocable letter of credit (see Attachment 3) or another form of Security approved in advance in writing by CDFW's Office of the General Counsel.
- 9.3 Security Timeline. The Security shall be provided to CDFW before Covered Activities begin or within 30 days after the effective date of this ITP, whichever occurs first.
- 9.4 Security Holder. The Security shall be held by CDFW or in a manner approved in advance in writing by CDFW.
- 9.5 Security Transmittal. If CDFW holds the Security, Permittee shall transmit it to CDFW with a completed Mitigation Payment Transmittal Form (see Attachment 4) or by way of an approved instrument such as escrow, irrevocable letter of credit, or other.
- 9.6 Security Drawing. The Security shall allow CDFW to draw on the principal sum if CDFW, in its sole discretion, determines that the Permittee has failed to comply with the Conditions of Approval of this ITP.
- 9.7 Security Release. The Security (or any portion of the Security then remaining) shall be released to the Permittee after CDFW has conducted an on-site inspection and received confirmation that all secured requirements have been satisfied, as evidenced by:
 - Written documentation of the acquisition of the HM lands;
 - Copies of all executed and recorded conservation easements;
 - Written confirmation from the approved Endowment Manager of its receipt of

Incidental Take Permit
No. 2081-2019-046-03
CITY OF ANTIOCH
BRACKISH WATER DESALINATION PROJECT

- the full Endowment; and
- Timely submission of all required reports.

Amendment:

This ITP may be amended as provided by California Code of Regulations, Title 14, section 783.6, subdivision (c), and other applicable law. This ITP may be amended without the concurrence of the Permittee as required by law, including if CDFW determines that continued implementation of the Project as authorized under this ITP would jeopardize the continued existence of the Covered Species or where Project changes or changed biological conditions necessitate an ITP amendment to ensure that all Project-related impacts of the taking to the Covered Species are minimized and fully mitigated.

Stop-Work Order:

CDFW may issue Permittee a written stop-work order requiring Permittee to suspend any Covered Activity for an initial period of up to 25 days to prevent or remedy a violation of this ITP, including but not limited to the failure to comply with reporting or monitoring obligations, or to prevent the unauthorized take of any CESA endangered, threatened, or candidate species. Permittee shall stop work immediately as directed by CDFW upon receipt of any such stop-work order. Upon written notice to Permittee, CDFW may extend any stop-work order issued to Permittee for a period not to exceed 25 additional days. Suspension and revocation of this ITP shall be governed by California Code of Regulations, Title 14, section 783.7, and any other applicable law. Neither the Designated Biologist nor CDFW shall be liable for any costs incurred in complying with stop-work orders.

Compliance with Other Laws:

This ITP sets forth CDFW's requirements for the Permittee to implement the Project pursuant to CESA. This ITP does not necessarily create an entitlement to proceed with the Project. Permittee is responsible for complying with all other applicable federal, state, and local law.

Notices:

The Permittee shall deliver a fully executed duplicate original ITP by registered first class mail or overnight delivery to the following address:

Habitat Conservation Planning Branch
California Department of Fish and Wildlife
Attention: CESA Permitting Program
Post Office Box 944209
Sacramento, CA 94244-2090

Alternatively, the Permittee shall email the digitally signed ITP to CESA@wildlife.ca.gov.

Incidental Take Permit
No. 2081-2019-046-03
CITY OF ANTIOCH
BRACKISH WATER DESALINATION PROJECT

Digital signatures shall comply with Government Code section 16.5.

Written notices, reports and other communications relating to this ITP shall be delivered to CDFW by email or registered first class mail at the following address, or at addresses CDFW may subsequently provide the Permittee. Notices, reports, and other communications shall reference the Project name, Permittee, and ITP Number (2081-2019-046-03) in a cover letter and on any other associated documents.

Original cover with attachment(s) to:

Gregg Erickson, Regional Manager
California Department of Fish and Wildlife – Bay Delta Region
2825 Cordelia Road, Suite 100
Fairfield, CA 94534

and a copy to:

Habitat Conservation Planning Branch
California Department of Fish and Wildlife
Attention: CESA Permitting Program
Post Office Box 944209
Sacramento, CA 94244-2090
CESA@wildlife.ca.gov

Unless Permittee is notified otherwise, CDFW's Regional Representative for purposes of addressing issues that arise during implementation of this ITP is:

James Starr
California Department of Fish and Wildlife – Bay Delta Region
2825 Cordelia Road, Suite 100
Fairfield, CA 94534
Telephone (209) 234-3440
Jim.Starr@wildlife.ca.gov

Compliance with CEQA:

CDFW's issuance of this ITP is subject to CEQA. CDFW is a responsible agency pursuant to CEQA with respect to this ITP because of prior environmental review of the Project by the lead agency, City of Antioch. (See generally Pub. Resources Code, §§ 21067, 21069). The lead agency's prior environmental review of the Project is set forth in the City of Antioch Brackish Water Desalination Project Environmental Impact Report (EIR), (SCH No.: 2017082044) dated June 29, 2018 that the City of Antioch certified for City of Antioch Brackish Water Desalination Project on October 23, 2018. At the time the lead agency

Incidental Take Permit
No. 2081-2019-046-03
CITY OF ANTIOCH
BRACKISH WATER DESALINATION PROJECT

certified the EIR and approved the Project it also adopted various mitigation measures for the Covered Species as conditions of Project approval.

This ITP, along with CDFW's related CEQA findings, which are available as a separate document, provide evidence of CDFW's consideration of the lead agency's EIR for the Project and the environmental effects related to issuance of this ITP [CEQA Guidelines, § 15096, subd. (f)]. CDFW finds that issuance of this ITP will not result in any previously undisclosed potentially significant effects on the environment or a substantial increase in the severity of any potentially significant environmental effects previously disclosed by the lead agency. Furthermore, to the extent the potential for such effects exists, CDFW finds adherence to and implementation of the Conditions of Project Approval adopted by the lead agency, and that adherence to and implementation of the Conditions of Approval imposed by CDFW through the issuance of this ITP, will avoid or reduce to below a level of significance any such potential effects. CDFW consequently finds that issuance of this ITP will not result in any significant, adverse impacts on the environment.

Findings Pursuant to CESA:

These findings are intended to document CDFW's compliance with the specific findings requirements set forth in CESA and related regulations. [Fish and Game Code § 2081, subs. (b)-(c); Cal. Code Regs., tit. 14, §§ 783.4, subds, (a)-(b), 783.5, subd. (c)(2)].

CDFW finds based on substantial evidence in the ITP application, City of Antioch Brackish Water Desalination Project Environmental Impact Report, and the administrative record of proceedings, that issuance of this ITP complies and is consistent with the criteria governing the issuance of ITPs pursuant to CESA:

- (1) Take of Covered Species as defined in this ITP will be incidental to the otherwise lawful activities covered under this ITP;
- (2) Impacts of the taking on Covered Species will be minimized and fully mitigated through the implementation of measures required by this ITP and as described in the MMRP. Measures include: (1) permanent habitat protection; (2) establishment of avoidance zones; (3) worker education; and (4) Monthly Compliance Reports. CDFW evaluated factors including an assessment of the importance of the habitat in the Project Area, the extent to which the Covered Activities will impact the habitat, and CDFW's estimate of the acreage required to provide for adequate compensation. Based on this evaluation, CDFW determined that the protection and management in perpetuity of 1.55 acres of compensatory habitat that is contiguous with other protected Covered Species habitat and/or is of higher quality than the habitat being destroyed by the Project, along with the minimization, monitoring, reporting, and funding requirements of this ITP minimizes and fully mitigates the impacts of the taking caused by the Project;

Incidental Take Permit
No. 2081-2019-046-03
CITY OF ANTIOCH
BRACKISH WATER DESALINATION PROJECT

- (3) The take avoidance and mitigation measures required pursuant to the conditions of this ITP and its attachments are roughly proportional in extent to the impacts of the taking authorized by this ITP;
- (4) The measures required by this ITP maintain Permittee's objectives to the greatest extent possible;
- (5) All required measures are capable of successful implementation;
- (6) This ITP is consistent with any regulations adopted pursuant to Fish and Game Code sections 2112 and 2114;
- (7) Permittee has ensured adequate funding to implement the measures required by this ITP as well as for monitoring compliance with, and the effectiveness of, those measures for the Project; and
- (8) Issuance of this ITP will not jeopardize the continued existence of the Covered Species based on the best scientific and other information reasonably available, and this finding includes consideration of the species' capability to survive and reproduce, and any adverse impacts of the taking on those abilities in light of (1) known population trends; (2) known threats to the species; and (3) reasonably foreseeable impacts on the species from other related projects and activities. Moreover, CDFW's finding is based, in part, on CDFW's express authority to amend the terms and conditions of this ITP without concurrence of the Permittee as necessary to avoid jeopardy and as required by law.

Attachments:

FIGURE 1	Figure 1-1, Action Area, Antioch Brackish Water Desalination Project Biological Assessment, EFH Assessment, and ITP Application, Environmental Science Associates, September 2019
FIGURE 2	Figure 3-4a, River Intake Pump Station, Antioch Brackish Water Desalination Project Biological Assessment, EFH Assessment, and ITP Application, Environmental Science Associates, September 2019
ATTACHMENT 1	Mitigation Monitoring and Reporting Program
ATTACHMENT 2A, 2B	Habitat Management Lands Checklist; Proposed Lands for Acquisition Form
ATTACHMENT 3	Letter of Credit Form
ATTACHMENT 4	Mitigation Payment Transmittal Form

Incidental Take Permit
No. 2081-2019-046-03
CITY OF ANTIOCH
BRACKISH WATER DESALINATION PROJECT

ISSUED BY THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

on 7/20/2020.

DocuSigned by:

Gregg Erickson

BE74D4C93C804EA...

Gregg Erickson, Regional Manager
Bay Delta Region

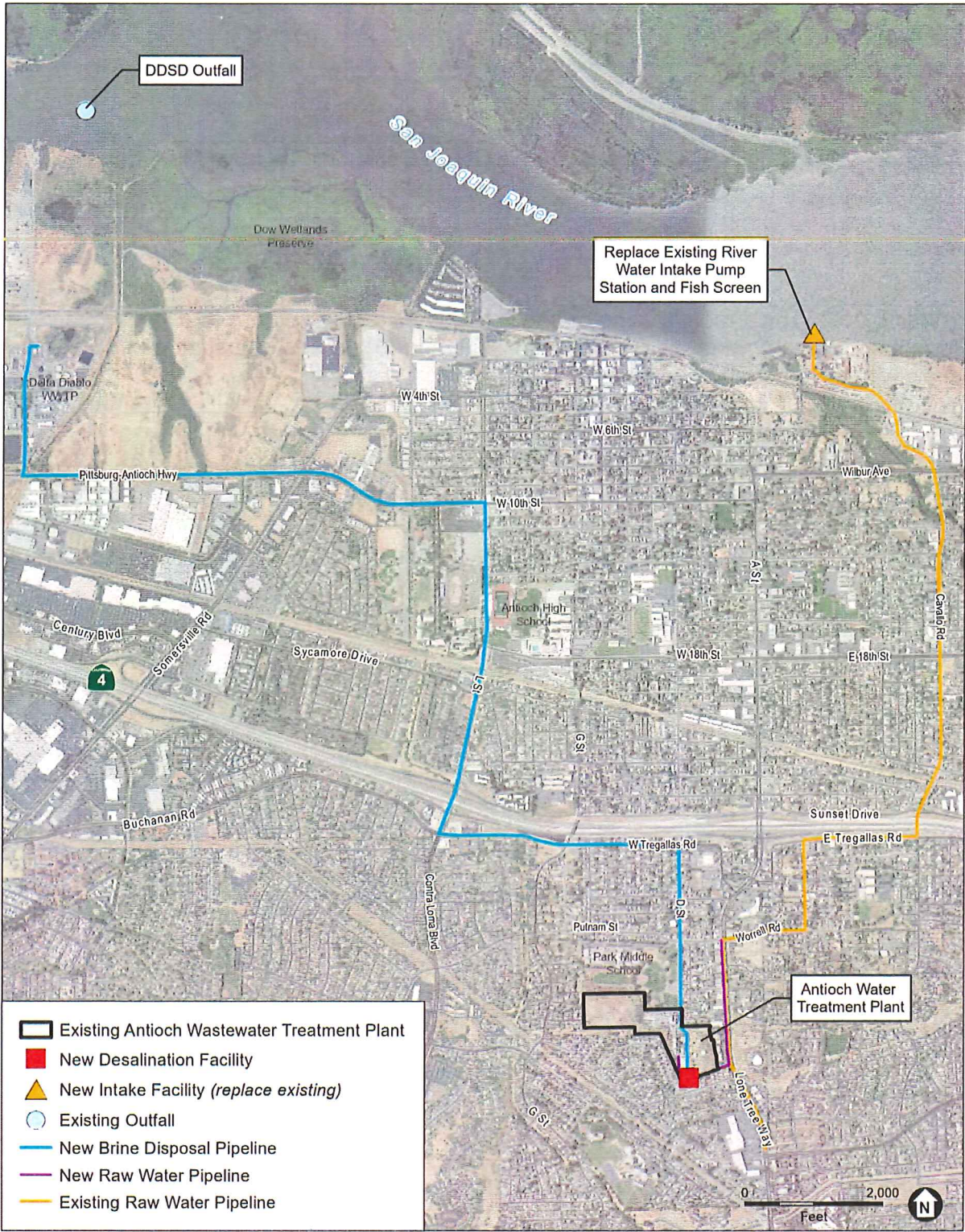
ACKNOWLEDGMENT

The undersigned: (1) warrants that he or she is acting as a duly authorized representative of the Permittee, (2) acknowledges receipt of this ITP, and (3) agrees on behalf of the Permittee to comply with all terms and conditions.

By: _____ Date: _____

Printed Name: Scott Buenting Title: _____

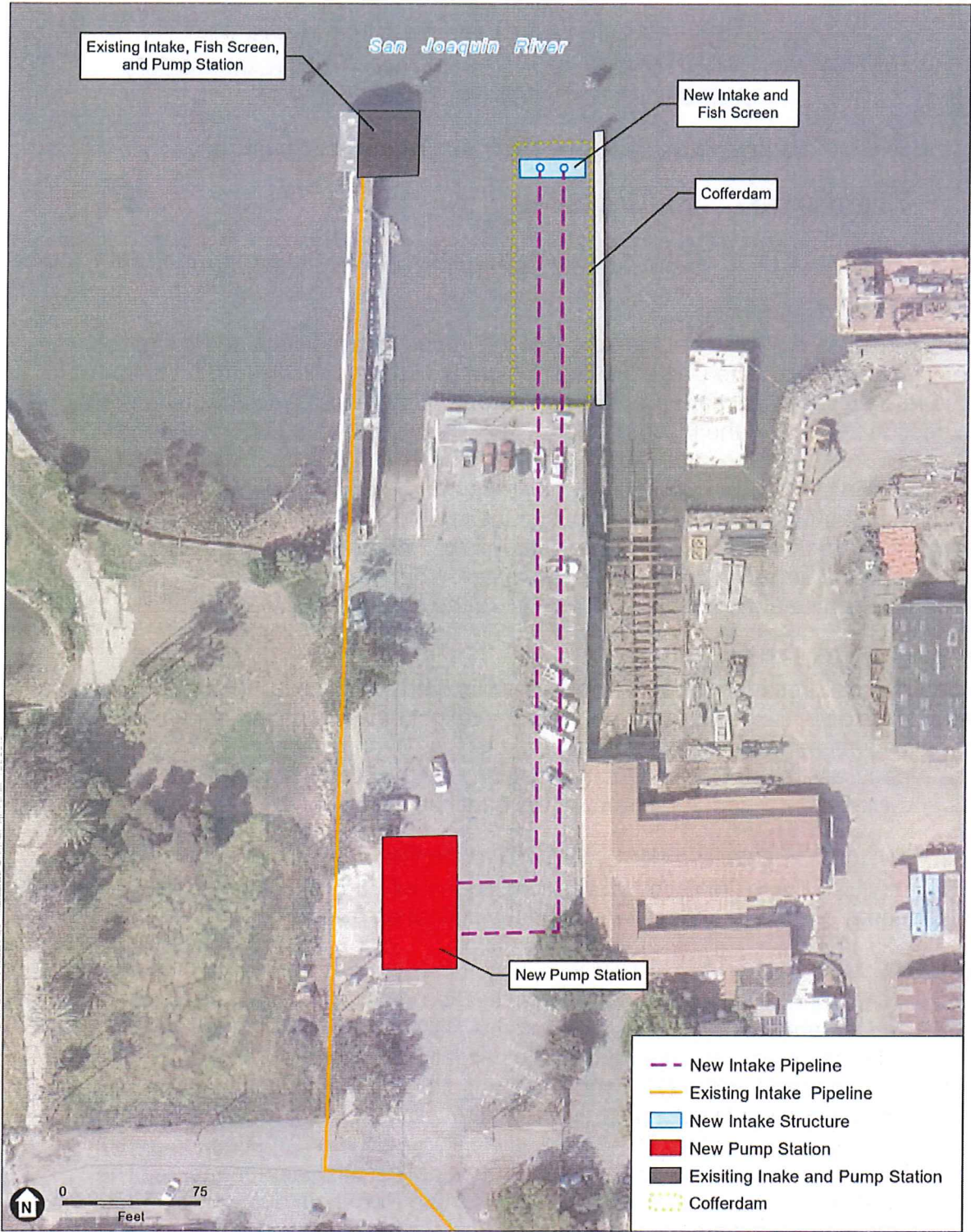
Incidental Take Permit
No. 2081-2019-046-03
CITY OF ANTIOCH
BRACKISH WATER DESALINATION PROJECT



SOURCE: USDA, 2018; ESRI, 2012; City of Antioch, 2019; Corollo, 2109; ESA, 2019

City of Antioch Desalination Project

Figure 1-1
Action Area



SOURCE: Sacramento County, 2018; ESRI, 2012; City of Antioch, 2019; Corollo, 2109; ESA, 2019

City of Antioch Desalination Project

Figure 3-4a
River Intake Pump Station

Attachment 1

**CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
MITIGATION MONITORING AND REPORTING PROGRAM (MMRP)
CALIFORNIA ENDANGERED SPECIES ACT**

INCIDENTAL TAKE PERMIT NO. 2081-2019-046-03

PERMITTEE: City of Antioch

PROJECT: City of Antioch Brackish Water Desalination Plant Project

PURPOSE OF THE MMRP

The purpose of the MMRP is to ensure that the impact minimization and mitigation measures required by the California Department of Fish and Wildlife (CDFW) for the above-referenced Project are properly implemented, and thereby to ensure compliance with section 2081(b) of the Fish and Game Code and section 21081.6 of the Public Resources Code. A table summarizing the mitigation measures required by CDFW is attached. This table is a tool for use in monitoring and reporting on implementation of mitigation measures, but the descriptions in the table do not supersede the mitigation measures set forth in the California Incidental Take Permit (ITP) and in attachments to the ITP, and the omission of a permit requirement from the attached table does not relieve the Permittee of the obligation to ensure the requirement is performed.

OBLIGATIONS OF PERMITTEE

Mitigation measures must be implemented within the time periods indicated in the table that appears below. Permittee has the primary responsibility for monitoring compliance with all mitigation measures and for reporting to CDFW on the progress in implementing those measures. These monitoring and reporting requirements are set forth in the ITP itself and are summarized at the front of the attached table.

VERIFICATION OF COMPLIANCE, EFFECTIVENESS

CDFW may, at its sole discretion, verify compliance with any mitigation measure or independently assess the effectiveness of any mitigation measure.

TABLE OF MITIGATION MEASURES

The following items are identified for each mitigation measure: Mitigation Measure, Source, Implementation Schedule, Responsible Party, and Status/Date/Initials. The Mitigation Measure column summarizes the mitigation requirements of the ITP. The Source column identifies the ITP condition that sets forth the mitigation measure. The Implementation Schedule column shows the date or phase when each mitigation measure will be implemented. The Responsible Party column identifies the person or agency that is primarily responsible for implementing the mitigation measure. The Status/Date/Initials column shall be completed by the Permittee during preparation of each Status Report and the Final Mitigation Report, and must identify the implementation status of each mitigation measure, the date that status was determined, and the initials of the person determining the status.

Mitigation Measure		Source	Implementation Schedule	Responsible Party	Status / Date / Initials
BEFORE DISTURBING SOIL OR VEGETATION					
1	Designated Representative. Before starting Covered Activities, Permittee shall designate a representative (Designated Representative) responsible for communications with CDFW and overseeing compliance with this ITP. Permittee shall notify CDFW in writing before starting Covered Activities of the Designated Representative's name, business address, and contact information, and shall notify CDFW in writing if a substitute Designated Representative is selected or identified at any time during the term of this ITP.	ITP Condition # 5.1	Before commencing ground- or vegetation-disturbing activities/ Entire Project	Permittee	
2	Designated Biologist. Permittee shall submit to CDFW in writing the name, qualifications, business address, and contact information of a biological monitor (Designated Biologist) at least 30 days before starting Covered Activities. Permittee shall ensure that the Designated Biologist is knowledgeable and experienced in the biology, natural history, collecting and handling of the Covered Species. The Designated Biologist shall be responsible for monitoring Covered Activities to help minimize and fully mitigate or avoid the incidental take of individual Covered Species and to minimize disturbance of Covered Species' habitat. Permittee shall obtain CDFW approval of the Designated Biologist in writing before starting Covered Activities and shall also obtain approval in advance in writing if the Designated Biologist must be changed.	ITP Condition # 5.2	Before commencing ground- or vegetation-disturbing activities	Permittee	
3	Education Program. Permittee shall conduct an education program for all persons employed or otherwise working in the Project Area before performing any work. The program shall consist of a presentation from the Designated Biologist that includes a discussion of the biology and general behavior of the Covered Species, information about the distribution and habitat needs of the Covered Species, sensitivity of the Covered Species to human activities, its status pursuant to CESA including legal protection, recovery efforts, penalties for violations and Project-specific protective measures described in this ITP. Permittee shall provide interpretation for non-English speaking workers, and the same instruction shall be provided to any new workers before they are authorized to perform work in the Project Area. Permittee shall prepare and distribute wallet-sized cards or a fact sheet handout containing this information for workers to carry in the Project Area. Upon completion of the program, employees shall sign a form stating they attended the program and understand all protection measures. This training shall be repeated at least once annually for long-term and/or permanent employees that will be conducting work in the Project Area.	ITP Condition # 5.4	Before commencing ground- or vegetation-disturbing activities/ Entire Project	Permittee	
4	Trash Abatement. Permittee shall initiate a trash abatement program before starting Covered Activities and shall continue the program for the duration of the Project. Permittee shall ensure that trash and food items are contained in animal-proof containers and removed at least once a week to avoid attracting opportunistic predators such as ravens, coyotes, and feral dogs.	ITP Condition # 5.6	Before commencing ground- or vegetation-disturbing activities/ Entire Project	Permittee	
5	Notification Before Commencement. The Designated Representative shall notify CDFW 14 calendar days before starting Covered Activities and shall document compliance with all pre-Project Conditions of Approval before starting Covered Activities.	ITP Condition # 6.1	Before commencing ground- or vegetation-disturbing activities/ Entire Project	Permittee	
6	Fish Relocation Plan. A plan to relocate fishes and other sensitive aquatic organisms from the de-watering associated with the coffer dam must be developed by the Permittee and approved in writing by CDFW prior to initiation of project activities. An electronic copy of the draft plan shall be transmitted via email to Jim.Starr@wildlife.ca.gov two weeks prior to expectation of feedback.	ITP Condition # 7.30	Before commencing ground- or vegetation-disturbing activities/ Entire Project	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
7	<p>CDFW has determined that permanent protection and perpetual management of compensatory habitat is necessary and required pursuant to CESA to fully mitigate Project-related impacts of the taking on the Covered Species that will result with implementation of the Covered Activities. This determination is based on factors including an assessment of the importance of the habitat in the Project Area, the extent to which the Covered Activities will impact the habitat, and CDFW's estimate of the acreage required to provide for adequate compensation.</p> <p>To meet this requirement, the Permittee shall purchase 1.55 acres (0.02 acres for permanent impacts and 1.53 acres for operations) of Covered Species credits from a CDFW-approved mitigation or conservation bank and 0.02 acres of floodplain mosaic habitat credits (Condition of Approval 8.1)</p> <p>Additional credits may be required if the CDFW-approved screen effectiveness monitoring do not support model results related to the "take" analysis submitted with the application for this ITP. Permittee shall provide CDFW with a copy of the credit purchase agreement for the required credits prior to commencing Covered Activities.</p>	ITP Condition # 8	Before commencing ground- or vegetation-disturbing activities (or within 18 months of issuance of the ITP if Security is provided)	Permittee	
8	<p>Covered Species and Habitat Credits. Permittee shall purchase 1.55 acres of Covered Species credits and 0.02 acres of floodplain mosaic habitat credits from a CDFW-approved mitigation or conservation bank prior to initiating Covered Activities, or no later than 18 months from the issuance of this ITP if Security is provided pursuant to Condition of Approval 9 below.</p>	ITP Condition # 8.1	Before commencing ground- or vegetation-disturbing activities (or within 18 months of issuance of the ITP if Security is provided)	Permittee	
9	<p>Cost Estimates. CDFW has estimated the cost of acquisition, protection, and perpetual management of the HM lands and the restoration of temporarily disturbed habitat as follows:</p>	ITP Condition # 8.2	Before commencing ground- or vegetation-disturbing activities (or within 18 months of issuance of the ITP if Security is provided)	Permittee	
10	<p>Purchase of 1.55 acres of Covered Species credits from a CDFW-approved mitigation or conservation bank calculated at \$175,000 per credit is estimated to be at \$271,250.</p>	ITP Condition # 8.2.1	Before commencing ground- or vegetation-disturbing activities (or within 18 months of issuance of the ITP if Security is provided)	Permittee	
11	<p>Purchase of 0.02 acres of floodplain mosaic credits from a CDFW-approved mitigation or conservation bank calculated at \$150,000 per credit is estimated to be at \$3,000.</p>	ITP Condition # 8.2.2	Before commencing ground- or vegetation-disturbing activities (or within 18 months of issuance of the ITP if Security is provided)	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
12	<p>Performance Security. The Permittee may proceed with Covered Activities only after the Permittee has ensured funding (Security) to complete any activity required by Condition of Approval 8 that has not been completed before Covered Activities begin. Permittee shall provide Security as follows:</p> <p>Security Amount. The Security shall be in the amount of \$274,250. This amount is based on the cost estimates identified in Condition of Approval 8.2 above.</p> <p>Security Form. The Security shall be in the form of an irrevocable letter of credit (see Attachment 3) or another form of Security approved in advance in writing by CDFW's Office of the General Counsel.</p> <p>Security Timeline. The Security shall be provided to CDFW before Covered Activities begin or within 30 days after the effective date of this ITP, whichever occurs first.</p> <p>Security Holder. The Security shall be held by CDFW or in a manner approved in advance in writing by CDFW.</p> <p>Security Transmittal. If CDFW holds the Security, Permittee shall transmit it to CDFW with a completed Mitigation Payment Transmittal Form (see Attachment 4) or by way of an approved instrument such as escrow, irrevocable letter of credit, or other.</p> <p>Security Drawing. The Security shall allow CDFW to draw on the principal sum if CDFW, in its sole discretion, determines that the Permittee has failed to comply with the Conditions of Approval of this ITP.</p> <p>Security Release. The Security (or any portion of the Security then remaining) shall be released to the Permittee after CDFW has conducted an on-site inspection and received confirmation that all secured requirements have been satisfied, as evidenced by:</p> <ul style="list-style-type: none"> • Written documentation of the acquisition of the HM lands; • Copies of all executed and recorded conservation easements; • Written confirmation from the approved Endowment Manager of its receipt of the full Endowment; and <p>Timely submission of all required reports.</p>	ITP Condition # 9	Before commencing ground- or vegetation-disturbing activities (or within 18 months of issuance of the ITP if Security is provided)	Permittee	
DURING CONSTRUCTION					
13	Designated Biologist Authority. To ensure compliance with the Conditions of Approval of this ITP, the Designated Biologist shall have authority to immediately stop any activity that does not comply with this ITP, and/or to order any reasonable measure to avoid the unauthorized take of an individual of the Covered Species.	ITP Condition # 5.3	Entire Project	Permittee	
14	Construction Monitoring Notebook. The Designated Biologist shall maintain a construction-monitoring notebook on-site throughout the construction period, which shall include a copy of this ITP with attachments and a list of signatures of all personnel who have successfully completed the education program. Permittee shall ensure a copy of the construction-monitoring notebook is available for review at the Project Area upon request by CDFW.	ITP Condition # 5.5	Entire Project	Permittee	
15	Hazardous Waste. Permittee shall immediately stop and, pursuant to pertinent state and federal statutes and regulations, arrange for repair and clean up by qualified individuals of any fuel or hazardous waste leaks or spills at the time of occurrence, or as soon as it is safe to do so. Permittee shall exclude the storage and handling of hazardous materials from the Project Area and shall properly contain and dispose of any unused or leftover hazardous products off-site.	ITP Condition # 5.7	Entire Project	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
16	<u>CDFW Access.</u> Permittee shall provide CDFW staff with reasonable access to the Project and shall otherwise fully cooperate with CDFW efforts to verify compliance with or effectiveness of mitigation measures set forth in this ITP.	ITP Condition # 5.8	Entire Project	Permittee	
17	<u>Refuse Removal.</u> Upon completion of Covered Activities, Permittee shall remove from the Project Area and properly dispose of all construction refuse, including, but not limited to, broken equipment parts, wrapping material, cords, cables, wire, rope, strapping, twine, buckets, metal or plastic containers, sheetpile walls, excess concrete on the riverbed that will result in more than 0.008 acres of permanent impact.	ITP Condition # 5.9	Entire Project	Permittee	
18	<u>Conduct Project Activities and Construct Project According to Accepted Plans.</u> Permittee and their consultants, contractors, and subcontractors shall adhere to and implement CDFW-accepted or approved plans and project designs.	ITP Condition # 5.10	Entire Project	Permittee	
19	<u>Notification of Non-compliance.</u> The Designated Representative shall immediately notify CDFW in writing if it determines that the Permittee is not in compliance with any Condition of Approval of this ITP, including but not limited to any actual or anticipated failure to implement measures within the time periods indicated in this ITP and/or the MMRP. The Designated Representative shall report any non-compliance with this ITP to CDFW within 24 hours.	ITP Condition # 6.2	Entire Project	Permittee	
20	<u>Compliance Monitoring.</u> The Designated Biologist shall be on-site daily when Covered Activities occur. The Designated Biologist shall conduct compliance inspections to (1) minimize incidental take of the Covered Species; (2) prevent unlawful take of species; (3) check for compliance with all measures of this ITP; (4) check all exclusion zones; (5) document and photograph site conditions and (6) ensure that signs, stakes, and fencing are intact, and that Covered Activities are only occurring in the Project Area. The Designated Representative or Designated Biologist shall prepare daily written observation and inspection records summarizing: oversight activities and compliance inspections, observations of Covered Species and their sign, survey results, and monitoring activities required by this ITP. The Designated Biologist shall conduct compliance inspections a minimum of once a day during periods of inactivity.	ITP Condition # 6.3	Entire Project	Permittee	
21	<u>Monthly Compliance Report.</u> The Designated Representative or Designated Biologist shall compile the observation and inspection records identified in Condition of Approval 6.3 into a Monthly Compliance Report and submit it to CDFW along with a copy of the MMRP table with notes showing the current implementation status of each mitigation measure. Monthly Compliance Reports shall be submitted to the CDFW offices listed in the Notices section of this ITP and via e-mail to CDFW's Regional Representative and Headquarters CESA Program. At the time of this ITP's approval, the CDFW Regional Representative is James Starr (Jim.Starr@wildlife.ca.gov) and Headquarters CESA Program email is CESA@wildlife.ca.gov . CDFW may at any time increase the timing and number of compliance inspections and reports required under this provision depending upon the results of previous compliance inspections. If CDFW determines the reporting schedule must be changed, CDFW will notify Permittee in writing of the new reporting schedule.	ITP Condition # 6.4	Monthly Until Project Construction Completed	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
22	Annual Status Report. Permittee shall provide CDFW with an Annual Status Report (ASR) no later than January 31 of every year beginning with issuance of this ITP and continuing until CDFW accepts the Final Mitigation Report identified below. Each ASR shall include, at a minimum: (1) a summary of all Monthly Compliance Reports for that year identified in Condition of Approval 6.4; (2) a general description of the status of the Project Area and Covered Activities, including actual or projected completion dates, if known; (3) a copy of the table in the MMRP with notes showing the current implementation status of each mitigation measure; (4) an assessment of the effectiveness of each completed or partially completed mitigation measure in avoiding, minimizing and mitigating Project impacts; (5) all available information about Project-related incidental take of the Covered Species; (6) an accounting of the number of acres subject to both temporary and permanent disturbance, both for the prior calendar year, and a total since ITP issuance; and (7) information about other Project impacts on the Covered Species.	ITP Condition # 6.5	Annually Until Project Construction Completed	Permittee	
23	Acceptance of Outstanding Fish Screen Design Evaluation Requirements. Prior to screen fabrication, Permittee shall submit: Shop fabrication drawings with design details. Preliminary operation and maintenance plan which includes preventive and corrective maintenance procedures, inspection and reporting requirements, maintenance logs, etc. Post-construction evaluation and monitoring plan with allocated funds in the construction budget to make need corrections to bring the fish screen within operational compliance.	ITP Condition # 6.9	Prior to Fish Screen Fabrication	Permittee	
24	Annual Fish Screen Maintenance and Effectiveness Monitoring. Permittee shall submit an annual report by December 31 in each year for the term of this ITP. The report shall include all monitoring elements identified in the CDFW approved plans required under Conditions of Approval 6.9.2 and 6.9.3.	ITP Condition # 6.10	Annually	Permittee	
25	Conduct Project Activities and Construct Project According to Accepted Plans. Permittee and their consultants, contractors, and subcontractors shall adhere to and implement CDFW-accepted or approved plans and project designs.	ITP Condition # 7.1	Entire Project	Permittee	
26	Maximum Diversion Rate from the San Joaquin River. Instantaneous rate of diversion from the new intakes shall not exceed 11,111 gallons per minute at any time and shall be limited to the minimum magnitude and duration to meet water demands.	ITP Condition # 7.2	Entire Project	Permittee	
27	No Diversion without Fish Screens. Permittee shall not divert water at any time without the CDFW-approved fish screen installed and fully operational.	ITP Condition # 7.3	Entire Project	Permittee	
28	Implement Fish Screen Operations and Evaluation Plans. Permittee shall implement the operation and maintenance plan and the post-construction evaluation plan according to the plans as approved by CDFW.	ITP Condition # 7.4	Entire Project	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
29	Screen Monitoring Study Plan. By August 1, 2021, and every three years subsequently, Permittee shall submit an updated study plan to CDFW for approval. The purpose of the study plan shall be to monitor the diversion to determine its efficiency at screening screenable size fish and the potential diversion rate of all species, with an emphasis on Covered Species of fish, either adults, juveniles, and larvae at the current Permittee intake. CDFW shall provide written comments and requested changes, if any, regarding the adequacy of the submitted study plan and its elements by September 1 of each year in which an updated study plan is submitted. If CDFW has comments or requested changes, Permittee shall resubmit a revised study plan that addresses CDFW's comments and requests by October 1. This study plan must be acceptable to and must be approved by CDFW prior to November 1 of each year in which an updated study plan is submitted. Permittee shall not be in violation of this provision if CDFW does not respond in writing regarding the acceptability of the latest study plan in accordance with this schedule, provided Permittee is implementing and adhering to the latest study plan submitted to CDFW. This study shall begin by March 1 and shall continue until June 30 unless an alternative schedule is agreed to by CDFW. Permittee shall submit a summary of the results of each study to CDFW in accordance with the schedule contained within the approved study plan. Permittee shall conduct fish sampling techniques and handling procedures in a manner that minimizes mortality to the Covered Species. Permittee shall coordinate with ongoing Interagency Ecological Program (IEP) and make the Project monitoring data available to IEP upon IEP's request.	ITP Condition # 7.5	By August 1, 2021 and Every Three Years Thereafter	Permittee	
30	Altering of Screen Device. If there are any significant changes made to the fish screen device, the City of Antioch shall conduct two consecutive years of sampling data to evaluate if the proposed changes had any impact on the effectiveness of the fish screen device. This study plan shall be submitted to CDFW for our review and approval prior to implementation of the proposed monitoring. If you do not hear back from CDFW within 30 working days, you may proceed with your proposed monitoring plan as submitted.	ITP Condition # 7.6	Entire Project	Permittee	
31	Disinfect Equipment Prior to Entry into Watercourses. To prevent spread of invasive aquatics and diseases, equipment to be used in watercourses including, but not limited to, boots, waders, hand tools and nets must be decontaminated with a minimum 5 percent chlorine solution for 2 minutes prior to entry into a watercourse. In addition, if a piece of equipment has been exposed or is suspected to have been exposed to areas harboring New Zealand mud snails then that equipment must be dried out for two weeks, frozen for 48 hours, or placed in 55 degrees Celsius water for 5 minutes.	ITP Condition # 7.7	Entire Project	Permittee	
32	Seasonal Work Restrictions on Covered Activities. All project-related in-stream work, excluding dewatered areas, shall be limited to the period between August 1 to November 30. Use of vibratory and impact (as necessary) drivers is restricted to the period between August 1 to November 30. HDD activities shall be limited to the period between June 15 through October 15. Covered activities in dewatered areas shall be done in a manner so that any hazardous substances or equipment and loose construction materials that could be washed away in an overtopping event can be removed within a 72-hours outside of period from October 15 to May 15 period. For purposes of this measure, in-stream work does not include equipment mobilization, materials transport, and cofferdam maintenance, dewatering, discharge or leak inspection.	ITP Condition # 7.8	Entire Project	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
33	<u>Weather Work Restriction.</u> The Permittee shall monitor the National Weather Service (NWS) 72-hour forecast for the Project Area. If 0.10 inches or more rain is predicted in the 24-hour forecast, no ground-disturbing activities shall occur on the Project site on the day the rain is predicted to occur. Unless otherwise authorized by CDFW, no work shall occur until 24 hours after rain has ceased.	ITP Condition # 7.9	Entire Project	Permittee	
34	<u>Time of Day Work Restriction.</u> Permittee shall terminate all Covered Activities 30 minutes before sunset and shall not resume Covered Activities until 30 minutes after sunrise unless otherwise authorized in writing by CDFW. Permittee shall use sunrise and sunset times established by the U.S. Naval Observatory Astronomical Applications Department for the geographic area where the project is located.	ITP Condition # 7.10	Entire Project	Permittee	
35	<u>On-Site Specialist.</u> Permittee shall have on-site a person professionally trained in spill containment/clean up to implement spill control devices in the event a spill occurs.	ITP Condition # 7.11	Entire Project	Permittee	
36	<u>Wet or Uncured Concrete within a non-dewatered Cofferdam.</u> Permittee shall not allow wet or uncured concrete to enter into rivers or stream at any time. This Measure applies to "cofferdams" that have not been completely dewatered, with the exception of within the cofferdam with secondary containment casing, that fully isolates the concrete being poured from the surrounding waterway. If wet or uncured concrete is placed within non-dewatered cofferdam with secondary containment, water within the cofferdam will not be released into and/or allowed to intermingle with San Joaquin River without water quality testing to demonstrate that pH levels and dissolved oxygen concentrations are within acceptable range, consistent with background conditions (pH between 6 and 8 [pH units]; dissolved oxygen greater than 6 mg/L). If water quality within cofferdam exceeds these ranges, water will be pumped and treated and/or disposed of consistent with federal, State, and/or local regulations.	ITP Condition # 7.12	Entire Project	Permittee	
37	<u>Seasonal Work Period.</u> Construction activities within a lake or stream and associated wetlands and riparian corridors shall be conducted after August 1 and before November 30. If Permittee needs more time to complete Project activities, work may be authorized outside of the work period and extended on a week-by-week basis by CDFW representative, Jim Starr, or if unavailable, through contact with the CDFW Bay Delta Regional Office by mail or phone (707) 428-2002. Authorization shall be in the form of written communication. If Permittee requests a work period variance, Permittee shall submit such a request in writing to the CDFW Bay Delta Office. The request shall: 1) describe the extent of work already completed; 2) detail the activities that remain to be completed; 3) detail the time required to complete each of the remaining activities; and 4) provide photographs of both the current work completed and the proposed site for continued work. The work period variance shall be issued at the discretion of CDFW. CDFW reserves the right to require additional measures to protect biological resources as a condition for granting the variance. CDFW shall have 10 business days to review the proposed work period variance.	ITP Condition # 7.13	Entire Project	Permittee	
38	<u>Cofferdam Work Area.</u> Precipitation forecasts and potential increases of river flow (i.e., San Joaquin River) shall be considered when planning construction activities within the cofferdam work area to avoid the potential for the release of materials or equipment into the river. Prior to departing the cofferdam work area each day, Contractor shall remove all non-fixed equipment and/or materials (not including pumps used for dewatering, as necessary) from the cofferdam work area and place in secured area.	ITP Condition # 7.14	Entire Project	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
39	Storm Event Inspection. After any storm event, Permittee shall inspect all sites scheduled to begin or continue construction within the next 72 hours. Corrective action for erosion and sedimentation shall be taken as needed.	ITP Condition # 7.15	Entire Project	Permittee	
40	No Equipment in Channel. With the exception of river barge, work vessels, and ancillary equipment for work in the San Joaquin River, no equipment shall be operated from within a flowing stream (including flowing or ponded water) at any time.	ITP Condition # 7.16	Entire Project	Permittee	
41	No New Project Phase without Erosion Control. No phase of the Project may be started if that phase and its associated erosion control measures cannot be completed prior to the onset of a storm event if that construction phase may cause the introduction of sediments into the stream. Erosion control measures shall be inspected frequently to minimize failure and conduct any necessary repairs. All non-structural related and non-biodegradable erosion control measures shall be removed from the Project area upon cessation of construction activities.	ITP Condition # 7.17	Entire Project	Permittee	
42	Stabilize Exposed Areas. Permittee shall stabilize all exposed/disturbed areas within the Project site to the greatest extent possible to reduce erosion potential, both during and following construction. Erosion control measures, such as: silt fences, straw hay bales, gravel, or rock-lined ditches, water check bars, and broadcasted straw shall be used wherever silt-laden water has the potential to leave the work site and enter State waters. Erosion control measures shall be monitored during and after each storm event. Modifications, repairs, and improvements to erosion control measures shall be made whenever they are needed.	ITP Condition # 7.18	Entire Project	Permittee	
43	Staging and Storage Areas. Construction equipment, building materials, fuels, lubricants, and solvents shall not be stockpiled or stored where they may be washed into State waters or where they will cover aquatic or riparian vegetation.	ITP Condition # 7.19	Entire Project	Permittee	
44	Equipment over Drip Pans. Stationary equipment such as motors, pumps, generators, compressors and welders, located within or adjacent to the stream and riparian areas shall be positioned over drip-pans.	ITP Condition # 7.20	Entire Project	Permittee	
45	Check Equipment for Leaks. Any equipment or vehicles driven and/or operated adjacent to the stream and riparian corridor shall be checked and maintained daily to prevent leaks of materials that if introduced to water could be deleterious to aquatic life, wildlife or riparian habitat. Vehicles shall be moved away from the stream prior to refueling and lubrication.	ITP Condition # 7.21	Entire Project	Permittee	
46	Hazardous Materials. Any hazardous or toxic materials that could be deleterious to aquatic life that could be washed into State waters or their tributaries shall be contained in watertight containers or removed from the Project site.	ITP Condition # 7.22	Entire Project	Permittee	
47	Imported Materials. Permittee shall not import, take from or move any rock, gravel, and/or other materials within the San Joaquin River, its streambeds or banks except as otherwise addressed in this Permit.	ITP Condition # 7.23	Entire Project	Permittee	
48	Debris and Waste Disposal. Permittee shall not dump any litter or construction debris within the Project area. All such debris and waste shall be picked up daily and properly disposed of at an appropriate site. Upon completion of operations and/or onset of wet weather, all construction material and/or debris shall be removed from the Project work site to an area not subject to inundation. All removed vegetation and debris shall be disposed of according to State and local laws and ordinances.	ITP Condition # 7.24	Entire Project	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
49	Spoils. Permittee shall not place spoil where it could enter State waters or other sensitive habitat, such as riparian, or place over vegetation except as specifically noticed to and accepted by CDFW, in writing. Spoil shall be hauled off-site or stockpiled in an upland location where it shall be covered with plastic sheeting or visquine whenever it is evident that rainy conditions threaten to erode loose soils into sensitive habitats.	ITP Condition # 7.25	Entire Project	Permittee	
50	Vegetation Disturbance. No disturbance or removal of vegetation, other than that specified in the Project description shall occur because of Project activities. Vegetation outside the construction corridor shall not be removed or damaged without prior consultation and approval of CDFW. Vegetation may be disturbed only as specified in this measure.	ITP Condition # 7.26	Entire Project	Permittee	
51	Cofferdam Installation and Removal. The Qualified Biologist and a Fisheries Biologist approved by CDFW (can be the same person) shall direct the installation, removal and dewatering efforts of all cofferdam structures. A Fisheries Biologist is defined under this Permit as someone that has a 4-year degree in fish biology or closely related field, has at least 2-years of experience in the handling of at least one of the special-status fish species that may be on-site, is in possession of appropriate State and Federal permits to handle the Covered Species, and has been provided written authorization from CDFW to act as a Fisheries Biologist under this Permit. The cofferdam installation shall be limited to the period between August 1 and November 30. During the period of active dewatering, the CDFW-approved Fisheries Biologist shall check daily for stranded aquatic life as the water level in the dewatering area drops and until active dewatering ceases. All stranded aquatic life in the dewatered areas shall be immediately relocated to habitat outside of harm's way. Cofferdams shall remain in place and functional during Covered Activities. Cofferdams that fail for any reason shall be repaired immediately. All materials used in cofferdam construction shall be removed from the project site once the coffer dams are no longer needed.	ITP Condition # 7.27	Entire Project	Permittee	
52	Daily Cofferdam Checks. The Qualified Biologist, Fisheries Biologist, or Biological Monitor shall check daily for stranded aquatic life in the dewatered areas prior to commencement of project activities each morning. If any fish is found within the dewatered area, then the biologist or monitor shall immediately stop work until the fish can be identified to species and relocated outside of harm's way by the Fisheries Biologist. Capture methods may include fish landing nets, dip nets, buckets and by hand.	ITP Condition # 7.28	Entire Project	Permittee	
53	Cofferdam Dams and Work Area Seepage. If the area within a cofferdam requires periodic pumping or seepage, pumping will occur under direct supervision of qualified fisheries biologist approved by CDFW. Pumps will be located on barges adjacent to the areas being dewatered. Any turbid water pumped from dewatered areas will be discharged into an area protected by a turbidity curtain to prevent suspended sediment from being transported upstream or downstream. Alternatively, Permittee may place pumps in upland flat areas, away from the stream channel. Pumps placed in uplands shall be secured by tying off to a tree or staked in place to prevent movement by vibration. Pump intakes shall be fitted with fish screens meeting CDFW criteria to prevent entrainment or impingement of fish. CDFW fish screen criteria can be found online in Appendix S of the California Salmonid Stream Habitat Restoration Manual. Pump intakes shall be periodically checked for impingement of fish or amphibians that shall be relocated according to the approved measured outlined for each species below. Any turbid water pumped from the work site itself to maintain it in a dewatered state shall be disposed of in an upland location where it will not drain directly into any stream channel.	ITP Condition # 7.29	Entire Project	Permittee	
POST-CONSTRUCTION					

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
54	Final Mitigation Report. No later than 45 days after completion of all mitigation measures, Permittee shall provide CDFW with a Final Mitigation Report. The Designated Biologist shall prepare the Final Mitigation Report which shall include, at a minimum: (1) a summary of all Monthly Compliance Reports and all ASRs; (2) a copy of the table in the MMRP with notes showing when each of the mitigation measures was implemented; (3) all available information about Project-related incidental take of the Covered Species; (4) information about other Project impacts on the Covered Species; (5) beginning and ending dates of Covered Activities; (6) an assessment of the effectiveness of this ITP's Conditions of Approval in minimizing and fully mitigating Project impacts of the taking on Covered Species; (7) recommendations on how mitigation measures might be changed to more effectively minimize take and mitigate the impacts of future projects on the Covered Species; and (8) any other pertinent information.	ITP Condition # 6.7	Post-construction	Permittee	

ATTACHMENT 2A
DEPARTMENT OF FISH AND WILDLIFE
HABITAT MANAGEMENT LAND ACQUISITION PACKAGE CHECKLIST FOR PROJECT APPLICANTS

The following checklist is provided to inform you of what documents are necessary to expedite the Department of Fish and Wildlife (CDFW) processing of your Habitat Management Land acquisition proposal. Any land acquisition processing requests which are incomplete when received, will be returned. The Region contact will review and approve the document package and forward it to the Habitat Conservation Planning Branch Senior Land Agent with a request to process the land acquisition for formal acceptance.

To: _____
Regional Manager, Region Name

From: _____
Project Applicant

Phone: _____

Tracking #: _____
CDFW assigned permit or agreement #

Project Name: _____

Enclosed is the complete package for the ☐ Conservation Easement OR ☐ Grant Deed

Documents in this package include:

☐ Fully executed, approved as to form Conservation Easement Deed or Grant Deed with legal description stamped by a licensed surveyor. Date executed: _____

☐ Proposed Lands for Acquisition Form (PLFAF)

☐ Phase I Environmental Site Assessment Report Date on report: _____
(An existing report may be used, but it must be less than two years old.)

☐ Preliminary Title Report(s) for subject property is enclosed and has been reviewed for Encumbrances, including severed mineral estates, and other easements. The title report must be less than six months old when final processing is conducted.

Included are additional documents:

☐ document(s) to support title exceptions

☐ document(s) to explain title encumbrances

☐ a plot or map of easements/encumbrances on the property

☐ Policy of Title Insurance (an existing title policy is not acceptable)

☐ County Assessor Parcel Map(s) for subject property

☐ Site Location Map (Site location with property boundaries outline on a USGS 1:24,000 scale topo)

☐ Final Permit or Agreement (or other appropriate instrument)

Type of agreement: ☐ Bank Agreement ☐ Mitigation Agreement

☐ Permit _____ Other: _____
(write in type of permit)

☐ Final Management Plan (if required prior to finalizing permit or agreement or if this package is for a Grant Deed)

☐ Biological Resources Report

☐ Draft Summary of Transactions ☐ hard copy ☐ electronic copy (both are required)



CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
PROPOSED LANDS FOR ACQUISITION FORM ("PLFAF")

Date: _____

TO: Regional Representative

Facsimile:

FROM: _____

Applicant proposes that the following parcel(s) of land be considered for approval by the California Department of Fish and Wildlife as suitable for purposes of habitat management lands to compensate the adverse environmental impacts of the Project:

<u>Section(s)</u>	<u>Township</u>	<u>Range</u>	<u>County</u>	<u>Acres</u>
_____	_____	_____	_____	_____

Current Legal Owner(s), of the surface and mineral estates, include Assessor's Parcel Number(s):

General Description of Location of Parcel(s):

Land Value: \$

For Region Use Only

APPROVED ____ By: _____ DATE: _____

Regional Manager's Signature

REJECTED ____

Region: _____

Explanation: _____

[Financial institution letterhead]

IRREVOCABLE STANDBY LETTER OF CREDIT
NO. **[number issued by financial institution]**

Issue Date: **[date]**

Beneficiary:

California Department of Fish and Wildlife
Habitat Conservation Planning Branch
Post Office Box 944209
Sacramento, CA 94244-2090
Attn: HCPB Contract Coordinator

Amount: U.S. \$**[dollar number]** **[(dollar amount)]**

Expiry: **[Date]** at our counters

Dear Sirs:

1. At the request and on the instruction of our customer, **[name of applicant]** ("Applicant"), we, **[name of financial institution]** ("Issuer"), hereby establish in favor of the beneficiary, the California Department of Fish and Wildlife ("CDFW"), this irrevocable standby letter of credit ("Credit") in the principal sum of U.S. \$**[dollar number]** **[(dollar amount)]** ("Principal Sum").
2. We are informed this Credit is and has been established for the benefit of CDFW pursuant to the terms of the incidental take permit for the **[name of project]** issued by CDFW to the Applicant on **[date]** (No. **[number]**) ("Permit").
3. We are further informed that pursuant to the Permit, the Applicant has agreed to complete certain mitigation requirements, as set forth in Conditions **[numbers]** in the Permit ("Mitigation Requirements").
4. We are finally informed that this Credit is intended by CDFW and the Applicant to serve as a security device for the performance by the Applicant of the Mitigation Requirements.
5. CDFW shall be entitled to draw upon this Credit only by presentation of a duly executed Certificate for Drawing ("Certificate") in the same form as Attachment A, which is attached hereto, at our office located at **[name and address of financial institution]**.

6. The Certificate shall be completed and signed by an "Authorized Representative" of CDFW as defined in paragraph 12 below. Presentation by CDFW of a completed Certificate may be made in person or by registered mail, return receipt requested, or by overnight courier.
7. Upon presentation of a duly executed Certificate as above provided, payment shall be made to CDFW, or to the account of CDFW, in immediately available funds, as CDFW shall specify.
8. If a demand for payment does not conform to the terms and conditions of this Credit, we shall give CDFW prompt notice that the demand for payment was not effected in accordance with the terms and conditions of this Credit, state the reasons therefore, and await further instruction.
9. Upon being notified that the demand for payment was not effected in conformity with the Credit, CDFW may correct any such non-conforming demand for payment under the terms and conditions stated herein.
10. All drawings under this Credit shall be paid with our funds. Each drawing honored by us hereunder shall reduce, *pro tanto*, the Principal Sum. By paying to CDFW an amount demanded in accordance herewith, we make no representations as to the correctness of the amount demanded.
11. This Credit will be cancelled upon receipt by us of Certificate of Cancellation/Reduction, which: (i) shall be in the form of Attachment B, which is attached hereto, and (ii) shall be completed and signed by an Authorized Representative of CDFW, as defined in paragraph 12 below.
12. An "Authorized Representative" shall mean the Director of CDFW; the General Counsel of CDFW; a Regional Manager of CDFW; or the Branch Chief of CDFW's Habitat Conservation Planning Branch.
13. This Credit shall be automatically extended without amendment for additional periods of one year from the present or any future expiration date hereof, unless at least sixty (60) days prior to any such date, we notify CDFW in writing by registered mail, return receipt requested, or by overnight courier that we elect not to consider this Credit extended for any such period.
14. Communications with respect to this Credit shall be in writing and addressed to us at [***name and address of financial institution***], specifically referring upon such writing to this credit by number. The address for notices with respect to this Credit shall be: (i) for CDFW: Department of Fish and Wildlife, Habitat Conservation Planning Branch, Post Office Box 944209, Sacramento, CA 94244-2090, Attn: HCPB Contract Coordinator; and (ii) for the Applicant: [***name and address of applicant***].

15. This Credit may not be transferred.

16. This Credit is subject to the International Standby Practices 1998 ("ISP 98"). As to matters not covered by the ISP 98 and to the extent not inconsistent with the ISP 98, this credit shall be governed by and construed in accordance with the Uniform Commercial Code, Article 5 of the State of California.

17. This Credit shall, if not canceled, expire on [**expiration date**], or any extended expiration date.

18. We hereby agree with CDFW that documents presented in compliance with the terms of this Credit will be duly honored upon presentation, as specified herein.

19. This Credit sets forth in full the terms of our undertaking. Such undertaking shall not in any way be modified, amended or amplified by reference to any document or instrument referred to herein or in which this Credit is referred to or to which this Credit relates and any such reference shall not be deemed to incorporate herein by reference any document or instrument.

[**Name of financial institution**]

By: _____

Name: _____

Title: _____

Telephone: _____

ATTACHMENT A

IRREVOCABLE STANDBY LETTER OF CREDIT NO. [*number issued by financial institution*]
CERTIFICATE FOR DRAWING

To:

[*Name and address of financial institution*]

Re: Incidental Take Permit No. [*permit number*]

The undersigned, a duly Authorized Representative of the California Department of Fish and Wildlife ("CDFW"), as defined in paragraph 12 in the above-referenced Irrevocable Standby Letter of Credit ("Credit"), hereby certifies to the Issuer that:

1. [*Insert one of the following statements:* "In the opinion of CDFW, the Applicant has failed to complete the Mitigation Requirements referenced in paragraph 3 of the Credit." **or** "As set forth in paragraph 13, the Issuer has informed CDFW that the Credit will not be extended and the Applicant has not provided CDFW with an equivalent security approved by CDFW to replace the Credit."]
2. The undersigned is authorized under the terms of the Credit to present this Certificate as the sole means of demanding payment on the Credit.
3. CDFW is therefore making a drawing under the Credit in amount of U.S. \$_____.
4. The amount demanded does not exceed the Principal Sum of the Credit.

Therefore, CDFW has executed and delivered this Certificate as of the ____ day of [*month*], [*year*].

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

BY: _____

[*Insert one of the following:* "DIRECTOR" **or** "GENERAL COUNSEL" **or** "REGIONAL MANAGER, [NAME OF REGIONAL OFFICE]" **or** "BRANCH CHIEF, HABITAT CONSERVATION PLANNING BRANCH"]

ATTACHMENT B

IRREVOCABLE LETTER OF CREDIT NO. *[number issued by financial institution]*
CERTIFICATE FOR *[insert either: "CANCELLATION" or "REDUCTION"]*

To:

[Name of financial institution and address]

Re: Incidental Take Permit No. *[permit number]*

The undersigned, a duly Authorized Representative of the California Department of Fish and Wildlife ("CDFW"), as defined in the paragraph 12 in the above-referenced Irrevocable Standby Letter of Credit ("Credit"), hereby certifies to the Issuer that:

1. *[Insert one of the following statements: "The Applicant has presented documentary evidence of full compliance with the Mitigation Requirements referenced in paragraph 3 of the Credit." or "The Applicant has presented documentary evidence of compliance with the following Mitigation Requirement[(s)] referenced in paragraph 3 of the Credit: [insert brief description of requirement(s) or requirement number(s) completed]." or "The Applicant has provided CDFW with an equivalent security approved by CDFW to replace the Credit."]*
2. *[Insert one of the following statements: "CDFW therefore requests the cancellation of the Credit." or "CDFW therefore requests a reduction in the Principal Sum in the amount of \$_____, thereby making the new Principal Sum \$_____."]*

[Insert one of the following statements: "Therefore, CDFW has executed and delivered this Certificate for Cancellation as of the ____ day of [month], [year]. or "Therefore, CDFW has executed and delivered this Certificate for Reduction as of the ____ day of [month], [year]."]

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

BY: _____

[Insert one of the following: "DIRECTOR" or "GENERAL COUNSEL" or "REGIONAL MANAGER, [NAME OF REGIONAL OFFICE]" or "BRANCH CHIEF, HABITAT CONSERVATION PLANNING BRANCH"]

State of California - Department of Fish and Wildlife
MITIGATION PAYMENT TRANSMITTAL FORM
 DFW 1057 (NEW 07/28/17)

Project Applicant Instructions: Please fill out and attach this form to payment. For conservation banks, also attach the Bill(s) of Sale for credits sold. One form may be used for multiple transactions, **BUT YOU MUST USE A SEPARATE FORM FOR EACH CHECK YOU TRANSMIT.** Make sure to include Project Name, Project Tracking Number, and ASB Mitigation Tracking Number (if available) on the attached payment type.

1. DATE: _____ TO: _____ Regional Manager _____ Region Office Address	2. FROM: _____ Name _____ Mailing Address _____ City, State, Zip _____ Telephone Number/FAX Number
3. RE: _____ Project Name as appears on permit/agreement	

4. AGREEMENT/ACCOUNT INFORMATION: (check the applicable type)

☐ 2081 Permit
 ☐ Conservation Bank
 ☐ 2835 NCCP
 ☐ 1802 Agreement
 ☐ 1600 Agreement
 ☐ Other _____

Project Tracking Number

5. PAYMENT TYPE (One check per form only): The following funds are being remitted in connection with the above referenced project:

Check information:

Total \$ _____ Check No. _____

Account No. _____ Bank Routing No. _____

a. Endowment: for Long-Term Management Subtotal \$ _____

b. Habitat Enhancement Subtotal \$ _____

c. Security:

1. Cash Refundable Security Deposit Subtotal \$ _____

2. Letter of Credit Subtotal \$ _____

1. Financial Institution: _____

2. Letter of Credit Number: _____

3. Date of Expiration: _____

ACCOUNTING OFFICE USE ONLY

Description	FI\$Cal Coding
Speedchart (Project, Program, Reference, Fund)	
Reporting Structure	
Category	
Date Established: _____ By: _____	



Central Valley Regional Water Quality Control Board

27 March 2020

Scott Buenting
City of Antioch
200 H Street
Antioch, CA 94509

CLEAN WATER ACT SECTION 401 WATER QUALITY CERTIFICATION AND ORDER FOR THE CITY OF ANTIOCH BRACKISH WATER DESALINATION PROJECT, CONTRA COSTA COUNTY (WDID#5B07CR00214)

Enclosed please find a Clean Water Act Section 401 Water Quality Certification and Order, authorized by Central Valley Regional Water Quality Control Board Executive Officer, Patrick Pulupa. This Order is issued to the City of Antioch for the City of Antioch Brackish Water Desalination Project (Project). Attachments A through F of the Enclosure are also part of the Order.

This Order is issued in response to an application submitted by the City of Antioch for proposed Project discharges to waters of the state, to ensure that the water quality standards for all waters of the state impacted by the Project are met. You may proceed with your Project according to the terms and conditions of the enclosed Order.

Please review your Order carefully to ensure that you understand all aspects of the Order. Note that this Order requires reporting and notification. Requirements for the content of the reporting and notification requirements are detailed in Attachment D, including specifications for photo and map documentation during the Project. Written reports and notifications must be submitted using the Reporting and Notification Cover Sheet located in Attachment D, which must be signed by the Permittee or an authorized representative.


These reports, notifications, and other submissions must be submitted in a searchable Portable Document Format (PDF). Documents less than 50 MB must be emailed to: centralvalleysacramento@waterboards.ca.gov. In the subject line of the email, include the Central Valley Water Board Contact, Project name, and WDID. Documents that are 50 MB or larger must be transferred to a disk and mailed to the Central Valley Water Board Contact.

If you require further assistance, please contact me by phone at (916) 464-4812 or by email at Jordan.Hensley@waterboards.ca.gov. You may also contact Stephanie

KARL E. LONGLEY SCD, P.E., CHAIR | PATRICK PULUPA, ESQ., EXECUTIVE OFFICER

11020 Sun Center Drive #200, Rancho Cordova, CA 95670 | www.waterboards.ca.gov/centralvalley

Tadlock, Unit Supervisor, by phone at (916) 464-4644 or by email at Stephanie.Tadlock@waterboards.ca.gov.



Jordan Hensley
Environmental Scientist
401 Water Quality Certification Unit

Enclosures (1): Order for the City of Antioch Brackish Water Desalination Project

cc: [Via email only] (w/ enclosure):

Thomas Faughnan (SPK-2019-00499)
United States Army Corps of Engineers
Sacramento District Headquarters
Regulatory Division
SPKRegulatoryMailbox@usace.army.mil

Sam Ziegler
United States Environmental Protection Agency
Ziegler.Sam@epa.gov

Brian Hansen
United States Fish & Wildlife Service
Brian_Hansen@fws.gov

Doug Hampton
National Marine Fish and Wildlife
Douglas.Hampton@noaa.gov

Jeanette Griffin (1600-2019-0247-R3)
California Department of Fish and Wildlife, Region 3
AskBDR@wildlife.ca.gov

CWA Section 401 WQC Program
Division of Water Quality
State Water Resources Control Board
Stateboard401@waterboards.ca.gov

Stephanie Tadlock
Unit Supervisor
Central Valley Regional Water Quality Control Board, Sacramento
Stephanie.Tadlock@waterboards.ca.gov

Jesse Halsted
Environmental Science Associates (ESA)
JHalsted@esassoc.com

cc: (w/ enclosure):

Bill Jennings
CA Sportfishing Protection Alliance
3536 Rainier Avenue
Stockton, CA 95204



Central Valley Regional Water Quality Control Board

CLEAN WATER ACT SECTION 401 WATER QUALITY CERTIFICATION AND ORDER

Effective Date:	27 March 2020	Reg. Meas. ID:	432962
Expiration Date:	26 March 2025	Place ID:	859703
Program Type:	Fill/Excavation	WDID No.:	5B07CR00214
		USACE No.:	SPK-2019-00499
			NWP No. 12
Project Type:	Permanent Diversion Structures		
Project:	City of Antioch Brackish Water Desalination Project (Project)		
Applicant:	City of Antioch		
Applicant Contact:	Scott Buenting 200 H Street Antioch, CA 94509 Phone: (925) 779-6129 Email: SBuenting@ci.antioch.ca.us		
Applicant's Agent:	Jesse Halsted Environmental Science Associates 2600 Capitol Avenue, Suite 200 Sacramento, CA 95816 Phone: (916) 231-1167 Email: JHalsted@esassoc.com		
Water Board Staff:	Jordan Hensley Environmental Scientist 11020 Sun Center Drive, Suite 200 Rancho Cordova, CA 95670 Phone: (916) 464-4812 Email: Jordan.Hensley@waterboards.ca.gov		

Water Board Contact Person: If you have any questions, please call Regional Water Quality Control Board, Central Valley Region (Central Valley Water Board) Staff listed above or (916) 464-3291 and ask to speak with the Water Quality Certification Unit Supervisor.

Table of Contents

I. Order 3

II. Public Notice 3

III. Project Purpose..... 3

IV. Project Description 3

V. Project Location 3

VI. Project Impact and Receiving Waters Information 3

VII. Description of Direct Impacts to Waters of the State..... 4

VIII. Description of Indirect Impacts to Waters of the State 5

IX. Avoidance and Mitigation 5

X. Compensatory Mitigation..... 5

XI. California Environmental Quality Act (CEQA)..... 5

XII. Petitions for Reconsideration..... 5

XIII. Fees Received 5

XIV. Conditions 5

XV. Water Quality Certification 22

- Attachment A:** Project Map
- Attachment B:** Receiving Waters, Impacts, and Mitigation Information
- Attachment C:** CEQA Findings of Facts
- Attachment D:** Report and Notification Requirements
- Attachment E:** Signatory Requirements
- Attachment F:** Certification Deviation Procedures

I. Order

This Clean Water Act (CWA) section 401 Water Quality Certification action and Order (Order) is issued at the request of the City of Antioch (hereinafter Permittee) for the Project. This Order is for the purpose described in application and supplemental information submitted by the Permittee. The application was received on 10 July 2019. The application was deemed complete on 9 August 2019.

Central Valley Water Board staff requested additional information necessary to supplement the contents of the complete application and the Permittee responded to the request for supplemental information on the following dates:

Date of Request for Supplemental Information: **20 February 2020**
Date all requested information was received: **4 March 2020**

II. Public Notice

The State Water Board provided public notice of the application pursuant to California Code of Regulations, title 23, section 3858 from 12 July 2019 to 2 August 2019. The Central Valley Water Board did not receive any comments during the comment period.

III. Project Purpose

The purpose of the Project is to replace the existing San Joaquin River intake pump station in preparation of constructing a desalination facility.

IV. Project Description

The 0.14-acre Project consists of installing a temporary cofferdam, dewatering the work area, installing the new intake structure, and removing the existing intake pipe.

V. Project Location

County: Contra Costa

Nearest City: Antioch

Section 18, Township 02 North, Range 02 East, MDB&M.

Latitude: 38.017431° and Longitude: -121.802699°

Maps showing the Project location are found in Attachment A of this Order.

VI. Project Impact and Receiving Waters Information

The Project is located within the jurisdiction of the Central Valley Water Board. Receiving waters and groundwater potentially impacted by this Project are protected in accordance with the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins, Fifth Edition, May 2018 (Basin Plan). The plan for the region and other plans and policies may be accessed at the [State Water Resources Control Board's Plans and Policies Web page](http://www.waterboards.ca.gov/plans_policies/) (http://www.waterboards.ca.gov/plans_policies/). The Basin Plan includes water

quality standards, which consist of existing and potential beneficial uses of waters of the state, water quality objectives to protect those uses, and the state and federal antidegradation policies.

It is the policy of the State of California that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes. This Order promotes that policy by requiring discharges to meet maximum contaminant levels designed to protect human health and ensure that water is safe for domestic use.

Project impact and receiving waters information can be found in Attachment B. Table 1 of Attachment B shows the receiving waters and beneficial uses of waters of the state impacted by the Project. Individual impact location and quantity is shown in Table 2 of Attachment B.

VII. Description of Direct Impacts to Waters of the State

A sheet pile cofferdam and pumps will be used to dewater approximately 0.119 acre of stream channel habitat for construction a new intake structure. Two conveyance pipelines will be trenched, requiring the excavation and replacement of native soil. The new intake structure will be built on cast-in-place concrete footings that will be supported by four steel pipe pilings and surrounded by riprap for scour protection. The existing hanging intake pipe will be removed from an adjacent pier.

The Project will temporarily impact 0.119 acre of stream channel habitat from the temporary placement of the cofferdam, dewatering the area, trenching of the conveyance piping, and removing the existing intake pipe. The Project will permanently impact 0.019 acre of stream channel habitat from the placement of the concrete and riprap.

Dewatering will occur within the Project area. Wet concrete will be placed into stream channel habitat.

Total Project fill/excavation quantities for all impacts are summarized in Tables 1 and 2. Permanent impacts are categorized as those resulting in a physical loss in area and also those degrading ecological condition.

Table 1: Total Project Fill/Excavation Quantity for Temporary Impacts¹

Aquatic Resources Type	Acres	Cubic Yards	Linear Feet
Stream Channel	0.119		

¹ Includes only temporary direct impacts to waters of the state and does not include area of temporary disturbance which could result in a discharge to waters of the state. Temporary impacts, by definition, are restored to pre-project conditions and therefore do not include a physical loss of area or degradation of ecological condition.

Table 2: Total Project Fill/Excavation Quantity for Permanent Physical Loss of Area Impacts

Aquatic Resources Type	Acres	Cubic Yards	Linear Feet
Stream Channel	0.019		

VIII. Description of Indirect Impacts to Waters of the State – Not Applicable**IX. Avoidance and Mitigation**

To minimize the potential effects of construction on water quality and resources, the Permittee shall implement all measures required as described in the Order.

According to the Permittee, the following measures will be in place during construction activities to avoid, reduce, and minimize impacts to waters of the state:

- The Permittee will implement the mitigation measures in the Project's Mitigation Monitoring and Reporting Program.

X. Compensatory Mitigation

The Permittee has agreed to provide compensatory mitigation for direct impacts, described in section VII for permanent impacts.

XI. California Environmental Quality Act (CEQA)

On 22 January 2019, the City of Antioch, as lead agency, certified an environmental impact report (EIR) (State Clearinghouse (SCH) No. 2017082044) for the Project and filed a Notice of Determination (NOD) at the SCH on 22 January 2019. Pursuant to CEQA, the Central Valley Water Board has made Findings of Facts (Findings) which support the issuance of this Order and are included in Attachment C.

XII. Petitions for Reconsideration

Any person aggrieved by this action may petition the State Water Board to reconsider this Order in accordance with California Code of Regulations, title 23, section 3867. A petition for reconsideration must be submitted in writing and received within 30 calendar days of the issuance of this Order.

XIII. Fees Received

An application fee of \$2,028.00 was received on 18 July 2019. The fee amount was determined as required by California Code of Regulations, Title 23, sections 3833(b)(3) and 2200(a)(3) and was calculated as Category A - Fill & Excavation Discharges (Fee Code 84) with the dredge and fill fee calculator.

XIV. Conditions

The Central Valley Water Board has independently reviewed the record of the Project to analyze impacts to water quality and designated beneficial uses within the

watershed of the Project. In accordance with this Order, the Permittee may proceed with the Project under the following terms and conditions:

A. Authorization

Impacts to waters of the state shall not exceed quantities shown in Tables 1 and 2.

B. Reporting and Notification Requirements

The following section details the reporting and notification types and timing of submittals. Requirements for the content of these reporting and notification types are detailed in Attachment D, including specifications for photo and map documentation during the Project. Written reports and notifications must be submitted using the Reporting and Notification Cover Sheet located in Attachment D, which must be signed by the Permittee or an authorized representative.

The Permittee must submit all notifications, submissions, materials, data, correspondence, and reports in a searchable Portable Document Format (PDF). Documents less than 50 MB must be emailed to:

centralvalleysacramento@waterboards.ca.gov

In the subject line of the email, include the Central Valley Water Board Contact, Project name, and WDID No. Documents that are 50 MB or larger must be transferred to a disk and mailed to the Central Valley Water Board Contact.

1. Project Reporting

- a. **Monthly Reporting:** The Permittee must submit a Monthly Report to the Central Valley Water Board on the 1st day of each month beginning the month after the submittal of the Commencement of Construction Notification. Monthly reporting shall continue until the Central Valley Water Board issues a Notice of Project Complete Letter to the Permittee.
- b. **Annual Reporting:** The Permittee shall submit an Annual Report each year on the 1st day of May. Annual reports shall continue until a Notice of Project Complete Letter is issued to the Permittee.

2. Project Status Notifications

- a. **Commencement of Construction:** The Permittee shall submit a Commencement of Construction Report at least seven (7) days prior to start of initial ground disturbance activities and corresponding Waste Discharge Identification Number (WDID#) issued under the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ; NPDES No. CAS000002).
- b. **Request for Notice of Completion of Discharges Letter:** The Permittee shall submit a Request for Notice of Completion of Discharges Letter

following completion of active Project construction activities, including any required restoration and permittee-responsible mitigation. This request shall be submitted to the Central Valley Water Board staff within thirty (30) days following completion of all Project construction activities. Upon acceptance of the request, Central Valley Water Board staff shall issue a Notice of Completion of Discharges Letter to the Permittee which will end the active discharge period.

- c. Request for Notice of Project Complete Letter:** The Permittee shall submit a Request for Notice of Project Complete Letter when construction and/or any post-construction monitoring is complete, and no further Project activities will occur. Completion of post-construction monitoring shall be determined by Central Valley Water Board staff and shall be contingent on successful attainment of restoration and mitigation performance criteria. This request shall be submitted to Central Valley Water Board staff within thirty (30) days following completion of all Project activities. Upon approval of the request, the Central Valley Water Board staff shall issue a Notice of Project Complete Letter to the Permittee which will end the post discharge monitoring period.

3. Conditional Notifications and Reports:

The following notifications and reports are required as appropriate.

a. Accidental Discharges of Hazardous Materials²

Following an accidental discharge of a reportable quantity of a hazardous material, sewage, or an unknown material, the following applies (Water Code, Section 13271):

- i. As soon as (A) Permittee has knowledge of the discharge or noncompliance, (B) notification is possible, and (C) notification can be provided without substantially impeding cleanup or other emergency measures then:
 - first call – 911 (to notify local response agency)
 - then call – Office of Emergency Services (OES) State Warning Center at:(800) 852-7550 or (916) 845-8911

² "Hazardous material" means any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. "Hazardous materials" include, but are not limited to, hazardous substances, hazardous waste, and any material that a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment. (Health & Safety Code, Section 25501.)

- Lastly, follow the required OES, procedures as set forth in the [Office of Emergency Services' Accidental Discharge Notification Web page](http://www.caloes.ca.gov/FireRescueSite/Documents/CalOES-Spill_Booklet_Feb2014_FINAL_BW_Acc.pdf) (http://www.caloes.ca.gov/FireRescueSite/Documents/CalOES-Spill_Booklet_Feb2014_FINAL_BW_Acc.pdf)
 - ii. Following notification to OES, the Permittee shall notify Central Valley Water Board, as soon as practicable (ideally within 24 hours). Notification may be delivered via written notice, email, or other verifiable means.
 - iii. Within five (5) working days of notification to the Central Valley Water Board, the Permittee must submit an Accidental Discharge of Hazardous Material Report.
- b. Violation of Compliance with Water Quality Standards:** The Permittee shall notify the Central Valley Water Board of any event causing a violation of compliance with water quality standards. Notification may be delivered via written notice, email, or other verifiable means.
- i. This notification must be followed within three (3) working days by submission of a Violation of Compliance with Water Quality Standards Report.
- c. In-Water Work and Diversions:**
- i. The Permittee shall notify the Central Valley Water Board at least forty-eight (48) hours prior to initiating work in water or stream diversions. Notification may be delivered via written notice, email, or other verifiable means.
 - ii. Within three (3) working days following completion of work in water or stream diversions, an In-Water Work/Diversions Water Quality Monitoring Report must be submitted to Central Valley Water Board staff.
- d. Modifications to Project**
- Project modifications may require an amendment of this Order. The Permittee shall give advance notice to Central Valley Water Board staff if Project implementation as described in the application materials is altered in any way or by the imposition of subsequent permit conditions by any local, state or federal regulatory authority by submitting a Modifications to Project Report. The Permittee shall inform Central Valley Water Board staff of any Project modifications that will interfere with the Permittee's compliance with this Order. Notification may be made in accordance with conditions in the certification deviation section of this Order.

e. Transfer of Property Ownership:

This Order is not transferable in its entirety or in part to any person or organization except after notice to the Central Valley Water Board in accordance with the following terms:

- i. The Permittee must notify the Central Valley Water Board of any change in ownership or interest in ownership of the Project area by submitting a Transfer of Property Ownership Report. The Permittee and purchaser must sign and date the notification and provide such notification to the Central Valley Water Board at least 10 days prior to the transfer of ownership. The purchaser must also submit a written request to the Central Valley Water Board to be named as the permittee in a revised order.
- ii. Until such time as this Order has been modified to name the purchaser as the permittee, the Permittee shall continue to be responsible for all requirements set forth in this Order.

f. Transfer of Long-Term BMP Maintenance:

If maintenance responsibility for post-construction BMPs is legally transferred, the Permittee must submit to the Central Valley Water Board a copy of such documentation and must provide the transferee with a copy of a long-term BMP maintenance plan that complies with manufacturer or designer specifications. The Permittee must provide such notification to the Central Valley Water Board with a Transfer of Long-Term BMP Maintenance Report at least 10 days prior to the transfer of BMP maintenance responsibility.

C. Water Quality Monitoring**1. General:**

If surface water is present continuous visual surface water monitoring shall be conducted during active construction periods to detect accidental discharge of construction related pollutants (e.g. oil and grease, turbidity plume, or uncured concrete). Sampling is not required in a wetland where the entire wetland is being permanently filled, provided there is no outflow connecting the wetland to surface waters. The Permittee shall perform surface water sampling:

- a. when performing any in-water work;
- b. during the entire duration of temporary surface water diversions;
- c. in the event that the Project activities result in any materials reaching surface waters; or
- d. when any activities result in the creation of a visible plume in surface waters.

2. Accidental Discharges/Noncompliance:

Upon occurrence of an accidental discharge of hazardous materials or a violation of compliance with a water quality standard, Central Valley Water Board staff may require water quality monitoring based on the discharge constituents and/or related water quality objectives and beneficial uses.

3. In-Water Work or Diversions:

During planned in-water work or during the entire duration of temporary water diversions, any discharge(s) to waters of the state shall conform to the following water quality standards:

- a. Waters shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.
- b. Activities shall not cause pH to be depressed below 6.5 nor raised above 8.5 in surface water.
- c. Activities shall not cause turbidity increases in surface water to exceed:
 - i. where natural turbidity is less than 1 Nephelometric Turbidity Units (NTUs), controllable factors shall not cause downstream turbidity to exceed 2 NTU;
 - ii. where natural turbidity is between 1 and 5 NTUs, increases shall not exceed 1 NTU;
 - iii. where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent;
 - iv. where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs;
 - v. where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent.

In determining compliance with the above limits, appropriate averaging periods may be applied provided that beneficial uses will be fully protected. Averaging periods may only be used with prior permission of the Central Valley Water Board Executive Officer.

For Delta waters, the general objectives for turbidity apply subject to the following: except for periods of storm runoff, the turbidity of Delta waters shall not exceed 50 NTUs in the waters of the Central Delta and 150 NTUs in other Delta waters.

Sampling during in-water work or during the entire duration of temporary water diversions shall be conducted in accordance with Table 3 sampling

parameters.³ The sampling requirements in Table 3 shall be conducted upstream out of the influence of the Project, and approximately 300 feet downstream of the work area.

The sampling frequency may be modified for certain projects with written approval from Central Valley Water Board staff. An In-Water Work and Diversion Water Quality Monitoring Report, as described in Attachment D, shall be submitted within two weeks on initiation of in-water construction, and every two weeks thereafter. In reporting the data, the Permittee shall arrange the data in tabular form so that the sampling locations, date, constituents, and concentrations are readily discernible. The data shall be summarized in such a manner to illustrate clearly whether the Project complies with Order requirements. The report shall include surface water sampling results, visual observations, and identification of the turbidity increase in the receiving water applicable to the natural turbidity conditions specified in the turbidity criteria in XIV.C.3.

If no sampling is required, the Permittee shall submit a written statement stating, "No sampling was required" within two weeks on initiation of in-water construction, and every two weeks thereafter.

Table 3: Sample Type and Frequency Requirements

Parameter	Unit of Measurement	Type of Sample	Minimum Frequency
pH	Standard Units	Grab	Every 4 hours
Turbidity	NTU	Grab	Every 4 hours
Visible construction related pollutants ⁴	Observations	Visual Inspections	Continuous throughout the construction period

³ Pollutants shall be analyzed using the analytical methods described in 40 Code of Federal Regulations Part 136; where no methods are specified for a given pollutant, the method shall be approved by Central Valley Water Board staff. Grab samples shall be taken between the surface and mid-depth and not be collected at the same time each day to get a complete representation of variations in the receiving water. A hand-held field meter may be used, provided the meter utilizes a U.S. EPA-approved algorithm/method and is calibrated and maintained in accordance with the manufacturer's instructions. A calibration and maintenance log for each meter used for monitoring shall be maintained onsite.

⁴ Visible construction-related pollutants include oil, grease, foam, fuel, petroleum products, and construction-related, excavated, organic or earthen materials.

4. Post-Construction:

Visually inspect the Project site during the rainy season for one year to ensure excessive erosion, stream instability, or other water quality pollution is not occurring in or downstream of the Project site. If water quality pollution is occurring, contact the Central Valley Water Board staff member overseeing the Project within three (3) working days. The Central Valley Water Board may require the submission of a Violation of Compliance with Water Quality Standards Report. Additional permits may be required to carry out any necessary site remediation.

D. Standard

1. This Order is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to Water Code section 13330, and California Code of Regulations, Title 23, Chapter 28, article 6 commencing with sections 3867-3869, inclusive. Additionally, the Central Valley Water Board reserves the right to suspend, cancel, or modify and reissue this Order, after providing notice to the Permittee, if the Central Valley Water Board determines that: the Project fails to comply with any of the conditions of this Order; or, when necessary to implement any new or revised water quality standards and implementation plans adopted or approved pursuant to the Porter-Cologne Water Quality Control Act (Water Code, section 13000 et seq.) or federal Clean Water Act section 303 (33 U.S.C. section 1313). For purposes of Clean Water Act section 401(d), the condition constitutes a limitation necessary to assure compliance with water quality standards and appropriate requirements of state law.
2. This Order is not intended and shall not be construed to apply to any activity involving a hydroelectric facility requiring a Federal Energy Regulatory Commission (FERC) license or an amendment to a FERC license, unless the pertinent certification application was filed pursuant to subsection 3855(b) of chapter 28, Title 23 of the California Code of Regulations, and that application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought.
3. This Order is conditioned upon total payment of any fee required under Title 23 of the California Code of Regulations and owed by the Permittee.
4. In the event of any violation or threatened violation of the conditions of this Order, the violation or threatened violation shall be subject to any remedies, penalties, process, or sanctions as provided for under state and federal law. For purposes of Clean Water Act, section 401(d), the applicability of any state law authorizing remedies, penalties, processes, or sanctions for the violation or threatened violation constitutes a limitation necessary to assure compliance with the water quality standards and other pertinent requirements incorporated into this Order.

E. General Compliance

1. Failure to comply with any condition of this Order shall constitute a violation of the Porter-Cologne Water Quality Control Act and the Clean Water Act. The Permittee and/or discharger may then be subject to administrative and/or civil liability pursuant to Water Code section 13385.
2. Permitted actions must not cause a violation of any applicable water quality standards, including impairment of designated beneficial uses for receiving waters as adopted in the Basin Plans by any applicable Regional Water Board or any applicable State Water Board (collectively Water Boards) water quality control plan or policy. The source of any such discharge must be eliminated as soon as practicable.
3. In response to a suspected violation of any condition of this Order, the Central Valley Water Board may require the holder of this Order to furnish, under penalty of perjury, any technical or monitoring reports the Water Boards deem appropriate, provided that the burden, including costs, of the reports shall bear a reasonable relationship to the need for the reports and the benefits to be obtained from the reports. The additional monitoring requirements ensure that permitted discharges and activities comport with any applicable effluent limitations, water quality standards, and/or other appropriate requirement of state law.
4. The Permittee must, at all times, fully comply with engineering plans, specifications, and technical reports submitted to support this Order; and all subsequent submittals required as part of this Order. The conditions within this Order and Attachments supersede conflicting provisions within Permittee submittals.
5. This Order and all of its conditions contained herein continue to have full force and effect regardless of the expiration or revocation of any federal license or permit issued for the Project. For purposes of Clean Water Act, section 401(d), this condition constitutes a limitation necessary to assure compliance with the water quality standards and other pertinent requirements of state law.
6. The Permittee shall adhere to all requirements in the mitigation monitoring and reporting program (MMRP) which is incorporated herein by reference and any additional measures as outlined in Attachment C, CEQA Findings of Fact.

F. Administrative

1. Signatory requirements for all document submittals required by this Order are presented in Attachment E of this Order.
2. This Order does not authorize any act which results in the taking of a threatened, endangered or candidate species or any act, which is now

prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish & Wildlife Code, sections 2050-2097) or the federal Endangered Species Act (16 U.S.C. sections 1531-1544). If a "take" will result from any act authorized under this Order held by the Permittee, the Permittee must comply with the California Endangered Species Act and federal Endangers Species Act prior to any construction or operation of the portion of the Project that may result in a take. The Permittee is responsible for meeting all requirements of the applicable endangered species act for the Project authorized under this Order.

3. The Permittee shall grant Central Valley Water Board staff, or an authorized representative (including an authorized contractor acting as a Water Board representative), upon presentation of credentials and other documents as may be required by law, permission to:
 - a. Enter upon the Project or compensatory mitigation site(s) premises where a regulated facility or activity is located or conducted, or where records are kept.
 - b. Have access to and copy any records that are kept and are relevant to the Project or the requirements of this Order.
 - c. Inspect any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order.
 - d. Sample or monitor for the purposes of assuring Order compliance.
4. A copy of this Order shall be provided to any consultants, contractors, and subcontractors working on the Project. Copies of this Order shall remain at the Project site for the duration of this Order. The Permittee shall be responsible for work conducted by its consultants, contractors, and any subcontractors.
5. A copy of this Order must be available at the Project site(s) during construction for review by site personnel and agencies. All personnel performing work on the Project shall be familiar with the content of this Order and its posted location at the Project site.
6. **Lake or Streambed Alteration Agreement:** The Permittee shall submit a signed copy of the California Department of Fish and Wildlife's Lake or Streambed Alteration Agreement or other authorization letter to the Central Valley Water Board immediately upon receipt and prior to any discharge to waters of the state.

G. Construction

1. Dewatering

- a. The Permittee shall develop and maintain on-site a Surface Water Diversion and/or Dewatering Plan(s). The Plan(s) must be developed prior to initiation of any water diversions. The Plan(s) shall include the proposed method and duration of diversion activities and include water quality monitoring conducted, as described in section XIV.C.3, during the entire duration of dewatering and diversion activities. The Plan(s) must be consistent with this Order and must be made available to the Central Valley Water Board staff upon request.
- b. For any temporary dam or other artificial obstruction being constructed, maintained, or placed in operation, sufficient water shall at all times be allowed to pass downstream, to maintain beneficial uses of waters of the state below the dam. Construction, dewatering, and removal of temporary cofferdams shall not violate section XIV.C.3.
- c. The temporary dam or other artificial obstruction shall only be built from clean materials such as sandbags, gravel bags, water dams, or clean/washed gravel which will cause little or no siltation. Stream flow shall be temporarily diverted using gravity flow through temporary culverts/pipes or pumped around the work site with the use of hoses.
- d. If water is present, the area must be dewatered prior to start of work.
- e. Dewatering will occur within the Project area.
- f. This Order does not allow permanent water diversion of flow from the receiving water. This Order is invalid if any water is permanently diverted as a part of the project.
- g. The Permittee shall work with the Central Valley Water Board to obtain coverage under an NPDES permit for dewatering activities that result in discharges into surface water.
- h. The State Water Resources Control Board has issued appropriative water rights for the proposed water diversion Project identified as Permit No. 1282. This Order is not valid if the Project is not conducted in accordance with an existing water right issued by the State Water Resources Control Board. This Order does not provide a new water right or modify an existing water right.

2. Directional Drilling

- a. If installation or relocation of dry and/or wet utility lines is anticipated, the Permittee shall develop and implement a Dry and Wet Utility Work Plan that includes a frack-out plan prior to commencement of dry and wet utility construction. The Dry and Wet Utility Plan must cover all phases of the certified project that will impact waters of the state and shall be consistent with this Certification.

The Dry and Wet Utility Plan shall include the types of dry and wet utilities to be removed and installed, method and duration of activities, structure configuration, construction materials, equipment, erosion and sediment controls, and a map or drawing indicating the location(s) of dry and wet utility work, as related to any water of the state in the Project area.

Should the methodology for dry and wet utility work include directional drilling, the Dry and Wet Utility Plan shall incorporate a Directional Drilling Plan to address potential frac-outs. The Directional Drilling Plan shall include, but not be limited to, a description of directional drilling activities, dry and wet utility routes, crossing locations and methods, and other geotechnical considerations (i.e., surficial overburden deposits, clays and shales, bedrock formations, hydrogeology), and a reporting procedure should any level of discharge from a frac-out occur, regardless of the discharge size.

The Directional Drilling Plan must be stamped by a California Registered Geologist or Engineer.

The Utility Work Plan and Direction Drilling Plan must be submitted to the Central Valley Water Board staff concurrently with the submittal of the Commencement of Construction Notification.

3. Dredging – Not Applicable

4. Fugitive Dust – Not Applicable

5. Good Site Management “Housekeeping”

- a. The Permittee shall develop and maintain onsite a project-specific Spill Prevention, Containment and Cleanup Plan outlining the practices to prevent, minimize, and/or clean up potential spills during construction of the Project. The Plan must detail the Project elements, construction equipment types and location, access and staging and construction sequence. The Plan must be made available to the Central Valley Water Board staff upon request.
- b. Refueling of equipment within the floodplain or within 300 feet of the waterway is prohibited. If critical equipment must be refueled within 300 feet of the waterway, spill prevention and countermeasures must be implemented to avoid spills. Refueling areas shall be provided with secondary containment including drip pans and/or placement of absorbent material. No hazardous materials, pesticides, fuels, lubricants, oils, hydraulic fluids, or other construction-related potentially hazardous substances should be stored within a floodplain or within 300 feet of a waterway. The Permittee must perform frequent inspections of construction equipment prior to utilizing it near surface waters to ensure leaks from the equipment are not occurring and are not a threat to water quality.

- c. All materials resulting from the Project shall be removed from the site and disposed of properly.

6. Hazardous Materials

- a. The discharge of petroleum products, any construction materials, hazardous materials, pesticides, fuels, lubricants, oils, hydraulic fluids, raw cement, concrete or the washing thereof, asphalt, paint, coating material, drilling fluids, or other substances potentially hazardous to fish and wildlife resulting from or disturbed by project-related activities is prohibited and shall be prevented from contaminating the soil and/or entering waters of the state. In the event of a prohibited discharge, the Permittee shall comply with notification requirements in sections XIV.B.3.a and XIV.B.3.b.
- b. Wet concrete will be placed into stream channel habitat the area has been completely dewatered.
- c. Concrete must be completely cured before coming into contact with waters of the United States and waters of the state. Surface water that contacts wet concrete must be pumped out and disposed of at an appropriate off-site commercial facility, which is authorized to accept concrete wastes.

7. Invasive Species and Soil Borne Pathogens

Prior to arrival at the project site and prior to leaving the project site, construction equipment that may contain invasive plants and/or seeds shall be cleaned to reduce the spread of noxious weeds.

8. Post-Construction Storm Water Management – Not Applicable

9. Bridges, Pipes, and Cofferdams

- a. Bridges, culverts, dip crossings, or other structures must be installed so that water and in-stream sediment flow is not impeded. Appropriate design criteria, practices and materials must be used in areas where access roads intersect waters of the state.
- b. Temporary materials placed in any water of the state must be removed as soon as construction is completed at that location, and all temporary roads must be removed or re-contoured and restored according to approved re-vegetation and restoration plans.
- c. Any structure, including but not limited to, culverts, pipes, piers, and coffer dams, placed within a stream where fish (as defined in California Fish and Game Code section 45) exist or may exist, must be designed, constructed, and maintained such that it does not constitute a barrier to upstream or downstream movement of aquatic life, or cause an avoidance reaction by fish due to impedance of their upstream or downstream movement. This includes, but is not limited to, maintaining the supply of

water and maintaining flows at an appropriate depth, temperature, and velocity to facilitate upstream and downstream fish migration. If any structure results in a long-term reduction in fish movement, the discharger shall be responsible for restoration of conditions as necessary (as determined by the Water Board) to secure passage of fish across the structure.

- d. A method of containment must be used below any temporary bridge, trestle, boardwalk, and/or other stream crossing structure to prevent any debris or spills from falling into the waters of the state. Containment must be maintained and kept clean for the life of the temporary stream crossing structure.

10. Sediment Control

- a. Except for activities permitted by the United States Army Corps of Engineers under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act, soil, silt, or other organic materials shall not be placed where such materials could pass into surface water or surface water drainage courses.
- b. Silt fencing, straw wattles, or other effective management practices must be used along the construction zone to minimize soil or sediment along the embankments from migrating into the waters of the state through the entire duration of the Project.
- c. The use of netting material (e.g., monofilament-based erosion blankets) that could trap aquatic dependent wildlife is prohibited within the Project area.

11. Special Status Species

Delta Smelt, Central Valley Steelhead, Sacramento River Winter-Run Chinook Salmon, Central Valley Spring-Run Chinook Salmon, and Green Sturgeon.

12. Stabilization/Erosion Control

- a. All areas disturbed by Project activities shall be protected from washout and erosion.
- b. Hydroseeding shall be performed with California native seed mix.

13. Storm Water

- a. During the construction phase, the Permittee must employ strategies to minimize erosion and the introduction of pollutants into storm water runoff. These strategies must include the following:

- i. An effective combination of erosion and sediment control Best Management Practices (BMPs) must be implemented and adequately working prior to the rainy season and during all phases of construction.

H. Site Specific – Not Applicable

I. Total Maximum Daily Load (TMDL) – Not Applicable

J. Mitigation for Temporary Impacts

1. The Permittee shall restore all areas of temporary impacts, including Project site upland areas, which could result in a discharge to waters of the state to pre-construction contours and conditions upon completion of construction activities as described in a restoration plan. The restoration plan shall be submitted for written acceptance by Central Valley Water Board staff within 90 days of issuance of this Order. The restoration plan shall provide the following: a schedule; plans for grading of disturbed areas to pre-project contours; planting palette with plant species native to the Project area; seed collection location; invasive species management; performance standards; and maintenance requirements (e.g. watering, weeding, and replanting).
2. The Central Valley Water Board may extend the monitoring period beyond requirements of the restoration plan upon a determination by Executive Officer that the performance standards have not been met or are not likely to be met within the monitoring period.
3. If restoration of temporary impacts to waters of the state is not completed within 365 days of the impacts, compensatory mitigation may be required to offset temporal loss of waters of the state.
4. Total required Project compensatory mitigation information for temporary impacts is summarized in Table 4. [Establishment (Est.), Re-establishment (Re-est.), Rehabilitation (Reh.), Enhancement (Enh.), Preservation (Pres.), Unknown.

Table 4: Required Project Mitigation Quantity for Temporary Impacts by Method

Aquatic Resource Type	Mitigation Type	Units	Est.	Re-est.	Reh.	Enh.	Pres.	Unknown
Stream Channel	Permittee Responsible	Acres		0.119				

K. Compensatory Mitigation for Permanent Impacts:

Compensatory Mitigation is for permanent physical loss and permanent ecological degradation of a water of the state.

1. Compensatory Mitigation Plan

- a. The Permittee has submitted draft compensatory mitigation plan as part of a complete application. The Permittee shall provide a final compensatory mitigation plan for written acceptance by Central Valley Water Board staff. Impacts to waters of the state are not authorized and shall not occur until a compensatory mitigation plan has been approved by Central Valley Water Board staff. Upon acceptance by Central Valley Water Board staff, the Permittee shall implement the approved plan.
- b. The final compensatory mitigation plan shall include all plan elements as outlined in 40 CFR section 230.94(c).
- c. Permittees fulfilling their compensatory mitigation obligations by securing credits from an approved mitigation bank or in-lieu fee program, need only include the items described in 40 CFR section 230.94(c)(5)-(6), and the name of the specific mitigation bank or in-lieu fee program to be used.

2. Irrevocable Letter of Credit – Not Applicable

3. Permittee-Responsible Compensatory Mitigation Responsibility – Not Applicable

4. Purchase of Mitigation Credits by Permittee for Compensatory Mitigation

- a. A copy of the fully executed agreement for the purchase of mitigation credits shall be provided to the Central Valley Water Board prior to the initiation of in water work.
- b. The Permittee shall retain responsibility for providing the compensatory mitigation and long-term management until Central Valley Water Board staff has received documentation of the credit purchase and the transfer agreement between the Permittee and the seller of credits.

5. Total Required Compensatory Mitigation

- a. The Permittee is required to provide compensatory mitigation for the authorized impact to 0.019 acre of stream channel habitat by purchasing 0.019 riverine habitat credits from a USACE approved mitigation bank.
- b. Total required Project compensatory mitigation information for permanent physical loss of area is summarized in Table 5. [Establishment (Est.), Re-establishment (Re-est.), Rehabilitation (Reh.), Enhancement (Enh.), Preservation (Pres.), Unknown].

Table 5: Total Required Project Compensatory Mitigation Quantity for Permanent Physical Loss of Area

Aquatic Resource Type	Mitigation Type	Units	Est.	Re-est.	Reh.	Enh.	Pres.	Unknown
Stream Channel	Mitigation Bank Credits	Acres						0.019

L. Certification Deviation

1. Minor modifications of Project locations or predicted impacts may be necessary as a result of unforeseen field conditions, necessary engineering re-design, construction concerns, or similar reasons. Some of these prospective Project modifications may have impacts on water quality. Some modifications of Project locations or predicted impacts may qualify as Certification Deviations as set forth in Attachment F. For purposes of this Certification, a "Certification Deviation" is a Project locational or impact modification that does not require an immediate amendment of the Order, because the Central Valley Water Board has determined that any potential water quality impacts that may result from the change are sufficiently addressed by the Order conditions and the CEQA Findings. After the termination of construction, this Order will be formally amended to reflect all authorized Certification Deviations and any resulting adjustments to the amount of water resource impacts and required compensatory mitigation amounts.
2. A Project modification shall not be granted a Certification Deviation if it warrants or necessitates changes that are not addressed by the Order conditions or the CEQA environmental document such that the Project impacts are not addressed in the Project's environmental document or the conditions of this Order. In this case a supplemental environmental review and different Order will be required.

XV. Water Quality Certification

I hereby issue the Order for the City of Antioch Brackish Water Desalination Project, WDID# 5B07CR00214, certifying that as long as all of the conditions listed in this Order are met, any discharge from the referenced Project will comply with the applicable provisions of Clean Water Act sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 303 (Water Quality Standards and Implementation Plans), 306 (National Standards of Performance), and 307 (Toxic and Pretreatment Effluent Standards).

The Central Valley Water Board will file a Notice of Determination (NOD) at the SCH within five (5) working days of issuance of this Order. This discharge is also regulated pursuant to State Water Board Water Quality Order No. 2003-0017-DWQ which authorizes this Order to serve as Waste Discharge Requirements pursuant to the Porter-Cologne Water Quality Control Act (Water Code, section 13000 et seq.).

Except insofar as may be modified by any preceding conditions, all Order actions are contingent on: (a) the discharge being limited and all proposed mitigation being completed in strict compliance with the conditions of this Order and the attachments to this Order; and, (b) compliance with all applicable requirements of Statewide Water Quality Control Plans and Policies, the Regional Water Boards' Water Quality Control Plans and Policies.

FOR

3/30/2020

Patrick Pulupa, Executive Officer
Central Valley Regional Water Quality Control Board

Date

- Attachment A:** Project Map
- Attachment B:** Receiving Waters, Impacts, and Mitigation Information
- Attachment C:** CEQA Findings of Facts
- Attachment D:** Report and Notification Requirements
- Attachment E:** Signatory Requirements
- Attachment F:** Certification Deviation Procedures

(This page intentionally left blank)

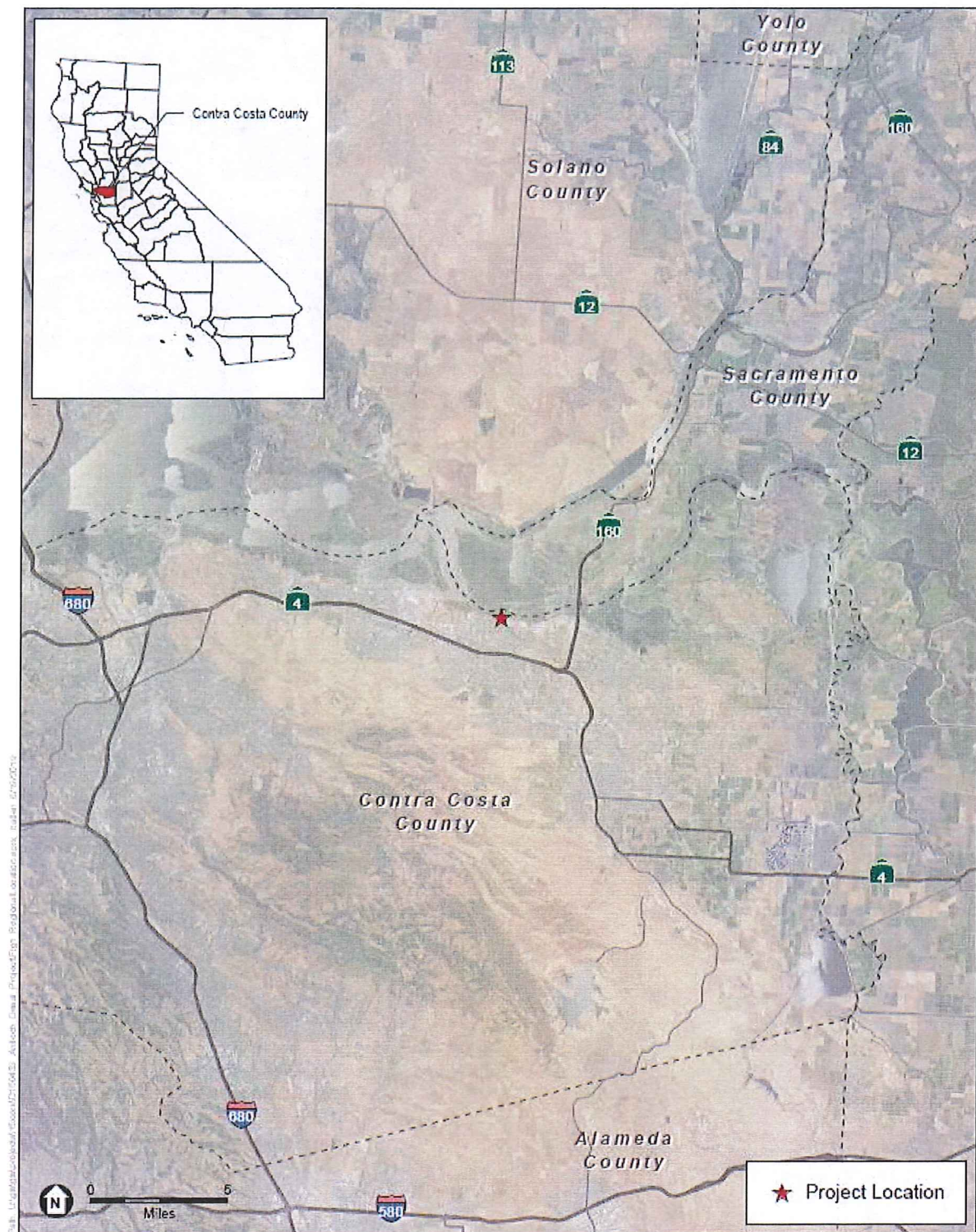
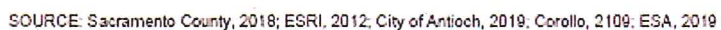


Figure 1 – Project Location Map



City of Antioch Desalination Project

Figure 2 – Site Impact Map

(This page intentionally left blank)

Receiving Waters, Impacts and Mitigation Information

The following table shows the receiving waters associated with each impact site.

Table 1: Receiving Water(s) Information

Impact Site ID	Waterbody Name	Impacted Aquatic Resources Type	Water Board Hydrologic Units	Receiving Waters	Receiving Waters Beneficial Uses	303d Listing Pollutant	California Rapid Assessment Method ID
Existing Intake	Sacramento – San Joaquin Delta	Stream	544.00	Sacramento – San Joaquin Delta	MUN, AGR, PROC, IND, POW, REC-1, REC-2, WARM, COLD, MIGR, SPWN, WILD, NAV	Arsenic, chlordane, chlorpyrifos, DDT, diazinon, dieldrin, electrical conductivity, group A pesticides, invasive species, mercury, PAHs, PCBs, total DDT, toxicity	N/A
New Intake	Sacramento – San Joaquin Delta	Stream	544.00	Sacramento – San Joaquin Delta	MUN, AGR, PROC, IND, POW, REC-1, REC-2, WARM, COLD, MIGR, SPWN, WILD, NAV	Arsenic, chlordane, chlorpyrifos, DDT, diazinon, dieldrin, electrical conductivity, group A pesticides, invasive species, mercury, PAHs, PCBs, total DDT, toxicity	N/A

Individual Direct Impact Locations

The following tables show individual impacts.

Table 2: Individual Temporary Fill/Excavation Impact Information

Impact Site ID	Latitude	Longitude	Indirect Impact Requiring Mitigation?	Acres	Cubic Yards	Linear Feet
Existing Intake	38.017808°	-121.802973°	No	0.00016		
New Intake	38.017431°	-121.802699°	No	0.119		

Table 3: Individual Permanent Fill/Excavation Impact Information

Impact Site ID	Latitude	Longitude	Indirect Impact Requiring Mitigation?	Acres	Cubic Yards	Linear Feet
New Intake	38.017431°	-121.802699°	No	0.019		

Compensatory Mitigation Information

The following tables show individual compensatory mitigation information and locations.

Mitigation Bank Compensatory Mitigation Site Information

Mitigation Bank Name:	Unknown (UNK)
Website:	To Be Determined (TBD)
Mitigation Bank Contact Name:	UNK
Phone:	TBD
Email:	TBD
Mitigation Location - County:	UNK
Latitude:	TBD
Longitude:	TBD

Table 4: Mitigation Type Information

Aquatic Resource Credit Type	Acres	Linear Feet	Number of Credits Purchased
Riverine Habitat	0.019		TBD

(This page is intentionally left blank)

A. Environmental Review

On 22 January 2019, the City of Antioch, as lead agency, certified a Final Environmental Impact Report (FEIR) (State Clearinghouse (SCH) No. 2017082044) for the Project and filed a Notice of Determination (NOD) at the SCH on 22 January 2019. The Central Valley Water Board is a responsible agency under CEQA (Public Resources Code, section 21069) and in making its determinations and findings, must presume that the City of Antioch's certified environmental document comports with the requirements of CEQA and is valid. (Public Resources Code, section 21167.3.) The Central Valley Water Board has reviewed and considered the environmental document and finds that the environmental document prepared by the City of Antioch addresses the Project's water quality impacts. (California Code of Regulations, Title 14, section 15096, subd. (f).) The environmental document includes the mitigation monitoring and reporting program (MMRP) developed by the City of Antioch for all mitigation measures that have been adopted for the Project to reduce potential significant impacts. (Public Resources Code, section 21081.6, subd. (a)(1); California Code of Regulations, Title 14, section 15091, subd. (d).)

B. Incorporation by Reference

Pursuant to CEQA, these Findings of Facts (Findings) support the issuance of this Order based on the Project FEIR, the application for this Order, and other supplemental documentation.

All CEQA project impacts, including those discussed in subsection C below, are analyzed in detail in the Project FEIR which is incorporated herein by reference. The Project FEIR is available at: 3rd and H Street, Second Floor, Antioch, CA 94531.

Requirements under the purview of the Central Valley Water Board in the MMRP are incorporated herein by reference.

The Permittee's application for this Order, including all supplemental information provided, is incorporated herein by reference.

C. Findings

The FEIR describes the potential significant environmental effects to water quality. Having considered the whole of the record, the Central Valley Water Board makes the following findings:

- (1) Findings regarding impacts that will be avoided or mitigated to a less than significant level. (Public Resources Code, section 21081, subd. (a)(1); California Code of Regulations, Title 14, section 15091, subd. (a)(1).)

Changes or alterations have been required in, or incorporated into, the Project which avoid or substantially lessen the significant environmental effect as identified in the FEIR.

a.i. Potential Significant Impact:

None.

a.ii. Facts in Support of Finding:

Not Applicable.

- (2) Findings regarding mitigation measures which are the responsibility of another agency. (Public Resources Code, section 21081, subd. (a)(2); California Code of Regulations, Title 14, section 15091, subd.(a)(2).)

There are changes or alterations that are within the responsibility and jurisdiction of another public agency and not the jurisdiction of the Central Valley Water Board. Such changes have been adopted by such other agency or can and should be adopted by such other agency.

a.i. Potential Significant Impact:

The Project will result in less than significant impacts after implementing mitigation measures to biological resources from the construction of the new intake facility.

a.ii. Facts in Support of Finding:

Mitigation Measure 3.3-3a: Conduct Worker Awareness Training.

A worker awareness training program shall be conducted for construction crews before the start of construction activities. The program shall include a brief overview of sensitive fisheries and aquatic resources (including riparian habitats) on the project site, measures to minimize impacts on those resources, and conditions of relevant regulatory permits.

Mitigation Measure 3.3-3b: Implement In-water Work Windows.

Any in-water construction activities (e.g., construction of the sheet pile cofferdam) shall be conducted during months when special-status fish species/sensitive life stages are least likely to be present or less susceptible to disturbance (e.g., August 1 to October 31; anadromous salmonids and smelts). If any in-water work is to be conducted, a qualified biologist or resource specialist shall be present during such work to monitor construction activities and ensure compliance with terms and conditions of permits issued by regulatory agencies (see Mitigation Measure 3.3-3d below).

Mitigation Measure 3.3-3c: Develop and Implement Fish Rescue Plan.

To reduce the potential for fish stranding or minimize the potential for harm during cofferdam dewatering activities, the City or its contractor shall develop and implement a fish rescue plan. Prior to the closure of the cofferdam in the Delta, seining by a qualified fisheries biologist shall be conducted within the cofferdam using a small-mesh seine to direct and move fish out of the cofferdam area. Upon completion of seining, the entrance to the cofferdam shall be blocked with a net to prevent fish from entering the cofferdam isolation area before the cofferdam is completed. Once the cofferdam is completed and the area within the cofferdam is closed and isolated, additional

seining shall be conducted within the cofferdam to remove any remaining fish, if present. Once all noticeable fish have been removed from the isolated area, portable pumps with intakes equipped with 1.75 mm mesh screen shall be used to dewater to a depth of 1.5-2 feet. A qualified biologist shall implement further fish rescue operations using electrofishing and dip nets. All fish that are captured shall be placed in clean 5-gallon buckets and/or coolers filled with Delta water, transported downstream of the construction area, and released back into suitable habitat in the Delta with minimal handling. After all fish have been removed using multiple seine passes, electrofishing, and dip nets (as necessary), portable pumps with screens (see above) shall be used for final dewatering. National Marine Fisheries Service (NMFS), United States Fish and Wildlife Service (USFWS), and the California Department of Fish and Wildlife (CDFW) shall be notified at least 48 hours prior to the fish rescue.

Mitigation Measure 3.3-3d: Consult with Resources Agencies and Implement Additional Measures.

The City shall also consult with NMFS, USFWS, and CDFW (as part of obtaining permit approvals (e.g., FESA Section 7, CESA [Fish and Game Code Sections 2080.1, 2081]) to determine necessary impact minimization actions, which may include surveying the intake site to determine fish presence prior to installation. The City shall implement any additional measures developed through the FESA Section 7 and Fish and Game Code Sections 2080.1, 2081 permit processes, to ensure that impacts are avoided and/or minimized.

Mitigation Measure 3.3-4: Underwater Sound Levels.

The City shall implement the following measures to avoid and minimize potential adverse effects that could otherwise result from in-water pile-driving activities:

- The City shall develop a plan for pile-driving activities to minimize impacts on fish and will allow sufficient time in the schedule for coordination with regulatory agencies. Measures will be implemented to minimize underwater sound pressure to levels below thresholds for peak pressure and accumulated sound exposure levels. Threshold levels established by NMFS are:
 - peak pressure = 206 dBpeak
 - accumulated sound exposure levels= 183 dBSEL
- Underwater sound monitoring shall be performed during pile-driving activities. A qualified acoustician, biologist, and/or natural resource specialist shall be present during such work to monitor construction activities and compliance with terms and conditions of permits.

- Pile driving shall occur during the established/approved work window (August 1 through October 31, or other as approved by NMFS, USFWS, and CDFW).
- Sheet piling shall be driven by vibratory or nonimpact methods (i.e., hydraulic) that result in sound pressures below threshold levels to the extent feasible.
- Pile driving activities may occur during periods of reduced currents as needed to meet the threshold limits. Pile-driving activities shall be monitored and if any stranding, injury, or mortality to fish is observed, CDFW, NMFS, and/or USFWS shall be immediately notified and in-water pile driving shall cease.
- Pile driving shall be conducted only during daylight hours and initially will be used at low energy levels and reduced impact frequency. Applied energy and frequency shall be gradually increased until the force and frequency necessary to advance the pile is achieved.
- If it is determined that impact hammers are required and/or underwater sound monitoring demonstrates that thresholds are being exceeded, the contractor shall implement sound dampening or attenuation devices to reduce levels to the extent feasible; these may include the following:
 - water bladder cofferdam;
 - confined or unconfined air bubble curtain.

Mitigation Measure 3.3-5: Purchase Mitigation Credits.

The City shall purchase mitigation credits from a public or private mitigation bank approved by USFWS, NMFS, and/or CDFW. The final number of credits to be purchased shall be determined in consultation with USFWS, NMFS, and CDFW. Mitigation credit purchase shall be conducted either before or as soon as possible after construction of the intake commences.

Mitigation Measure 3.4-1a: Pre-construction Nesting Bird Surveys.

The general raptor and passerine bird nesting period cited by CDFW is often cautiously interpreted as the period between February 1 and August 31. Breeding birds are protected under Section 3503 of the California Fish and Game Code (Code), and raptors are protected under Section 3503.5. In addition, both Section 3513 of the Code and the Federal Migratory Bird Treaty Act (16 USC, Sec. 703 Supp. I, 1989) prohibit the killing, possession, or trading of migratory birds. Finally, Section 3800 of the Code prohibits the taking of non-game birds, which are defined as birds occurring naturally in California that are neither game birds nor fully protected species.

In general, CDFW recommends a 250-foot construction exclusion zone around the nests of active passerine songbirds during the breeding season, and a 500-foot buffer for nesting raptors. These buffer distances are considered initial

starting distances once a nest has been identified, and are sometimes revised downward to 100 feet and 250 feet, respectively, based on site conditions and the nature of the work being performed. These buffer distances may also be modified if obstacles such as buildings or trees obscure the construction area from active bird nests, or existing disturbances create an ambient background disturbance similar to the proposed disturbance.

- a) Avian surveys shall be performed during breeding bird season (February 1 to August 31) no more than 14 days prior to ground disturbing or in-water construction activities in order to locate any active passerine nests within 250 feet of the project footprint and any active raptor nests within 500 feet of the project footprint. Building demolition, trenching, pipeline installation, and new construction activities performed between September 1 and January 31 avoid the general nesting period for birds and therefore would not require pre-construction surveys.
- b) If active nests are found on either the proposed construction site, no-work buffer zones shall be established around the nests (100 to 150 feet for passerine birds and 150 to 250 feet for raptors, depending upon species sensitivity to disturbance) in coordination with CDFW. No staging, ground-disturbing, or construction activities shall occur within a buffer zone until young have fledged or the nest is otherwise abandoned as determined by the qualified biologist. If work during the nesting season stops for 14 days or more and then resumes, then nesting bird surveys shall be repeated, to ensure that no new birds have begun nesting in the area.

Mitigation Measure 3.4-1b: Pre-construction Bat Survey

To minimize impacts on special-status bats, a preconstruction survey shall be performed from accessible lands, and no-disturbance buffers shall be created around active bat roosting sites, if found.

Prior to ground disturbing construction activities (i.e., ground clearing, trenching, and grading) within 200 feet of trees that could support special-status bats, a qualified bat biologist shall survey for special-status bats. If no evidence of bats (i.e., direct observation, guano, staining, or strong odors) is observed, no further mitigation shall be required.

If evidence of bats is observed, the following measures shall be implemented to avoid potential impacts on breeding populations:

- a) A no-disturbance buffer of 200-feet shall be created around active bat roosts during the breeding season (April 15 through August 15). Bat roosts initiated during construction are presumed to be unaffected by the indirect effects of noise and construction disturbances. However, the direct take of individuals will be prohibited.
- b) In the case that removal of trees showing evidence of bat activity is needed, tree removal shall occur during the period least likely to affect bats, as determined by a qualified bat biologist (generally between February 15 and

October 15 for winter hibernacula, and between August 15 and April 15 for maternity roosts). Bat exclusion activities (e.g., installation of netting to block roost entrances) shall also be conducted during these periods.

The qualified biologist shall be present during any tree trimming and disturbance, if trees containing or suspected of containing bat roosts are present. Trees with roosts shall be disturbed only when no rain is occurring or is forecast to occur for 3 days and when daytime temperatures are at least 50 degrees Fahrenheit (°F). Branches and limbs not containing cavities or fissures in which bats could roost shall be cut only using chainsaws. Branches or limbs containing roost sites shall be trimmed the following day, under the supervision of the qualified biologist, also using chainsaws.

Mitigation Measure 3.4-3: Recontour Aquatic Habitat and Remove Debris Following In-Water Construction.

To mitigate impacts on waters of the U.S. in the San Joaquin River, it is estimated that the City will remove debris (e.g., concrete, the existing pipeline, and piers) and structures from the work area in an amount that is equal to or greater than the area of new facilities that will be introduced into the water. Because no wetlands (i.e., vegetated aquatic habitat) is present in the project footprint, the City need only restore the bottom contours of the San Joaquin River bed to emulate existing aquatic conditions at the site and no further shoreline restoration is needed. Specific water quality requirements during construction are identified in Section 3.10, Local Hydrology and Water Quality.

D. Determination

The Central Valley Water Board has determined that the Project, when implemented in accordance with the MMRP and the conditions in this Order, will not result in any significant adverse water quality or supply impacts. (California Code of Regulations, Title 14, section 15096, subd. (h).) The Central Valley Water Board will file a NOD with the SCH within five (5) working days from the issuance of this Order. (California Code of Regulations, Title 14, section 15096, subd. (i).)

(This page intentionally left blank)

REPORTS AND NOTIFICATION REQUIREMENTS

I. Copies of this form

In order to identify your project, it is necessary to include a copy of the Project specific Cover Sheet below with your report; please retain for your records. If you need to obtain a copy of the Cover Sheet, you may download a copy of this Order as follows:

A. [Central Valley Regional Water Quality Control Board's Adopted Orders Web page](https://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/401_wqcerts/)

(https://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/401_wqcerts/)

B. Find your Order based on the County, Permittee, WDID No., and/or Project Name.

II. Report Submittal Instructions

A. Check the box on the Report and Notification Cover Sheet next to the report or notification you are submitting. (See your Order for specific reports required for your Project)

- **Part A (Monthly & Annual Reports):** These reports will be submitted monthly and annually until a Notice of Project Complete Letter is issued.
- **Part B (Project Status Notifications):** Used to notify the Central Valley Water Board of the status of the Project schedule that may affect Project billing.
- **Part C (Conditional Notifications and Reports):** Required on a case by case basis for accidental discharges of hazardous materials, violation of compliance with water quality standards, notification of in-water work, or other reports.

B. Sign the Report and Notification Cover Sheet and attach all information requested for the Report Type.

C. Electronic Report Submittal Instructions:

- Submit signed Report and Notification Cover Sheet and required information via email to: centralvalleysacramento@waterboards.ca.gov and cc: Jordan.Hensley@waterboards.ca.gov
- Include in the subject line of the email:
ATTN: Jordan Hensley; Project Name; and WDID No. 5B07CR00214

III. Definition of Reporting Terms

- A. **Active Discharge Period:** The active discharge period begins with the effective date of this Order and ends on the date that the Permittee receives a Notice of Completion of Discharges Letter or, if no post-construction monitoring is required, a Notice of Project Complete Letter. The Active Discharge Period includes all elements of the Project including site construction and restoration, and any Permittee responsible compensatory mitigation construction.
- B. **Request for Notice of Completion of Discharges Letter:** This request by the Permittee to the Central Valley Water Board staff pertains to projects that have post construction monitoring requirements, e.g. if site restoration was required to be monitored for 5 years following construction. Central Valley Water Board staff will review the request and send a Completion of Discharges Letter to the Permittee upon approval. This letter will initiate the post-discharge monitoring period and a change in fees from the annual active discharge fee to the annual post-discharge monitoring fee.
- C. **Request for Notice of Project Complete Letter:** This request by the Permittee to the Central Valley Water Board staff pertains to projects that either have completed post-construction monitoring and achieved performance standards or have no post-construction monitoring requirements, and no further Project activities are planned. Central Valley Water Board staff will review the request and send a Project Complete Letter to the Permittee upon approval. Termination of annual invoicing of fees will correspond with the date of this letter.
- D. **Post-Discharge Monitoring Period:** The post-discharge monitoring period begins on the date of the Notice of Completion of Discharges Letter and ends on the date of the Notice of Project Complete Letter issued by the Central Valley Water Board staff. The Post-Discharge Monitoring Period includes continued water quality monitoring or compensatory mitigation monitoring.
- E. **Effective Date:** 27 March 2020

IV. Map/Photo Documentation Information

When submitting maps or photos, please use the following formats.

A. **Map Format Information:**

Preferred map formats of at least 1:24000 (1" = 2000') detail (listed in order of preference):

- **GIS shapefiles:** The shapefiles must depict the boundaries of all project areas and extent of aquatic resources impacted. Each shape should be attributed with the extent/type of aquatic resources impacted. Features and boundaries should be accurate to within 33 feet (10 meters). Identify datum/projection used and if possible, provide map with a North American Datum of 1983 (NAD83) in the California Teale Albers projection in feet.

- **Google KML files** saved from Google Maps: My Maps or Google Earth Pro. Maps must show the boundaries of all project areas and extent/type of aquatic resources impacted. Include URL(s) of maps. If this format is used include a spreadsheet with the object ID and attributed with the extent/type of aquatic resources impacted.
 - **Other electronic format** (CAD or illustration format) that provides a context for location (inclusion of landmarks, known structures, geographic coordinates, or USGS DRG or DOQQ). Maps must show the boundaries of all project areas and extent/type of aquatic resources impacted. If this format is used include a spreadsheet with the object ID and attributed with the extent/type of aquatic resources impacted.
 - Aquatic resource maps marked on paper **USGS 7.5 minute topographic maps** or **Digital Orthophoto Quarter Quads (DOQQ)** printouts. Maps must show the boundaries of all project areas and extent/type of aquatic resources impacted. If this format is used include a spreadsheet with the object ID and attributed with the extent/type of aquatic resources impacted.
- B. Photo-Documentation:** Include a unique identifier, date stamp, written description of photo details, and latitude/longitude (in decimal degrees) or map indicating location of photo. Successive photos should be taken from the same vantage point to compare pre/post construction conditions.

V. Report and Notification Cover Sheet

Project: City of Antioch Brackish Water Desalination Project
Permittee: City of Antioch
WDID: 5B07CR00214
Reg. Meas. ID: 432962
Place ID: 859703
Order Effective Date: 27 March 2020
Order Expiration Date: 26 March 2025

VI. Report Type Submitted

A. Part A – Project Reporting

Report Type 1 ☐ Monthly Report
Report Type 2 ☐ Annual Report

B. Part B – Project Status Notifications

Report Type 3 ☐ Commencement of Construction
Report Type 4 ☐ Request for Notice of Completion of Discharges Letter
Report Type 5 ☐ Request for Notice of Project Complete Letter

C. Part C – Conditional Notifications and Reports

Report Type 6 ☐ Accidental Discharge of Hazardous Material Report
Report Type 7 ☐ Violation of Compliance with Water Quality Standards Report
Report Type 8 ☐ In-Water Work/Diversions Water Quality Monitoring Report
Report Type 9 ☐ Modifications to Project Report
Report Type 10 ☐ Transfer of Property Ownership Report
Report Type 11 ☐ Transfer of Long-Term BMP Maintenance Report

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Print Name¹	Affiliation and Job Title
-------------------------------	----------------------------------

Signature	Date
------------------	-------------

¹STATEMENT OF AUTHORIZATION (include if authorization has changed since application was submitted)

I hereby authorize _____ to act in my behalf as my representative in the submittal of this report, and to furnish upon request, supplemental information in support of this submittal.

Permittee's Signature	Date
------------------------------	-------------

*This Report and Notification Cover Sheet must be signed by the Permittee or a duly authorized representative and included with all written submittals.
--

A. Part A – Project Reporting

1. Report Type 1 - Monthly Report

- a. Report Purpose** - Notifies Central Valley Water Board staff of the Project status and environmental compliance activities on a monthly basis.
- b. When to Submit** - On the 1st day of each month after the submittal of the Commencement of Construction Notification until a Notice of Project Complete Letter is issued to the Permittee.
- c. Report Contents -**
 - i. Construction Summary
Describe Project progress and schedule including initial ground disturbance, site clearing and grubbing, road construction, site construction, and the implementation status of construction storm water Best Management Practices (BMPs). Best Management Practices (BMPs) is a term used to describe a type of water pollution or environmental control. If construction has not started, provide estimated start date.
 - ii. Event Summary
Describe distinct Project activities and occurrences, including environmental monitoring, surveys, and inspections.
 - iii. Photo Summary
Provide photos of Project activities. For each photo, include a unique site identifier, date stamp, written description of photo details, and latitude/longitude (in decimal degrees) or map indicating location of photo. Successive photos should be taken from the same vantage point to compare pre/post construction conditions.
 - iv. Compliance Summary
 - List name and organization of environmental surveyors, monitors, and inspectors involved with monitoring environmental compliance for the reporting period.
 - List associated monitoring reports for the reporting period.
 - Summarize observed incidences of non-compliance, compliance issues, minor problems, or occurrences.
 - Describe each observed incidence in detail. List monitor name and organization, date, location, type of incident, corrective action taken (if any), status, and resolution.

2. Report Type 2 - Annual Report

- a. **Report Purpose** - Notify the Central Valley Water Board staff of Project status during both the active discharge and post-discharge monitoring periods.
- b. **When to Submit** - Annual reports shall be submitted each year on the 1st day of May. Annual reports shall continue until a Notice of Project Complete Letter is issued to the Permittee.
- c. **Report Contents** - The contents of the annual report shall include the topics indicated below for each project period. Report contents are outlined in Annual Report Topics below.

During the Active Discharge Period

- **Topic 1: Construction Summary**
- **Topic 2: Mitigation for Temporary Impacts Status**
- **Topic 3: Compensatory Mitigation for Permanent Impacts Status**

During the Post-Discharge Monitoring Period

- **Topic 2: Mitigation for Temporary Impacts Status**
- **Topic 3: Compensatory Mitigation for Permanent Impacts Status**

i. Annual Report Topic 1 - Construction Summary

When to Submit - With the annual report during the Active Discharge Period.

Report Contents - Project progress and schedule including initial ground disturbance, site clearing and grubbing, road construction, site construction, and the implementation status of construction storm water best management practices (BMPs). If construction has not started, provide estimated start date and reasons for delay.

1) Map showing general Project progress.

2) If applicable:

- a) Summary of Conditional Notification and Report Types 6 and 7 (Part C below).
- b) Summary of Certification Deviations. See Certification Deviation Attachment for further information.

ii. Annual Report Topic 2 - Mitigation for Temporary Impacts Status

When to Submit - With the annual report during both the Active Discharge Period and Post-Discharge Monitoring Period.

Report Contents -

- 1) Planned date of initiation and map showing locations of mitigation for temporary impacts to waters of the state and all upland areas of temporary disturbance which could result in a discharge to waters of the state.
 - 2) If mitigation for temporary impacts has already commenced, provide a map and information concerning attainment of performance standards contained in the restoration plan.
- iii. Annual Report Topic 3 - Compensatory Mitigation for Permanent Impacts Status

When to Submit - With the annual report during both the Active Discharge Period and Post-Discharge Monitoring Period.

Report Contents - *If not applicable report N/A.

1) Part A. Permittee Responsible

- a) Planned date of initiation of compensatory mitigation site installation.
- b) If installation is in progress, a map of what has been completed to date.
- c) If the compensatory mitigation site has been installed, provide a final map and information concerning attainment of performance standards contained in the compensatory mitigation plan.

2) Part B. Mitigation Bank or In-Lieu Fee

- a) Status or proof of purchase of credit types and quantities.
- b) Include the name of bank/ILF Program and contact information.
- c) If ILF, location of project and type if known.

B. Part B – Project Status Notifications

1. Report Type 3 - Commencement of Construction

- a. Report Purpose** - Notify Central Valley Water Board staff prior to the start of construction.
- b. When to Submit** - Must be received at least seven (7) days prior to start of initial ground disturbance activities.
- c. Report Contents** -
 - i. Date of commencement of construction.
 - ii. Anticipated date when discharges to waters of the state will occur.
 - iii. Project schedule milestones including a schedule for onsite compensatory mitigation, if applicable.
 - iv. Construction Storm Water General Permit WDID No.
 - v. Proof of purchase of compensatory mitigation for permanent impacts from the mitigation bank or in-lieu fee program.

2. Report Type 4 - Request for Notice of Completion of Discharges Letter

- a. Report Purpose** - Notify Central Valley Water Board staff that post-construction monitoring is required and that active Project construction, including any mitigation and permittee responsible compensatory mitigation, is complete.
- b. When to Submit** - Must be received by Central Valley Water Board staff within thirty (30) days following completion of all Project construction activities.
- c. Report Contents** -
 - i. Status of storm water Notice of Termination(s), if applicable.
 - ii. Status of post-construction storm water BMP installation.
 - iii. Pre- and post-photo documentation of all Project activity sites where the discharge of dredge and/or fill/excavation was authorized.
 - iv. Summary of Certification Deviation discharge quantities compared to initial authorized impacts to waters of the state, if applicable.
 - v. An updated monitoring schedule for mitigation for temporary impacts to waters of the state and permittee responsible compensatory mitigation during the post-discharge monitoring period, if applicable.

3. Report Type 5 - Request for Notice of Project Complete Letter

- a. Report Purpose** - Notify Central Valley Water Board staff that construction and/or any post-construction monitoring is complete, or is not required, and no further Project activity is planned.

b. When to Submit - Must be received by Central Valley Water Board staff within thirty (30) days following completion of all Project activities.

c. Report Contents -

i. Part A: Mitigation for Temporary Impacts

- 1) A report establishing that the performance standards outlined in the restoration plan have been met for Project site upland areas of temporary disturbance which could result in a discharge to waters of the state.
- 2) A report establishing that the performance standards outlined in the restoration plan have been met for restored areas of temporary impacts to waters of the state. Pre- and post-photo documentation of all restoration sites.

ii. Part B: Permittee Responsible Compensatory Mitigation

- 1) A report establishing that the performance standards outlined in the compensatory mitigation plan have been met.
- 2) Status on the implementation of the long-term maintenance and management plan and funding of endowment.
- 3) Pre- and post-photo documentation of all compensatory mitigation sites.
- 4) Final maps of all compensatory mitigation areas (including buffers).

iii. Part C: Post-Construction Storm Water BMPs

- 1) Date of storm water Notice of Termination(s), if applicable.
- 2) Report status and functionality of all post-construction BMPs.

C. Part C – Conditional Notifications and Reports

1. Report Type 6 - Accidental Discharge of Hazardous Material Report

- a. Report Purpose** - Notifies Central Valley Water Board staff that an accidental discharge of hazardous material has occurred.
- b. When to Submit** - Within five (5) working days following the date of an accidental discharge. Continue reporting as required by Central Valley Water Board staff.
- c. Report Contents** -
 - i. The report shall include the OES Incident/Assessment Form, a full description and map of the accidental discharge incident (i.e. location, time and date, source, discharge constituent and quantity, aerial extent, and photo documentation). If applicable, the OES Written Follow-Up Report may be substituted.
 - ii. If applicable, any required sampling data, a full description of the sampling methods including frequency/dates and times of sampling, equipment, locations of sampling sites.
 - iii. Locations and construction specifications of any barriers, including silt curtains or diverting structures, and any associated trenching or anchoring.

2. Report Type 7 - Violation of Compliance with Water Quality Standards Report

- a. Report Purpose** - Notifies Central Valley Water Board staff that a violation of compliance with water quality standards has occurred.
- b. When to Submit** - The Permittee shall report any event that causes a violation of water quality standards within three (3) working days of the noncompliance event notification to Central Valley Water Board staff.
- c. Report Contents** - The report shall include: the cause; the location shown on a map; and the period of the noncompliance including exact dates and times. If the noncompliance has not been corrected, include: the anticipated time it is expected to continue; the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and any monitoring results if required by Central Valley Water Board staff.

3. Report Type 8 - In-Water Work and Diversions Water Quality Monitoring Report

- a. Report Purpose** - Notifies Central Valley Water Board staff of the start and completion of in-water work. Reports the sampling results during in-water work and during the entire duration of temporary surface water diversions.

- b. When to Submit** - Seven (7) days prior to the start of in-water work. Within three (3) working days following the completion of in-water work. Surface water monitoring reports to be submitted two (2) weeks on initiation of in-water construction and during entire duration of temporary surface water diversions. Continue reporting in accordance with the approved water quality monitoring plan or as indicated in XIV.C.3.
- c. Report Contents** - As required by the approved water quality monitoring plan or as indicated in XIV.C.3.

4. Report Type 9 - Modifications to Project Report

- a. Report Purpose** - Notifies Central Valley Water Board staff if the Project, as described in the application materials, is altered in any way or by the imposition of subsequent permit conditions by any local, state or federal regulatory authority.
- b. When to Submit** - If Project implementation as described in the application materials is altered in any way or by the imposition of subsequent permit conditions by any local, state or federal regulatory authority.
- c. Report Contents** - A description and location of any alterations to Project implementation. Identification of any Project modifications that will interfere with the Permittee's compliance with the Order.

5. Report Type 10 - Transfer of Property Ownership Report

- a. Report Purpose** - Notifies Central Valley Water Board staff of change in ownership of the Project or Permittee-responsible mitigation area.
- b. When to Submit** - At least 10 working days prior to the transfer of ownership.
- c. Report Contents** -
 - i. A statement that the Permittee has provided the purchaser with a copy of this Order and that the purchaser understands and accepts:
 - 1) the Order's requirements and the obligation to implement them or be subject to administrative and/or civil liability for failure to do so; and
 - 2) responsibility for compliance with any long-term BMP maintenance plan requirements in this Order. Best Management Practices (BMPs) is a term used to describe a type of water pollution or environmental control
 - ii. A statement that the Permittee has informed the purchaser to submit a written request to the Central Valley Water Board to be named as the permittee in a revised order.

6. Report Type 11 - Transfer of Long-Term BMP Maintenance Report

- a. Report Purpose** - Notifies Central Valley Water Board staff of transfer of long-term BMP maintenance responsibility.
- b. When to Submit** - At least 10 working days prior to the transfer of BMP maintenance responsibility.
- c. Report Contents** - A copy of the legal document transferring maintenance responsibility of post-construction BMPs.

(This page intentionally left blank)

SIGNATORY REQUIREMENTS

All Documents submitted in compliance with this Order shall meet the following signatory requirements:

- A.** All applications, reports, or information submitted to the Central Valley Water Quality Control Board (Central Valley Water Board) must be signed and certified as follows:
 - 1.** For a corporation, by a responsible corporate officer of at least the level of vice-president.
 - 2.** For a partnership or sole proprietorship, by a general partner or proprietor, respectively.
 - 3.** For a municipality, or a state, federal, or other public agency, by either a principal executive officer or ranking elected official.
- B.** A duly authorized representative of a person designated in items 1.a through 1.c above may sign documents if:
 - 1.** The authorization is made in writing by a person described in items 1.a through 1.c above.
 - 2.** The authorization specifies either an individual or position having responsibility for the overall operation of the regulated activity.
 - 3.** The written authorization is submitted to the Central Valley Water Board Staff Contact prior to submitting any documents listed in item 1 above.
- C.** Any person signing a document under this section shall make the following certification:

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

(This page intentionally left blank)

CERTIFICATION DEVIATION PROCEDURES

I. Introduction

These procedures are put into place to preclude the need for Order amendments for minor changes in the Project routing or location. Minor changes or modifications in project activities are often required by the Permittee following start of construction. These deviations may potentially increase or decrease impacts to waters of the state. In such cases, a Certification Deviation, as defined in Section L of the Order, may be requested by the Permittee as set forth below:

II. Process Steps

- A. Who may apply:** The Permittee or the Permittee's duly authorized representative or agent (hereinafter, "Permittee") for this Order.
- B. How to apply:** By letter or email to the 401 staff designated as the contact for this Order.
- C. Certification Deviation Request:** The Permittee will request verification from the Central Valley Water Board staff that the project change qualifies as a Certification Deviation, as opposed to requiring an amendment to the Order. The request should:
 1. Describe the Project change or modification:
 - a. Proposed activity description and purpose;
 - b. Why the proposed activity is considered minor in terms of impacts to waters of the state;
 - c. How the Project activity is currently addressed in the Order; and,
 - d. Why a Certification Deviation is necessary for the Project.
 2. Describe location (latitude/longitude coordinates), the date(s) it will occur, as well as associated impact information (i.e., temporary or permanent, federal or non-federal jurisdiction, water body name/type, estimated impact area, etc.) and minimization measures to be implemented.
 3. Provide all updated environmental survey information for the new impact area.
 4. Provide a map that includes the activity boundaries with photos of the site.
 5. Provide verification of any mitigation needed according to the Order conditions.
 6. Provide verification from the CEQA Lead Agency that the proposed changes or modifications do not trigger the need for a subsequent environmental document, an addendum to the environmental document, or a supplemental EIR. (Cal. Code Regs., tit. 14, §§ 15162-15164.)

D. Post-Discharge Certification Deviation Reporting:

1. Within 30 calendar days of completing the approved Certification Deviation activity, the Permittee will provide a post-discharge activity report that includes the following information:
 - a. Activity description and purpose;
 - b. Activity location, start date, and completion date;
 - c. Erosion control and pollution prevention measures applied;
 - d. The net change in impact area by water body type(s) in acres, linear feet and cubic yards;
 - e. Mitigation plan, if applicable; and,
 - f. Map of activity location and boundaries; post-construction photos.

E. Annual Summary Deviation Report:

1. Until a Notice of Completion of Discharges Letter or Notice of Project Complete Letter is issued, include in the Annual Project Report (see Construction Notification and Reporting attachment) a compilation of all Certification Deviation activities through the reporting period with the following information:
 - a. Site name(s);
 - b. Date(s) of Certification Deviation approval;
 - c. Location(s) of authorized activities;
 - d. Impact area(s) by water body type prior to activity in acres, linear feet and cubic yards, as originally authorized in the Order;
 - e. Actual impact area(s) by water body type in, acres, linear feet and cubic yards, due to Certification Deviation activity(ies);
 - f. The net change in impact area by water body type(s) in acres, linear feet and cubic yards; and
 - g. Mitigation to be provided (approved mitigation ratio and amount).

CHAPTER 4

Mitigation Monitoring and Reporting Program

4.1 Introduction

The California Environmental Quality Act (CEQA) requires that when a public agency makes findings pursuant to Public Resource Code Section 21081 before approving a project that would result in one or more significant impacts on the environment, the agency must adopt a reporting or monitoring program for mitigation measures incorporated into a project or imposed as conditions of approval. The program must be designed to ensure compliance during project implementation (Public Resource Code Section 21081.6).

This Mitigation Monitoring and Reporting Plan (MMRP) for the Brackish Water Desalination Facility (project) will be in place through all phases of the project, including design and construction, and will help ensure that project objectives are achieved. As the CEQA Lead Agency, the City of Antioch (City) is responsible for verifying that the provisions of the MMRP as a whole are carried out, pursuant to Section 15097(a) of the CEQA Guidelines. The City may delegate reporting or monitoring responsibilities to a subsidiary public agency or to a private entity such as a project contractor who accepts the delegation; however, until mitigation measures have been completed, the City remains responsible for ensuring that implementation of the mitigation measures occurs in accordance with the program. The City will ensure that monitoring is documented through periodic reports and that deficiencies are promptly corrected.

4.2 Format

Table 4-1 below lists all mitigation measures for the proposed project identified in the EIR by resource area. The components of the MMRP include:

Impact Number: This column presents the impact number identified in the EIR.

Impact Statement: This column presents the impact statement identified in the EIR.

Mitigation Measure: This column presents the mitigation measure identified in the EIR.

Implementation Responsibility: This column identifies the person/group responsible for implementation of the migration measure.

Monitoring Responsibility: This column contains an assignment of responsibility for the monitoring and reporting tasks.

Monitoring and Reporting Action(s): This column refers to the outcome from implementing the mitigation measure.

Timing: The general schedule for conducting each mitigation task, identifying where appropriate both the timing and the frequency of the action.

Verification of Compliance: This column may be used by the lead agency to document the person who verified the implementation of the mitigation measure and the date on which this verification occurred.

The following abbreviations are used in the table:

City	City of Antioch
BAAQMD	Bay Area Air Quality Management District
CDFW	California Department of Fish and Wildlife
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

TABLE 4-1
MITIGATION AND MONITORING AND REPORTING PROGRAM

Impact No.	Impact Summary	Mitigation Measure	Implementing Responsibility	Monitoring Responsibility	Monitoring and Reporting Action(s)	Timing	Verification of Compliance
Air Quality							
3.2-1	Construction of the project would result in criteria pollutant emissions that could exceed air quality standards or contribute substantially to an existing or projected air quality violation.	<p>3.2-1: BAAQMD Basic Construction Measures.</p> <p>To limit air pollutant emissions associated with construction, the City of Antioch and/or its construction contractor(s) shall implement and include in all contract specifications for the project the following BAAQMD-recommended Basic Construction Measures (BCM):</p> <ul style="list-style-type: none"> • All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day. • All haul trucks transporting soil, sand, or other loose material off-site shall be covered. • All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. • All vehicle speeds on unpaved roads shall be limited to 15 miles per hour (mph). • All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. • Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California Airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. • All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation. • Post a publicly visible sign with the telephone number and persons to contact at the City of Antioch regarding dust complaints. These persons shall respond and take corrective action within 48 hours. The BAAQMD's phone number shall also be visible to ensure compliance with applicable regulations. 	1. City 2. City/Contractor	1. City 2. City	1. Incorporate all listed BAAQMD-recommended BCMS into the contract specifications. 2. Monitor to verify implementation of BCMS.	1. Preconstruction 2. Construction	
3.2-3	Construction of the project would result in emissions that could conflict with the 2017 Clean Air Plan.	<p>Implement Mitigation Measure 3.2-1: BAAQMD Basic Construction Measures (see details above)</p>					
3.2-4	Construction of the project could expose sensitive receptors to toxic air contaminants, including diesel particulate matter emissions.	<p>3.2-4: Construction Emissions Minimization.</p> <p>The City of Antioch (and/or its construction contractor(s)) shall ensure that all diesel-powered equipment to be operated during construction activities at the river pump station and desalination facility sites meet USEPA-certified Tier 4 standards, the highest USEPA-certified tiered emission standards. An Exhaust Emissions Equipment Inventory shall be prepared prior to the commencement of construction and maintained throughout construction that identifies each off-road unit's certified tier specification status to be operated at the river pump station and desalination facility sites.</p> <p>Implement Mitigation Measure 3.2-1: BAAQMD Basic Construction Measures (see details above)</p>	1. City/Contractor 2. Contractor	1. City 2. City	1. Prepare Exhaust Emissions Equipment inventory for river pump station and desalination facility sites. 2. Maintain Exhaust Emissions Equipment inventory	1. Preconstruction 2. Construction	
3.2-C-1	Construction of the proposed project, in combination with other cumulative development, could result in criteria pollutant emissions that would exceed air quality standards or contribute substantially to an existing or projected air quality violation.	<p>Implement Mitigation Measure 3.2-1: BAAQMD Basic Construction Measures (see details above)</p>					
3.2-C-3	Construction of the proposed project, in combination with other cumulative development, could expose sensitive receptors to toxic air contaminants, including diesel particulate matter emissions.	<p>Implement Mitigation Measure 3.2-4: Construction Emissions Minimization (see details above)</p>					

TABLE 4-1 (CONTINUED)
MITIGATION AND MONITORING AND REPORTING PROGRAM

Impact No.	Impact Summary	Mitigation Measure	Implementing Responsibility	Monitoring Responsibility	Monitoring and Reporting Action(s)	Timing	Verification of Compliance
Aquatic Biological Resources							
3.3-3	Construction of the proposed intake facility could result in direct impacts to the mortality of fish from installation of cofferdams and dewatering.	<p>3.3-3a: Conduct Worker Awareness Training. A worker awareness training program shall be conducted for construction crews before the start of construction activities at the river intake pump station site. The program shall include a brief overview of sensitive fisheries and aquatic resources (including riparian habitats) on the project site, measures to minimize impacts on those resources, and conditions of relevant regulatory permits.</p> <p>3.3-3b: Implement In-water Work Windows. Any in-water construction activities (e.g., construction of the sheetpile cofferdam) shall be conducted during months when special-status fish species/sensitive life stages are least likely to be present or less susceptible to disturbance (e.g., August 1 to October 31; anadromous salmonids and smelts). If any in-water work is to be conducted, a qualified biologist or resource specialist shall be present during such work to monitor construction activities and ensure compliance with terms and conditions of permits issued by regulatory agencies (see Mitigation Measure 3.3-3d below).</p> <p>3.3-3c: Develop and Implement Fish Rescue Plan. To reduce the potential for fish stranding or minimize the potential for harm during cofferdam dewatering activities, the City or its contractor shall develop and implement a fish rescue plan. Prior to the closure of the cofferdam in the Delta, seining by a qualified fisheries biologist shall be conducted within the cofferdam using a small-mesh seine to direct and move fish out of the cofferdam area. Upon completion of seining, the entrance to the cofferdam shall be blocked with a net to prevent fish from entering the cofferdam isolation area before the cofferdam is completed. Once the cofferdam is completed and the area within the cofferdam is closed and isolated, additional seining shall be conducted within the cofferdam to remove any remaining fish, if present. Once all noticeable fish have been removed from the isolated area, portable pumps with intakes equipped with 1.75 mm mesh screen shall be used to dewater to a depth of 1.5-2 feet. A qualified biologist shall implement further fish rescue operations using electrofishing and dip nets. All fish that are captured shall be placed in clean 5-gallon buckets and/or coolers filled with Delta water, transported downstream of the construction area, and released back into suitable habitat in the Delta with minimal handling. After all fish have been removed using multiple seine passes, electrofishing, and dip nets (as necessary), portable pumps with intakes equipped with 1.75 mm mesh screen shall be used to dewater. NMFS, USFWS, and CDFW shall be notified at least 48 hours prior to the fish rescue.</p> <p>3.3-3d: Consult with Resources Agencies and Implement Additional Measures. The City shall also consult with NMFS, USFWS, and CDFW (as part of obtaining permit approvals (e.g., FESA Section 7, CESA [Fish and Game Code Sections 2080.1, 2081]) to determine necessary impact minimization actions, which may include surveying the intake site to determine fish presence prior to installation. The City shall implement any additional measures developed through the FESA Section 7 and Fish and Game Code Sections 2080.1, 2081 permit processes, to ensure that impacts are avoided and/or minimized.</p> <p>3.3-4: Underwater Sound Levels. The City shall implement the following measures to avoid and minimize potential adverse effects that could otherwise result from in-water pile-driving activities:</p> <ul style="list-style-type: none"> The City shall develop a plan for pile-driving activities to minimize impacts on fish and will allow sufficient time in the schedule for coordination with regulatory agencies. Measures will be implemented to minimize underwater sound pressure to levels below thresholds for peak pressure and accumulated sound exposure levels. Threshold levels established by NMFS are: <ul style="list-style-type: none"> peak pressure = 206 dBpeak accumulated sound exposure levels = 183 dBSEL Underwater sound monitoring shall be performed during pile-driving activities. A qualified acoustician, biologist, and/or natural resource specialist shall be present during such work to monitor construction activities and compliance with terms and conditions of permits. 	<ol style="list-style-type: none"> City (Biologist) 	1. City	1. Conduct worker awareness training for construction at river intake pump station site.	1. Preconstruction	
			<ol style="list-style-type: none"> City City (Biologist) 	<ol style="list-style-type: none"> City City 	<ol style="list-style-type: none"> Limit in-water construction to August 1 to October 31. Retain qualified biologist or resource specialist during in-water work at river intake pump station site. 	<ol style="list-style-type: none"> Construction Construction 	
			<ol style="list-style-type: none"> City/Contractor City City (Biologist) 	<ol style="list-style-type: none"> City City City 	<ol style="list-style-type: none"> Develop fish rescue plan Notify NMFS, USFWS, and CDFW at least 48 hours prior to fish rescue Retain qualified biologist to conduct activities according to the protocol described in the mitigation measure. 	<ol style="list-style-type: none"> Preconstruction Preconstruction Construction 	
			<ol style="list-style-type: none"> City City 	<ol style="list-style-type: none"> City City/NMFS, USFWS, and CDFW 	<ol style="list-style-type: none"> Consult with NMFS, USFWS, and CDFW. Implement additional measures identified through consultation process. 	<ol style="list-style-type: none"> Preconstruction Construction 	
3.3-4	Construction of the proposed intake facility could result in a short-term degradation of aquatic habitat caused by an increase in hydrostatic pressure, underwater noise, and vibrations.		<ol style="list-style-type: none"> City City (Acoustician, Biologist, and/or Natural Resource Specialist) City/Contractor 	<ol style="list-style-type: none"> City City City 	<ol style="list-style-type: none"> Develop plan for pile-driving activities. Retain qualified acoustician, biologist, and/or natural resource specialist to monitor pile-driving activities. Conduct construction activities according to the protocol described in the mitigation measure. 	<ol style="list-style-type: none"> Preconstruction Construction Construction 	

TABLE 4-1 (CONTINUED)
MITIGATION AND MONITORING AND REPORTING PROGRAM

Impact No.	Impact Summary	Mitigation Measure	Implementing Responsibility	Monitoring Responsibility	Monitoring and Reporting Action(s)	Timing	Verification of Compliance
Aquatic Biological Resources (cont.)							
3.3-4 (cont.)		<ul style="list-style-type: none"> Pile driving shall occur during the established approved work window (August 1 through October 31, or other as approved by NMFS, USFWS, and CDFW). Sheet piling shall be driven by vibratory or nonimpact methods (i.e., hydraulic) that result in sound pressures below threshold levels to the extent feasible. Pile driving activities may occur during periods of reduced currents as needed to meet the threshold limits. Pile-driving activities shall be monitored and if any stranding, injury, or mortality to fish is observed, CDFW, NMFS, and/or USFWS shall be immediately notified and in-water pile driving shall cease. Pile driving shall be conducted only during daylight hours and initially will be used at low energy levels and reduced impact frequency. Applied energy and frequency shall be gradually increased until the force and frequency necessary to advance the pile is achieved. If it is determined that impact hammers are required and/or underwater sound monitoring demonstrates that thresholds are being exceeded, the contractor shall implement sound dampening or attenuation devices to reduce levels to the extent feasible; these may include the following: <ul style="list-style-type: none"> water bladder cofferdam; confined or unconfined air bubble curtain. 					
3.3-5	Construction of the proposed intake facility would result in a loss of shallow water habitat.	<p>3.3-5: Purchase Mitigation Credits.</p> <p>The City shall purchase mitigation credits from a public or private mitigation bank approved by USFWS, NMFS, and/or CDFW. The final number of credits to be purchased shall be determined in consultation with USFWS, NMFS, and CDFW. Mitigation credit purchase shall be conducted either before or as soon as possible after construction of the intake commences.</p>	1. City	1. City	1. Purchase mitigation credits in consultation with USFWS, NMFS, and/or CDFW.	1. Preconstruction/Construction	
Terrestrial Biological Resources							
3.4-1	The proposed project could result in significant impacts, either directly or through habitat modifications, on species identified as sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service.	<p>3.4-1a: Pre-construction Nesting Bird Surveys.</p> <p>The general raptor and passerine bird nesting period cited by CDFW is often cautiously interpreted as the period between February 1 and August 31. Breeding birds are protected under Section 3203 of the California Fish and Game Code (Code), and raptors are protected under Section 3202 of the California Fish and Game Code (Code) and the Federal Migratory Bird Treaty Act (16 USC, Sec. 703 Sub 1, 1989) prohibit the killing of migratory birds. Finally, Section 3800 of the Code prohibits the taking of non-game birds, which are defined as birds occurring naturally in California that are neither game birds nor fully protected species.</p> <p>In general, CDFW recommends a 250-foot construction exclusion zone around the nests of active passerine songbirds during the breeding season, and a 500-foot buffer for nesting raptors. These buffer distances are considered initial starting distances once a nest has been identified, and are sometimes revised downward to 100 feet and 250 feet, respectively, based on site conditions and the nature of the work being performed. These buffer distances may also be limited if obstacles such as buildings or trees obscure the construction area from active bird nesting. Nesting disturbances create an ambient background disturbance similar to the proposed disturbance.</p> <p>a) Avian surveys shall be performed during breeding bird season (February 1 to August 31) no more than 14 days prior to ground disturbing or in-water construction activities in order to locate any active passerine nests within 250 feet of the project footprint and any active raptor nests within 500 feet of the project footprint. Building demolition, trenching, pipeline installation, and new construction activities performed between September 1 and January 31 avoid the general nesting period for birds and therefore would not require pre construction surveys.</p> <p>b) If active nests are found on either the proposed construction site, no-work buffer zones shall be established around the nests (100 to 150 feet for passerine birds and 150 to 250 feet for raptors, depending upon species sensitivity to disturbance) in coordination with CDFW. No staging, ground-disturbing, or construction activities shall occur within a buffer zone until young have fledged or the nest is otherwise abandoned as determined by the qualified biologist. If work during the nesting season stops for 14 days or more and then resumes, then nesting bird surveys shall be repeated, to ensure that no new birds have begun nesting in the area.</p>	1. City (Biologist) 2. City (Biologist) 3. City (Biologist) 4. City (Biologist)	1. City 2. City/CDFW if required 3. City/CDFW if required 4. City	1. Retain qualified biologist to conduct preconstruction avian surveys for active nests in accordance with CDFW protocols and reporting requirements. 2. Conduct construction activities according to the protocol described in the mitigation measure. 3. Retain qualified biologist to conduct preconstruction burrowing owl surveys in accordance protocol described in the mitigation measure. 4. Retain qualified biologist to conduct preconstruction surveys on Swainson's hawk in accordance protocol described in the mitigation measure.	1. Preconstruction 2. Preconstruction/Construction 3. Preconstruction/Construction 4. Preconstruction	

TABLE 4-1 (CONTINUED)
MITIGATION AND MONITORING AND REPORTING PROGRAM

Impact No.	Impact Summary	Mitigation Measure	Implementing Responsibility	Monitoring Responsibility	Monitoring and Reporting Action(s)	Timing	Verification of Compliance
Terrestrial Biological Resources (cont.)							
3.4-1 (cont.)		<p>c) Burrowing owl Take Avoidance Surveys shall be conducted according to the methodologies prescribed in the CDFW Staff Report on Burrowing Owl Mitigation (CDFG, 2012) for annual grasslands located north of the Pittsburg-Antioch Highway. Take Avoidance Surveys shall be conducted 14 days prior or less to initiating ground disturbance. As burrowing owls may recolonize a site after only a few days, time lapses greater than 14 days between project activities require subsequent surveys, including but not limited to a final survey conducted within 24 hours prior to ground disturbance to ensure absence. Surveys are intended to identify burrows and burrowing owls outside of the study area, which may be impacted by factors such as noise and vibration (heavy equipment) during project construction. As no access is available to grasslands north of the highway, a pedestrian surveys transect shall be performed from the northern edge of the public right-of-way.</p> <p>i. If burrowing owls are detected during surveys, the following restricted activity dates and setback distances derived from the 2012 Staff Report on Burrowing Owl Mitigation (CDFG 2012) shall apply, or as otherwise coordinated with the CDFW:</p> <ol style="list-style-type: none"> 1. Occupied burrows shall not be disturbed during the nesting season, from February 1 through August 31; 2. No disturbances shall occur within 50 meters (approximately 160 feet) of occupied burrows during October 16 through March 31 or within 200 meters (approximately 660 feet) April 1 through October 15; 3. No earth-moving activities or other disturbance shall occur within the aforementioned buffer zones of occupied burrows. These buffer zones shall be well-marked. If burrowing owls were found in the study area, a qualified biologist shall also delineate the extent of burrowing owl habitat on the site, and 4. Buffers may be modified by a qualified burrowing owl biologist that is knowledgeable enough to establish buffer sizes that are commensurate with the acclimation of western burrowing owls to disturbance. These buffers if modified over that prescribed above, shall be coordinated with the CDFW. 5. Because no burrowing owl habitat occurs on-site, passive relocation of owls is not anticipated. Information regarding the occurrence of burrowing owls near the project site shall be reported to the CNDDB. <p>d) Preconstruction Surveys for Swainson's hawk and white-tailed kite. If construction activities occur between February 1 and August 31, the Project Applicant shall retain a qualified biologist to conduct surveys for Swainson's hawk and white-tailed kite in accordance with the Swainson's Hawk Technical Advisory Committee 2000 guidelines (SHTAC 2000), or current guidance. Surveys shall cover a minimum of a 0.5-mile radius around the construction area. If Swainson's hawks or white-tailed kites are detected, the qualified biologist shall establish a 0.5-mile no-disturbance buffer. Buffers shall be maintained until the qualified biologist has determined that the construction project is no longer reliant upon the nest or parental care for survival. No habitat loss would occur for either species; hence, compensatory mitigation is not necessary.</p> <p>3.4-1b: Pre-construction Bat Survey. To minimize impacts on special-status bats, a preconstruction survey shall be performed from accessible lands, and no-disturbance buffers shall be created around active bat roosting sites, if found. Prior to ground disturbing construction activities (i.e., ground clearing, trenching, and grading) within 200 feet of trees that could support special-status bats, a qualified bat biologist shall survey for special-status bats. If no evidence of bats (i.e., direct observation, guano, staining, or strong odors) is observed, no further mitigation shall be required. If evidence of bats is observed, the following measures shall be implemented to avoid potential impacts on breeding populations: a) A no-disturbance buffer of 200-feet shall be created around active bat roosts during the breeding season (April 15 through August 15). Bat roosts initiated during construction are presumed to be unaffected by the indirect effects of noise and construction disturbances. However, the direct take of individuals will be prohibited.</p>	<ol style="list-style-type: none"> 1. City (Biologist) 2. City (Biologist) 	<ol style="list-style-type: none"> 1. City 2. City 	<ol style="list-style-type: none"> 1. Retain qualified biologist to conduct preconstruction surveys for active bat roosting sites or evidence of special status bats. 2. Conduct construction activities according to the protocol described in the mitigation measure. 	<ol style="list-style-type: none"> 1. Preconstruction 2. Construction 	

TABLE 4-1 (CONTINUED)
MITIGATION AND MONITORING AND REPORTING PROGRAM

Impact No.	Impact Summary	Mitigation Measure	Implementing Responsibility	Monitoring Responsibility	Monitoring and Reporting Action(s)	Timing	Verification of Compliance
Terrestrial Biological Resources (cont.)							
3.4-1 (cont.)		<p>b) In the case that removal of trees showing evidence of bat activity is needed, tree removal shall occur during the period least likely to affect bats, as determined by a qualified bat biologist (generally between February 15 and October 15 for winter hibernacula, and between August 15 and April 15 for maternity roosts). Bat exclusion activities (e.g., installation of netting to block roost entrances) shall also be conducted during these periods.</p> <p>The qualified biologist shall be present during any tree trimming and disturbance, if trees containing or suspected of containing bat roosts are present. Trees with roosts shall be disturbed only when no rain is occurring or is forecast to occur for 3 days and when daytime temperatures are at least 50 degrees Fahrenheit (°F). Branches and limbs not containing cavities or fissures in which bats could roost shall be cut only using chainsaws. Branches or limbs containing roost sites shall be trimmed the following day, under the supervision of the qualified biologist, also using chainsaws.</p>					
3.4-3	The proposed project could have a substantial adverse effect on state or federally-protected wetlands, 'other waters', and navigable waters through direct removal, filling, hydrological interruption, or other means.	<p>3.4-3: Recontour Aquatic Habitat and Remove Debris Following In-Water Construction.</p> <p>To mitigate impacts on waters of the U.S. in the San Joaquin River, it is estimated that the City will remove debris (e.g., concrete, the existing pipeline, and piers) and structures from the work area in an amount that is equal to or greater than the area of new facilities that will be introduced into the water. Because no wetlands (i.e., vegetated aquatic habitat) is present in the project footprint, the City need only restore the bottom contours of the San Joaquin River bed to a state similar to existing conditions at the site and no further shoreline restoration is needed to a State Standard required by the project. Specific standards required by the Local Hydrology and Water Quality.</p>	1. City/Contractor	1. City/USACE	1. Verify bottom of the San Joaquin River in the work area is recontoured.	1. Post-construction	
3.4-5	Development facilitated by the proposed project would not conflict with local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.	<p>Implement Mitigation Measure 3.4-1a: Pre-construction Nesting Bird Surveys (see details above)</p> <p>Implement Mitigation Measure 3.4-1b: Pre-construction Bat Survey (see details above)</p>					
3.4-C-1	Implementation of the proposed project, in combination with past, present, and reasonably foreseeable future development could result in a cumulatively significant impact related to terrestrial biological resources.	<p>Implement Mitigation Measure 3.4-1a: Pre-construction Nesting Bird Surveys (see details above)</p> <p>Implement Mitigation Measure 3.4-1b: Pre-construction Bat Survey (see details above)</p>					
Cultural Resources							
3.5-2	The project could cause a substantial adverse change in the significance of an archaeological resource.	<p>3.5-1: Inadvertent Discovery of Archaeological Resources.</p> <p>If prehistoric or historic-era archaeological resources are encountered by construction personnel during project implementation, all construction activities within 100 feet shall halt until a qualified archaeologist, defined as one meeting the Secretary of the Interior's Professional Qualification Standards for archaeology, can assess the significance of the find. Prehistoric archaeological materials might include obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or toolmaking debris; culturally darkened soil (middens) containing heat-affected rocks, artifacts, or shellfish remains; stone milling equipment (e.g., mortars, pestles, hand stones, or milling slabs); and battered stone tools, such as hammer stones and pitted stones. Historic-era materials might include stone, concrete, or adobe footings and walls; filled wells or privies; and deposits of metal, glass, and/or ceramic refuse.</p> <p>If a find is evaluated and determined to be significant, a mitigation plan shall be developed that recommends preservation in place as a preference or, if preservation in place is not feasible, data recovery through excavation. The mitigation plan will be developed in consultation with the affiliated Native American tribe(s), as appropriate. If preservation in place is feasible, this may be accomplished through one of the following means: (1) modifying the construction plan to avoid the resource; (2) incorporating the resource within open space; (3) capping and covering the resource before building appropriate facilities on the resource site; or (4) deeding the resource site into a permanent conservation easement. If preservation in place is not feasible, a qualified archaeologist shall prepare and implement a detailed treatment plan to</p>	1. City (Archaeologist) 2. City	1. City 2. City	1. Retain qualified archaeologist in the event prehistoric or historic-era archaeological resources are discovered 2. Comply with the protocol described in the mitigation measure.	1. Preconstruction 2. Construction	

TABLE 4-1 (CONTINUED)
MITIGATION AND MONITORING AND REPORTING PROGRAM

Impact No.	Impact Summary	Mitigation Measure	Implementing Responsibility	Monitoring Responsibility	Monitoring and Reporting Action(s)	Timing	Verification of Compliance
Cultural Resources (cont.)							
3.5-2 (cont.)		recover scientifically consequential information from the resources prior to any excavation at the site. Treatment for most resources would consist of (but would not necessarily be limited to) sample excavation, artifact collection, site documentation, and historical research, with the aim to target the recovery of important scientific data contained in the portion(s) of the significant resource to be impacted by the project. The treatment plan shall include provisions for analysis of data in a regional context; reporting of results within a timely manner; curation of artifacts and data at an approved facility; and dissemination of reports to local and state repositories, libraries, and interested professionals. Should the project include federal funding or oversight or otherwise qualify as a federal National Historic Landmark, the archaeological study shall be prepared in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended.					
3.5-3	The proposed project could disturb human remains, including those interred outside of dedicated cemeteries.	3.5-2: Inadvertent Discovery of Human Remains. In the event human remains are uncovered during construction activities for the project, the City shall immediately halt work, contact the Contra Costa County Coroner to evaluate the remains, and follow the procedures and protocols pursuant to Section 15064.5(e)(1) of the CEQA Guidelines. State Health and Safety Code Section 7050.5 requires that no further disturbance shall occur until PRC Section 5097.98. If the remains are determined to be of Native American descent, the coroner shall notify the Native American Heritage Commission (NAHC). The NAHC will then identify the person that the remains belong to, be it the Most Likely Descendant of the deceased Native American. The Most Likely Descendant will make recommendations as to means of treating, with appropriate dignity, the human remains and any associated grave goods as provided in PRC Section 5097.98.	1. City/Contractor	1. City	1. Comply with the protocol described in the mitigation measure if human remains are found.	1. Construction	
3.5-C-1	Implementation of the proposed project, in combination with other cumulative development, could contribute to cumulative impacts to archaeological resources.	Implement Mitigation Measure 3.5-2: Inadvertent Discovery of Human Remains (see details above)					
3.5-C-2	Implementation of the proposed project, in combination with other cumulative development, could contribute to cumulative impacts to human remains.	Implement Mitigation Measure 3.5-2: Inadvertent Discovery of Human Remains (see details above)					
Energy Conservation							
3.7-1	The project would not use large amounts of fuel or energy in an unnecessary, wasteful, or inefficient manner.	3.7-1: Construction Equipment Efficiency. The City shall retain a qualified professional (i.e., construction planner/energy efficiency expert) to identify the specific measures that the City (and its construction contractors) will implement as part of project construction and decommissioning to increase the efficient use of construction equipment to the maximum extent feasible. Such measures shall include, but not necessarily be limited to: procedures to ensure that all construction equipment is properly tuned and maintained at all times; a commitment to utilize existing electricity sources where feasible rather than portable diesel-powered generators; and identification of procedures (including the routing of haul trips) that will be followed to ensure that all materials and debris hauling is conducted in a fuel-efficient manner. The measures shall be incorporated into construction specifications and implemented throughout the construction and decommissioning periods. Implement Mitigation Measure 3.2-1: Idling Restrictions (see details under Air Quality, above) Implement Mitigation Measure 3.2-1: Idling Restrictions (see details under Air Quality, above) Implement Mitigation Measure 3.7-1: Construction Equipment Efficiency (see details above)	1. City/ Contractor	1. City	1. Retain qualified construction planner/energy efficiency expert and incorporate construction equipment efficiency measures in the construction specifications. 2. Verify implementation of equipment efficiency measures.	1. Design 2. Construction/ Decommissioning	
3.7-C-1	Implementation of the project, in combination with past, present, and reasonably foreseeable future development, would not use large amounts of fuel or energy in an unnecessary, wasteful, or inefficient manner.						

TABLE 4-1 (CONTINUED)
MITIGATION AND MONITORING AND REPORTING PROGRAM

Impact No.	Impact Summary	Mitigation Measure	Implementing Responsibility	Monitoring Responsibility	Monitoring and Reporting Action(s)	Timing	Verification of Compliance
Hazards and Hazardous Materials							
3.9-2	The proposed project could emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.	Implement Mitigation Measure 3.17-1b: Construction Traffic Control/Traffic Management Plan (see details under Transportation and Circulation, below)					
3.9-3	The proposed project would be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, could create a significant hazard to the public or the environment.	<p>3.9-3a: Health and Safety Plan.</p> <p>The construction contractor(s) shall prepare and implement site-specific Health and Safety Plans (HASPs) in accordance with 29 CFR 1910.120 to protect construction workers and the public during all excavation and grading activities. This HASP shall be submitted to the City of Antioch for review prior to commencement of demolition and construction activities and as a condition of the grading, construction, and/or demolition permit(s). The HASP shall include, but is not limited to, the following elements:</p> <ul style="list-style-type: none"> • Designation of a trained, experienced site safety and health supervisor who has the responsibility and authority to develop and implement the site HASP; • A summary of all potential risks to demolition and construction workers and maximum exposure limits for all known and reasonably foreseeable site chemicals; • Specified personal protective equipment and decontamination procedures, if needed; • Emergency procedures, including route to the nearest hospital; and • Procedures to be followed in the event that evidence of potential soil or groundwater contamination (such as soil staining, noxious odors, debris or buried storage containers) is encountered. These procedures shall be in accordance with hazardous waste operations regulations and specifically include, but are not limited to, the following: immediately stopping work in the vicinity of the unknown hazardous materials release, notifying Contra Costa Health Services - Hazardous Materials Programs, and retaining a qualified environmental firm to perform sampling and remediation. <p>3.9-3b: Soil Management Plan.</p> <p>In support of the HASP described above in Mitigation Measure 3.9-3a, the contractor shall develop and implement a Soil Management Plan (SMP) that includes a materials disposal plan specifying how the construction contractor(s) will remove, handle, transport, and dispose of all excavated materials in a safe, appropriate, and lawful manner. This SMP shall be submitted to the City of Antioch for review prior to commencement of demolition and construction activities and as a condition of the grading, construction, and/or demolition permit(s). The SMP must identify protocols for soil testing and disposal, identify the approved disposal site, and include written documentation that the disposal site can accept the waste. Contract specifications shall mandate full compliance with all applicable local, state, and federal regulations related to the identification, transportation, and disposal of hazardous materials, including those encountered in excavated soil. In addition, the City or its contractor shall contact the Fulton Shipyards to acquire the most current information regarding chemicals in sediments around the proposed project location. Contact information: Delia L. Coyle, Shannon Creson, 2200 Wynore Way, Antioch, California 94509, shannon@drilling.com.</p> <p>3.9-3c: ACM Management Plan.</p> <p>Prior to commencement of demolition and construction activities and as a condition of the grading, construction, and/or demolition permit(s), the contractor that would be excavating at the location of the oil pipes that may be present shall conduct a survey to determine if the oil pipes are present and if they are coated with ACM. In the event that the abandoned petroleum pipelines are coated with ACM and in support of the HASP described above in Mitigation Measure 3.9-3a, the contractor shall develop and implement an ACM Management Plan (ACMMP) that includes a materials disposal plan specifying how the construction contractor will remove, handle, transport, and dispose of all ACM-insulated pipe materials in a safe, appropriate, and lawful manner. The ACMMP must identify protocols for worker protection, ACM testing and disposal, identification of the approved disposal site, and include written documentation that the disposal site can accept the waste. The ACMMP shall be submitted to the BAAQMD for their review and approval. Contract specifications shall mandate full compliance with all applicable local, state, and federal regulations related to the identification, transportation, and disposal of ACM.</p>	<p>1. Contractor</p> <p>2. City</p> <p>3. Contractor</p>	<p>1. City</p> <p>2. City</p> <p>3. City</p>	<p>1. Prepare and submit site-specific HASP to the City for review and approval.</p> <p>2. Verify implementation of HASP.</p>	<p>1. Preconstruction</p> <p>2. Construction</p>	
			<p>1. Contractor</p> <p>2. Contractor</p> <p>3. Contractor</p>	<p>1. City</p> <p>2. BAAQMD</p> <p>3. City</p>	<p>1. Prepare and submit SMP to the City for review and approval and incorporate requirements into the contract specifications.</p> <p>2. Contact Fulton Shipyards to acquire sediment quality information.</p> <p>3. Verify implementation of SMP.</p>	<p>1. Preconstruction</p> <p>2. Preconstruction</p> <p>3. Construction</p>	
			<p>1. Contractor</p> <p>2. Contractor</p> <p>3. Contractor</p>	<p>1. City</p> <p>2. BAAQMD</p> <p>3. City</p>	<p>1. Conduct survey to determine presence of ACM.</p> <p>2. Prepare and submit ACMMP in accordance with specifications in Mitigation Measure 3.9-3c to BAAQMD for review and approval and incorporate requirements into the contract specifications.</p> <p>3. Verify implementation of ACMMP.</p>	<p>1. Preconstruction</p> <p>2. Preconstruction</p> <p>3. Construction</p>	

TABLE 4-1 (CONTINUED)
MITIGATION AND MONITORING AND REPORTING PROGRAM

Impact No.	Impact Summary	Mitigation Measure	Implementing Responsibility	Monitoring Responsibility	Monitoring and Reporting Action(s)	Timing	Verification of Compliance
Hazards and Hazardous Materials (cont.)							
3.9-4	The proposed project could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.	Implement Mitigation Measure 3.17-1b: Construction Traffic Control/Traffic Management Plan (see details under: Transportation and Circulation, below)					
Noise and Vibration							
3.13-1	Construction of facilities under the proposed project could generate noise levels that exceed applicable regulatory noise standards or result in a substantial temporary increase in ambient noise levels at nearby sensitive receptors.	<p>3.13-1: General Noise Controls for Construction Equipment and Activities.</p> <p>a) The construction contractor(s) shall assure that construction equipment with internal combustion engines have sound control devices at least as effective as those provided by the original equipment manufacturer. No equipment shall be permitted to have an unmuffled exhaust.</p> <p>b) To reduce potential daytime construction noise impacts to residential uses immediately south and west of the desalination facility contractors shall employ temporary noise curtains or barriers along the southern and western property boundary of the WTP to shield daytime construction noise impacts to residential uses to the south and west. To reduce potential construction noise impacts to residential uses immediately east of the proposed new pump station, contractors shall employ temporary noise curtains or barriers along the eastern property boundary of the pump station veriside to shield daytime construction noise impacts to residential uses to the east. Implementation of this measure will ensure that daytime construction activities do not exceed noise criteria for daytime construction at residential uses (70 dBA Leq). These barriers shall be installed prior to the start of construction.</p> <p>c) Impact tools (i.e., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. Where use of pneumatic tools is unavoidable, an exhaust muffler shall be placed on the compressed air exhaust to lower noise levels by up to approximately 10 dBA. External jackets shall be used on impact tools, where feasible, in order to achieve a further reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible.</p> <p>3.13-3: Stationary-Source Noise Controls.</p> <p>The City shall retain an acoustical professional to design stationary-source noise controls and ensure the applicable noise standards are met. At a minimum, all stationary noise sources (e.g., RO pumps) shall be located with noise shields and shall be subject to adequate noise screening, as needed, to maintain noise levels no greater than 5 dBA above existing monitored ambient values and 60 CNEL at the property lines of nearby residences. Once the stationary noise sources have been installed, the contractor(s) shall monitor noise levels to ensure compliance with local noise standards.</p>	<p>1. Contractor</p> <p>2. City</p>	<p>1. City</p> <p>2. City</p>	<p>1. Incorporate requirement to use best available noise control techniques into contract specifications.</p> <p>2. Verify implementation of noise control measures.</p>	<p>1. Design/Preconstruction</p> <p>2. Construction</p>	
3.13-3	Operation of the project would generate traffic, stationary source, and area source noise similar to existing noise levels and would not exceed City noise requirements.	<p>3.13-3: Stationary-Source Noise Controls.</p> <p>The City shall retain an acoustical professional to design stationary-source noise controls and ensure the applicable noise standards are met. At a minimum, all stationary noise sources (e.g., RO pumps) shall be located with noise shields and shall be subject to adequate noise screening, as needed, to maintain noise levels no greater than 5 dBA above existing monitored ambient values and 60 CNEL at the property lines of nearby residences. Once the stationary noise sources have been installed, the contractor(s) shall monitor noise levels to ensure compliance with local noise standards.</p>	<p>1. City/Contractor</p> <p>2. Contractor</p>	<p>1. City</p> <p>2. City</p>	<p>1. Retain an acoustical professional to design stationary-source noise controls and incorporate requirements into contract specifications.</p> <p>2. Monitor and verify compliance with local noise standards.</p>	<p>1. Design/Preconstruction</p> <p>2. Construction</p>	
3.13-C-1	Implementation of the proposed project in combination with other cumulative development could result in a significant noise impact for which the proposed project would make a considerable contribution.	Implement Mitigation Measure 3.13-1: General Noise Controls for Construction Equipment and Activities (see details above)					
Public Services and Utilities							
3.15-1	The proposed project could disrupt operations or require relocation of regional or local utilities.	<p>3.15-1a: Locate and Confirm Utility Lines.</p> <p>Before excavation begins, the City of Antioch or its contractor(s) shall locate all overhead and underground utility lines (such as natural gas, electricity, sewerage, telephone, fuel, and water lines) that are reasonably expected to be encountered during excavation. When a project excavation is within the approximate location of a subsurface utility, the City of Antioch or its contractor shall determine the exact location of the underground utility by safe and acceptable means, including the use of hand tools and modern techniques. Information regarding the size, color, and location of existing utilities shall be confirmed before construction activities begin. These utilities shall be highlighted on all construction drawings.</p>	<p>1. City/Contractor</p>	<p>1. City</p>	<p>1. Identify utility lines in the project area that could be encountered during excavation and include locations on construction drawings.</p>	<p>1. Design/Preconstruction</p>	

TABLE 4-1 (CONTINUED)
MITIGATION AND MONITORING AND REPORTING PROGRAM

Impact No.	Impact Summary	Mitigation Measure	Implementing Responsibility	Monitoring Responsibility	Monitoring and Reporting Action(s)	Timing	Verification of Compliance
Public Services and Utilities (cont.)							
3.15-1 (cont.)		<p>3.15-1b: Coordinate Final Construction Plans with Affected Utilities. The City of Antioch or its contractor(s) shall coordinate final construction plans, schedule, and specifications with affected utilities with utility providers and affected jurisdictions (e.g., the City of Pittsburg). Arrangements shall be made with these entities regarding the appropriate protection, relocation, or temporary disconnection of services. If any interruption of service is required, the City of Antioch or its contractor(s) shall notify residents and businesses in the project corridor or any planned utility service disruption at least 2 working days and up to 14 calendar days in advance.</p> <p>3.15-1c: Safeguard Employees from Potential Accidents Related to Underground Utilities. When any excavation is open, the construction contractor(s) shall protect, support, or remove underground utilities as necessary to safeguard employees. The contractor(s) shall be required to provide weekly updates to the City of Antioch and construction workers regarding the planned excavations for the upcoming week, and to specify when construction will occur near a high-priority utility (i.e., pipelines carrying petroleum products, oxygen, chlorine, or toxic or flammable gases; natural gas pipelines greater than 6 inches in diameter or with normal operating pressures greater than 60 pounds per square inch gauge; and underground electric supply lines, conductors, or cables that have a potential to ground more than 300 volts that do not have effectively grounded sheaths). Construction managers shall hold regular tailgate meetings with construction staff on days when work near high-priority utilities will occur to review all safety measures regarding such excavations, including measures identified in the Mitigation Monitoring and Reporting Program and in the project specifications. The contractor shall designate a qualified Health and Safety Officer who shall specify and document the safety measures to be taken to protect workers and such utility lines shall not be authorized until the designated Health and Safety Officer confirms and documents in the construction records that: (1) the line was appropriately located in the field by the utility owner using as-built drawings and a pipeline-locating device; and (2) the location was verified by hand by the construction contractor.</p> <p>3.15-1d: Emergency Response Plan. Before commencement of construction, the City of Antioch or its contractor(s) shall develop an emergency response plan that outlines procedures to follow in the event of a leak or explosion. The emergency response plan shall identify the names and phone numbers of staff at the potentially affected utilities that would be available 24 hours per day in the event that construction activities cause damage to or rupture of a high-risk utility. The plan shall also detail emergency response protocols, including notification, inspection, and evacuation procedures; any equipment and vendors necessary to respond to an emergency (such as an alarm system); and routine inspection guidelines.</p> <p>3.15-1e: Notify Local Fire Departments. The City of Antioch or its contractor(s) shall notify local fire departments in advance of any time work that is to be performed in close proximity to a gas utility line, or any time damage to a gas utility line results in a leak or suspected leak, or whenever damage to any utility results in a threat to public safety.</p> <p>3.15-1f: Ensure Prompt Reconnection of Utilities. The City of Antioch or its contractor(s) shall promptly contact utility providers to reconnect any disconnected utility lines as soon as it is safe to do so.</p> <p>Implement Mitigation Measures 3.15-1a through f (see details above)</p>	<p>1. City/Contractor</p> <p>1. Contractor</p>	<p>1. City</p> <p>1. City</p>	<p>1. Implement protocol described in the mitigation measure.</p> <p>1. Provide weekly updates to the City and comply with protocol described in the mitigation measure.</p>	<p>1. Preconstruction 2. Preconstruction</p> <p>1. Preconstruction/Construction</p>	
3.15-C-1	The proposed project, in combination with other cumulative developments, could disrupt operations or require relocation of regional or local utilities.		1. City/Contractor	1. City	1. Develop emergency response plan.	1. Preconstruction	
			1. City/Contractor	1. City	1. Notify fire department in advance of work near or when work affects a gas utility line.	1. Preconstruction/Construction	
			1. City/Contractor	1. City	1. Contact utility providers when it is safe to reconnect disconnected utility lines.	1. Construction	
Recreation							
3.16-1	Project construction activities could temporarily disrupt access to recreational resources in the vicinity of the project components.	Implement Mitigation Measure 3.17-1b: Construction Traffic Control/Traffic Management Plan (see details under Transportation and Circulation, below)					

TABLE 4-1 (CONTINUED)
MITIGATION AND MONITORING AND REPORTING PROGRAM

Impact No.	Impact Summary	Mitigation Measure	Implementing Responsibility	Monitoring Responsibility	Monitoring and Reporting Action(s)	Timing	Verification of Compliance
Transportation and Circulation							
3.17-1	Construction of the proposed project would have temporary and intermittent effects on traffic and transportation conditions in the project area.	<p>3.17-1a: Encroachment Permits.</p> <p>The construction contractor shall obtain any necessary road encroachment permits prior to constructing each project component and shall comply with the conditions of approval attached to all project permits and approval. In addition, the Construction Traffic Control/Traffic Management Plan (subject to local jurisdiction review and approval) required by Mitigation Measure 3.17-1b, would include safety measures for traffic flow and circulation during project construction.</p> <p>3.17-1b: Construction Traffic Control/Traffic Management Plan.</p> <p>The construction contractor shall prepare a Construction Traffic Control/Traffic Management Plan and submit it to the appropriate local jurisdiction prior to construction (i.e., City of Antioch, City of Pittsburg) for review and approval prior to construction. The plan shall include the following components:</p> <ul style="list-style-type: none">Identify hours of construction (between 8:00 AM and 5:00 PM; no construction shall be permitted between 10:00 PM and 7:00 AM);Schedule truck trips outside of peak morning and evening commute hours to minimize adverse impacts on traffic flow (i.e., if agencies with jurisdiction over the affected roads identify highly congested roadway segments during their review of the encroachment permit applications). Haul routes that minimize truck traffic on local roadways and residential streets shall be used;Develop circulation and detour plans to minimize impact to local street circulation. This may include the use of signing and flagging to guide vehicles, bicyclists, and pedestrians through and/or around the construction zone;Control and monitor construction vehicle movements by enforcing standard construction specifications through periodic onsite inspections;Install traffic control devices where traffic conditions warrant, as specified in the applicable jurisdiction's standards (e.g., the California Manual of Uniform Traffic Controls for Construction and Maintenance Work Zones);Perform construction that crosses on-street and off-street bikeways, sidewalks, and other walkways in a manner that allows for safe access for bicyclists and pedestrians. Alternatively, provide safe detours to reroute affected bicycle/pedestrian traffic.Consult with the Tri Delta Transit at least one month prior to construction to coordinate bus stop relocations (as necessary) and to reduce potential interruption of transit service;Comply with roadside safety protocols to reduce the risk of accidents. Provide "Road Work Ahead" warning signs and speed control (including signs informing drivers of state-legislated double fines for speed infractions in a construction zone) to achieve required speed reductions for safe traffic flow through the work zone.Identify all access and parking restrictions, pavement markings and signage requirements (e.g., speed limit, temporary loading zones);Store all equipment and materials in designated contractor staging areas;Encourage construction crews to park at staging areas to limit lane closures in the public ROW;Include a plan and implementation process for notifications and a process for communication with affected residents, businesses, and recreational users (public boat launch ramp and Contra Costa County Fairground) prior to the start of construction. Advance public notification shall include posting of notices and appropriate signage of construction activities at least one week in advance. The written notification shall include the construction schedule, the exact location and duration of activities within each street (i.e., which lanes and access point/driveways would be blocked on which days and for how long), and a toll-free telephone number for receiving questions or complaints;	1. Contractor	1. City	1. Obtain road encroachment permits.	1. Preconstruction	
			1. Contractor	1. City	1. Prepare and submit a Construction Traffic Control/Traffic Management Plan to the appropriate local jurisdiction for review and approval. 2. Verify implementation of a Construction Traffic Control/Traffic Management Plan measure.	1. Preconstruction 2. Construction	

TABLE 4-1 (CONTINUED)
MITIGATION AND MONITORING AND REPORTING PROGRAM

Impact No.	Impact Summary	Mitigation Measure	Implementing Responsibility	Monitoring Responsibility	Monitoring and Reporting Action(s)	Timing	Verification of Compliance
Transportation and Circulation (cont.)							
3.17-1 (cont.)		<ul style="list-style-type: none"> Include a plan and implementation process to coordinate all construction activities with emergency service providers in the area at least one month in advance. Emergency service providers shall be notified of the timing, location, and duration of construction activities. All roads shall remain passable to emergency service vehicles at all times; Include a plan and implementation process to coordinate all construction activities with the Antioch Unified School District at least two months in advance. The School District shall be notified of the timing, location, and duration of construction activities. The City shall coordinate with the School District to identify peak circulation periods at schools along the alignment(s) (i.e., the arrival and departure of students), and require their contractor to avoid construction and lane closures during those periods. The construction contractor for each project component shall be required to maintain vehicle, bicycle, pedestrian, and school bus service during construction through inclusion of such provisions in the construction contract. The assignment of temporary crossing guards at designated intersections may be needed to enhance pedestrian safety during project construction; Identify all roadway locations where special construction techniques (e.g., trenchless pipeline installation or night construction) will be used to minimize impacts to traffic flow. Include the requirement that all open trenches be covered with metal plates at the end of each workday to accommodate traffic and access; and Specify the street restoration requirements pursuant to agreements with the local jurisdictions (i.e., City of Antioch, City of Pittsburg). 					
3.17-2	Construction of the proposed project would temporarily disrupt circulation patterns near sensitive land uses (schools, hospitals, fire stations, police stations, and other emergency providers).	Implement Mitigation Measure 3.17-1b: Construction Traffic Control/Traffic Management Plan (see details above)					
3.17-3	Construction of the proposed project would have temporary effects on alternative transportation or facilities in the project area.	Implement Mitigation Measure 3.17-1b: Construction Traffic Control/Traffic Management Plan (see details above)					
3.17-4	Construction of the proposed project would temporarily increase the potential for accidents on project area roadways.	Implement Mitigation Measure 3.17-1b: Construction Traffic Control/Traffic Management Plan (see details above)					
3.17-5	Construction of the proposed project would increase wear-and-tear on the designated haul routes used by construction vehicles to access the project area work sites.	3.17-5: Roadway Repairs. The City shall repair any roads damaged by project construction to a structural condition equal to that which existed prior to construction activity. Prior to project construction, City of Antioch Public Works Department shall document road conditions for all routes that would be used by project-related vehicles. The City shall also document road conditions after project construction is completed. Roads damaged by project construction shall be repaired to a structural condition equal to that which existed prior to construction activity.	1. City	1. City	1. Document road conditions for all routes that would be used by project-related vehicles. 2. Repair roads damaged by project-related vehicles.	1. Preconstruction/ Post-construction 2. Post-construction	
3.17-C-1	Construction of the proposed project, in combination with other cumulative development, could result in cumulative effects relating to transportation and circulation conditions in the project study area.	Implement Mitigation Measure 3.17-1a: Encroachment Permits (see details above) Implement Mitigation Measure 3.17-1b: Construction Traffic Control/Traffic Management Plan (see details above) Implement Mitigation Measure 3.17-5: Roadway Repairs (see details above)					

TABLE 4-1 (CONTINUED)
MITIGATION AND MONITORING AND REPORTING PROGRAM

Impact No.	Impact Summary	Mitigation Measure	Implementing Responsibility	Monitoring Responsibility	Monitoring and Reporting Action(s)	Timing	Verification of Compliance
Tribal Cultural Resources							
3.18-1	The project could cause a substantial adverse change in the significance of a tribal cultural resource.	Implement Mitigation Measure 3.5-1: Inadvertent Discovery of Archaeological Resources (see details under Cultural Resources, above) Implement Mitigation Measure 3.5-2: Inadvertent Discovery of Human Remains (see details under Cultural Resources, above)					
3.18-C-1	Implementation of the proposed project in combination with other cumulative development, could contribute to cumulative impacts to tribal cultural resources.	Implement Mitigation Measure 3.5-1: Inadvertent Discovery of Archaeological Resources (see details under Cultural Resources, above) Implement Mitigation Measure 3.5-2: Inadvertent Discovery of Human Remains (see details under Cultural Resources, above)					