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-2019-03507

June 23, 2020

Mr. James Henke
Branch Chief
Northern San Joaquin Valley Biology Branch
California Department of Transportation
PO Box 2048
Stockton, California 95201

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Stockton Channel Viaduct Rehabilitation Project.

Dear Mr. Henke,

Thank you for your letter of October 31, 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 Stockton Channel Viaduct Rehabilitation 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).

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.

Based on the best available scientific and commercial information, the biological opinion concludes that the proposed Project is not likely to adversely affect the federally listed threatened Central Valley (CV) spring-run Chinook salmon evolutionarily significant unit (ESU) *(Oncorhynchus tshawytscha),* and is not likely to jeopardize the continued existence of the federally listed threatened California Central Valley (CCV) steelhead distinct population segment (DPS) (*O. mykiss*) or the threatened southern DPS (sDPS) of North American green sturgeon (*Acipenser medirostris*) and is not likely to destroy or adversely modify designated critical habitats for CCV steelhead or sDPS green sturgeon. For the above species, with the exception of CV spring-run Chinook salmon, NMFS has included an incidental take statement with reasonable and prudent measures and non-discretionary terms and conditions that are necessary and appropriate to avoid, minimize, or monitor incidental take of listed species associated with the Project.

NMFS recognizes that Caltrans has assumed the Federal Highway Administration's (FHWA) responsibilities under Federal environmental laws for this Project as allowed by a Memorandum of Understanding (NEPA Assignment) with the FHWA effective December 23, 2016. As such, Caltrans serves as the lead Federal Action Agency for the proposed Project.

Please contact Lyla Pirkola in NMFS' California Central Valley Office via email at lyla.pirkola@noaa.gov or via phone at (916) 930-5615 if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

A. Catherine Marcinkevage

Cathy Marcinkevage
Acting Assistant Regional Administrator
California Central Valley Office

Enclosure

cc: 151422-WCR2019-SA00558

UNITED STATES DEPARTMENT OF COMMERCE
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Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion, Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response and Fish and Wildlife Coordination Act Recommendations.

Stockton Channel Viaduct Rehabilitation Project

NMFS Consultation Number: WCRO-2019-03507

Action Agency: California Department of Transportation (Caltrans)

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?
California Central Valley steelhead (*Oncorhynchus mykiss*) distinct population segment (DPS)	Threatened	Yes	No	Yes	No
Southern DPS of North American green sturgeon (*Acipenser medirostris*)	Threatened	Yes	No	Yes	No
Central Valley spring-run Chinook Salmon ESU (*O. tshawytscha*)	Threatened	No	N/A	N/A (Does not occur within the action area for this species)	N/A (Does not occur within the action area for this species)

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	Yes
Pacific Groundfish	Yes	Yes

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

A. Catherine Marcinkevage

Issued By: Cathy MarcinkevageActing

Acting Assistant Regional Administrator

Date: *June 23, 2020*

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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.

Because the proposed action would modify a stream or other body of water, NMFS also provides recommendations and comments for the purpose of conserving fish and wildlife resources, and enabling the Federal agency to give equal consideration with other project purposes, as required under the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq*.).

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 (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 NMFS California Central Valley Office in Sacramento, California.

1.2. Consultation History

- On April 29, 2019, California Department of Transportation (Caltrans) requested technical assistance regarding the action area for underwater sound effects for the Stockton Channel Viaduct Rehabilitation Project (Project). NMFS agreed that the 1,000-meter guidance found in the Caltrans 2015 Compendium for determination of the action area would be appropriate.
- On October 31, 2019, NMFS received a request for formal consultation from Caltrans for the Project for anticipated impacts to ESA listed California Central Valley (CCV) steelhead and southern DPS of green sturgeon; and EFH for Chinook salmon and Pacific groundfish.
- On November 15, 2019, NMFS responded with a letter of insufficiency requesting more information about the Project description and extent of effects.
- Additional requested information was received by NMFS on December 6, 2019, and consultation was initiated on that date.
- On January 27, 2020, NMFS requested Caltrans update their determinations to include federally threatened CV spring-run Chinook salmon, consultation was paused at this time.

- On February 7, 2020, NMFS and Caltrans discussed Project mitigation options including compensatory mitigation.
- On February 28, 2020, Caltrans responded by updating their determinations to include that the Project was "not likely to adversely affect" ESA-listed Central Valley (CV) spring-run Chinook salmon.
- On March 13, 2020, NMFS and Caltrans met on site to discuss Project impacts and mitigation.
- On April 14, 2020, NMFS received additional information from Caltrans regarding proposed mitigation.
- On April 22, 2020, NMFS requested clarification on the proposed mitigation.
- On April 23, 2020, Caltrans responded with sufficient information and consultation initiation was reset and re-started.

1.3. Proposed Federal Action

Under ESA, "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).Under the Magnuson-Stevens Act, 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). We considered whether or not the proposed action would cause any other activities and determined that it would not.

Project Description

Caltrans is proposing to rehabilitate the northbound and southbound Stockton Deepwater Channel Viaduct Bridges in the City of Stockton on Interstate 5 (I-5) due to structural deficiencies. The proposed Project also includes construction of a new reconfigured Pershing Avenue off-ramp with an auxiliary lane to connect I-5 to the Pershing exit. The proposed Project would remove and replace the existing viaduct structures, superstructures (*i.e*., deck, girders) and substructures (*i.e*., piers) to meet current standards. The new viaduct structure would consist of multiple parallel, adjacent cast-in-place, pre-stressed, concrete box girders. Additionally, the Pershing off-ramp structure would be built between the existing I-5 and State Route 4 (SR-4) interchange and the connection to Pershing Avenue on the north side of the Stockton Deepwater Channel, this would be a separate structure constructed to the east of the viaduct structure. Construction is anticipated to begin in 2025 and take approximately 3-4 years to complete.

Construction would be completed in four stages:

Stage 1:

- The outside shoulder of the existing northbound viaduct structure would be closed to traffic and used as a temporary construction work area.
- The existing Pershing exit ramp would be removed and a temporary ramp segment would be constructed and used for traffic while the new Pershing off-ramp structure is constructed.

Stage 2:

- The inside lanes (adjacent to the median) of the northbound and southbound viaduct structures would be removed.
- A new viaduct center section would be constructed.

- The existing viaduct structure lanes would be open for traffic during this stage.

Stage 3:

- The existing southbound viaduct structure would be removed and the new southbound structure would be constructed.
- Traffic would be carried on the new viaduct structure center section and the existing northbound structure.

Stage 4:

- The existing northbound viaduct structure would be removed and the new northbound structure would be constructed.
- Traffic would be carried on the new viaduct structure center section and the new southbound structure.

Construction Access, Staging and Storage

Morelli Park on the south side of the Stockton Deepwater Channel is a large paved parking lot used as a public boat launch facility. This area will be used for equipment and material storage, construction staging, and an on-site settling basin for managing water accumulated during dewatering. The slopes leading up to the southern viaduct structure abutment in the Morelli Park area may be used to construct falsework for the construction of the new structure. Additionally, the freeway interchange loops associated with the I-5/SR-4 interchange would be used during the construction of the southern segment of the Pershing off-ramp structure. On the north side of the Stockton Deepwater Channel, staging would occur directly under the existing viaduct structure and Pershing ramp structure on both sides of West Fremont Street. Existing facilities leased in this space would be demolished and the area would be used for equipment and material storage, construction staging, and construction of falsework to access the northern end of the viaduct structure. Mature trees occurring adjacent to the banks of the Stockton Channel will be removed to facilitate access and construction activities resulting in a loss of 0.62 acres of riparian habitat.

Pershing Off-ramp Temporary Structure

A temporary Pershing off-ramp structure would be required to maintain a northbound exit to Pershing Avenue until the new structure is complete. The temporary structure is expected to consist of steel I-girders and a concrete deck that would be constructed on top of temporary steel bent system. Pile foundations for falsework may be used if site conditions require. No in-water access would be required for the construction of the temporary structure or the demolition of either the existing or the temporary structure.

In-water Construction Access

In-water construction within the Stockton Deepwater Channel would be required for new bents 4 and 5 of the viaduct structure and bents 14 and 15 of the Pershing off-ramp structure. Access to these construction areas and activities would require the use of barges and/or temporary construction trestles.

Construction Barge Concept

Construction barges are typically flat-bottomed ships built for river and canal transport of heavy goods, which are not self-propelled and must be towed or pushed by tugboat. Because barges need to be stationary during construction, it is expected that “spud barges” would be used. A spud barge is a type of barge that is moored using through-deck pilings or steel shafts, referred to

as “spuds.” The spud barge provides a stable flat surface on the water from which construction activities can occur. Operation of spuds is achieved using a crane placed aboard the barge or by a spud winch. Spuds are then hammered into the river bottom until refusal, which allows the barge to rise and fall with changes in the water level. Barges would be assembled, equipped, and launched from Morelli Park or at a contractor’s facility and transported via tugboat to the construction site. Boats would be used during construction to maneuver the barge and transport people, equipment, and materials to and from the site.

Temporary Construction Trestle Concept

Temporary trestle structures include three access trestles, one from the south side and two from the north side of the Stockton Deepwater Channel. On the south side, a single “L” shaped trestle is proposed to access Bent 4 of the viaduct structure and Bent 14 of the proposed Pershing off-ramp structure. On the north side, two linear trestles would be constructed to access Bent 5 of the viaduct structure and Bent 15 of the Pershing off-ramp structure. The temporary trestles would be approximately 40 feet wide and would be constructed on bents supported by temporary 18-inch to 24-inch diameter steel pipe piles. Each bent would be comprised of six piles and each bent would be spaced approximately 30 feet apart. Temporary piles would be driven approximately 60 feet below the mud-line. Construction of the three temporary trestles would require the installation of approximately 126 steel pipe piles. The 18-inch to 24-inch diameter steel pipe piles would be installed by pile driving. The piles would be initially placed using a vibratory hammer and would require impact driving to set for final elevation. All in-channel steel pipe pile driving would be performed behind an aquatic sound attenuation device. Installation of piles and trestles would occur only during the “in-water” work window and would remain in place for as long as it takes to achieve trestle-mounted construction or demolition, multiple trestles would be operational at any time of year and trestle decks would be at a height above the expected higher-high tide elevation. Removal of trestle structures would include disassembling the trestles and removing temporary steel pipe piles using a vibratory extractor. Depending on site conditions, during removal piles may be cut two feet below the mudline. Removal of temporary piles would occur during the “in-water” work window.

In-channel Dewatering Activities

When construction takes place below the water level, a cofferdam would be built to give workers access to a dry work environment. Work requiring a dewatered area could include excavation, construction of foundation components, construction of formwork, crew or equipment access to foundation areas, use as sound attenuation, and in-water demolition activities.

Cofferdams are designed to control the intrusion of water from a waterway and/or the ground and consist of 1) vertical sheet piling, 2) a bracing system composed of wales, struts, or tiebacks, and, 3) a bottom seal course to prevent water from piping up into the excavation. The temporary cofferdams would use double-walled sheet piles in combination with steel pipe piles at the proposed corners of each sheetpile cofferdam. Steel pipe pile would be 24-inch in diameter and installed using a combination of vibratory and impact hammer methods to a depth of 60 feet below the mudline, removal would use a vibratory hammer. It is not feasible to drive sheet piles behind air bubble curtains, so no attenuation devices would be used during installation of sheet piles for temporary cofferdams. It is estimated that 150 24-inch diameter pipe piles would be needed and up to 17,576.63 square feet (0.41 acres) of habitat would be dewatered.

Structure Demolition

Demolition is expected to require a combination of the following methods due to the combination of concrete and steel in the existing structure:

- Explosives - explosives are inserted into boreholes to take down large amounts of concrete.
- Hydraulic breakers - boom-mounted or hand-mounted breakers are used to break apart bridge materials, this technique could be adapted for use underwater to demolish bridge supports or abutments.
- Dismantling - the bridge would be cut into sections with a saw or thermic lance and removed with a crane.
- Bursting - pressure is used from a chemical or mechanical force to split concrete.

The demolition would involve the removal of the existing superstructure, including pier footings, down to the existing pile cap at the channel mudline. The existing bents 8 and 9 conflict with the placement of the new piles for bents 4 and 5, these segments of the existing pile cap would require full demolition. Contractors would utilize upland areas or barge-mounted/trestle-mounted access for demolition activities. Demolition activities would be conducted in accordance with the Caltrans 2017 Best Management Practices (BMPs) Manual Sections WM-01 (Material Delivery and Storage), WM-04 (Spill Prevention and Control), NS-13 (Material and Equipment Use Over Water), and NS-15 (Structure Demolition/Removal Over Water) to minimize or eliminate discharge or pollutants into the water. Barges, dewatered cofferdams, and catchment methods would be used to prevent material from entering the waterway.

Deep Foundation

Large diameter drilled and/or driven piles would be used as a basis for foundation of permanent structures. Smaller diameter piles may be used for temporary structures, such as falsework or temporary bents. A combination of impact driven and cast-in-drilled-hole (CIDH) piles may be used at upland locations. CIDH piles would not be used at "in-water" locations, only driven piles.

Installation of Cast-In-Steel-Shell (CISS) Piles

CISS piles are driven steel pipe piles that are filled with cast-in-place reinforced concrete. CISS piles and steel pipe piles can be driven open ended or closed ended. If only CISS piles are used, the Project would install 144 open-ended CISS piles for deep foundations using a vibratory and impact hammer. One hundred and four piles are required for the viaduct structure and 40 for the Pershing off-ramp structure. Proposed foundation pile sizes for the viaduct structure are 60-inch diameter piles, 80-inch diameter piles would be used for bents four and five (in-water bents). Proposed foundation pile sizes for the Pershing off-ramp structure are 60-inch diameter piles at bents 11, 12, 13, 16, and 17, and 84-inch diameter piles at bents 2-10, 14, 15, 18, 19, and 20.

Forty 84-inch CISS foundation piles would be driven within the Stockton Deepwater Channel (32 for the viaduct structure and 8 for the Pershing off-ramp structure). A total of thirty-four 60-inch CISS or CIDH foundation piles would be driven or drilled in uplands approximately 200 feet from the Stockton Deepwater Channel or Mormon Slough (22 for the viaduct structure and 12 for the Pershing off-ramp structure). Five 84-inch CISS or CIDH piles would be driven or

drilled within 200 feet of Mormon Slough to construct the Pershing off-ramp structure. The remaining 65 foundation piles would be driven or drilled more than 200 feet away from waters of the Stockton Deepwater Channel. It is assumed that CISS piles will require driving with an impact hammer. Pile-driving hammers would be operated from barges or trestles as described above.

Any pile driving activities would be conducted in accordance with Caltrans 2017 Best Management Practices Manual Section NS-11 to reduce the discharge of potential pollutants into the water. All in-channel CISS pile driving would be performed behind an aquatic sound attenuation device. If CISS piles were to be driven behind a cofferdam, it would be prior to dewatering of the cofferdam. On-land installation would be similar to in-water construction. However, soil would first be excavated to the elevation of the bottom of the proposed pile cap. If ground water intrudes the excavation, dewatering would occur. Water removed from dewatered areas would be treated in accordance with Caltrans 2014 Field Guide to Construction Site Dewatering.

After soil and water are removed from the centers of the piles, steel rebar reinforcement cages and spacers are inserted into the hollow, and then the hollow is filled with concrete. This creates a solid reinforced concrete pile with a steel shell. Concrete work would be conducted in accordance with Caltrans 2017 BMPs Manual to avoid the risk of discharge of pollutants to the water.

Installation of CIDH piles

CIDH piles are reinforced concrete piles cast in holes drilled to predetermined elevations. To install CIDH piles, a borehole is drilled into the ground then concrete and steel reinforcement cages are placed into the borehole to form the pile. For CIDH piles to be used the ground must be stable enough for the drilled hole to retain its shape before and during concrete placement.

CIDH piles would not be used at in-water locations. Therefore, a maximum of 120 CIDH piles would be used for deep foundations. A maximum of 88 CIDH piles would be used for the viaduct structure and 32 for the Pershing off-ramp. Up to five 84-inch piles may be drilled within 200 feet of Mormon Slough. If only CIDH piles are used in uplands, the remaining 65 foundation piles for both structures would be drilled more than 200 feet away from waters of the Stockton Deepwater Channel.

Most commonly, a drilling auger is used for CIDH piles. Auger-cast piles are formed by drilling into the ground with a hollow stemmed continuous flight auger and no casing is required. A cement grout mix is then pumped down the stem of the auger. The auger is slowly withdrawn conveying the soil upwards out of the hole. Drilling would be performed with portable drilling rigs. These units can be self-propelled crawler mounted, truck mounted, or crane mounted. Excavated or augured soils during CIDH installation would be managed in accordance with Caltrans 2017 BMPs to minimize or eliminate the discharge of pollutants into the water.

Construction of Pile Caps

A pile cap is a thick concrete mat that resets on piles that have been driven into soft or unstable ground to provide a suitable stable foundation. The cast concrete pile cap distributes the load of

the structure to the piles. Construction of pile caps consists of concrete pours and thus require formwork and internal reinforcement. Pile caps for bents 4 and 5 of the viaduct structure and 14 and 15 of the Pershing off-ramp structure would be constructed in waters of the Stockton Deepwater Channel. The pile caps at these locations would be constructed at an elevation at which the bottom of the pile cap sits just above the water line (mean high tide line). The pile caps may be entirely cast-in-place or some components may be precast and hauled to the site, while some are cast-in-place.

Under the cast-in-place scenario, construction of the formwork for the pile cap would be connected to above water portions of the previously placed piles. Steel reinforcement bars (rebar) for supporting the pile cap are constructed within the formwork and connected to the existing steel rebar cages in the piles to provide a reinforced connection. Preliminary formwork and reinforcement for the bridge piers/columns (rebar cages) are integrated into the reinforcement for the pile cap before concrete for the pile cap is poured.

Alternatively, segments of the pile caps may be pre-cast on barges or land locations using traditional formwork and reinforcement then hauled to the construction site by barge. Pre-cast pile cap segments would have holes where the previously driven piles would stick through. These pile cap segments would be mounted on the piles using a barge or trestle mounted construction crane or other mechanical equipment. Formwork and reinforcement would then be constructed around the sides of the pre-cast units. Preliminary formwork and reinforcement of bridge piers would be integrated and concrete would be cast-in-place on top of the pre-cast unit, thereby "locking" the pre-cast units into place.

Construction of pile caps on land would be similar to the cast-in-place in-water construction described above.

Formwork refers to the temporary or permanent molds into which concrete is poured. Formwork for concrete construction including foundation pile caps and bridge piers are expected to use temporary formwork systems. These systems may consist of timber formwork or engineered formwork. Engineered formwork allows for faster construction and can be reused multiple times.

Any construction activities occurring within the Stockton Deepwater Channel would be conducted in accordance with Caltrans BMPs for Material Delivery and Storage, Spill Prevention and Control, Material and Equipment Use over Water, Concrete Curing and Concrete Finishing. Work will also be in accordance with Caltrans Standard Specifications for Stormwater Pollution Prevention Plan and Job Site Management. (Cite Caltrans 2017 BMPs and 2018 Standard Specs).

Substructure

Construct Abutments

No in-water access would be required for the demolition of old abutments or the construction of new abutments. The new viaduct structure would be constructed on the same alignment as the existing structure. Therefore, abutments for the new structure would be constructed in approximately the same locations as the existing abutments. Construction of the new structure

would require two new abutments. Each abutment would be set on 25 24-inch diameter CISS or CIDH piles (50 total abutment foundation piles). Construction of the Pershing off-ramp structure would require construction of one new abutment at the northern terminus. This new abutment would be set on twelve (12) 24-inch diameter CISS or CIDH piles. Construction of abutments is expected to require demolition of existing features, earthwork including excavation and fill activities, crane-mounted pile driving activities with an impact hammer, and concrete pours including the use of temporary formwork. CISS or CIDH piles for abutments would be constructed in the same manner as described above for deep foundation elements.

Construct Piers and Pier Tables

As described above, preliminary formwork and reinforcement for the bridge piers/columns (rebar cages) are integrated into the pile cap. Pier reinforcement cages would be fabricated at an on-land construction staging area or on a barge. Construction cranes would place and mount the piers to the pile cap. For the viaduct structure, each bent (2-7) will consist of three piers, with each of the outer spans supported by a 10.5' x 7' rectangular pier and a single 7'diameter column supporting the center span. For the Pershing off-ramp structure, each bent (2-20) will consist of single 7' diameter columns. Pier tables are the upper part of a bridge pier, usually made of concrete and designed to distribute loads evenly over the area of the pier. Construction of bridge piers requires concrete pours, formwork, internal reinforcement, and falsework. Construction of bridge piers and pier tables is expected to require barge-mounted and/or trestle mounted construction and use of cranes.

Superstructure

The basic purpose of the super structure is to carry loads from the deck across the span and to the bridge supports (substructure). The superstructure supports the riding surface of the bridge. The new superstructure of the viaduct structure would use cast-in-place segmental construction over the waterway and on land as well as conventional cast-in-place methods for the end spans. The Pershing off-ramp structure would also be constructed using cast-in-place segmental methods, with the possible exception of spans 1-9 which may require precast concrete "I" girders or conventional concrete box girders. The new viaduct structure would result in permanent shading of 3.02 acres over the waters of the Stockton Deepwater Channel. The Pershing off-ramp structure would result in permanent shading to 0.67 acres for a total of 3.69 acres of overwater structure shade on the Stockton Deepwater Channel. Compared to the existing structures, the closure of the median gap of the new viaduct structure will result in approximately 0.34 acres of additional overwater structure. Construction of the new Pershing off-ramp will result in approximately 0.67 acres of additional overwater structure, for a total of 1.01 acres of additional overwater structure shade on the Stockton Deepwater Channel.

Roadway Work

Off-structure roadwork is anticipated at areas where the new structure conforms to existing roadways. Work at each of these locations would require earthwork to modify the existing highway embankments; these activities would require the use of earth-moving equipment such as loaders, graders, excavators, backhoes, dump trucks, soil compactors or similar machinery. The design of the new roadway and bridge also includes the installation of night lighting, permanent lighting will be placed away from water surfaces to limit the amount of light shining on water surfaces. The lights will be shielded and focused on the bridge away from water surfaces.

1.4. Avoidance and Minimization Measures

The following BMPs are proposed by Caltrans to minimize or avoid overall impacts associated with the proposed action:

- Environmentally Sensitive Area Designation
    - Environmentally sensitive areas will be clearly shown on contract plans.
    - High visibility orange construction fence would be installed along the perimeter of environmentally sensitive areas.
    - Contractor encroachment into these areas will be prohibited. Work will be stopped and the Caltrans Resident Engineer will be notified if breached.
- Designated Biologist
    - NMFS-approved biologist(s) will be on-site to monitor any activities that have potential to affect listed species or habitat.
- Containment Measures and Construction Site BMPs
    - Prior to construction, the contractor would submit either a Water Pollution Control Plan (WPCP) or a Stormwater Pollution Prevention Plan (SWPPP) as appropriate.
    - The contractor will follow all applicable guidelines and requirements in Section 13 of the Caltrans 2018 Standard Specifications or any Special Provisions.
    - Project specific BMPs will address (among other things):
        - Spill prevention and control
        - Material delivery, use, storage, and stockpiles
        - Waste management
        - Vehicle and equipment cleaning, fueling, and maintenance
        - Material use over water
        - Structure removal over or adjacent to water
        - Pile driving
        - Dewatering
        - Temporary soil stabilization
        - Temporary sediment control
        - Illegal discharge detection and reporting
    - Caltrans and the contractor would perform routine inspections to verify that BMPs are properly implemented, maintained, and operating as designed.
- Worker Environmental Awareness Training
    - Prior to the onset of work, a qualified biologist will conduct a mandatory worker environmental awareness training to educate the workers about the importance of avoiding impacts to listed fish species and habitats in the work area.
    - The training will cover relevant permit conditions and avoidance and minimization measures that protect sensitive species and habitats, as well as the penalties for non-compliance with State and Federal laws.
    - The training will include information about the life history and habitat requirements of listed fish species, potential to occur in the work area, and the terms and conditions of the biological opinion.
- In-water work window

    - Construction activities below the highest-high tideline of the Stockton Deepwater Channel will occur between June 1 and October 15 to minimize effects to the most sensitive life stages of listed fish.
    - Work from barges, trestle structures or dewatered areas would occur outside of this work window.
- Restore/Revegetate disturbed areas onsite
    - Disturbed areas within the construction limits will be re-contoured to match pre-Project conditions where feasible no later than October 15 of each construction season to avoid erosion and runoff.
    - Permanent erosion control seeding will be performed at all disturbed sites over the course of construction as each site is complete, with all sites seeded by the completion of construction.
    - Caltrans will develop a riparian revegetation plan (Riparian Plan) to include revegetation of riparian habitat onsite and purchase of riparian or shaded riverine aquatic (SRA) mitigation credits.
- Pest-free construction equipment/vehicles
    - Construction equipment and vehicles will be cleaned and washed at the contractor's facility prior to arrival at the construction site.
    - All equipment and vehicles will be visually inspected for signs of New Zealand Mud snail, Chinese mitten crabs or Mississippi silversides. These organisms would be removed and ballast water would be drained and disposed of before entering the Stockton Deepwater Channel.
- Vibratory pile installation (where possible)
    - Vibratory drivers would be used for all driven piles to the maximum extent feasible to reduce the potential for adverse effects from an impact driver.
- Pile-driving attenuation
    - All impact pile driving would be performed behind a NMFS approved aquatic sounds attenuation device to reduce the transmission of sound through the water.
    - Attenuation devices include bubble curtains and dewatered cofferdams.
- Daily limited operation period for impact pile driving
    - Pile driving with impact hammers within the Stockton Deepwater Channel will observe a 12-hour non-operational period during each 24-hour cycle.
- Salvage species from dewatered areas
    - A fish relocation plan would be developed by the designated biologist for review and approval by NMFS prior to the onset of construction.
    - Dewatering pump intakes would be screened to prevent uptake of fish in accordance with the *Fish Screening Criteria for Anadromous Salmonids (*NMFS 1997).
    - Salvaged fish would be relocated to suitable habitat within the action area but outside of the construction area.
- Construction and structure lighting
    - Temporary and permanent lighting will have correlated color temperatures and under 3000K to minimize disturbance to nocturnal wildlife.
    - Temporary and permanent lighting will be shielded in a manner that prevents light from penetrating above a 90-degree angle.

    - Temporary construction lighting directly over surface waters of the Stockton Deepwater Channel will be minimized to the maximum extent feasible.
- Mitigation compensation
    - To compensate for impacts to listed salmonids resulting from the proposed construction, off-site mitigation credits for salmonids will be purchased from a NMFS-approved mitigation bank for 0.62 acres at a 1:1 ratio for riparian impacts and 1.01 acres at a 1:1 ratio for in-water impacts.

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. Caltrans determined the proposed action is not likely to adversely affect CV spring-run Chinook salmon or its critical habitat, NMFS concurrence is documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.12).

2.1. Analytical Approach

This 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 CFR402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This opinion also 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 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.

The designation(s) of critical habitat for (species) use(s) 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 opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

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 area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the function of the essential PBFs that help to form that conservation value. This opinion analyzes the effects of the Project on the following evolutionarily significant units (ESUs) and distinct population segments (DPS): California Central Valley (CCV) steelhead DPS *(O. mykiss)*, and the southern DPS (sDPS) North American green sturgeon *(A. medirostris)*. See Table 1 for species and Table 2 for critical habitat information.

Table 1. Description of species, current ESA listing classification and summary of species status.

Species	Listing Classification and Federal Register Notice	Status Summary
CCV steelhead DPS	Threatened 9/2/2005 70 FR 52488	According to the NMFS (2016c) 5-year species status review, the status of CCV steelhead has changed little since the 2011 status review, which concluded that the DPS was likely to become endangered within the foreseeable future. Most populations of natural-origin CCV steelhead 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 (sDPS green sturgeon)	Threatened 8/9/2009 74 FR 52300	According to the NMFS (2015) 5-year species status review, some threats to the species have recently been eliminated, such as take from commercial fisheries and removal of some passage barriers, but the species viability continues to be constrained by factors such as a small population size, lack of multiple spawning populations, and concentration of spawning sites into just a few locations. The species continues to face a moderate risk of extinction.

Table 2: Description of critical habitat, designation details, and status summary.

Species	Designation Date and Federal Register Notice	Status Summary
CCV Steelhead	9/2/2005 70 FR 52488	Critical habitat for CCV steelhead 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. PBFs considered essential to the conservation of the species include spawning habitat, freshwater rearing habitat, freshwater migration corridors, and estuarine areas. Many of the PBFs of CCV steelhead critical habitat are currently degraded and provide limited high quality habitat. Although the current conditions of CCV steelhead critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain in the Sacramento/San Joaquin River watersheds and the Delta are considered to have high intrinsic value for the conservation of the species, as they are critical to ongoing recovery effort.
sDPS green sturgeon	8/9/2009, 74 FR 52300	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. 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. 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. Currently, many of the PBFs of sDPS green sturgeon are degraded and provide limited high quality habitat. Although the current conditions of green sturgeon critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain in both the Sacramento/San Joaquin River watersheds, the Delta, and nearshore coastal areas are considered to have high intrinsic value for the conservation of the species.

2.2.1. *Recovery Plans*

In July 2014, NMFS released a final Recovery Plan for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, 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 for 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 threatened and endangered anadromous fish in the Central Valley 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 Central Valley salmon and steelhead. 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 Central Valley Chinook salmon populations can persist (Williams 2006).

Although 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 Dam (ACID) is considered the upriver extent of green sturgeon passage in the Sacramento River. The upriver extent of green sturgeon spawning, however, is approximately 30 kilometers downriver of ACID where water temperature is higher than ACID during late spring and summer. Thus, if water temperatures increase with climate change, temperatures adjacent to ACID may remain within tolerable levels for the embryonic and larval life stages of green sturgeon, but temperatures at spawning locations lower in the river may be more affected.

In summary, observed and predicted climate change effects are generally detrimental to the 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 there is uncertainty associated with projections, which increases over time, the direction of change is relatively certain (McClure *et al*. 2013).

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). The Project is located in the City of Stockton in San Joaquin County on I-5. The action area extends from south to north along the I-5 and SR-4 interchange. It extends across the Stockton Deepwater Channel to the existing Pershing Street off ramp. Additional surface water bodies within the action area include Old Mormon Slough, Port of Stockton Turning Basin, New Mormon Slough and McLeod Lake.

The action area includes all connecting waterways within 3,280 feet (1,000 meters) upstream and downstream of proposed in-water construction areas. This area represents the potential area of impacts from the proposed Project, such as turbidity, in addition to noise effects based on pile-driving noise during construction activities. This action area is based in part on the Caltrans 2015 Pile Driving Compendium, which states, "it is not possible to reliably predict audibility (or detectability) with any certainty at distances beyond 500 to 1,000 meters. Consequently, the Project action area based on pile driving sound should never be considered to extend more than 1,000 meters (3,280 feet or 0.62-mile) from the pile driving activity."

Since the proposed action includes the purchase of mitigation credits from a conservation bank, the action area also includes the areas affected by mitigation banks that have service areas relevant to the Project areas. These include the Fremont Landing Conservation Bank, which is a 100-acre site along the Sacramento River (Sacramento River Mile 78 through 80); Bullock Bend Mitigation Bank, which is a 116.15-acre site along the Sacramento River (Sacramento River Mile 80); Cosumnes Floodplain Mitigation Bank, which is a 472-acre site at the confluence of the Cosumnes and Mokelumne rivers (Mokelumne River Mile 22); Liberty Island Conservation Bank, which is a 186-acre site located at the south end of the Yolo Bypass on Liberty Island in the Delta; and North Delta Fish Conservation Bank, which is an 811-acre site located in Yolo County on Liberty Island.

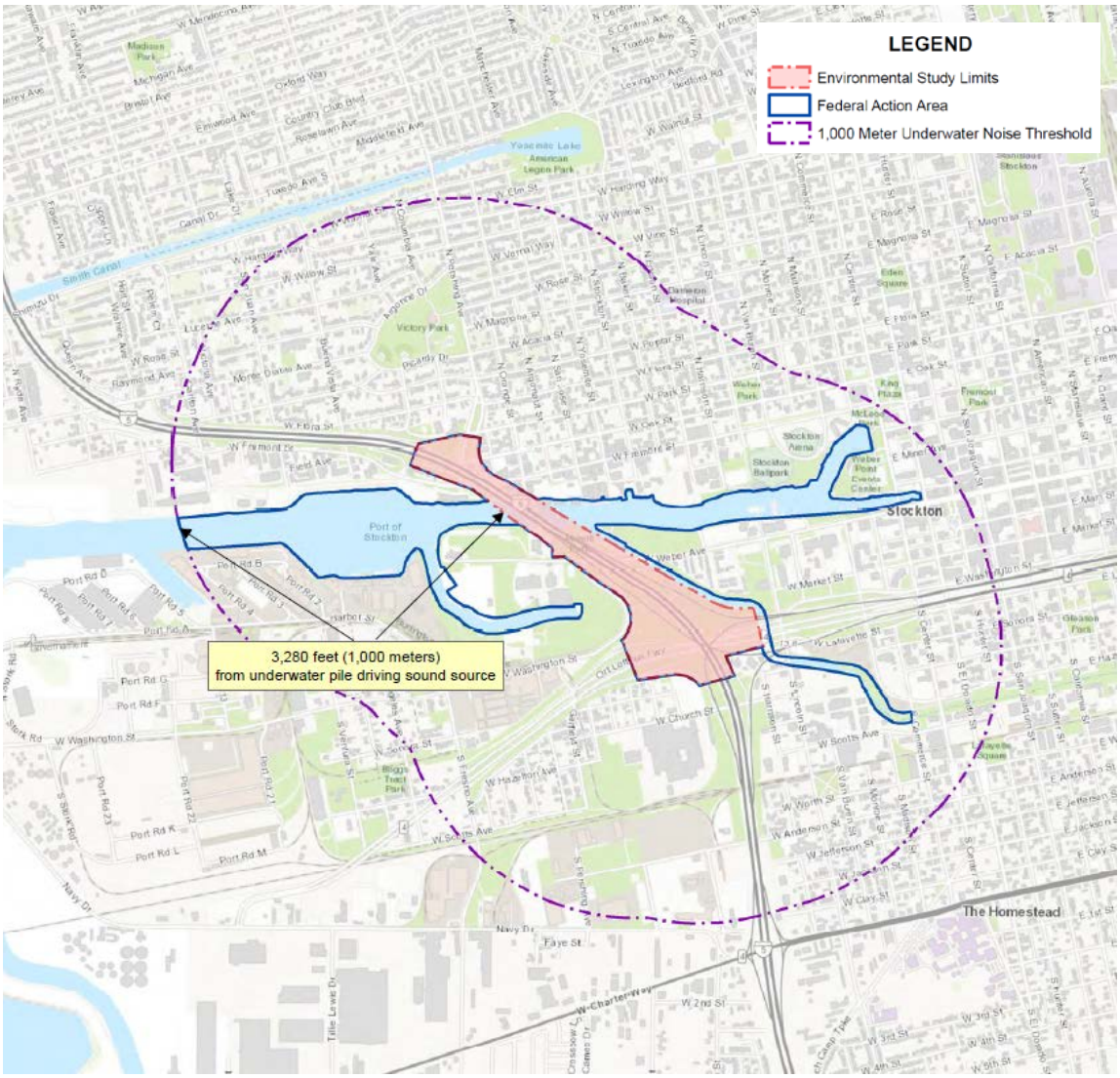

Figure 1: Proposed Action Area (Caltrans Biological Assessment, 2019)

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).

2.4.1. *Occurrence of Listed Species and Critical Habitat in the Action Area*

The federally listed anadromous species that use and occupy the action area are migrating adult and juvenile CCV steelhead and juvenile, subadult and adult sDPS green sturgeon. The action area is within designated critical habitat for CCV steelhead and sDPS green sturgeon. The nearby San Joaquin River mainstem is the primary migration corridor for both adult and juvenile CCV steelhead life stages originating in the San Joaquin River Basin. The Delta and the San Joaquin River contain important rearing habitat for juveniles. All anadromous fish that utilize the San Joaquin River Basin must also pass through the Delta at least twice to successfully complete their life histories. Juvenile and subadult sDPS green sturgeon may be present throughout the Delta during every month of the year, whereas spawning and post-spawn adults are unlikely to migrate through the action area (east of the Delta), because their primary migratory route between the ocean and upstream spawning habitats lies predominantly in the Sacramento River and its tributaries.

CCV steelhead

The life history strategies of CCV steelhead are extremely variable between individuals, and it is important to take into account that CCV steelhead are iteroparous (*i.e*., can spawn more than once in their lifetime) (Busby *et al*. 1996), and therefore may emigrate back down the system after spawning. As such, the determination of the presence or absence of CCV steelhead in the Delta accounted for both upstream and downstream migrating adult steelhead (kelts).

Adult CCV steelhead enter freshwater in August (Moyle 2002) and peak migration of adults moving upriver occurs in August through September (Hallock *et al*. 1957). Adult CCV steelhead will hold until flows are high enough in the tributaries to migrate upstream where they will spawn from December to April (Hallock *et al*. 1961). After spawning, most surviving steelhead kelts migrate back to the ocean and reach the Sacramento River during March and April, and have a high presence in the Delta in May. Migrating adult CCV steelhead through the San Joaquin River are present from July to March, with the highest abundance between December and January.. Small, remnant populations of CCV steelhead are known to occur in the Stanislaus River and the Tuolumne River and their presence is assumed on the Merced River due to proximity, similar habitats, historical presence, and recent otolith chemistry studies verifying at least one steelhead in the limited samples collected from the river (Zimmerman *et al*. 2008). Out-migrating juveniles from these tributaries would have to pass through the action area during their emigration to the ocean. Juveniles would emigrate from February through June, with the core of their migration occurring March through May.

The proposed construction period is June 1 to October 15. This will overlap with the adult CCV steelhead migration period in the San Joaquin River Basin (*i.e*., the months of September and October), but will avoid the peak of spawning migration from November through January.

DPS green sturgeon

Adult sDPS green sturgeon enter the San Francisco Bay starting in February, have been recorded in San Pablo Bay in March (Heublein *et al*., 2008), and in the Sacramento River system between late February and late July (Moyle *et al*., 1995). In general, sDPS green sturgeon enter the San

Francisco Bay estuary in winter and continue upstream to their spawning grounds from mid-winter to late summer. Spawning occurs from April to July in the mainstem Sacramento River (Poytress *et al*. 2015) and Feather River (Seesholtz *et al*. 2015). Adults have been recorded out-migrating from the Sacramento River in the fall (November to December) and summer (June to August) (Heublein *et al*., 2008). It has been suggested that spawning may also occur in the San Joaquin River (Moyle *et al*. 1995) however, this was based on a 1-year study in the 1960's collecting a large number of young green sturgeon during the summer at a shallow shoal area in the lower San Joaquin River (Radtke 1966). Data on sDPS green sturgeon distribution is extremely limited and out-migration appears to be variable occurring at different times of year. Seven years of CDFW catch data for adult sDPS green sturgeon show that they are present in the Delta during all months of the year. Adult and juvenile sDPS green sturgeon are therefore assumed to be present in the Delta year-round.

Prior to October 2017, all accounts of sDPS green sturgeon sightings in the San Joaquin River Basin were anecdotal at best or misidentified white sturgeon (Gruber *et al*. 2012, Jackson *et al*. 2016). During late October in 2017, an adult sDPS green sturgeon was sighted in the Stanislaus River near Knights Ferry by a fish biologist and its identity was genetically confirmed by genetic analysis of green sturgeon environmental DNA in the surrounding water (Breitler, 2017). This is the first confirmed sighting of a green sturgeon in a San Joaquin River tributary, and indicates that adults are able to pass upstream of the proposed action area given river flows of suitable quality and amount. Since only one adult has been confirmed in the Stanislaus River and spawning activities in the San Joaquin River Basin have never been recorded, the production of juveniles from the Stanislaus River is not considered likely in the near future. However, with the implementation of recovery actions, potential spawning grounds may become available for sDPS green sturgeon.

While the San Joaquin River Basin may not produce juvenile sDPS green sturgeon, juveniles may use both estuarine and freshwater portions of the Delta to rear for 1 to 3 years prior to exiting the system and entering the Pacific Ocean. During this period, they may range and stray up non-natal waterways searching for appropriate food resources, water quality conditions, and shelter. Therefore, foraging juveniles, subadults, and adults may be found in the Stockton Deepwater Channel at the location of the proposed action at nearly any time of year, depending on the local water depth, temperature, and quality.

Both adult and juvenile sDPS green sturgeon are expected to occur in the action area, but in low numbers. The Delta serves as an important migratory corridor for adults during their spawning migrations and as year round rearing habitat for juveniles. Both non-spawning adults and subadults use the Delta and estuary for foraging during the summer. Since there are no physical barriers to sDPS green sturgeon moving into the action area from the waters of the Delta adjacent to the action area during their rearing or foraging behaviors, presence in the action area is seen as feasible and likely. The proposed construction period is from June 1 to October 31. Since adult, subadult, and juvenile sDPS green sturgeon may be present in the Delta year round, the construction period will overlap with their presence.

CCV steelhead and sDPS green sturgeon Critical Habitat

The action area occurs within the San Joaquin Delta hydrologic unit ([HU] 18040003) and is included in the critical habitat designated for CCV steelhead. The San Joaquin Delta HU is in the southwestern portion of CCV steelhead range and includes portions of the south and central Delta channel complex. The San Joaquin Delta HU encompasses approximately 628 square miles, with 455 miles of stream channels (at 1:100,000 hydrography). The PBFs of steelhead critical habitat within the action area include freshwater rearing habitat and freshwater migration corridors. The features of the PBFs included in these different sites essential to the conservation of the CCV steelhead DPS include the following: sufficient water quantity and floodplain connectivity to form and maintain physical habitat conditions necessary for salmonid development and mobility, sufficient water quality, food and nutrients sources, natural cover and shelter, migration routes free from obstructions, no excessive predation, holding areas for juveniles and adults, and shallow water areas and wetlands. Habitat within the action area is primarily utilized for freshwater rearing and migration by CCV steelhead juveniles and smolts and for adult freshwater migration. No spawning of CCV steelhead occurs within the action area.

In regards to the designated critical habitat for sDPS green sturgeon, the action area includes the following PBFs: adequate food resources for all life stages utilizing the Delta; water flows sufficient to allow adults, subadults, and juveniles to orient to flows for migration and normal behavioral responses; water quality sufficient to allow normal physiological and behavioral responses; unobstructed migratory corridors for all life stages utilizing the Delta; a broad spectrum of water depths to satisfy the needs of the different life stages present in the estuary; and sediment with sufficiently low contaminant burdens to allow for normal physiological and behavioral responses to the environment. The general condition and function of this habitat for both CCV steelhead and sDPS green sturgeon have already been described in the Status of the Species and Critical Habitat section of this opinion. The substantial degradation over time of several of the essential critical elements has diminished the function and condition of the freshwater rearing and migratory habitats in the action area. It has only rudimentary functions compared to its historical status. The channels of the south Delta have been heavily riprapped with coarse stone slope protection on artificial levee banks and these channels have been straightened to enhance water conveyance through the system. The extensive riprapping and levee construction has precluded natural river channel migrations and the formation of riffle pool configurations in the Delta's channels. The natural floodplains have essentially been eliminated, and the once extensive wetlands and riparian zones have been cleared for farming. Little riparian vegetation remains in the south Delta, limited mainly to tules growing along the foot of artificial levee banks. Numerous artificial channels also have been created to bring water to irrigated lands that historically did not have access to the river channels (*i.e.*, Victoria Canal, Grant Line Canal, Fabian and Bell Canal, Woodward Cut, etc.). These artificial channels have disturbed the natural flow of water through the south Delta. As a byproduct of this intensive engineering of the Delta's hydrology, numerous irrigation diversions have been placed along the banks of the flood control levees to divert water from the area's waterways to the agricultural lands of the Delta's numerous "reclaimed" islands. Most of these diversions are not screened adequately to protect migrating fish from entrainment. Sections of the south Delta have been routinely dredged to provide adequate intake depth to these agricultural water diversions in order to reduce the probability of pump cavitation or loss of head on siphons.

Water flow through the south Delta is highly manipulated to serve human purposes. Rainfall and snowmelt is captured by reservoirs in the upper watersheds, from which its release is dictated primarily by downstream human needs. The SWP and CVP pumps draw water towards the south Delta, which creates a net upstream flow of water towards their intake points. Fish, and the forage base they depend upon for food, represented by free-floating phytoplankton and zooplankton, as well as larval, juvenile, and adult forms, are drawn along with the current towards these diversion points. In addition to the altered flow patterns in the south Delta, numerous discharges of treated wastewater from sanitation wastewater treatment plants (*e.g.*, Cities of Tracy, Stockton, Manteca, Lathrop, Modesto, Turlock, Riverbank, Oakdale, Ripon, Mountain House, and the Town of Discovery Bay) and the untreated discharge of numerous agricultural waste ways are emptied into the waters of the San Joaquin River and the channels of the south Delta. This leads to cumulative additions to the system of thermal effluent loads as well as cumulative loads of potential contaminants (*i.e.*, selenium, boron, endocrine disruptors, pesticides, biostimulatory compounds, etc.). The seasonal installation of temporary rock barriers by the California Department of Water Resources (DWR) has been an ongoing activity in the channels of the south Delta since 1991.

Installation of a fall rock barrier at the head of Old River has occurred intermittently since the early 1960s in order to enhance water quality downstream in the Port of Stockton and the Stockton Deepwater Channel; additionally, South Delta agricultural barriers will be installed. These barriers alter the hydrology of the south Delta each time they are installed by redirecting flows and increasing water elevation behind the barriers.

Even though the habitat has been substantially altered and its quality diminished through years of human actions, its conservation value remains high for San Joaquin River basin steelhead. This segment of CCV steelhead must pass through the San Joaquin Delta HU to reach their upstream spawning and freshwater rearing areas on the tributary watersheds and to pass through the region again during the downstream migrations of both adult runbacks and juvenile smolts. Therefore, it is of critical importance to the long-term viability of the San Joaquin River basin portion of CCV steelhead to maintain a functional migratory corridor and freshwater rearing habitat throughout the action area and the San Joaquin Delta HU.

2.4.2. *Factors Affecting Listed Species and Critical Habitat in the Action Area*

The action area encompasses a small portion of the area utilized by CCV steelhead and the sDPS green sturgeon. Many of the range-wide factors affecting these species are discussed in section 2.2 of this opinion, and are considered the same in the action area. This section will focus on the specific factors in the action area that are most relevant to the proposed Stockton Channel Viaduct Rehabilitation Project.

The magnitude and duration of peak flows during the winter and spring, which affects listed salmonids in the action area, are reduced by water impoundment in upstream reservoirs. Instream flows during the summer and early fall months have increased over historic levels for deliveries of municipal and agricultural water supplies. Overall, water management now reduces natural variability by creating more uniform flows year-round. Current flood control practices require peak flood discharges to be held back and released over a period of weeks to avoid overwhelming the flood control structures downstream of the reservoirs (*i.e.*, levees) and low

lying terraces under cultivation (*i.e.*, orchards and row crops) in the natural floodplain along the basin tributaries. Consequently, managed flows in the main stem of the river often truncate the peak of the flood hydrograph and extend the reservoir releases over a protracted period. These actions reduce or eliminate the scouring flows necessary to mobilize sediments and create natural riverine morphological features within the action area. Furthermore, the unimpeded river flow in the San Joaquin River basin is severely reduced by the combined storage capacity of the different reservoirs located throughout the basin's watershed. Very little of the natural hydrologic input to the basin is allowed to flow through the reservoirs to the valley floor sections of the tributaries leading to the Delta. Most is either stored or diverted for anthropogenic uses. Elevated flows on the valley floor are typically only seen in wet years or flood conditions, when the storage capacities of the numerous reservoirs are unable to contain all of the inflow from the watersheds above the reservoirs.

High water temperatures also limit habitat availability for listed salmonids in the San Joaquin River and the lower portions of the tributaries feeding into the main stem of the river. High summer water temperatures in the lower San Joaquin River frequently exceed 72°F, and create a thermal barrier to the migration of adult and juvenile salmonids.

Levee construction and bank protection have affected salmonid habitat availability and the processes that develop and maintain preferred habitat by reducing floodplain connectivity, changing riverbank substrate size, and decreasing riparian habitat and SRA cover. Such bank protection generally results in two levels of impacts to the environment: (1) site-level impacts, which affect the basic physical habitat structure at individual bank protection sites; and (2) reach-level impacts, which are the cumulative impacts to ecosystem functions and processes that accrue from multiple bank protection sites within a given river reach (USFWS 2000). Armored embankments result in loss of sinuosity and braiding and reduce the amount of aquatic habitat. Impacts at the reach level result primarily from halting erosion and controlling riparian vegetation. Reach-level impacts, which cause significant impacts to fish are reductions in new habitats of various kinds, changes to sediment and organic material storage and transport, reductions of lower food-chain production, and reduction in large woody debris (LWD). The use of rock armoring limits recruitment of LWD from non-riprapped areas, and greatly reduces, if not eliminates, the retention of LWD once it enters the river channel. Riprapping creates a relatively clean, smooth surface that diminishes the ability of LWD to become securely snagged and anchored by sediment. LWD tends to become only temporarily snagged along riprap, and generally moves downstream with subsequent high flows. Habitat value and ecological functioning aspects are thus greatly reduced, because wood needs to remain in place for extended periods to generate maximum values to fish and wildlife (USFWS 2000). Recruitment of LWD is limited to any eventual tree mortality or abrasion and breakage that may occur during high flows (USFWS 2000). Juvenile salmonids are likely being impacted by reductions, fragmentation, and general lack of connectedness of remaining near shore refuge areas.

Point and non-point sources of pollution resulting from agricultural discharge and urban and industrial development occur upstream of, and within the action area. The effects of these impacts are discussed in section 2.2 of this opinion. Environmental stresses, because of low water quality, can lower reproductive success and may account for low productivity rates in fish.

Organic contaminants from agricultural drain water, urban and agricultural runoff from storm events, and high trace element (*i.e.*, heavy metals) concentrations may deleteriously affect early life-stage survival of fish in the Central Valley watersheds (USFWS 1995).

2.4.3. Mitigation Banks and the Environmental Baseline

Mitigation banks present a unique factual situation, and this warrants a particular approach to how they are addressed. Specifically, when NMFS is consulting on a proposed action that includes mitigation bank credit purchases, it is likely that physical restoration work at the bank site has already occurred and/or that a section 7 consultation occurred at the time of bank establishment. A traditional reading of "environmental baseline" might suggest that the overall ecological benefits of the mitigation bank actions therefore belong in the environmental baseline. However, under this reading, all proposed actions, whether or not they included proposed credit purchases, would benefit from the environmental 'lift' of the entire mitigation bank because it would be factored into the environmental baseline. In addition, where proposed actions did include credit purchases, it would not be possible to attribute their benefits to the proposed action, without double counting. These consequences undermine the purposes of mitigation banks and do not reflect their unique circumstances. Specifically, mitigation banks are established based on the expectation of future credit purchases. In addition, credit purchases as part of a proposed action will also be the subject of a future section 7 consultation.

It is therefore appropriate to treat the beneficial effects of the bank as accruing incrementally at the time of specific credit purchases, not at the time of bank establishment or at the time of bank restoration work. Thus, for all projects within the service area of a bank, only the benefits attributable to credits sold are relevant to the environmental baseline. Where a proposed action includes credit purchases, the benefits attributable to those credit purchases are considered effects of the action. That approach is taken in this opinion.

The Project occurs within the service area of five banks approved by NMFS, with available credits for purchase or which are anticipated to have available credits for purchase prior to construction under the proposed action:

Bullock Bend Mitigation Bank: Established in 2016, the Bullock Bend Mitigation Bank is a 119.65-acre floodplain site along the Sacramento River at the confluence of the Feather River (Sacramento River Mile 106) and is approved by NMFS to provide credits for impacts to Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon and CCV steelhead. There are salmonid floodplain restoration, salmonid floodplain enhancement and salmonid riparian forest credits available. All features of this bank are designated critical habitat for the species analyzed in this opinion. The ecological value (increased rearing habitat for juvenile salmonids) of the credits that have been sold to date is part of the environmental baseline.

Cosumnes Floodplain Mitigation Bank: Established in 2008, the Cosumnes Floodplain Mitigation Bank is 472-acre floodplain site at the confluence of the Cosumnes and Mokelumne Rivers (Mokelumne River Mile 22) and is approved by NMFS to provide credits for impacts to CCV steelhead. There are SRA, floodplain riparian, and floodplain mosaic wetlands credits available. All features of this bank are designated critical habitat for the species analyzed in this

opinion. The ecological value (increased rearing habitat for juvenile salmonids) of the credits that have been sold to date is part of the environmental baseline.

Fremont Landing Conservation Bank: Established in 2006, the Fremont Landing Conservation Bank is 100-acre floodplain site along the Sacramento River at the confluence of the Feather River (Sacramento River Mile 80) and is approved by NMFS to provide credits for impacts to Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon and CCV steelhead. There are off-channel shaded aquatic habitat credits, riverine shaded aquatic habitat credits and floodplain credits available. All features of this bank are designated critical habitat for the species analyzed in this opinion. The ecological value (increased rearing habitat for juvenile salmonids) of the credits that have been sold to date is part of the environmental baseline.

Liberty Island Conservation Bank: Established in 2010, the Liberty Island Conservation Bank is a 186-acre site located at the southern end of the Yolo Bypass on Liberty Island in the Delta. It is approved by NMFS to provide credits for impacts to Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead. There are riparian shaded aquatic, salmonid preservation and salmonid restoration credits available. All features of this bank are designated critical habitat for the species analyzed in this opinion. The ecological value (increased rearing habitat for juvenile salmonids) of the credits that have been sold to date is part of the environmental baseline.

North Delta Fish Conservation Bank: Established in 2013, North Delta Fish Conservation Bank is an 811-acre site located in Yolo County and is approved by NMFS to provide credits for impacts to Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon and CCV steelhead. There are salmonid preservation and salmonid enhanced and created credits that are anticipated to be available prior to construction under the proposed action. All features of this bank are designated critical habitat for the species analyzed in this opinion.

2.4.4. NMFS Recovery Plan Recommendations

The NMFS Recovery Plan (NMFS 2014) identifies recovery actions for the San Joaquin River Basin CCV steelhead populations whose range includes the proposed action area. Recovery efforts focus on addressing several key stressors that are vital to CCV steelhead: (1) elevated water temperatures affecting adult migration and holding; (2) low flows and poor fish passage facilities, affecting attraction and migratory cues of migrating adults; and (3) possible catastrophic events (*e.g.*, fire or volcanic activity).

CCV Steelhead DPS

The NMFS Recovery Plan (NMFS, 2014) criteria for CCV steelhead describes the San Joaquin River's eastside tributaries (Stanislaus, Tuolumne, and Merced rivers) as Core 2 populations (meaning these watersheds have the potential to support viable populations, due to lower abundance, or amount and quality of habitat) downstream of major dams, and as candidates to reach viable population status if reintroduced upstream of the dams, and lists the San Joaquin River, below Friant Dam, as the primary candidate to reach viable population status (Core 1).

sDPS green sturgeon

As previously mentioned, sDPS green sturgeon spawning has not been observed in the San Joaquin River; therefore, the San Joaquin River Basin is not a main focus of their Recovery Plan. However, the sDPS does utilize the lower San Joaquin River and the discovery of an individual adult in the Stanislaus River in October 2017 highlights that passage for adults is possible during certain river conditions, the Recovery Plan goals are not likely to be modified unless adult spawning or juvenile reproduction occurs (NMFS 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).

2.5.1. Effects to Species

The following is an analysis of the potential effects to listed fish species that may occur as a result of implementing the proposed action on the Stockton Deepwater Channel. For our analysis, we have used the presence of listed species in the action area to determine the risk each species and life stage may face if exposed to Project impacts. The expected effects of the proposed action include impacts due to: (1) changes in water quality, (2) noise exposure, (3) and dewatering and fish relocation.

Water Quality

Sediment and Turbidity
Construction activities could result in increased turbidity, suspended sediment concentrations, and contaminant concentrations. Construction activities, including demolition of the existing structure, construction of the new viaduct and Pershing off-ramp structures, use of staging areas, installation and removal of piles, and barge operations could disturb sediments and soils within and adjacent to waterways. Any construction-related erosion or disturbance of sediments and soils would increase turbidity and sedimentation downstream of the Project area. The distance soils would be transported is dependent on river flows.

The abundance, distribution, and survival of fish populations have been linked to levels of turbidity and silt deposition. Prolonged exposure to high levels of suspended sediment could reduce visual capability in fish in aquatic habitats within the Project area, leading to reduced feeding and growth rates. Such exposure could also result in a thickening of the gills, potentially causing the loss of respiratory function; in clogging and abrasion of gills; and increased stress levels, which in turn could reduce tolerance to disease and toxicants (Waters 1995). Turbidity also could result in increased water temperature and decreased dissolved oxygen levels, especially in low-velocity pools, which can cause stressed respiration.

Many fish, including salmonids (Chinook and steelhead), are visual feeders, and turbid waters reduce the ability of these fish to locate and capture prey. Some fish, particularly juveniles, could become disoriented and leave the areas where their main food sources are located, ultimately reducing growth rates. Prey of fish populations, such as macroinvertebrates, could be adversely affected by declines in habitat quality (water quality and substrate conditions) caused by increased turbidity, decreased dissolved oxygen content, and an increased level of pollutants.

Avoidance of adverse habitat conditions by fish is the most common response to increases in turbidity and sedimentation (Waters 1995). Fish are not expected to occupy areas unsuitable for survival unless they have no other option. Therefore, increased turbidity attributed to construction activities could preclude fish from occupying habitat required for specific life stages. A review by Lloyd (1987) indicated that several behavioral characteristics of salmonids can be altered by even relatively small changes in turbidity (10 to 50 nephelometric turbidity units [NTUs]) that are expected to result from this proposed Project. Salmonids exposed to slight to moderate increases in turbidity exhibited avoidance, reduced feeding rates and reduced use of overhead cover. Reaction distances of rainbow trout to prey were reduced with increases of turbidity of only 15 NTUs over an ambient level of 4 to 6 NTUs in experimental stream channels (Barret *et al*. 1992), indicating that they are more susceptible to predation in elevated turbidity.

During installation and removal of piles, and barge operations there would be an increase in sediment and turbidity in and downstream of the Project area. The Stockton Channel Viaduct structure is anticipated to take three to four years to complete, with the majority of the work occurring over the summer work windows. NMFS anticipates that short-term construction related turbidity events will occur for the duration of in-water construction during those three to four years.

The in-water work activities that would result in increased sediment and turbidity would occur during June to mid-October. This period coincides with when CCV steelhead are least likely to be present in the action area. Adult CCV steelhead may commence their upstream migration as early as October. However, juveniles would not likely be migrating downstream during this time. Rearing juveniles, resident or holding CCV steelhead are not expected to occur in the Project site during the in-water work window, due to unsuitable habitat conditions such as warm water temperatures. This species is only likely to be present within the action area during migrations, so timing the construction outside of the primary migratory periods will limit the potential for CCV steelhead exposure to construction activities. NMFS expects that foraging adult sDPS green sturgeon and rearing juvenile sDPS green sturgeon could be present in the Delta. However, diminished water quality (low dissolved oxygen, low flow, and increased water temperatures) in the action area would preclude presence of green sturgeon during the in-water work window.

Installation of cofferdams, pile driving, and removal of piles is expected to result in short-term, localized increases in turbidity. Therefore, there could be some impacts to the listed species, if present during the installation of the cofferdam and associated construction activities. However, because the cofferdam will isolate the work area, continued increases in turbidity and sediment mobility during in-water work activities is not expected to occur.

Actions that take place early in the work window (June through September) in the Stockton Deepwater Channel are expected to affect low numbers of CCV steelhead, since the likelihood of their presence in the action area is considered low. Should in-water work be postponed or started later in the work window (*i.e*., September or October), then the probability of in-water work overlapping with listed salmonid presence increases and the potential for exposure to elevated turbidity increases. This increases the risk for non-lethal effects to exposed fish, such as behavioral changes, which may result in increased predation or reduced feeding.

Contaminants
During construction, the potential exists for spills or leakage of toxic substances that could enter the waterways. Refueling, operation, and storage of construction equipment and materials could result in accidental spills of pollutants (*e.g*., fuels, lubricants, sealants, and oil). Adverse effects to listed fish may result from point and non-point source chemical contaminant discharges within the action area. These contaminants include, but are not limited to, oil and gasoline product discharges, lime, bentonite, and concrete.

Concrete work will be performed during all stages of the Project. Contact with uncured concrete may cause significant increase in the pH of the surrounding waters, negatively affecting aquatic life. Lime is a major component of cement and concrete work. It easily dissolves in water and drastically changes the pH of water increasing the alkalinity (pH 11-13), which causes burns on fish and kills other aquatic life. Project activities that cause concrete to contact water include concrete cutting, demolition of structures, washing concrete dust residues, raw concrete spills, disposal of concrete, dampening freshly laid concrete, and washing equipment.

Bentonite is used as a lubricant for pile placement or to seal joints between adjacent sheet piles for temporary cofferdams. Bentonite is potentially lethal to fish. Steelhead and Coho salmon show reduced growth rates or increased emigration rates when exposed to 125 to 175 mg/L bentonite (Sigler *et al*. 1984).

High concentrations of contaminants can cause short-term and long-term effects to fish. The severity of these effects depends on the contaminant, the concentration, duration of exposure, and sensitivity of the affected life stage. Sublethal effects include increased susceptibility to disease that reduces the overall health and survival of the exposed fish. A long-term effect of contamination is reduced prey availability (Kidd *et al*. 2014). Invertebrate prey species survival can be reduced, therefore, less food is available for fish. In addition, fish consuming prey affected by contamination can absorb toxins directly. However, implementation of avoidance and minimization measures, including implementation of a WPCP and BMPs, would minimize any risk, and therefore, avoid potential for exposure to hazardous chemicals. Additionally, only a small number of CCV steelhead would be expected to be present in the action area, because of the timing of in-water work.

Green sturgeon may be more susceptible to aquatic contaminants, since they are benthic foragers. Studies on white sturgeon found that bioaccumulation of pesticides and other contaminants adversely affect growth and reproductive development (Feist *et al*. 2005). However, with the implementation of the water quality conservation measures (as described in

the Project description) and in-water work window, exposure to contaminants is expected to be avoided.

Noise Exposure

Pile Driving
Construction of the new viaduct and Pershing off-ramp structures will require the use of both vibratory and impact pile driving to install the sheet piling for cofferdams, steel pipe piles for temporary trestles, CISS piles for deep foundations, and removal of temporary piles.
During the construction period, steel pipe piles and sheetpiles will be temporarily placed into the Stockton Deepwater Channel by combination of vibratory hammer and impact hammer during the proposed in-water work window of June 1 to October 15 for 3-4 years. In-water pile driving will be accomplished with a barge-mounted crane. Once the sheet piles form a cofferdam, the internal area will be dewatered so that foundation piles can be installed "in-the-dry."

Pile driving near or in water has the potential to kill, injure, and cause delayed death to fish through infection of minute internal injuries, or cause sensory impairments leading to increased susceptibility to predation. The pressure waves generated from driving piles into river bed substrate propagate through the water and can damage a fish's swim bladder and other internal organs by causing sudden rapid oscillations in pressure, which translates to rupturing or hemorrhaging tissue in the bladder when the air in swim bladders expand and contract (Gisiner 1998, Popper, *et al*. 2006). Sensory cells and other internal organ tissue may also be damaged by pressure waves generated during pile driving activities as sound reverberates through a fish's viscera (Caltrans 2015). In addition, morphological changes to the form and structure of auditory organs (saccular and lagenar maculae) have been observed after intense noise exposure (Hastings and Popper 2005). Smaller fish with lower mass are more susceptible to the impacts of elevated sound fields than larger fish, so acute injuries resulting from acoustic impacts are expected to scale based on the mass of a given fish. Since juveniles and fry have less inertial resistance to a passing sound wave, they are more at risk for non-auditory tissue damage (Popper and Hastings 2009) than larger fish (yearlings and adults) of the same species. Beyond immediate injury, multiple studies have also shown responses in the form of behavioral changes in fish due to human-produced noises (Wardle *et al*. 2001, Slotte *et al*. 2004, Popper and Hastings 2009).

Based on recommendations from the Fisheries Hydroacoustic Working Group, NMFS uses interim dual metric criteria to assess onset of injury for fish exposed to pile driving sounds (NMFS 2008, Caltrans 2015, and Caltrans 2019). The interim thresholds of underwater sound levels denote the expected instantaneous injury/mortality and cumulative injury, as well as a third threshold criterion for behavioral changes to fish. Impact pile driving is expected to produce underwater pressure waves exceeding all three threshold levels. Vibratory pile driving generally stays below injurious thresholds, but often introduces pressure waves that will incite behavioral changes. Even at great distances from the pile driving location, underwater pressure changes/noises from pile driving is likely to cause flight, hiding, feeding interruption, area avoidance, and movement blockage, as long as pile driving is ongoing.

For a single strike, the peak exposure level (peak) above which injury is expected to occur is 206 decibels (dB) (reference to one micro-pascal [1µpa] squared per second). However, cumulative

acoustic effects are expected for any situation in which multiple strikes are being made to an object with a single strike peak dB level above the effective quiet threshold of 150 dB. Therefore, the accumulated SEL level above which injury to fish is expected to occur is 187 dB for fish greater than 2 grams in weight, and 183 dB for fish less than 2 grams. If either the peak SEL or the accumulated SEL threshold is exceeded, then physical injury is expected to occur to fish within the estimated distance thresholds. Underwater sound levels below injurious thresholds are expected to produce behavioral changes. NMFS uses a 150 dB root-mean-square (RMS) threshold for behavioral responses in salmonids and green sturgeon.

According to the Caltrans 2012 pile driving compendium of field data (Caltrans 2012), in-water impact pile driving of 96-inch diameter CISS piles for this Project could generate unattenuated underwater sound waves of up to 220 dB peak, 194 dB SEL, and 205 dB RMS, as measured at 10 meters from the strikes. (Table 4). These estimates are calculated from field data gathered from pile driving activities at other locations and are considered informative only; not the definite levels that will be generated by impact pile driving in the Stockton Deepwater Channel during the course of this Project. This is because each pile-driving situation is unique and variations in the substrate, channel shape, depth, salinity, and water temperature can alter how the underwater pressure waves propagate and the amount of transmission loss that will dampen the underwater sounds as they travel. Data is provided for 72-inch diameter land based piles as an estimate for similarly driven 60-inch and 84-inch piles driven on land. The largest piles proposed for in-water use are 84-inch CISS piles; estimated sound exposure levels for 96-inch piles are used to provide a conservative estimate in lieu of data for 84-inch piles.

Table 3: Summary of Estimated Underwater Attenuated Sound Exposure Levels.

Pile Type	Driver Type	Strikes Per Day	Reference Distance (m)	Attenuation (dB)	Peak (dB)	SEL (dB)	RMS (dB)	Distance (m) to Threshold			
								Onset of Physical Injury			Behavior
								Peak dB	Cumulative SEL dB		RMS dB
									Fish >2 g	Fish < 2 g	
								206 dB	187 dB	183 dB	150 dB
24-inch Steel Pipe Pile	impact hammer	25,540	10	5	205	178	190	9	736	736	4642
72-inch CISS Piles (near-water, unattenuated)	impact hammer	25,440	10	N/A	204	175	189	7	464	464	3981
96-inch CISS	impact hammer	18,240	10	5	215	189	200	40	3981	3981	21544
24-inch AZ Sheet Pile	impact hammer	48,000	10	N/A	209	179	189	16	858	858	3981

Attenuated strikes of 84-inch CISS piles would be expected to attenuate to the ambient underwater noise level of 150 dB at 21,544 meters.. However, the Caltrans 2015 Pile Driving Compendium states, “it is not possible to reliably predict audibility (or detectability) with any certainty at distances beyond 500 to 1,000 meters. Consequently, the Project action area based on pile driving sound should never be considered to extend more than 1,000 meters (3,280 feet or 0.62-mile) from the pile driving activity.” Based on this guidance, noise effects are only considered within 1000 meters of the pile driving activity. Installation of all piles except for those used in constructing the cofferdams will occur in the dewatered area behind a cofferdam, effectively isolating the exposed portion of the driven pile and dampening any vibration’s translation into the water column. However, the portion of the pile beneath the riverbed will translate vibrations through the saturated substrate sideways and up into water column outside of the cofferdam, therefore, some underwater pressure waves will propagate. NMFS considers that attenuation measures, such as pile driving within a dewatered cofferdam, reduce the underwater pressure waves by 5 dB for each application.

Caltrans estimates that driving the estimated forty (40) 84-inch permanent CISS piles within the Stockton Deepwater Channel with the impact hammer will require approximately 120 strikes per foot. Based on pile type and local geology it is assumed that the permanent CISS piles will be driven to a tip elevation of approximately 150 feet. It is therefore estimated that each 84-inch temporary steel pipe pile will require approximately 18,000 strikes; the installation of the forty (40) 66-inch diameter temporary steel pipe piles below the OHWM of the Stockton Deepwater Channel will require an estimated 720,000 total strikes (40 piles * 18,000 strikes = 720,000 strikes).

The distance that behavioral changes are expected is up to 21,544 meters from the driven pile, where the RMS sound will be above 150 dB RMS. SELs below 150 dB are assumed to not accumulate and cause fish injury, or be significantly different from ambient conditions, (*i.e.*, effective quiet). Pressure levels in excess of 150 dBRMS are expected to cause temporary behavioral changes (startle and stress) that could decrease a fish’s ability to avoid predators or delay normal migration past the work site. The background RMS sound pressure levels, or effective quiet, are assumed to be 150 dBRMS and the acoustic impact area is the area where the predicted RMS sound pressure level generated by pile driving exceeds this threshold. Once the pressure waves attenuate below this level, fish are assumed to no longer be adversely affected by pile driving sounds. Under the concept of effective quiet being less than or equal to 150 dBRMS, the distance fish are expected to be adversely affected during pile driving is out to 21,544 meters from the location of the pile being driven, assuming a transmission loss constant of 15 (NMFS 2008). This distance effectively covers the width of the Stockton Deepwater Channel bank to bank and would be expected to propagate approximately through the entire action area, 1,000 meters both up- and downstream from the pile driving location.

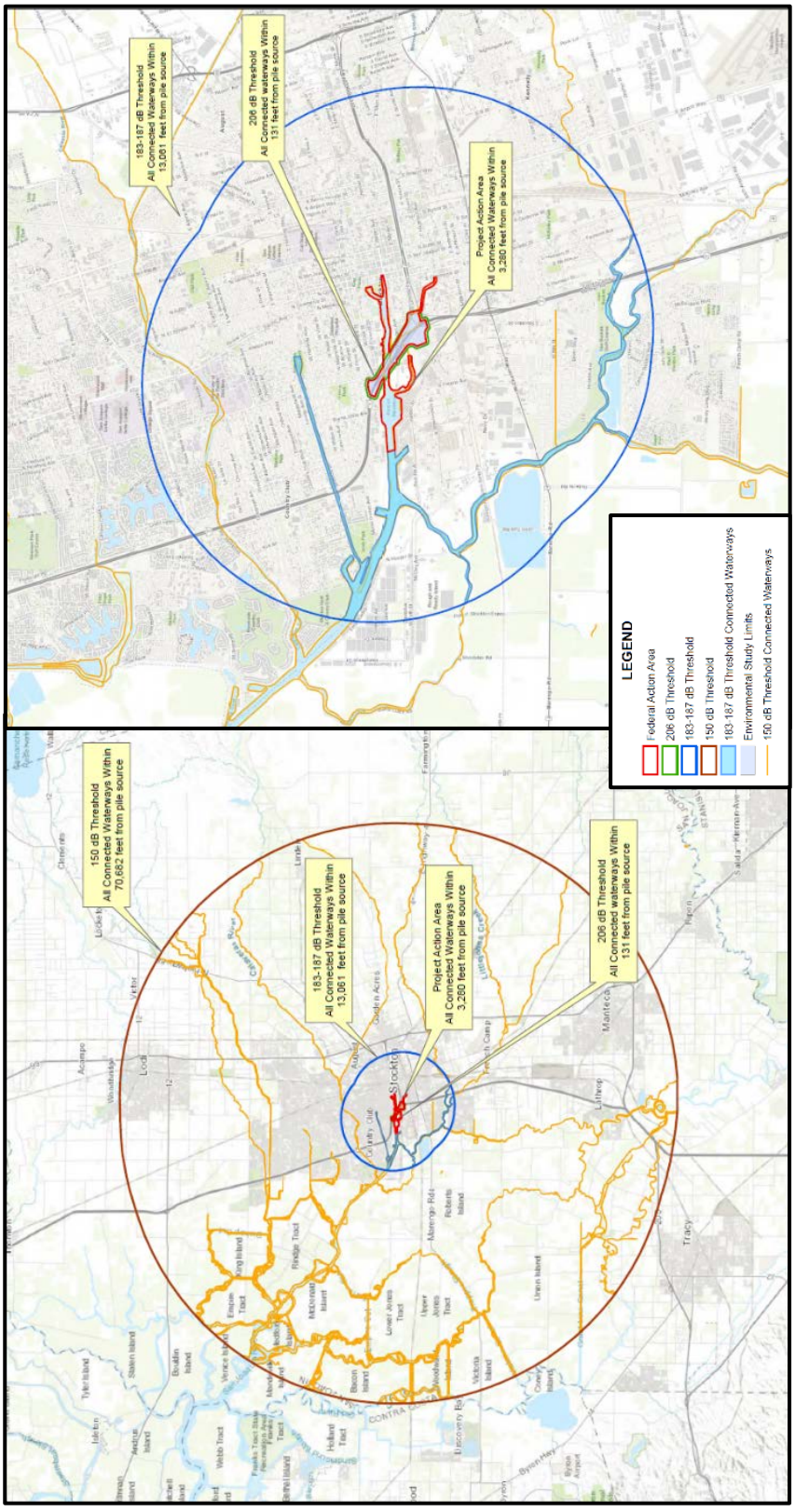

Figure 2: Hydroacoustic Sound Exposure Level Thresholds for 84-inch CISS piles, Attenuated.

The underwater sound conditions described above would be expected to occur on days when in-water impact pile driving of 84-inch diameter CISS piles occur (*i.e.*, during installation of the foundations for the viaduct and Pershing off-ramp structures). The in-water work window of June 1 through October 15 is a span of only 136 days, therefore, the proposed action would likely require at least three seasons of pile driving with few breaks to complete in-water work during the in-water work window, even with the high number of impact strikes (18,000-48,000 strikes) proposed per day.

CCV steelhead adults can begin their upstream migration anytime from July through December, and sDPS green sturgeon may remain in freshwater systems feeding and rearing throughout the year. It is possible that adult CCV steelhead may use the action area as a migration corridor, while sDPS green sturgeon adults and juveniles may use the action area as foraging and rearing habitat during the in-water work window, whenever water temperatures are suitable (at least below 75°F). According to in-river monitoring data available on the California Data Exchange Center for the San Joaquin River at Garwood Bridge station, water temperatures upstream of the action area in the San Joaquin River are likely to exceed thermal limits of anadromous fish (CCV steelhead and sDPS green sturgeon) regularly during the work window. Water temperatures are likely to drop in September, with atmospheric temperature drops and increased cloud cover and rainfall. In some years, water temperatures may be tolerable to anadromous fish use throughout the summer, as seen in 2011 and 2017. Therefore, CCV steelhead and sDPS green sturgeon are assumed to be present when local water temperatures are below 75°F, though the total number of individual fish using the area during the work window is expected to be low.

Due to the large area that will be impacted by elevated underwater sounds above effective quiet (at least 1,000 meters from the location of the pile being driven), and the large number of days required to complete the proposed Project, CCV steelhead, and sDPS green sturgeon are expected to be adversely affected by impact pile driving associated with this action. While vibratory pile driving is generally not directly injurious to fishes even when performed in water without attenuation, it is likely that the underwater pressure waves and sounds will disturb the normal behaviors of fish using this area. This disturbance could include potentially interrupting migration patterns and foraging activities, even while the Project observes the proposed in-water and on-land work windows, and uses underwater sound control measures.

Impact pile driving is expected to directly injure or kill fishes within certain distance thresholds, depending on the size of pile being driven, the number of strikes used in a day, and whether attenuation measures are being employed. Using the greatest numbers of strikes estimated to drive the largest piles (up to 18,000), it is expected that fish may be killed within 3,981meters (attenuated) to 8,577 meters (unattenuated) of the driven pile due to in-water impact pile driving due to the cumulative SELs produced by in-water impact pile driving. CCV steelhead and sDPS green sturgeon are expected to be affected.

Acoustic Effects of Barge and Boat Traffic

Barge and tugboat traffic will create additional sources of noise in the aquatic environment. This could result in negative impacts to listed species present. Ships under power produce a substantial amount of mechanical- and flow-induced noise from motor, propeller, and hull turbulence. Measurements of sound intensity from commercial shipping have shown sound

levels up to approximately 180 dB (ref. 1 μPa) at the point source (1 meter from ship) (Kipple and Gabriele 2007). This level of noise will drop off by 40 dB at 100 yards away and approximately 53 dB lower at one-quarter mile (Kipple and Gabriele 2007).

The narrow confines of the Stockton Deepwater Channel in the action area would indicate that the elevated noise levels generated by the passage of vessels, such as tugboats, would subject fish within the confines of the channel to anthropogenic-produced noise conditions. The relatively rapid passage of the barge and tugboat past a given point will somewhat attenuate these effects by decreasing the duration of the elevated sound levels, but some temporary effects can be anticipated to occur, depending on the proximity of the exposed fish to the sound source.

The presence of underwater noise may adversely affect a fish's ability to detect predators, locate prey, or sense their surrounding acoustic environment (Slabbekoorn *et al*. 2010, Radford *et al*. 2014). Other species of fish have been shown to respond to recorded ambient shipping noise by either reacting more slowly to predators, thus increasing their susceptibility to predation (Simpson *et al*. 2015, Simpson et al. 2016), or becoming hyper-alert and reacting more quickly to a visual predator stimulus, causing them to cease feeding and hide (Voellmy *et al*. 2014b). Voellmy *et al*. (2014a) state that elevated sound levels could affect foraging behavior in three main ways: 1) noise acts as a stressor, decreasing feeding behavior directly through reduced appetite, or indirectly through a reduction in activity, locomotion, and alterations to the cognitive processes involved in food detection, classification, and decision making; 2) noise acts as a distracting stimulus, diverting an individual's limited amount of attention from their primary task to the noise stimuli that have been added to the environment; and 3) noise masks crucial acoustic cues, such as those made by both prey and predators.

Fish also may exhibit noise-induced avoidance behavior that causes them to move into less suitable habitat for foraging or will wait to feed when the noise has abated. Voellmy *et al*. (2014a) surmised that sustained decreases in food consumption could have long-term energetic impacts that result in reductions in growth, survival, and breeding success. Moreover, compensatory feeding activities could increase predation risks by increasing time exposed to predators or by forcing animals to feed in less favorable conditions, such as in times or areas of higher predation pressure.

Increased noise, produced by barge and tugboat traffic may result in CCV steelhead and green sturgeon fleeing the area of those noises and moving into the Stockton Deepwater Channel's shallowest margins or adjacent habitat. The channel margins of many Delta waterways have submerged and emergent vegetation (*e.g*., *Egeria*) and rock riprapped levees where predatory species are likely to occur in greater numbers than in the open waters of the channel. This scenario, therefore, could increase the predation risk of salmonids, particularly smolts. Likewise, elevated noise exposure can reduce the ability of fish to detect piscine predators, by either reducing the sensitivity of the auditory response in the exposed fish or masking the noise of an approaching predator. Such would be the case if open water predators, such as striped bass (*Morone saxatilis*), encounter the juvenile fish in the open channel, while a barge and tugboat are present.

Because of the variability and uncertainty associated with the population sizes of the species present, annual variation in the timing of migration and variability regarding individual habitat use of the action area, the actual number of individuals of listed fish present in the action area during the in-water work window is not known. However, exposure would be limited to small numbers of individuals, since most juvenile CCV steelhead would have left the action area by late spring and are least likely present in the action area during in-water work season, therefore, low numbers of individuals are expected to be impacted by elevated noise levels from barge or tugboat.

Dewatering and Fish Relocation

Fish capture and relocation may be necessary during dewatering activities, if listed fish are present and found in the enclosed area of the cofferdam. Each step during the capture/relocation process could induce physiological stress leading to injury or death, even when a skilled fish biologist performs the relocation. The potential capture and relocation of CCV steelhead and sDPS green sturgeon associated with the dewatering of the cofferdam are expected to adversely affect a small number of fish if present in the action area. Although upstream-migrating adult CCV steelhead and rearing or migration adult sDPS green sturgeon may occur in the Project area during in-water work, the large size and probable avoidance of the enclosed area makes it unlikely that they would be trapped in the cofferdams. Juvenile green sturgeon could occur during any month in the Delta, although in small numbers in the action area.

Because of the variability and uncertainty associated with the population sizes of the species present, annual variation in the timing of migration and variability regarding individual habitat use of the action area, the actual number of individuals present in the action area during the in-water work window is not known. However, there would be few individuals present, since most juvenile salmonids would have left the action area by late spring and are not likely to be present in the action area during the in-water work season. Juvenile CCV steelhead or green sturgeon that evade capture and remain in the construction area may be injured or killed from construction activities. This includes desiccation, if fish remain in the dewatered area, or death, if fish are crushed by personnel or equipment. However, because experienced biologists will be collecting fish, most are expected to be removed from the area. Juvenile CCV steelhead or green sturgeon may be present during relocation, and thus subject to the above effects. Effects to adult CCV steelhead and green sturgeon are improbable, due to their large size and probable avoidance.

2.5.2. Effects to Critical Habitat

The Project is expected to adversely impact PBFs of critical habitat for CCV steelhead (freshwater rearing habitat) and sDPS green sturgeon (food resources, water flow, and water quality). The proposed Project is expected to cause short- and long-term, and permanent effects on critical habitat for CCV steelhead and sDPS green sturgeon. Potential Project effects include temporary water quality degradation from localized increases in turbidity and suspended sediment, permanent habitat loss/modification of critical habitat, and in-channel disturbance from pile driving and other construction activities. Long-term effects on designated critical habitat include degradation of the CCV steelhead PBF of freshwater rearing habitat and the green sturgeon PBF of food resources. This is expected to result in potential decrease of survival of fish in the action area, which is due to the overwater viaduct structure. An increase in artificial

shade can create sharp contrasting shadows that can impair fish vision, limit photosynthetic production, alter fish behavior and may favor ambush predators.

Sedimentation and Turbidity

There is potential for degradation of PBFs resulting from turbidity and sedimentation associated with the proposed action. Kemp *et al*. (2011) describe a suite of physiochemical effects to lotic aquatic systems resulting from increased sedimentation and turbidity-related events. Sedimentation events in a system that shares both lotic and estuarine characteristics have the potential to increase turbidity on a broad temporal scale and reduce oxygen supply. These impacts could degrade the PBFs for CCV steelhead and green sturgeon, such as riparian habitat, that provide the necessary habitat for successful juvenile development and survival. BMPs, such as groundcover and stabilization, will be implemented during construction to help prevent Project-disturbed soil on land from entering the water. With the minimization and avoidance measures included in the proposed action, turbidity and sedimentation are expected to result in minor and short-term effects to PBFs of designated critical habitat for CCV steelhead (freshwater rearing habitat) and green sturgeon (food resources and water quality) in the action area.

Riparian Vegetation Removal

Removal of riparian vegetation will occur during the clearing of staging areas and access roads, and grading activities. These activities have the potential to result in direct or indirect adverse effects to critical habitat PBFs. Riparian vegetation plays a key role in the conservation value of rearing habitat for many salmonid life stages. It provides shading to reduce stream temperatures, increases the recruitment of large woody material into the river that increases habitat complexity, provides shelter from predators, and enhances the productivity of aquatic macroinvertebrates (Anderson and Sedell 1979, Pusey and Arthington 2003). It has also been shown to directly influence channel morphology and may be directly correlated with improved water quality in riverine systems through biogeochemical cycling, soil and channel chemistry, water movement, and erosion (Schlosser and Karr 1981, Dosskey *et al*. 2010). The proposed action will result in the temporary loss of 0.62 acres of riparian habitat due to disturbance from Project activities. This loss of riparian habitat will result in the degradation of migratory corridors and rearing habitat PBFs for CCV steelhead and green sturgeon. A NMFS approved Riparian Plan, including both on-site restoration and compensatory mitigation credit purchase, will be implemented to return riparian areas to pre-Project conditions. However, return to pre-Project conditions may take 1-5 years. With implementation of a riparian plan, long-term impacts to critical habitat due to riparian habitat removal are expected to be minimal.

Structure Shading

The new viaduct structure would result in permanent shading of 3.02 acres over the waters of the Stockton Deepwater Channel. The Pershing off-ramp structure would result in permanent shading to 0.67 acres for a total of 3.69 acres of new overwater structure shade on the Stockton Deepwater Channel. This overwater structure will reduce natural cover and may facilitate increased predation on juvenile CV steelhead and green sturgeon, which permanently degrades rearing habitat quantity and quality.

Night Lighting
The design of the new bridge includes the permanent installation of night lighting. Night lighting has the potential to result in permanent adverse effects to critical habitat PBFs. Night lights can shine onto waters during nighttime hours and may facilitate increased predation on juvenile CCV steelhead and green sturgeon by predatory fish, birds, and mammals (Kahler *et al.* 2000). BMPs, including limitation of night work and placement of permanent lighting away from water surfaces, will be implemented to incorporate night lighting designs, which limit the amount of light shining on water surfaces. The lights will be shielded and focused on the bridge away from water surfaces. This action will minimize the extent of any negative effects associated with night lighting.

2.5.3. Mitigation/Conservation Bank Credit Purchase

To address permanent loss of riparian and aquatic habitats, the proposed action includes purchase of mitigation bank credits at a 1:1 ratio. Caltrans will purchase 0.62-acre credits of salmonid or riparian SRA habitat credits for the temporary loss of 0.62 acres of riparian habitat. Caltrans will purchase 1.01 acres of salmonid credits for the permanently increased acreage of artificial shade.

The purchase of compensatory mitigation credits will restore and preserve, in perpetuity, SRA habitat or similar types of riverine habitat that will be beneficial to salmonids. The mitigation banks that serve the action area offer floodplain or other habitat that can support migrating juvenile and adult CCV steelhead and sDPS green sturgeon in the same way that river margin habitat otherwise would have, had the project not occurred. SRA habitat types of conservation credits can benefit both adult and juvenile CCV steelhead and sDPS green sturgeon, even if such banks are located far from the action area and individuals affected by the project would be unlikely to benefit from the compensation purchase.

Both the riparian and aquatic habitat impacts affect designated critical habitat, as well as listed fish species, described above in this opinion. The purchase of mitigation credits will address the loss of ecosystem functions due to the modification of the riverbank. These credit purchases are ecologically relevant to the PBFs of critical habitat and the species affected by the proposed action, because both banks include SRA, riparian forest and floodplain credits with habitat values that are already established and meeting performance standards. Also, the banks are located in areas that will benefit the CCV steelhead DPS affected. The purchase of mitigation credits at one of these banks is expected to benefit the PBFs of freshwater rearing habitat and migration corridors for juvenile CCV steelhead by providing suitable floodplain and riparian habitat. The floodplains and riparian forest in the bank benefit the growth and survival of rearing salmonids by providing habitat with abundant food in the form of aquatic invertebrates, structural diversity, such as instream woody material (IWM) and cooler stream temperatures.

The purchase of credits provides a high level of certainty that the benefits of a credit purchase will be realized, because all of the NMFS-approved banks considered in this opinion have mechanisms in place to ensure credit values are met over time. Such mechanisms include legally binding conservation easements, long-term management plans, detailed performance standards, credit release schedules that are based on meeting performance standards, monitoring plans and annual monitoring reporting to NMFS, non-wasting endowment funds that are used to manage and maintain the bank and habitat values in perpetuity, performance security requirements, a

remedial action plan, and site inspections by NMFS. In addition, each bank has a detailed credit schedule, and each tracks their credit transactions and availability on the Regulatory In-lieu fee and Bank Information Tracking System (RIBITS). RIBITS was developed by the U.S. Army Corps of Engineers with support from the Environmental Protection Agency, the U.S. Fish and Wildlife Service, the FHWA, and NMFS to provide better information on mitigation and conservation banking and in-lieu fee programs across the country. RIBITS allows users to access information on the types and numbers of mitigation and conservation bank and in-lieu fee program sites, associated documents, mitigation credit availability, service areas, as well information on national and local policies and procedures that affect mitigation and conservation bank and in-lieu fee program development and operation.

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).

The private and State activities described below are likely to adversely affect CCV steelhead, sDPS green sturgeon, and their designated critical habitats. These potential factors are ongoing and expected to continue into the future. However, the extent of the adverse effects from these activities is uncertain, and it is not possible to accurately predict the extent of the effects from these future non-Federal activities.

2.6.1. Agricultural Practices

Agricultural practices in the action area may adversely affect riparian habitats through upland modifications of the watershed that lead to increased siltation, reductions in water flow, or agricultural runoff. Grazing activities from cattle operations can degrade or reduce suitable critical habitat for listed salmonids by increasing erosion and sedimentation, as well as introducing nitrogen, ammonia, and other nutrients into the watershed, which can flow into the receiving waters of the associated watersheds. Stormwater and irrigation discharges related to both agricultural and urban activities contain numerous pesticides and herbicides that may adversely affect listed salmonids reproductive success and survival rates (Dubrovsky *et al*. 1998, Daughton 2003).

2.6.2. Increased Urbanization

Increases in urbanization and housing developments can impact habitat by altering watershed characteristics, and changing both water use and stormwater runoff patterns. Increased growth would 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 that are situated away from waterbodies, would not require Federal permits, and thus would not undergo review through the ESA section 7 consultation process with NMFS.

Increased urbanization also is expected to result in increased recreational activities in the region. Among the activities expected to increase in volume and frequency is recreational boating. Boating activities typically result in increased wave action and propeller wash in waterways. This potentially would degrade riparian and wetland habitat by eroding channel banks and mid-channel islands, thereby causing an increase in siltation and turbidity. Wakes and propeller wash also churn up benthic sediments thereby potentially re-suspending contaminated sediments and degrading areas of submerged vegetation. This in turn would reduce habitat quality for the invertebrate forage base required for the survival of juvenile salmonids moving through the system. Increased recreational boat operation is anticipated to result in more contamination from the operation of gasoline and diesel-powered engines on watercraft entering the associated water bodies.

2.6.3. Rock Revetment and Levee Repair Projects

Depending on the scope of the action, some non-Federal riprap projects carried out by State or local agencies do not require Federal permits. These types of actions, as well as illegal placement of riprap occur, within the watershed. The effects of such actions result in continued degradation, simplification, and fragmentation of riparian and freshwater habitat.

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 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.

Potential adverse effects to critical habitat PBFs for the species addressed in this opinion resulting from turbidity and sedimentation are not expected to occur at a scale in which critical habitat will be permanently impacted or reduce the value.

2.7.1. Summary Status of CCV steelhead DPS

The 2016 status review (NMFS 2016) concluded that overall, the status of CCV steelhead appears to have changed little since the 2011 status review, that CCV steelhead should remain listed as threatened, as the DPS is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Further, there is still a general lack of data on the status of wild steelhead populations. There are some encouraging signs, as several hatcheries in the Central Valley (such as Mokelumne River) have experienced increased returns of steelhead over the last few years. There has also been a slight increase in the percentage of wild steelhead in salvage at the south Delta fish facilities, and the percent of wild fish in those data remains much higher than at Chipps Island. Although there have been recent restoration efforts in the San Joaquin River tributaries, CCV steelhead populations in the San Joaquin River Basin continue to show an overall very low abundance and fluctuating return rates. The NMFS Recovery Plan (NMFS 2014) strategy for CCV steelhead lists the San Joaquin River's eastside tributaries (Stanislaus, Tuolumne, and Merced rivers) as Core 2 populations. These eastside tributary watersheds have the potential to support viable populations, although with lower abundance based on amount and quality of habitat downstream of major dams. The Recovery Plan also lists these tributaries as candidates to reach viable population status, if species are reintroduced upstream of the dams, and lists the San Joaquin River, below Friant Dam, as a candidate to reach viable population status. The action area provides habitat to these eastside tributaries.

2.7.2. Summary Status of the sDPS green sturgeon

The federally listed sDPS green sturgeon and its designated critical habitat occur in the action area and may be affected by the proposed action. It was listed as threatened in 2006 and its designated critical habitat in 2009. Adult sDPS green sturgeon potentially migrate through the action area to reach upstream riverine habitat based on catches of sDPS green sturgeon in the San Joaquin River mainstem, upstream of the Delta (CDFW sturgeon report card data). There is a strong need for additional information regarding sDPS green sturgeon, especially concerning a robust abundance estimate, a greater understanding of their biology, and further information about their micro- and macro-habitat ecology. The upstream portion of the San Joaquin River is not known to currently host sDPS green sturgeon spawning; therefore, the San Joaquin River Basin is not a main focus of their recovery plan. Though the sDPS does utilize the lower San Joaquin River and the discovery of an individual adult in the Stanislaus River October 2017 highlights that passage for adults is possible during certain river conditions, the recovery plan and efforts are not likely to be modified, unless adult spawning or juvenile reproduction occurs (NMFS, 2018).

2.7.3. Status of the Environmental Baseline and Cumulative Effects in the Action Area

Listed salmonids primarily use the action area as a migration corridor and rearing site. For CCV steelhead the San Joaquin migratory corridor is an important piece of the recovery criteria (NMFS 2014), which includes two viable populations for CCV steelhead to be established in the San Joaquin River Basin. The San Joaquin River Basin is not the main focus for sDPS green sturgeon recovery plan. Currently, the San Joaquin River, although degraded due to levees and lack of floodplain habitat, is an important migratory corridor for the recovery of these species.

The Cumulative Effects section of this opinion describes how continuing or future effects, such as the discharge of point and non-point source chemical contaminants discharges and increased urbanization affect the species in the action area. These actions typically result in habitat fragmentation, and conversion of complex nearshore aquatic habitat to simplified habitats that incrementally reduces the carrying capacity of migratory corridors.

2.7.4. Summary of Project Effects on listed species

1) Construction-related effects

   During construction, some behavioral effects, as well as injury or death to individual fish, are likely to result. Construction activities would occur during the summer and early fall months, when the abundance of individual fish is low and outside most of the migrating adult and juvenile timing period, which would result in correspondingly low numbers of fish injured or killed. In addition, during construction activities, some water quality impacts may occur, such as increased sediment and turbidity and noise-related effects. However, with the implementation of avoidance and minimization measures, impacts would be minimized and affect a low number of listed species.

2) Long term effects
   CCV steelhead and sDPS green sturgeon will at some point pass under the new viaduct and Pershing off-ramp structures. These species would be susceptible to increased predation and decreased water quality from the presence of this overwater structure. The proportion of the populations that will come in contact with the viaduct structure as fish migrate through the Stockton Deepwater Channel is unknown, since the spatial distribution of fish across the channel by the different fish species and life stages is unknown. However, it is certain that the viaduct structure enhances the risk to passing CCV steelhead and sDPS green sturgeon and, therefore, should be considered an adverse affect to the populations of CCV steelhead and sDPS green sturgeon in the action area.

2.7.5. Summary of Project Effects on CCV steelhead and sDPS green sturgeon

NMFS finds that the construction of the viaduct and Pershing off-ramp structures is unlikely to substantially affect the population of CCV steelhead in the Stockton Deepwater Channel. Construction will occur from June 1 to October 15 when few individuals are likely to be present, since most juvenile salmonids would have left the action area by late spring. Individuals present during the work window are unlikely to represent a substantial proportion of the population present in the system, thus impacts to the entire population are minimal. The low impact of the viaduct structure over the foreseeable future will not substantially affect the larger CCV steelhead DPS population and will not negatively affect its viability.

NMFS finds that the construction of the new viaduct and Pershing off-ramp structures are not likely to substantially affect the population of sDPS green sturgeon in the Central Valley. Construction will occur when both juvenile and adult sDPS green sturgeon may be present in the

Stockton Deepwater Channel. However, available information indicates that sDPS green sturgeon are present in low densities and numbers in this area of the Delta based on the low numbers of fish catches on the CDFW sturgeon report cards, compared to other areas of the Delta. The majority of reported sDPS green sturgeon catches in monitoring efforts and sport fishing catches indicate that sDPS green sturgeon utilize other areas of the Delta and Sacramento River watershed for their life history needs, rather than the Stockton Deepwater Channel. Using the same reasoning as given for CCV steelhead, there is a low likelihood of injury/death to green sturgeon, due to the proposed work window and the low numbers of fish present. The loss of the few individual fish that will be subject to construction effects will not substantially affect the overall population of green sturgeon in the Central Valley and should not impair the viability of the DPS.

2.7.6. Summary of Project Effects on CCV steelhead and sDPS green sturgeon critical habitat

Within the action area, the relevant PBFs of the designated critical habitats for listed CCV steelhead are migratory corridors and rearing habitat. For sDPS green sturgeon, PBFs include food resources, water flow, and water quality.

Based on the effects of the proposed Project described previously in this opinion, the impacts to the designated critical habitat degrade designated critical habitat for both CCV steelhead and sDPS green sturgeon. The quality of the current conditions of the PBFs for CCV steelhead and sDPS green sturgeon in the action area are poor compared to historical conditions (pre-levees). The habitat does not provide the functionality necessary for the long-term survival and recovery of the species. In particular, levees, riprapping, and removal of riparian vegetation have greatly diminished the value of the aquatic habitat in the action area by decreasing rearing area, food resources via food-web degradation, and complexity and diversity of habitat forms necessary for holding and rearing (channel and bathymetry diversity). Perpetuating the overwater structure with the construction of the new viaduct and Pershing off-ramp structures would contribute to the degradation of designated critical habitat.

The temporary construction impacts to designated critical habitat would negatively affect the ability of CCV steelhead and sDPS green sturgeon to use the action area as rearing habitat and as migratory corridors during the overlap of migration periods and construction, as discussed in the Effects to Species section. Construction effects would last for the entirety of each work season, but would not permanently modify critical habitat function, as noise and turbidity would end after construction ends.

The viaduct and Pershing off-ramp structures are located on the Stockton Deepwater Channel off the San Joaquin River. The presence of the structures will continue into the foreseeable future, thus creating a perpetual source of predation impacts to the action area, and a permanent adverse effect to the listed species. However, it is not expected to substantially impede overall migration through the main migratory corridor of the San Joaquin River for listed species.

2.7.7. Mitigation Bank Credits

Caltrans' mitigation credit purchase is expected to mitigate some of the impacts from the Stockton Deepwater Channel Viaduct project by providing some benefits to the CCV steelhead DPS by improving riverine or floodplain habitat conditions elsewhere through restoration and ensuring their preservation into the future. The benefits offered to these populations are expected to exist in perpetuity. Although some of the banks that cover the action area in their service area may not technically offer sDPS green sturgeon credits, we expect that some sDPS green sturgeon individuals should benefit from the purchase of credits from these banks, since individuals should be able to access the purchased riverine habitat areas created and maintained by the banks/programs.

2.7.8. Summary of the Risk to the DPS for each Species and Critical Habitat

According to the most recent status reviews, CCV steelhead and sDPS green sturgeon are at some level of threat or risk of extinction, due to past and present activities within the range of the DPS. Significant habitat loss, degradation, and fragmentation has occurred in the San Joaquin watershed. Cumulative effects, like water diversions, increased urbanization, and continuing rock projects, will all continue to happen in the action area without necessarily requiring Federal permitting. During this proposed Project, fish are expected to be harassed, injured, or killed during completion of the proposed action through various pathways. Construction-related effects from the Project, as well as dewatering and fish capture and relocation, turbidity increases, increased shading, and a loss of critical habitat, are all expected to adversely affect fish. Avoidance and mitigation measures, as well as BMPs, have been put in place to decrease any likelihood and level of effects to listed species.

The proposed construction will temporarily decrease the action area's ability to safely support CCV steelhead and sDPS green sturgeon at a variety of life stages and will increase mortality events and behavioral changes. A total of 3.69 acres of critical habitat will be permanently affected in shading from the new overwater structures. The rearing PBF that supports CCV steelhead and the food resources PBF that supports sDPS green sturgeon will be adversely affected. These permanent impacts only represent a small loss in the scope of available habitat for these species, but the intrinsic value of the area for conservation of fish remains high. Onsite mitigation will minimize the loss of ecosystem function due to modification of the riverbank and streambed (see section 1.4).

Although there are long-term and short-term impacts to the DPSs, the impacts are expected to occur during seasons when adult fish presence is unlikely and juvenile abundance is low. To mitigate the adverse effects of the project, Caltrans plans to purchase mitigation credits off-site at a 1:1 ratio for 0.62 acres of temporal loss of riparian habitat, and at a 1:1 ratio for 1.01 acre of increased overwater structure shade, for a total of 1.63 acres purchased. The purchase of mitigation bank credits will improve floodplain and shaded aquatic and riverine habitat for CCV steelhead and sDPS green sturgeon.

Combining the adverse and beneficial effects (compensatory mitigation) associated with the proposed action described above, including the environmental baseline, cumulative effects, status of the species, and critical habitat, the Project is not expected to reduce appreciably the

likelihood of both the survival and recovery of the listed species in the wild by reducing their numbers, reproduction, or distribution; or appreciably diminish the value of designated critical habitat for the conservation of the species.

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, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' opinion that the proposed action is not likely to jeopardize the continued existence of CCV steelhead and sDPS green sturgeon, or destroy or adversely modify designated critical habitat for CCV steelhead and sDPS 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 opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

NMFS anticipates that adult CCV steelhead and adult and juvenile sDPS green sturgeon will be killed, injured, or harmed as a result of Project implementation, due to expected presence in the action area during the scheduled in-water work window. Specifically, take will result from dewatering and pile driving activities. Additionally, take is expected as a result of increasing bridge shade in critical habitat. This is expected to reduce the primary productivity of the affected habitat and increase the number of predatory fishes and their ability to prey on listed fish species resulting in injury, death and harm to listed species.

It is not practical to quantify or track the amount or number of individuals that are expected to be incidentally taken as a result of the proposed action, due to the variability associated with the response of listed fish to the effects of the proposed action, annual variations in the timing of spawning and migration, individual habitat use within the action area, and difficulty in observing injured or dead fish.

However, it is possible to estimate the extent of incidental take by designating ecological surrogates, and it is practical to quantify and monitor the surrogates to determine the extent of incidental take that is occurring. The most appropriate threshold for incidental take is an ecological surrogate of temporary habitat disturbance expected to occur during dewatering and pile driving activities and permanent habitat disturbance expected to occur due to the bridge shade in critical habitat.

Pile driving, dewatering, capture, and handling result in fish behavioral modifications, stranding, harm, injury, or death. Bridge shade reduces primary productivity of affected habitats and increases the number of predatory fishes in the action area and/or their ability to prey on listed fish species leading to injury. NMFS anticipates incidental take will be limited to the following forms:

1) Take in the form of harm, injury and death to listed fish, due to handling or stranding during the dewatering of approximately 0.41 acres of river habitat. This habitat disruption will affect the behavior of listed fish resulting in displacement and increased predation, and decreased feeding, which will result in decreased survival, reduced growth and reduced fitness, respectively.
2) Take in the form of harm, injury and death to listed fish, due to pile driving. The 150dB RMS behavioral threshold is expected to be 21,544 meters from the pile, 187dB cumulative threshold is expected to be 3,981 meters from the pile, and the peak 206dB threshold is expected to be 40 meters from the pile.
3) Take in the form of harm to listed fish from loss and degradation of river channel habitat leading to injury and death by creating habitat conditions that increase predation associated with the new bridge components. The total spatial footprint of the bridge over the waters of the Stockton Channel is 3.69 acres.

If the total acreage of dewatering areas for the Project exceeds 0.41 acres by more than 10 percent, the anticipated take levels described are also exceeded, triggering the need to reinitiate consultation. If monitoring indicates that sound levels greater than 206 dB peak, 187 dB or 183 dB cumulative SEL, or 150 dB RMS extend beyond the distances expected for the pile size and attenuation type, the amount of incidental take would be exceeded, triggering the need to stop work and contact NMFS within 24 hours.. If the viaduct and Pershing off-ramp structures shade footprint over the Stockton Deepwater Channel exceeds 3.7 acres the anticipated incidental take levels described area exceeded, triggering the need to reinitiate consultation.

2.9.2. Effect of the Take

In the 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.

2.9.3. Reasonable and Prudent Measures

“Reasonable and prudent measures” are non-discretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). Specifics are outlined in the “Terms and Conditions” section below.

1) Measures shall be taken by Caltrans, or the contractor, to reduce underwater sound impacts and other disturbances related to pile driving and barge and boat traffic, as discussed in this opinion (Section 1.4).
2) Measures shall be taken by Caltrans, or the contractor, to reduce mortality of listed species requiring capture/relocation in association with dewatering activities.
3) Measures shall be taken by Caltrans, or the contractor, to reduce the extent of degradation and alteration to the habitats in the action area as a result of the overwater structure placement, related to both direct and indirect effects of this Project, as discussed in this opinion.
4) Measures shall be taken by Caltrans, or the contractor, to prepare and provide NMFS with a plan and a report describing how listed species in the action area would be protected and/or monitored and to document the observed effects of the action on listed species and critical habitat.

2.9.4. Terms and Conditions

The terms and conditions described below are non-discretionary, and Caltrans or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). Caltrans 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.

1) The following terms and conditions implement reasonable and prudent measure 1:

   a) In-water and barge-mounted pile driving shall only occur during the June 1st – October 15th work window. Impact pile driving within a cofferdam surrounded by water is considered in-water pile driving.

   b) A soft start method (initially driving the pile with low hammer energy and increasing hammer energy as necessary) shall be used at the beginning of each pile driving day to allow fish to leave the work area before strikes become lethal.

   c) During the in-water work window of June 1st– October 15th, when water temperatures are below 75°F, the daily work schedule shall be limited to between one hour after sunrise to one hour before sunset, to avoid peak fish migration times and to allow for cumulative SEL impacts to reset daily.

   d) When local water temperatures are below 75°F, attenuation measures shall be used during impact pile driving to control and dampen underwater pressure wave propagation. Effective attenuation measures include:

      i) Pile driving within a dewatered cofferdam or caisson.

      ii) Use of a bubble curtain around the pile.

      iii) Use of a cushion block between the hammer and the pile.

e) Underwater sound monitoring shall be conducted during impact pile driving when water temperatures are below 75°F, to ensure incidental take limits are not exceeded according to the ecological surrogates assigned.

i) No more than 206 dB peak beyond a 40 meter radius from each pile driven with an impact hammer.

ii) No more than 187 dB SEL cumulative beyond 3,981 meters from the construction site boundary per day.

2) The following terms and conditions implement reasonable and prudent measure 2:

a) During dewatering activities, a qualified fish biologist shall be present onsite to make observations, and capture/relocate fish, if they become entrapped in the dewatered area.

b) Only fish biologists trained in salmonid capture and relocation shall remove and relocate fish during dewatering activities.

c) A fish relocation plan will be submitted to NMFS for approval 30 days prior to commencing activities.

3) The following terms and conditions implement reasonable and prudent measure 3:

a) The removal of existing vegetation shall be minimized.

b) Caltrans shall develop and implement a Riparian Plan addressing onsite habitat enhancement and purchase of mitigation bank credits to compensate for the permanent and temporal loss of habitat. The plan shall be submitted to NMFS for approval 30 days prior to the start of construction. As proposed by Caltrans, credits will be purchased at a 1:1 ratio for temporary and permanent riparian and in-water impacts. The plan shall also include provisions for leaving the root system of removed trees, only include planting of native species, and revegetation as close to the channel bank as practicable.

4) The following terms and conditions implement reasonable and prudent measure 4:

a) Caltrans, or its applicant, shall provide a report of Project activities to NMFS by December 31 of each year that construction takes place.

b) The report shall include a summary description of in-water construction activities, incidental take avoidance and minimization measures taken, and any observed take incidents, including number and species captured and relocated during dewatering.

c) Updates and reports required by these terms and conditions shall be submitted to:

Cathy Marcinkevage
Acting Assistant Regional Director
Central Valley Office
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento CA 95814
FAX: (916) 930-3629
Phone: (916) 930-3600

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) Caltrans 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 and sturgeon habitat restoration projects.

2.11. Reinitiation of Consultation

This concludes formal consultation for the Stockton Channel Viaduct Rehabilitation 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

Central Valley spring-run Chinook salmon

The Federally listed ESU of CV spring-run Chinook salmon may occur in the action area and may be affected by the proposed action. Its designated critical habitat does not occur within the action area. According to the most recent status review (NMFS 2016a), this ESU would not be expected to be affected by this proposed action. However, since 2015, the San Joaquin River Restoration Program (SJRRP) has been reintroducing CV spring-run Chinook salmon incrementally back into the San Joaquin River mainstem upstream of the construction area. According to a final rule under ESA Section 10(j), these reintroduced CV spring-run Chinook salmon are designated as a non-essential experimental population inside of the experimental

population area, which is generally in the San Joaquin River from its confluence with the Merced River upstream to Friant Dam (78 FR 79622; December 31, 2013).

However, outside of the experimental population area, these reintroduced CV spring-run Chinook salmon (any others in the area), are considered part of the CV spring-run Chinook salmon ESU, which is listed as a threatened species. Since the action area for this proposed action occurs outside of the experimental population area but includes rearing and migration habitat the reintroduced fish may use to reach the ocean or return to the experimental population area, NMFS included analysis of the effects of the proposed action on the CV spring-run Chinook salmon in the action area to this opinion. The number of CV spring-run Chinook salmon returning to the upper San Joaquin River in the experimental population area is expected to increase over time, as experimental hatchery release numbers, adult spawning returns, and the number of juveniles produced naturally in the restoration area increases. Detailed information regarding the ESU's life history, and viable salmonid population (VSP) parameters pertaining to the natural populations that occur in tributaries of the Sacramento River Basin can be found in the most recent 5-year status review (NMFS 2016a).

Typical CV spring-run Chinook salmon life history patterns have adults returning to freshwater basins in March. Capitalizing on springtime runoff, adults travel to holding pools, where they are available, in preparation to over-summer. Adults arrive in an immature state, hold over the summer months, and develop gonads until ready to spawn in late summer through mid-autumn. CV spring-run Chinook salmon are considered functionally extirpated from the Southern Sierra Nevada diversity group despite their historical abundance in the San Joaquin River Basin (NMFS 2016). There have been observations of low numbers of springtime running fish returning to major San Joaquin River tributaries that exhibit some typical spring-run life history characteristics. While the genetic disposition of such fish remains inconclusive, the implementation of reintroduction of the spring-run Chinook salmon into the San Joaquin River has begun and has resulted in over 800 wild-spawned juvenile spring-run Chinook salmon (SJRRP preliminary data presented in weekly reports ending May 7, 2018, Don Portz, Bureau of Reclamation). These juveniles should be imprinted to the upper San Joaquin River mainstem below Friant Dam, and are expected to return as adults when volitional passage is achieved and river conditions are suitable (NMFS 2016).

Based on known spring-run Chinook salmon life history timing and limited information of use of the San Joaquin River Basin, juveniles are expected in the action area November through May as they emigrate through the action area. Returning adults may travel through the action area from March through June. Exact timing of CV spring-run Chinook salmon use of the action area would depend on in-river water being adequate in quality and temperature, and actual life history stage timelines are expected to differ slightly between the Sacramento River and San Joaquin River basins. The proposed construction period for the Project's actions is June 1 through October 15. There is very little likelihood that either adult or juvenile life history stages of CV spring-run Chinook salmon would overlap with this timing. Therefore, potential effects (described in section 2.5) to CV spring-run Chinook are considered discountable, as it is highly unlikely that individuals would be present during the in-water work window.

It is extremely unlikely that CV spring-run Chinook salmon from the San Joaquin River Experimental Population would be present in the action area within the Stockton Deepwater Channel during the proposed in-water work window. During summer months when work is proposed, water quality conditions in the Stockton Deepwater Channel do not provide suitable habitat for CV spring-run Chinook salmon. Designated critical habitat for CV spring-run Chinook salmon does not exist in the action area. Based on this analysis, NMFS concurs that the proposed action is not likely to adversely affect CV spring-run Chinook salmon.

3. MAGNUSON-STEVENS 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 Caltrans and descriptions of EFH for Pacific Coast groundfish (Pacific Fishery Management Council [PFMC] 2005) and Pacific Coast salmon (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 geographic extent of salmon freshwater EFH is described as all water bodies currently or historically occupied by PFMC managed salmon within the USGS 4th field hydrologic units identified by the fishery management plan (PFMC 2014). This designation includes the Lower San Joaquin River (HUC 18040002) for all runs of Chinook salmon that historically and currently use these watersheds (spring-run, fall-run, and late fall-run). The Pacific Coast salmon fishery management plan also identifies Habitat Areas of Particular Concern (HAPCs): complex channel and floodplain habitat, spawning habitat, thermal refugia, estuaries, and submerged aquatic vegetation, of which the HAPC for complex channel and floodplain habitat is expected to be either directly or indirectly adversely affected by the proposed action.

The geographic extent of groundfish inland EFH is described as the inland extent of saltwater intrusion to where ocean-derived salts measure 0.5ppt during the period of average annual low flow (PFMC, 2019). The Pacific Coast groundfish fishery management plan also identifies HAPCs: estuaries, rocky reefs, canopy-forming kelp, seagrasses, and "areas of interest" of which, the HAPC for estuaries is expected to be either directly or indirectly adversely affected by the proposed action. Because of the extensive urbanization that has occurred in the California Central Valley over the last 100 years, the San Joaquin River in the action area has been leveed

and channelized and is currently degraded habitat for Pacific salmon complex channel and floodplain HAPC and Pacific groundfish estuary HAPC.

3.2. Adverse Effects on Essential Fish Habitat

Effects to Pacific Coast salmon HAPCs for complex channel and floodplain habitat are discussed in the context of effects to critical habitat PBFs as designated under the ESA and described in section 2.5.2. Pacific groundfish will also be adversely affected in estuarine area HAPCs where the Project will occur. A list of adverse effects to EFH HAPCs is included in this EFH consultation. The effects are expected to be similar to the impacts affecting critical habitat and include the following: sediment and turbidity, in-channel disturbance from pile driving, and permanent habitat loss/modification.

Sediment and turbidity

- Degraded water quality
- Reduction/change in aquatic macroinvertebrate production

In-channel disturbance from pile driving

- Channel disturbance and noise pollution from pile driving activity and associated piles

Permanent habitat loss/modification

- Reduced shelter from predators
- Reduction/change in aquatic macroinvertebrate production
- Reduced habitat complexity

3.3. Essential Fish Habitat Conservation Recommendations

(1) Caltrans should revegetate areas adjacent to the channel with native plant species

(2) Caltrans should recommend to contractors to use biodegradable lubricants and hydraulic fluid in construction machinery. The use of petroleum alternatives can greatly reduce the risk of contaminants from directly or indirectly entering the aquatic ecosystem.

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in section 3.2, above, approximately 0.45 acres of designated EFH for Pacific Coast salmon and Pacific Coast groundfish.

3.4. Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, Caltrans must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action, if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a

response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5. Supplemental Consultation

Caltrans 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 is Caltrans. Other interested users could include the Central Valley Flood Protection Board and the City of Stockton. Individual copies of this opinion were provided to Caltrans. The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. 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.

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