



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: WCR-2018-10275

September 26, 2018

Mr. Benjamin Broyles
Northern San Joaquin Valley
California Department of Transportation
1976 E. Dr. Martin Luther King Jr. Boulevard
Stockton, California 95205

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens
Fishery Conservation and Management Act Essential Fish Habitat Response for the
MER-99 Livingston Median Widening Project (10-0Q120)

Dear Mr. Broyles:

Thank you for your letter we received July 2, 2018, requesting initiation of consultation with the 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 MER-99 Livingston Median Widening Project (10-0Q120). 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.

The enclosed biological opinion is based on our review of the proposed action as detailed in the provided biological assessment, and project effects on the federally listed threatened California Central Valley steelhead (*Oncorhynchus mykiss*) distinct population segment and their designated critical habitat, in accordance with Section 7 of the ESA. Using the best available scientific and commercial information, NMFS concludes that the project is not likely to jeopardize the continued existence of this federally listed species, nor adversely modify or destroy its critical habitat. 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 the incidental take of federally listed fish that will occur with project implementation.

This biological opinion also includes NMFS's review of the potential effects of the proposed action on EFH for Pacific Coast Salmon, as designated under the MSA. The document concludes that the project will adversely affect the EFH of Pacific Coast Salmon in the action area and has included EFH Conservation Recommendations.


As required by section 305(b)(4)(B) of the MSA, the action agency 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 your response to the EFH portion of this consultation, we ask that you clearly identify the number of Conservation Recommendations accepted.

Please contact Katie Schmidt at (916) 930-3685, or via email at katherine.schmidt@noaa.gov, regarding questions concerning this letter, or if you require additional information.

Sincerely,


for Barry A. Thom
Regional Administrator

Enclosure

cc: To the file 151422-WCR2018-SA00454

Jason Meigs, Caltrans Biologist, jason.meigs@dot.ca.gov



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

MER-99 Livingston Median Widening Project (10-0Q120)

NMFS Consultation Number: WCR-2018-10275

Action Agency: California Department of Transportation


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 (<i>Oncorhynchus mykiss</i>) distinct population segment	Threatened	Yes	No	Yes	No

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

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

Issued By:

for 
 Barry A. Thom
 Regional Administrator

Date: September 26, 2018



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LIST OF ACRONYMS

°C	degrees Celsius
°F	degrees Fahrenheit
AMM	avoidance and minimization measure
BA	biological assessment
BMP	best management practice
Caltrans	California Department of Transportation
CCV	California Central Valley
CDEC	California Data Exchange Center
CDFW/CDFG	California Department of Fish and Wildlife
CRs	Conservation Recommendations
CRS	Merced River Cressey sensor
dB	decibels
Delta	Sacramento-San Joaquin River Delta
DPS	distinct population segment
EFH	essential fish habitat
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
ESAs	environmentally sensitive areas
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FHWG	Fisheries Hydroacoustic Working Group
HAPCs	Habitat Areas of Particular Concern
ITS	incidental take statement
LMWP	Livingston Median Widening Project
MHA	Merced River Hagman Park sensor
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NB	northbound
NMFS	National Marine Fisheries Service
NTU	nephelometric turbidity units
OHWM	ordinary high water mark
opinion	biological opinion
PAHs	polyaromatic hydrocarbons
PBFs	physical or biological features
PCTS	Public Consultation Tracking System
PM	post mile
PFMC	Pacific Fisheries Management Council
RMS	root-mean-square
ROW	right-of-way
RPMS	reasonable and prudent measures
SB	southbound
sDPS	southern distinct population segment
SEL	sound exposure level
SFS	Stockton Fire Station precipitation station

SJR	San Joaquin River
SPCCP	Spill Prevention Plan Control and Countermeasures Plan
SR	state route
SWPPP	stormwater pollution prevention plan
TMDL	Total Maximum Daily Load
USFWS	United States Fish & Wildlife Service

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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.

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

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available through NMFS' Public Consultation Tracking System (PCTS): [<https://pcts.nmfs.noaa.gov/pcts-web/homepage.pcts>, PCTS#: WCR-2018-10275]. A complete record of this consultation is on file at the NMFS California Central Valley Area Office, titled: "Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for MER-99 Livingston Median Widening Project (10-0Q120)".

1.2 CONSULTATION HISTORY

On November 6, 2012, NMFS received a letter from the California Department of Transportation (Caltrans), requesting informal consultation pursuant to Section 7 of the ESA and EFH consultation in accordance with section 305(b)(2) of the MSA, regarding the Livingston Median Widening Project (LMWP) (SR-99-PM 28.8/37.3). In this letter, Caltrans identified that the proposed project may affect, but was not likely to adversely affect:

- California Central Valley (CCV) steelhead (*Oncorhynchus mykiss*) distinct population segment (DPS) and its critical habitat

On March 26, 2013, NMFS issued a letter of concurrence (PCTS# 2013/9499) agreeing with Caltrans' determination that the project was "not likely to adversely affect" CCV steelhead or their critical habitat.

Early in 2016, Caltrans made the decision to split the construction of the MER-99 LMWP 10-0Q120 into two separate projects due to funding constraints.

During May of 2017, Caltrans engineers determined the previously submitted construction design that included a temporary culvert-based stream diversion/crossing system was infeasible and changed to a temporary trestle design to provide suitable construction access.

On July 2, 2018, NMFS received a letter from Caltrans requesting reinitiation/initiation of formal consultation regarding the MER-99 LMWP (10-0Q120) consultation on State Route (SR) 99. Due to project design changes, Caltrans changed their “not likely to adversely affect” determination for CCV steelhead to “may adversely affect”. Caltrans also requested concurrence that the project would not adversely affect Pacific Coast Salmon EFH.

On July 9, 2018, NMFS requested additional information regarding the duration steel piles would be in place in the Merced River and whether attenuation measures would be used to control underwater pressure waves created by pile driving via a phone call.

On July 9, 2018, NMFS received the requested information via phone conversation and initiated the consultation.

On September 5, 2018, Caltrans answered questions regarding vegetation removal timing and tactics were answered via email.

On September 18, 2018, via email, Caltrans asked to change the construction personnel environmental awareness training conservation measure proposed for this action to read, “Construction personnel will participate in worker environmental awareness program. A qualified biologist will inform all construction personnel about the life history of CCV steelhead and its potential presence in the project area and explain the state and federal laws pertaining to protecting this species and its habitat.”

1.3 PROPOSED FEDERAL ACTION

Under ESA implementing regulations, “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 MSA implementing regulations, 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). 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 October 1, 2012.

The MER-99 LMWP 10-0Q120 is a roadway widening project on SR 99 between post mile (PM) 28.8 and 37.3 in Merced County, California. Its purpose is to reduce congestion by increasing roadway capacity and to provide route continuity with the existing roadway north and south of the project. While NMFS originally issued a letter of concurrence dated March 26, 2013, in 2016 the Caltrans Project Development Team decided to split the construction of the LMWP into two separate projects: MER-99 Northbound (NB) LMWP 10-0Q121 and the MER-99 Southbound (SB) LMWP 10-0Q122. The scope of the NB LMWP also changed as a temporary trestle was added to the project description to serve as a stream crossing and work platform over the Merced River.

The Route Concept Report for SR 99 requires a six-lane freeway for this section of Merced County, however the SR 99 section in the area is currently a four-lane freeway. The new concept will have three lanes in each direction and to achieve this goal, the median between the NB and SB lanes will be filled with a lane each. While the project encompasses median widening between PM 28.8 and 37.3, this opinion focuses on the project aspects of the work near, in, and

over the Merced River and associated impacts on CCV steelhead and their designated critical habitat. Therefore the proposed project description presented here will be limited and only include details relevant to assessing impacts to anadromous resources under NMFS jurisdiction, (i.e., the NB Merced River Bridge widening at PM 31.08). The full project description was included in the submitted biological assessment (BA) (Caltrans, 2018).

The MER-99 NB Merced River Bridge will be widened toward the median space between the NB and SB decks to accommodate the additional lane of NB traffic. Both of the NB bridge abutments will be extended to accommodate the widened bridge deck, however the single supporting bent wall will not be widened as the existing bridge bent wall is sufficiently wide and will accommodate an additional lane, as is. A temporary trestle will be constructed to provide project-related construction access to the MER-99 NB Merced River Bridge and to support the temporary falsework needed.

In addition to restoring and revegetating the construction access impact zones subsequent to the completion of project construction, Caltrans proposes to vegetate approximately 0.181 acre of streambank within Caltrans' ROW on the north bank of the Merced River, immediately adjacent to the SB MER-99 Merced River Bridge with appropriately native riparian tree and shrub species to offset necessary vegetation removal.

Conservation measures incorporated into the proposed project design are considered as design-inherent components that will be implemented according to Caltrans standards:

- Standard construction best management practices (BMPs) will be used to avoid or otherwise minimized impacts to the water quality related to project activities.
- Environmentally sensitive areas (ESAs) information will be shown on contract plans and discussed as special provisions considered in contract awards.
- May use high-visibility fencing to identify the limits of work areas adjacent to sensitive resources, or to exclude sensitive resources from potential construction impacts on ESAs.
- ESAs provisions will be implemented as a first order of work and remain in place until all construction activities are complete.
- Contractor encroachment into ESAs will be prohibited, including staging, operation, storage, or casting of materials.
- **Vegetation and tree removal** will occur sometime between during **October 1st through January 31st** to avoid sensitive bird nesting and bat use.
- An employee education program shall be implemented to promote worker environmental awareness for onsite personnel prior to beginning activities. Program will be conducted by a person knowledgeable in biology and natural history of the local site.
- Prior to entering worksites, vehicles and equipment will be cleaned according to Caltrans' 2013 Construction BMPs Manual (Caltrans, 2003) to minimize the introduction of pollutants, foreign materials, or spread invasive plants.

- A stormwater pollution prevention plan (SWPPP) will be written prior to the start of construction, and will include Caltrans BMPs to avoid any pollution resulting from construction activities.

CCV steelhead-specific AMMs adopted into the proposed action from the 2013 NMFS letter of concurrence:

- **All in-water work and pile driving activities** will be restricted to the period from **June 15th through October 1st**, a period when high water temperatures prevent salmonid survival in the area.
- A qualified fish biologist will be present for the first two and last two weeks in the **instream/pile-driving work window** of **June 15th through October 1st** to survey the stream for the presence of CCV steelhead individuals, including potentially a snorkel survey within the project action area, to ensure project compliance.
- Fish passage shall be maintained at all times.
- Excavated material from the streambed will be stockpiled where it cannot wash back into the stream or outside of the designated construction limits.
- Sediment control devices such as silt fences will be placed around all work areas, staging areas, soil stockpiles, or other disturbed ground and maintained for the duration of the construction to prevent erosion of fine textured sediment into the river. The contractor will take all reasonable precautions to prevent increases in downstream turbidity.
- Construction equipment will not be refueled within 100 feet of the river in the project area.
- Construction by-products such as petroleum products, chemicals, or other hazardous materials will not be allowed to enter into streams or waters. A plan for emergency clean-up of any spills will be available when construction equipment is in use such as a Spill Prevention Plan Control and Countermeasures Plan (SPCCP).
- Vegetation clearing will be confined to the minimal area necessary within 200 feet of aquatic habitat to facilitate construction access and implementation activities.
- Orange barrier fencing will be erected to clearly define steelhead habitat/delineate as ESAs to be avoided by equipment and personnel.
- Shaded riverine aquatic habitat or natural woody riparian habitat will be avoided and preserved to the extent practicable. Any disturbed riparian vegetation will be replanted with native trees and shrubs with appropriate irrigation, care, and monitoring to ensure that healthy riparian and shaded riverine aquatic habitat is fully re-established.
- Disturbed riparian habitat will be revegetated with native grasses and forbs, to be planted within the 0.161 acre construction access impact zones subsequent to the completion of project activities.

- Construction vehicles and equipment will be maintained to prevent contamination of soil or water from external grease and oil, or from leaking hydraulic fluid, fuel, or lubricant.
- Any holes in the river bottom created by construction would be filled with gravel sized between one-half inch and four-inches in diameter for CCV steelhead spawning gravel.
- Construction personnel will participate in worker environmental awareness program. A qualified biologist will inform all construction personnel about the life history of CCV steelhead and its potential presence in the project area and explain the state and federal laws pertaining to protecting this species and its habitat.

“Interrelated actions” are those that are part of a larger action and depend on the larger action for their justification. “Interdependent actions” are those that have no independent utility apart from the action under consideration (50 CFR 402.02). The *Endangered Species Act Consultation Handbook* (USFWS & NMFS, 1998) provides NMFS with applicable guidance on how to analyze whether an activity is interrelated to or interdependent with the proposed action:

As a practical matter, the analysis of whether other activities are interrelated to, or interdependent with, the proposed action under consultation should be conducted by applying a “but for” test. The biologist should ask whether another activity in question would occur “but for” the proposed action under consultation. If the answer is “no,” that the activity in question would not occur but for the proposed action, then the activity is interrelated or interdependent and should be analyzed with the effects of the action.

The MER-99 SB LMWP (EA-10-0Q122) is interrelated to the NB section proposed action because Caltrans split the NB and SB median widening aspects into two separate projects, and the SB portion is not included in the project description under analysis. The ultimate goal of achieving a six-lane freeway in this section of SR 99 will not be achieved until the SB LMWP is implemented. Normally, the adverse effects of these project would be considered together however, the SB LMWP is currently unfunded and its implementation date has not been determined. When the SB LMWP is granted funding and moves forward, its environmental impacts will be fully reviewed at that time and therefore its associated effects to species are not included in the analyses of this opinion. Furthermore, each section will be able to function separately from each other, and in that view, may not be considered interdependent on the NB LMWP 10-0Q121.

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 provides 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.

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 "to jeopardize the continued existence of" a listed species, which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (81 FR 7214; February 11, 2016).

The designations of critical habitat for CCV steelhead use the term primary constituent element or essential features. The new critical habitat regulations (81 FR 7414; February 11, 2016) replace 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 primary constituent elements, PBFs, or essential features. In this biological opinion, we use the term PBF to mean primary constituent element 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:

- Identify the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.

- Analyze the effects of the proposed action on both species and their habitat using an “exposure-response-risk” approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors by: (1) Reviewing the status of the species and critical habitat; and (2) adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species and critical habitat.
- Reach a conclusion about whether species are jeopardized or critical habitat is adversely modified.
- 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 the 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’ current “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 current function of the essential PBFs that help to form that conservation value. The status of species section presented in this opinion is a synopsis of the detailed information available on NMFS’s West Coast Regional website: <http://www.westcoast.fisheries.noaa.gov/>.

In 2016, NMFS completed status reviews of 28 species of Pacific salmon, steelhead, and eulachon (including CCV steelhead), and concluded that these species’ statuses should remain as listed (81 FR 33468). **Table 1** below summarizes the current status of the CCV steelhead population, and identifies the waterbodies and the important PBFs that comprise their designated critical habitat. While the conclusion of the most recent status review was that the CCV steelhead status of “threatened” should remain unchanged, the review team found that the DPS had suffered severe impacts associated with the recent, exceptionally dry California drought that occurred 2012 through 2016 (NMFS, 2016).

The link below Table 1 leads to web content that provide more detailed information regarding CCV steelhead life history and geographical distribution, as well as relevant Federal Register Notices.

2.1.1 Global Climate Change

A major factor affecting the rangewide status of ESA-listed anadromous fishes in the Central Valley and the quality of their aquatic habitats at large is climate change. The warmer climate

associated with climate change in California is predicted to reduce snowpack and alter the seasonality and volume in contrast to historical hydrograph patterns (Cohen et al., 2000). Central California has shown trends toward warmer winters since the 1940s (Dettinger & Cayan, 1995), and while there is uncertainty associated with projections (uncertainty which the amount of increase over time), the direction of the trend to a warmer climate is relatively certain (McClure et al., 2013).

Projected warming is expected to negatively affect Central Valley Chinook salmon and other anadromous species that depend on reliable cold water outputs to persist below rim dams. In the CCV, summer and early fall temperatures below the dams in many streams already exceed the recommended temperatures for optimal growth of juvenile steelhead, which range from 14°C to 19°C (57°F to 66°F). Because the vast majority of salmonid runs in the Central Valley are currently restricted to low elevations as a result of impassable rim dams, if climate warms as predicted (by 5°C/9°F), it is questionable whether any Central Valley Chinook salmon populations can persist unassisted (Williams, 2006). For example, the embryonic and larval life stages of winter-run Chinook salmon occurring during the summer. These stages of their development are when they are most sensitive and vulnerable to warmer water temperatures, and so this run is particularly at risk from climate warming. The CV spring-run ESU of Chinook salmon are also vulnerable to climate change because spring-run adults over-summer in freshwater streams before spawning in autumn (Thompson et al., 2011). The core of the spring-run Chinook salmon ESU spawning occurs primarily in the tributaries to the Sacramento River, and tributaries without cold water refugia (usually input from springs) will be more susceptible to temperatures increases driven by climate change. Although steelhead will experience similar effects of climate change to Chinook salmon, as they are also blocked from the vast majority of their historical spawning and rearing habitat, the adverse effects to the CCV DPS may be even greater than what may occur to Chinook salmon, as juvenile steelhead need to rear in freshwater streams for one to two summers prior to emigrating as 1+ yearling smolts (NMFS, 2014).

In summary, observed and predicted climate change effects are generally expected to be detrimental to Central Valley anadromous species (McClure, 2011; Wade et al., 2013), so unless offset by pronounced improvements in other factors, the status of the species and suitability of their critical habitats is likely to decline over time. The climate change projections referenced above cover the time period between the present and approximately 2100.

Table 1. Description of CCV steelhead and their designated critical habitat, current ESA listing classifications, and summary of current status.

Species Population	Listing Classification and Federal Register Notice	Population Status Summary
Steelhead, <i>Oncorhynchus mykiss</i> , CCV DPS	Listed as threatened, January 5, 2006 (71 FR 834)	According to the most recent status review (NMFS, 2016), the viability of CCV steelhead appears to have changed little since the last status review (2011) that concluded that the DPS was in danger of extinction. Most wild CCV populations are very small, are not monitored, and may lack the resiliency to persist for protracted periods if subjected to additional stressors, particularly widespread stressors such as climate change. The genetic diversity of CCV steelhead at risk from by low population sizes and high numbers of hatchery fish relative to wild 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 of CCV steelhead.

Table 2. Description of CCV steelhead designated critical habitat, and summary of current status.

Species Critical Habitat	Designation Date and Federal Register Notice	Critical Habitat Status Summary
CCV steelhead designated critical habitat	Designated, September 2, 2005, (70 FR 52488)	<p>Critical habitat for CCV steelhead includes portions of the southern Sacramento-San Joaquin River Delta (Delta); the stream reaches of the American, Mokelumne, Calaveras, Stanislaus, Tuolumne, and Merced Rivers; and the San Joaquin River downstream its confluence with the Merced River. Critical habitat includes the stream channels in the designated stream reaches and the lateral extent as defined by the ordinary high-water line. In areas where the ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation.</p> <p>PBFs considered essential to the conservation of the species include: Spawning habitat; freshwater rearing habitat; freshwater migration corridors; and estuarine areas.</p>

[Go to NOAA Fisheries West Coast Region website, for CCV steelhead DPS and critical habitat information.](#)

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 proposed project runs from south of the Hammett/SR 99 interchange 8.5 miles to the Merced/Stanislaus County Line, and occurs on SR 99 between PM 28.8 to 37.3, running through the rural towns of Livingston and Delhi, California. The project is located on the Turlock and Cressey U.S. Geological Survey 7.5 quadrangles, Township 6 South Range 11 East Sections 5, 6, 8, 9, 15, 16, 22, 25, 26, and Township 5 South Range 11 East Section 31. The approximate center of the NB Merced River Bridge occurs at Latitude 37.39941, Longitude -120.74261.

The project action area encompasses all areas affected by the project, including those associated with placement and construction of project features, State Highway right-of-way (ROW) and the areas required for access, and the operation, storage, and staging of equipment and materials. It also includes the point where project generated noise attenuates to baseline/ambient noise levels underwater from the point at which the noise was created.

Relating to the underwater noise associated with pile driving, the project action area extends to the distance where peak pile driving noise is predicted to exceed ambient noise levels. NMFS and Caltrans assume that ambient underwater sound levels 150 decibels (dB) or less to represent ‘effective quiet’ or baseline conditions (Caltrans, 2015). Since the project requires impact pile driving of 24-inch diameter steel pipe piles, available data indicate that placing piles of such a diameter and type are expected to generate peak sounds up to 209 dB. Introducing underwater sound waves of this magnitude are therefore expected to elevate ambient underwater sound levels that exceed 150 dB up to 7,719 meters upstream and downstream of the location of the pile driving. Beyond this distance the introduced sound is expected to attenuated back to or below the 150 dB ambient threshold. Therefore, the action area of the proposed project also includes the Merced River 7,719 meters (or 4.8 miles) up and downstream from the Merced River Bridge location (**Error! Reference source not found.**), and its water column up to the ordinary high water mark (OHWM).

2.4 ENVIRONMENTAL BASELINE

The “environmental baseline” includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

2.4.1 Occurrence of CCV Steelhead and Their Critical Habitat

The CCV steelhead in the Merced River below the Crocker Huffman Dam are considered part of the Southern Sierra Nevada Diversity Group. Historically, this population spawned much further upstream in the Merced River, however because they are blocked from reaching higher elevation areas by several dams, they must spawn below the Crocker Huffman Dam (the first impassable dam) in less suitable spawning habitat. The steelhead in the Merced River are considered a Core 2 population with an uncertain risk of extinction; Core 2 populations being defined as having

met, or have the potential to meet, the biological recovery standard for moderate risk of extinction, though the hosting watersheds have a lower potential to support viable populations.

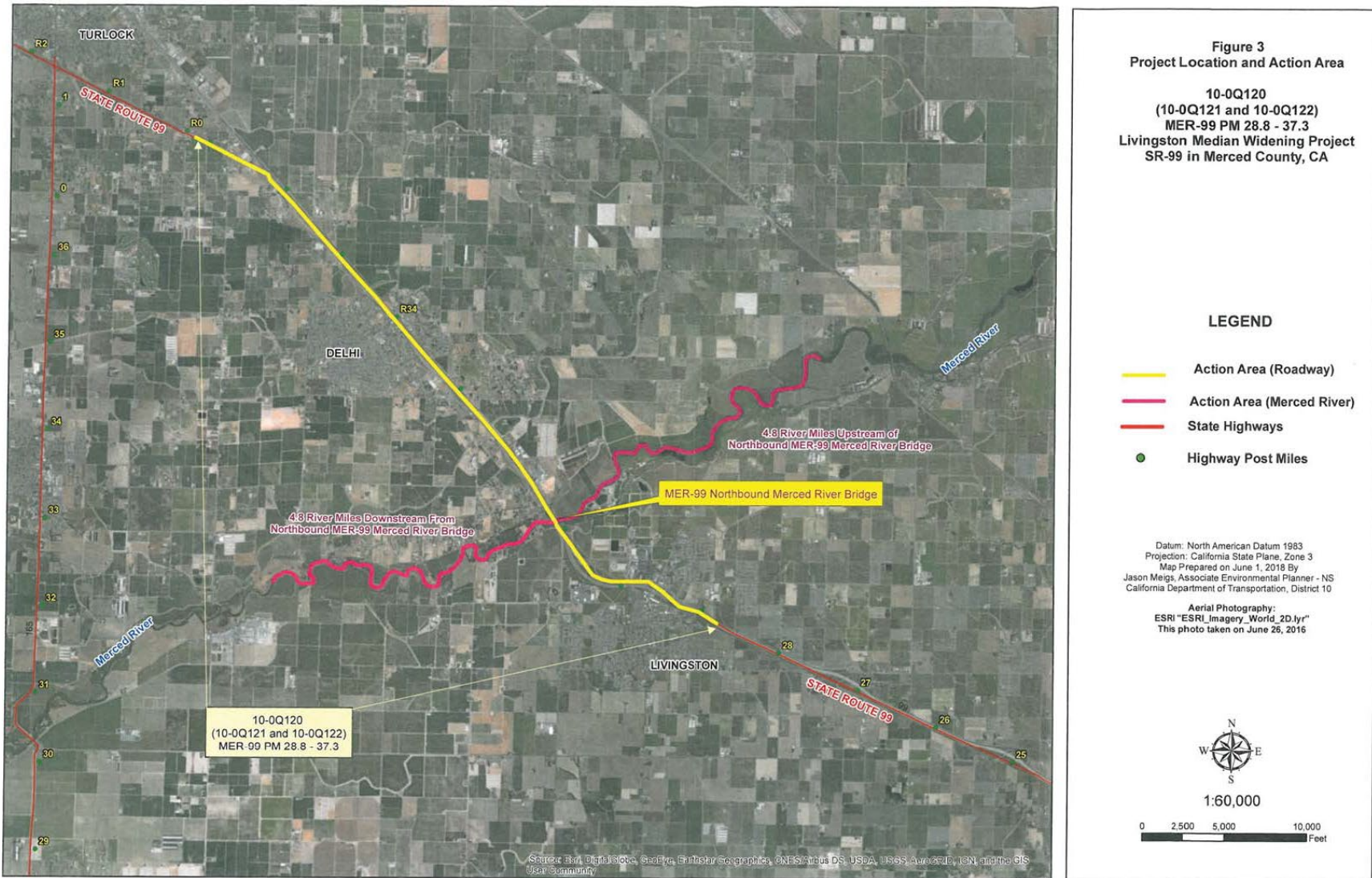


Figure 1. Project location and action area map for proposed action MER-99 NB LMWP 10-0Q121 (Caltrans, 2018).

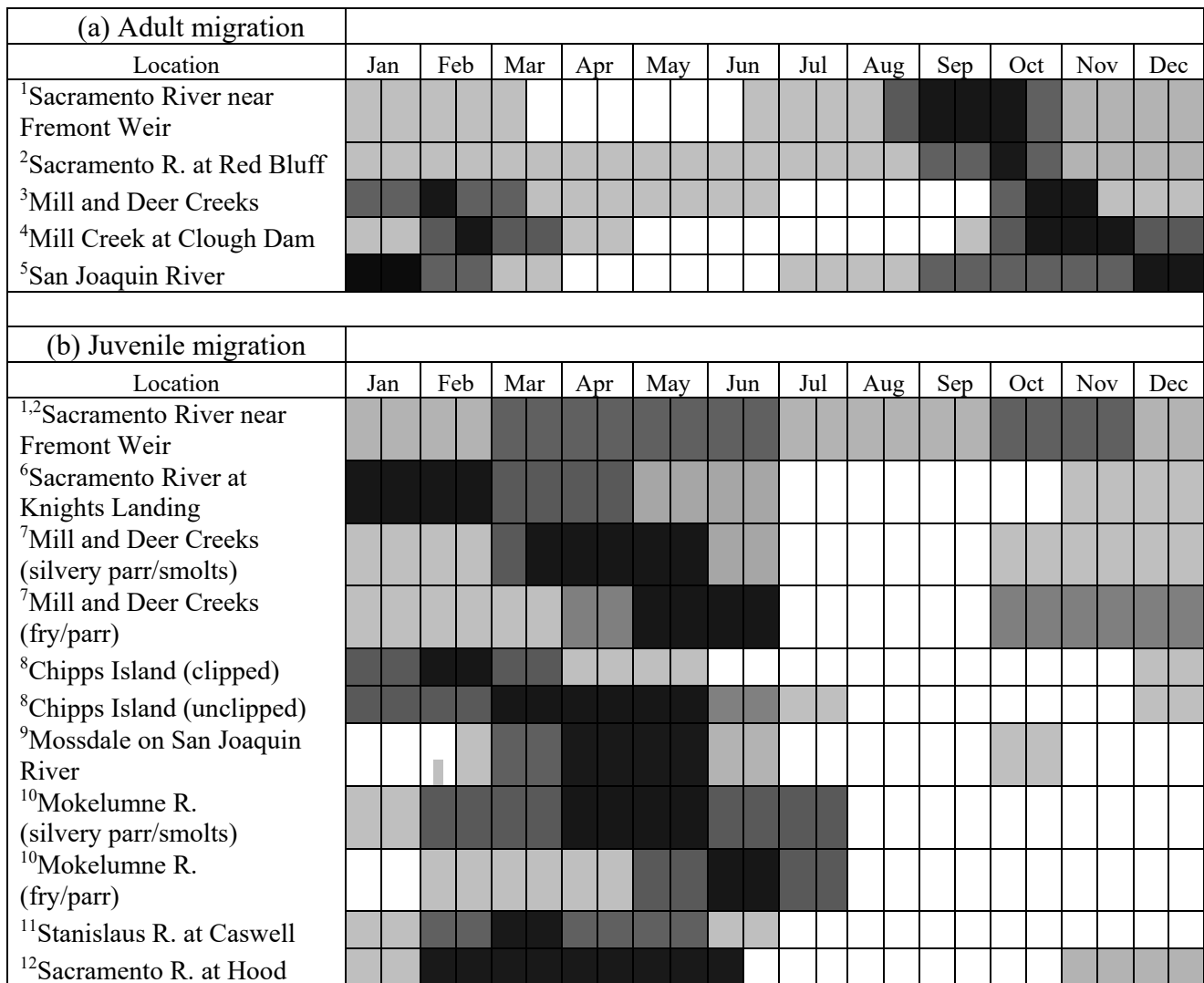
Generally, Core 2 populations increase the life history diversity of a DPS and buffer against catastrophic occurrences that may affect nearby populations of greater value (NMFS, 2014).

The Merced River is the southernmost San Joaquin River tributary designated as CCV steelhead critical habitat. The PBFs for CCV steelhead critical habitat in the defined action area include (1) freshwater migration corridors for both adults and juveniles, and (2) rearing habitat for juveniles. The freshwater migration utility in the action area is rated as being of periodic in availability and of poor quality, due to the influence of the Crocker-Huffman Dam and other dams. The released river flows are insufficient in magnitude, quality, and temperatures at times to support all adult and juvenile uses of the lower section of the Merced River otherwise available. The quality of the natal rearing habitat is rated as sporadic and poor for the same reasons, and the Merced River is not considered suitable for non-natal rearing. The critical habitat within the action area is not considered suitable for CCV steelhead spawning or egg incubation; those activities occur miles upstream from the action area, close to the base of the Crocker-Huffman Dam.

It is believed that all current stocks of California Central Valley steelhead have a “winter run” timing, meaning most of the population migrates up the rivers starting with the first notable pulse of rain run-off in the fall and spawn in winter (Moyle et al., 1995), however life history strategies between individuals are extremely variable. It is important to take into account that steelhead are iteroparous (i.e., they can spawn more than once in their lifetime (Busby et al., 1996)), and therefore a few adults may be expected to survive a spawning event and travel back down rivers to return to the ocean. As such, the determination of the presence or absence of steelhead in the Delta (**Error! Reference source not found.**) accounts for both upstream migration of spawning adults and the downstream migration of adults that survived spawning (kelts).

Adult and juvenile CCV steelhead periodically use and occupy the Merced River within the defined action area (**Error! Reference source not found.**). Adult steelhead are believed to enter the San Joaquin River freshwater system sometime between July through August (**Error! Reference source not found.a**, San Joaquin River), and peak migration of adults moving upriver occurs September through February (**Error! Reference source not found.**). Adult steelhead will hold until flows are high enough in the tributaries to move into riffle areas where they will spawn from December to April (Hallock et al., 1961). Steelhead kelts migrating back through the freshwater system to the Pacific Ocean may persist in the CCV from December through May, residing for lengths of time in the Delta as they make the transition back to saltwater physiology.

There is less data available on the outmigration timing of juveniles in the San Joaquin River Basin, however they have a large presence at Mossdale Bridge in the mainstem of the San Joaquin River in the Delta from February through June, with the core of their migration occurring March through May. Larger juveniles, in the process of smoltification (parr going to smolt stage), have been captured in the spring until July on the Mokelumne River (**Error! Reference source not found.b**, Mokelumne River fry/parr/smolts). In the Stanislaus River, capture data indicate juveniles out-migrate February through June (**Error! Reference source not found.b**, Stanislaus River at Caswell). Since the Stanislaus River is closer to the Merced River compared to all other available datasets in Figure 2, juvenile outmigration information from that tributary is used in this opinion to represent the outmigration timing of CCV steelhead juvenile movement timing in the action area.






Relative Abundance:  = High  = Medium  = Low
Sources: ¹(R. J. Hallock, D.H. Fry Jr., and Don A. LaFaunce, 1957); ²(D. R. McEwan, 2001); ³(Harvey, 1995); ⁴CDFW unpublished data; ⁵CDFG Steelhead Report Card Data 2007; ⁶NMFS analysis of 1998-2011 CDFW data; ⁷(Johnson & Merrick, 2012); ⁸NMFS analysis of 1998-2011 USFWS data; ⁹NMFS analysis of 2003-2011 USFWS data; ¹⁰unpublished EBMUD RST data for 2008-2013; ¹¹Oakdale RST data (collected by Fishbio) summarized by John Hannon (Reclamation); ¹²(Schaffter, 1980).

Figure 2. The temporal occurrence of (a) adult and (b) juvenile California Central Valley steelhead at locations in the Central Valley. Darker shades indicate months of greatest relative abundance (NMFS, 2014).

2.4.2 Factors Affecting Listed Species and Critical Habitats

The Merced River is the third largest tributary of the San Joaquin River and flows 145 miles from its headwaters in the Sierra Nevada into the San Joaquin Valley. Within the Yosemite Valley, it has the status of a “National Wild and Scenic River” and remains in its most natural form, running swift, steep, and regularly cold, sourced primarily from Sierra Nevada snowmelt.

Once the Merced River reaches the San Joaquin Valley floor, it becomes a slow-moving meandering stream that is typically warmer than permissible salmonid temperature thresholds.

Large-scale irrigation was developed in the San Joaquin Valley in the late 19th century and numerous state, federal, and privately owned dams and reservoirs (New Exchequer Dam/Lake McClure, McSwain Dam, Merced Falls Dam, and Crocker-Huffman Dam) were constructed to divert, store, and artificially manage its water resources for urban and agricultural purposes. Current diversions often reduce Merced River flow to that of a small stream by the time it meets the San Joaquin River mainstem (Wikipedia, 2018). Upstream of the action area, the Crocker-Huffman Dam is a non-Federal Energy Regulatory Commission (FERC) dam (i.e., does not generate hydro-electricity) that diverts water into the Merced Irrigation District's Main Canal for irrigation uses. This dam is operated in conjunction with two FERC regulated dams further upstream that do generate power. There is currently an inoperative fish ladder on the Crocker-Huffman Dam, therefore this dam is the limit of anadromy on the Merced River (NMFS, 2018). It is estimated that salmonids have access to only 19% of the aquatic habitat offered by the Merced River (The Nature Conservancy, 2017).

The latest Water Quality Assessment Status from the Environmental Protection Agency (EPA) considered the Lower Merced River between the McSwain Reservoir to its confluence with the San Joaquin River (EPA, 2018) as impaired for the following designated uses: 1) cold freshwater habitat; 2) commercial and sport fish; 3) migration of aquatic organisms; 4) spawning, reproduction, and/or early development; 5) warm freshwater habitat; and 6) water contact recreation. The causes of impairments limiting the uses of the Merced River are chlorpyrifos, diazinon, *Escherichia coli*, Group A pesticides, mercury, high water temperatures, and unknown toxicity (EPA, 2018). The same waterbody section is rated as good for municipal and domestic water supply. Though causes of impairment have been identified, total maximum daily loads (TMDLs) have not been established for this waterbody. Since TMDLs have not been established, resolution of the water quality impairments in this waterbody is not expected in the near future.

Regarding water temperatures, which are critical to the success of steelhead in the Merced River in the action area, the California Data Exchange Center (CDEC) offers historical and current water temperature records from several in-river sensors. The sensor in the Merced River near Hagman Park (MHA), Lat 37.3708/Long -120.83588, is approximately 7 miles downstream of the action area and was maintained by the California Department of Fish and Wildlife when in operation. Water temperature records taken at MHA are available hourly in degrees Fahrenheit from September 10, 2007 until October 4, 2011 (California Department of Water Resources, 2018b). Another sensor, approximately 6.5 miles upstream of the action area, the Merced River at Cressey (CRS), Lat 37.425/Long -120.663, is currently maintained by the California Department of Water Resources. This sensor records a variety of data, including daily and hourly water temperature in degrees Fahrenheit, available from October 25, 2000, to the present (California Department of Water Resources, 2018a). Data from these sensors available on CDEC were used to represent daily water temperatures of the Merced River in the action area.

According to CDEC records, the first day of the year water temperatures at the CRS station exceeded 73 F° may be as early as the month of April to as late as sometime in July, given data recorded between the years of 2010 to 2017 (**Error! Reference source not found., Error! Reference source not found.**). While juvenile steelhead can tolerate water temperatures up to 81

F° for short periods if they are gradually acclimated up to this maximum and are otherwise in good condition, 73 F° is generally considered the upper limit of juvenile steelhead water temperature tolerance (NMFS, 2014). Therefore, it is likely that any steelhead using the action area will have left the system before this temperature threshold is reached and are considered to be absent from the action area after this threshold is exceeded, sometime between April and July of each year. This assumption is consistent with available data on juvenile presence timing in other San Joaquin tributaries (**Error! Reference source not found.**).

Table 3. The date daily water temperature at CDEC station CRS first exceeds 73 F° each year, 2010 through 2017.

Year	Date	Water Temperature (F°)
2010	6/24	73.4
2011	7/21	73.7
2012	4/22	74.5
2013	5/11	73.4
2014	5/14	74.1
2015	4/30	73.7
2016	5/12	73.8
2017	7/16	73.2

Adult steelhead have a much lower temperature tolerance threshold compared to juveniles, generally experience deleterious effects in waters over 52 F° (NMFS, 2014). They must leave the system much earlier to avoid warm water temperatures compared to when must juveniles exit. When adult steelhead travel upstream in the fall, the earliest date they may access tributaries is related to the first flush of the season and whether it provides adequate flows to facilitate upstream movement. It is also an event which is closely linked to lowered in-river water temperatures. According to available temperature data, suitable adult temperature conditions under 52 F° begin to occur in November and December in the action area each year (**Error! Reference source not found.**), and consistently persist until at least January in dry years and up until April in non-drought years.

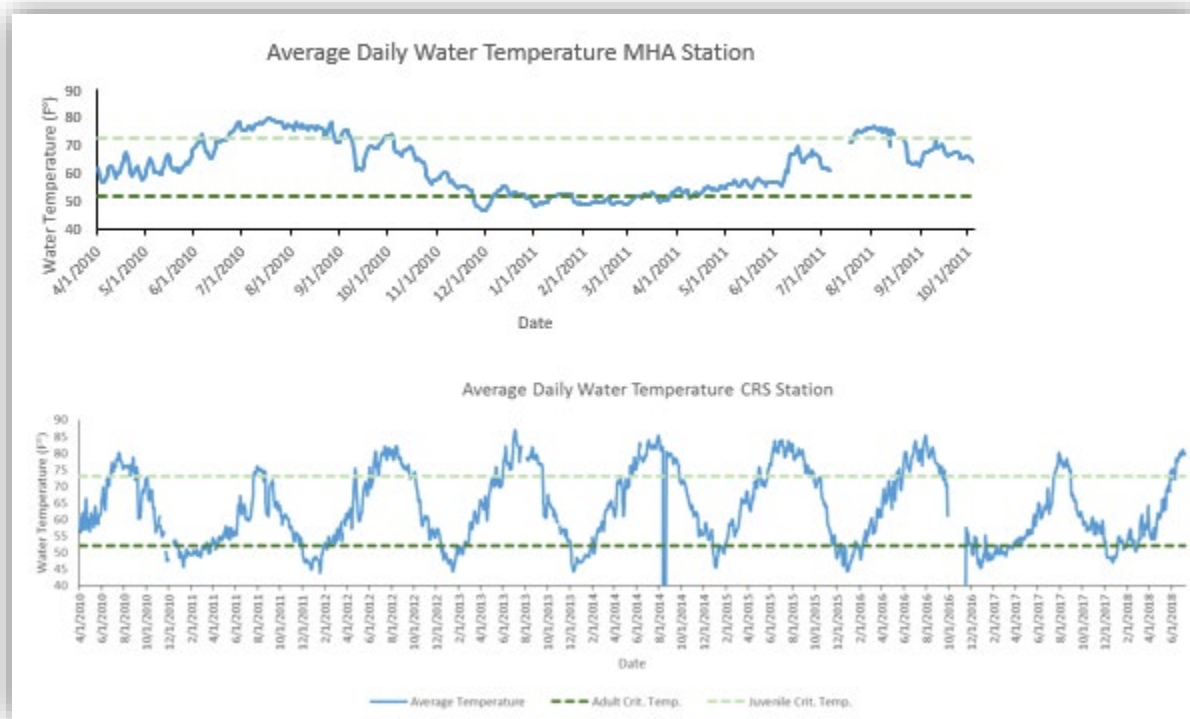


Figure 3. Daily water temperature of the Merced River (blue line) at MHA (4/1/2010 through 10/1/2011) and CRS stations (4/1/2010 through 6/1/2018), with lines representing critical temperature thresholds for adult (dark green, 52 F°) and juvenile (light green, 73 F°) CCV steelhead. (California Department of Water Resources, 2018a; California Department of Water Resources, 2018b).

2.4.3 Conservation, Restoration, and Recovery Efforts

In the San Joaquin River basin in general, the Merced River included, conditions in the available habitat can be challenging to CCV steelhead reproduction and survival. Key stressors identified as preventing CCV steelhead recovery in the San Joaquin River basin (NMFS, 2014):

- A. Low spatial structure distribution (criteria requires at least two viable populations within the San Joaquin River basin)
- B. Passage impediments/barriers
- C. Warm water temperatures for rearing
- D. Hatchery effects
- E. Predation
- F. Loss of historical habitat/degradation of remaining habitat

In contrast to the challenges faced by CCV steelhead identified above, several projects and programs implemented in the watershed aim to restore the riverine habitat, the anadromous species (steelhead, Chinook, lamprey, etc.), or may benefit steelhead by returning the Merced River to historical conditions. For example, near the town of Snelling is the Merced River Hatchery, which is a Chinook salmon propagation facility maintained by the California Department of Fish and Wildlife (California Department of Fish and Wildlife, 2018b). It is located just below the Crocker-Huffman Dam and was constructed with the purpose of increasing the production of fall-run Chinook salmon through increased juvenile and adult survival rates in the basin, and to mitigate for the loss of habitat that came with the construction of the Crocker-Huffman, Merced Falls, and Exchequer dams (California Department of Fish and Wildlife, 2018a). In 2014, CDFW performed a fish rescue on adult rainbow trout (the resident form of *O. mykiss*)/steelhead in response to low oxygen conditions in the river caused by drought conditions. Captured adults were held at the Merced River Hatchery cold-water holding facility until water conditions improved. Persisting poor water quality conditions led CDFW to keep the fish an additional year. Half of the rescued fish matured at the facility, and hatchery staff successfully spawned 12 pairs to produce 750 juvenile *O. mykiss* (California Department of Fish and Wildlife, 2016). These events are relevant because both anadromous and resident *O. mykiss* parents may produce anadromous type juveniles (i.e., federally-listed steelhead).

Several river restoration projects have occurred, or continue to occur, along the Merced River. Far above the action area, the National Parks Service has long-term restoration strategy for the Merced River within the borders of the Yosemite National Park (National Parks Service, 2017). Work has been ongoing since 2015, and largely aims to revegetate the river banks, rebuild them, and remove armoring riprap in favor of more natural protective measures where necessary. The goal of this effort is the preservation and restoration of the values of the Merced River as a “Wild and Scenic River” through the Yosemite Valley. Though steelhead are currently unable to access these areas, improvement of this habitat may be beneficial to the DPS when passage above the dams is achieved in the future.

Other restoration projects have been implemented in the lower Merced River below the Crocker-Huffman Dam and are currently accessible to steelhead. Of note, in 2013, the Merced River Ranch and Floodplain Restoration Plan purchased 318 acres of land on both sides of the Merced River and redesigned and restructured flow dynamics to improve salmonid spawning areas along with other restorative measures (USFWS, 2018). And in 2015, the Henderson Park Habitat Restoration Project was completed, reclaiming 15 acres of floodplain habitat, adding 72,000 cubic yards of spawning gravel, and rehabilitating 7.2 acres of salmonid spawning and rearing habitat. In total, in the lower Merced River, 2 miles of spawning and rearing habitat was restored, 163,000 cubic yards of spawning gravel was added, 0.5 miles of side channels were opened, and 19 acres of floodplain habitat was restored or made accessible (The Nature Conservancy, 2017). These efforts are expected to benefit CCV steelhead using the Merced River as well.

The NMFS recovery plan identified that the Merced River steelhead population should be maintained as a Core 2 population to support the Southern Sierra Nevada diversity group of the CCV DPS. The recovery plan also details that the Merced River upstream of the Crocker Huffman Dam is a candidate area for steelhead reintroduction in the future (NMFS, 2014). Recovery efforts for this area focus on several key stressors that are vital to CCV steelhead in general throughout their range: 1) elevated water temperatures that affect adult migration and

holding; 2) low in-river 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). Recovery efforts identified in the recovery plan that are relevant to this consultation/Merced River include: developing a program to re-establish steelhead in their historic habitat upstream of the high dams and other impediments on the lower Merced River, managing releases from New Exchequer Reservoir to provide beneficial flow and temperatures for all life stages, developing an *O. mykiss*/steelhead data collection team for the Merced River to get more information specific to the watershed, improving floodplain and side channel habitat to increase available habitat diversity and functionality, implementing a long term gravel supplementation and management program, increasing the amount of fish screens on diversions, and working with water rights holders to provide more flows for fish benefits. The restoration projects described in the preceding paragraphs are in line with actions outlined in the NMFS Recovery plan as necessary to recovery the CCV steelhead DPS. However, enduring stressors continue to prevent full recovery, so additional effort and actions must be taken before significant population growth can be reasonably expected.

2.5 EFFECTS OF THE ACTION

Under the ESA, “effects of the action” means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

2.5.1 Effects of the Proposed Action to Listed Fish Species

The following is an analysis of the potential effects to CCV steelhead that may occur as a result of implementing the proposed LMWP at the Merced River Bridge. For our analysis on the effects of the proposed action to listed species, we have used the presence of species in the action area to determine the risk each the species and life stage may face if exposed to project impacts. The effects of the proposed action components that were analyzed include: 1) general construction and associated effects, and 2) pile driving and associated underwater acoustic exposure effects.

1) General construction and associated effects

Construction near aquatic habitats can cause harm to listed fishes through a predictable set of adverse effects, the severity of which is moderated by the timing, duration, and intensity of the activity. For example, a construction project on a river bank is likely to introduce noise, vibrations, sediments, and trace amounts of hazardous materials into the immediate environment to some degree, and cause direct and indirect adverse effects to fishes occupying or using that habitat. The potential magnitude of the harassment an individual fish may experience depends on a number of factors, including the type and intensity of disturbance, the proximity of disturbance-generating activities to the water body, the timing of the activities relative to the behavior of the fish, the frequency and duration of disturbance periods, the life stages affected and their sensitivity to disturbance, and the condition of the individuals when they are affected by project disturbances.

Before the removal of the riprap and other construction can begin, onsite vegetation and tree removal will take place on the south bank of the Merced River. Woody riparian vegetation is not present in the location slated for disturbance; wood riparian vegetation nearby will be protected via inclusion in the ESAs established prior to all other activities. No vegetation in the water has been identified as requiring removal. Vegetation removal will occur during October 1st through January 31st to avoid sensitive time periods for other species in the area however, this vegetation removal timing means this activity may overlap with adult CCV steelhead upstream migration use of the action area. Steelhead adults would typically start entering the San Joaquin River system July through October (**Error! Reference source not found.**), depending on river temperatures and flows, to move up to spawn in tributaries by wintertime. The aquatic habitat near the vegetation removal disturbance is not spawning habitat, so adults would only be using the area as a migration corridor. Heavy equipment will not be used to remove vegetation, only motorized tools such as chain-saws, man-lift vehicles and hand tools. The removal process will take approximately seven working days. Since the noise and activity level is lower compared to heavy equipment disturbance and the duration of vegetation removal is limited with nightly breaks, this activity is not likely to preclude adults from migrating past the area as needed. Therefore, the vegetation removal as described is not expected to adversely affect adult CCV steelhead use of the area.

In response to noises and vibrations of greater magnitudes permeating into the underwater environment, fish usually exhibit avoidance tactics and move from the area. This displaces fish from locations they normally would be using for their own benefit, into locations that may be less suitable or even detrimental to their survival. Depending on the behavior disrupted, the direct and indirect adverse effects could be varied. Given the in-water/pile-driving work window, the rearing behavior and outmigration timing of juvenile CCV steelhead is expected to be adversely affected. Behaviors that are essential to their maturation and survival, such as feeding, sheltering, and avoiding predators are likely to be interrupted by project activities. It is also possible that juvenile steelhead startled by construction noises may be displaced into areas where they are more likely to be predated upon at higher rates compared to their original location. It is likely these fish will experience sublethal effects like increased stress levels, decreased feeding opportunities, and decreased resting periods while they vacate the noisy area. As long as construction is co-occurring with juvenile use, sublethal adverse effects associated with equipment operation and human activity near aquatic habitats are expected to persist.

Another part of general construction activity near waterways is the placement of structures and movement of materials and soils, either in the water or along the river banks, or both. Such disturbance is likely to mobilize sediment and increase the likelihood of erosion, possibly sending it into associated waterways at elevated rates. Localized increases in erosion and in-water turbidity are expected to have adverse effects to juvenile steelhead present in the action area during the proposed in-water construction window. High levels of turbidity can generally result in gill fouling, reduced temperature tolerance, reduced tolerance to fish diseases and toxicants, reduced swimming capacity and reduced forage capacity in lotic fishes (Waters, 1995; Wood & Armitage, 1997). In salmonids specifically, high sedimentation and turbidity levels has been shown to decrease juvenile growth and survival as a result of reduced prey detection and availability, and individual physical injury rates increase in high turbidity due to increased activity, aggression, and gill fouling (Kemp et al., 2011; Sigler et al., 1984; Suttle et al., 2004). However, in a lab study using juvenile steelhead and coho salmon, individuals were found to

preferentially occupy parcels of water between 57 and 77 nephelometric turbidity units (NTU) when given a choice (Sigler et al., 1984). This result suggests that juvenile salmonids may avoid waters of low turbidities (i.e., clear waters). Coupled with information presented by Gregory (1993), which found that juvenile salmonids decrease predator avoidance behaviors at increased turbidities, juvenile salmonids may avoid clear waters where they are easily visible to predators but since they experience negative physiological effects in muddy waters, they may be most successful overall in slightly cloudy waters. Given the proposed development of a SWPPP and the other erosion control BMPs included in the project description, it is unlikely that construction activities will increase in-river turbidities to a degree that steelhead using the action area would be expected to be adversely affected.

Adverse effects of mobilizing sediments into the water may be compounded if the local sediments contain legacy pollutants like mercury, because mobilization of the sediments into water will also mobilize those toxic compounds back into the aquatic ecosystem and cause further indirect damage, though these processes depend on the amount of disturbance and flow rates (Demers et al., 2013; Suchanek et al., 2008). In 2004, a report of the mercury content of sediments associated with nearby mining tailings, and their potential to negatively affect the local aquatic ecosystem if disturbed, concluded that the available sediment near the lower Merced River is no higher in mercury content than reference native soils (Stillwater Sciences, 2004). Therefore, compounding harm due to mobilized mercury associated with legacy pollution in sediments is not expected.

In addition, the proposed action may introduce hazardous compounds into the aquatic environment through a variety of pathways during construction. Operation of construction equipment/heavy machinery is likely to deposit trace amounts of heavy metals throughout the action area (Paul & Meyer, 2008). Heavy metals, even in trace amounts, have been shown to alter juvenile salmonid behavior through disruptions of various physiological mechanisms including sensory dampening, endocrine disruption, neurological dysfunction, and metabolic disruption (Scott & Sloman, 2004). Oil-based products used in combustion engines contain polyaromatic hydrocarbons (PAHs), which have been known to bio-accumulate in other fish taxa, and cause carcinogenic, mutagenic, and cytotoxic effects to fish (Johnson et al., 2002). Studies have shown that increased exposure of salmonids to PAHs results in reduced immunosuppression and therefore increases their susceptibility to pathogens (Arkoosh et al., 1998; Arkoosh & Collier, 2002).

Finally, a variety of hazardous materials may be stored on site (within the larger action area) so that regular refueling and equipment maintenance is more convenient. Keeping such materials near sensitive habitats increases the chances that contamination of aquatic areas will occur following accidental spills or leaks from compromised storage containers. Unlike the type of effects examined above, hazardous material/accidental pollution-related effects have both direct and indirect components, and may be persistent in the action area well after construction activity concludes as the chemicals can affect multiple life stages as they persist in the environment or in the bodies of fish that contacted the substance. The hazardous materials may also be transported further downstream to new locations and move throughout food webs. The potential magnitude of biological effects resultant from accidental, unintentional, or unavoidable chemical discharges depends on 1) the type, amount, concentration, and solubility of the contaminant; 2) the timing of the discharge and duration the contaminant persists in the environment; and 3) the affected

species sensitivity and susceptibility to that particular contaminant, the duration and frequency of their exposure, and their initial health before exposure. Given that the development of a SPCCP and numerous other BMPS were included as part of the proposed action, environmental contamination following a spill or leak is greatly reduced in probability.

Caltrans proposes to employ a variety of BMPs and AMMs to reduce the impacts of general construction disturbance, mobilized sediment, and hazardous materials on federally listed fishes:

- a. Primarily, Caltrans proposes an **in-water and near water pile-driving work window of June 15th through October 1st**. This AMM is particularly effective in avoiding adult steelhead use of the action area. Adult steelhead kelts are expected to have left the area by April, and adults returning to spawn would not be expected until at least September (**Error! Reference source not found.**a, #5 San Joaquin River). However, due to their much lower water temperature tolerance compared to juveniles, water in the action area is regularly too warm (>52 F°) until November (**Error! Reference source not found.**). Therefore, project interactions with adult CCV steelhead are not expected if the construction activities adhere to the proposed work window and direct adverse effects to adults due to construction is not anticipated. Juveniles however may persist in the action area until the end of June during their outmigration and rearing periods (**Error! Reference source not found.**b, #11 Stanislaus River at Caswell). Water conditions in this section of the Merced River are likely to become unsuitable (i.e., exceed juvenile temperature threshold of 73 F°) by the end of July (**Error! Reference source not found.**, **Error! Reference source not found.**). Given the proposed in-water work window of **June 15th through October 1st**, juvenile steelhead may be present during the months of June and July and overlap with construction.
- b. To further reduce impacts to juvenile CCV steelhead, Caltrans proposes to also limit daily work to one hour after sunrise to one hour before sunset to avoid crepuscular and nighttime hours which correspond to important daily juvenile movement periods (Keefer et al., 2012). There is no proposed night work for the Merced River Bridge location, and Caltrans states that no lights from construction will shine on the water at night, so adverse effects from lighted night construction activities is not expected.
- c. To minimize the probability of accidental introduction of hazardous materials and mobilized sediment into waterways, Caltrans proposes to draft and implement a SPCCP and a stormwater management plan for the site. The use of an SPCCP and a SWPPP is expected to help avoid a potential spill and erosion event, or at least limit the amount of material discharged into the aquatic environment should an accident occur. Caltrans is also expected to follow other BMPs and AMMs outlined in their construction site manual (Caltrans, 2003), aimed at avoiding or minimizing the introduction of hazardous materials and sediment into the natural environment. By undertaking these measures, it becomes unlikely that a CCV steelhead would be adversely affected during the construction of the proposed action through these avenues.

Though many AMMs are employed, it remains likely that general construction activities will disturb CCV steelhead juveniles and interrupt their normal use of the action area June through July, when water temperatures may still be below critical thresholds. The 73°F threshold has

been exceeded each year between April through July (Table 2), so date at first exceedance is variable and difficult to predict with accuracy, therefore the work window alone is not sufficient to avoid all interaction and harm to juvenile steelhead using the Merced River. Juveniles rearing or out-migrating in warmer water conditions usually display slower growth rates and are under environmental stress, and therefore would be more susceptible to injury compared to unstressed juveniles.

2) Pile driving and associated underwater acoustic exposure effects

Pile driving near or in water has the potential to kill, injure, and cause death through infection via internal injuries, or cause sensory impairments leading to increased susceptibility to predation. The Fisheries Hydroacoustic Working Group (FHWG) has established interim thresholds of underwater sound levels that are used by Caltrans and NMFS to denote expected instantaneous injury/mortality, cumulative injury, and behavioral changes in fishes (Table 4, Table 5). Impact pile driving is normally expected to produce underwater pressure waves that has all three threshold levels in action. 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.

Table 4. Expected hydroacoustic sounds based on the size of pile and method of placement, in approximately 5 meters of water, according to the NMFS Underwater Sound Calculator (Fisheries Hydroacoustic Working Group, 2008).

Pile Type	Driver Type	Number of Strikes per day	Reference Distance	Attenuation (dB)	Peak (dB)	SEL (dB)	RMS (dB)
24-inch diameter steel pipe piles	Impact	1000	10 meters	0	203	177	190

Table 5. Threshold distances to adverse effects, fish weight >2 grams.

Strikes per Day	Peak (dB) ≥ 206	Cumulative SEL (dB) ≥ 187	RMS (dB) ≥ 150
1000	6 meters	215 meters	4642 meters
17,000	6 meters	631 meters	4642 meters

According to the NMFS hydroacoustic calculator and Caltrans 2012 pile driving compendium of field data (Caltrans, 2015), impact pile driving of 24-inch diameter steel pipe piles for this project will generate underwater sound waves of 203 dB peak, 177 dB sound exposure level (SEL), and 190 dB root-mean-square (RMS), as measured at 10 meters from the strikes, in approximately 5 meters of water depth (Table 3). 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 under the MER-99 Merced River Bridge. This is because each pile driving situation is unique and variations in the substrate, channel shape, depth, and even water temperature are expected to alter how the pressure waves

will propagate and the amount of transmission loss that will dampen the underwater sounds as they travel.

For 1,000 strikes a day, the NMFS Pile Driving Calculator indicates (using the above underwater pressure numbers) that the distance instantaneous mortality due to underwater pressures above 206 dB peak threshold would be expected to occur is within 6 meters from the driven pile. For fish above 2 grams, the distance at which injury is expected to occur due to cumulative SEL exposure above 187 dB is within 215 meters from the driven pile (Table 4). The distance within which behavior changes are expected is 4,642 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).

The Caltrans BA (Caltrans, 2018) states a maximum of 17,000 strikes may occur in a single work day. While these additional strikes are not expected to change the peak dB created, or the distance to which the ambient dB may be elevated above 150 dB, the distance to which fish above two grams (i.e. outmigrating CCV steelhead juveniles) may experience cumulative SEL injury increases to 631 meters from the driven pile with the increase in strikes per day. Eight piles are scheduled to be driven on land near the Merced River, and eight piles are scheduled to be driven in the Merced River. The piles driven on the land are expected to introduce SELs above the 150 dB effective quiet but are not expected to cause underwater sound pressures expected to be injurious to juvenile steelhead, and encompass a smaller area of elevated sound that would be introduced by piles driven in the water.

Caltrans proposes to employ a variety of BMPs and AMMs to reduce the impacts of pile driving effects on federally listed fishes, in addition to those that address impacts generated by general construction, mobilized sediment, and hazardous materials pollution:

- a. The 24-inch diameter piles will be initially ‘stabbed’, or placed using a vibratory hammer, before completing the pile driving using an impact pile driving hammer. Each pile is expected to be driven to an initial depth of 10 feet into the substrate before an impact hammer is employed. By using this method, it is likely that any fish present in the immediate construction area will leave in response to the low-level pressure waves produced by the vibratory hammer. This will disturb their normal behaviors and use of the area, but also decreases the likelihood that fishes will remain near the pile driving location and experience the more powerful pressure waves created by impact pile driving. So while the fishes are expected to be disturbed, the chances steelhead will be injured or killed due to impact pile driving is reduced.
- b. After median widening is complete, the temporary trestle will be removed, during the in-water work window of June 15th – October 1st. The steel pipe piles will be removed via vibratory extractor, or may be cut off at the mudline. The effects caused by vibrating the piles out are expected to be similar to the disturbance type effects discussed above.
- c. Any holes in the bottom of the river created by removing the piles will be backfilled with imported clean gravel sized to be suitable for CCV steelhead spawning, between one-half to four-inches in diameter. Filling holes will help return the benthic habitat back closer to

its natural state and is expected to provide benefits to CCV steelhead via increases in benthic prey production, and will increase the spawning suitability of the area.

Caltrans does not propose to use attenuation measures to control underwater sounds. During the months of June and July, while water temperatures remain suitable, there is a risk that CCV steelhead juveniles using the action area will be harassed, injured, or killed due to impact pile driving.

2.5.2 Effects of the Proposed Action to Critical Habitat

The following is an analysis of the effects to designated CCV steelhead critical habitat in the action area, which will have indirect effects to CCV steelhead individuals in the long term, as a result of implementing the proposed LMWP at the Merced River Bridge. The PBFs within the Merced River in the action area for CCV steelhead include freshwater rearing sites for juveniles and freshwater migration corridors for both adults and juveniles. The effects of the proposed action components that were analyzed include: 1) bank stabilization effects, 2) vegetation removal and replanting effects, 3) in-water temporary trestle structure effects, and 4) overwater structure effects. The most valuable rearing habitat for salmonids in the CCV are side channels and floodplains, neither of which are offered in this section of the Merced River action area due to existing levees and bank stabilization. In addition, suitable water temperatures do not persist long into the late spring/early summer as the upstream dams redirect water flow and water that may be released from reservoirs retains more heat the longer it is stored as summer progresses.

1) Bank stabilization effects

Caltrans proposes to remove the existing riprap during construction, however Caltrans also plans on replacing it in the same manner and in the same location after construction is complete for continued bank stability. Installing riprap on stream banks removes the marginal shallow water habitat at the water/bank interface that provides refugia for rearing steelhead, reduces the amount of riparian vegetation that can be established in the future, changes the prey base through alteration of the benthic substrate type and water dynamics, and often provides ambush habitat for non-native piscivorous fishes. In addition, the act of bank stabilization is expected to prevent normal stream processes, like natural braiding and erosion, which would eventually create the habitat complexity that supports steelhead rearing. Instead the reestablishment of riprap will perpetuate the channelization of the Merced River. Therefore, the habitat changes that follow the reestablishment of the riprap is expected to have a negative impact on juvenile CCV steelhead survivorship and growth in the area, due to the many small adverse changes associated with bank stabilization expected to compound in magnitude. These adverse effects will persist as long as riprap remains and serves as bank stabilization.

2) Vegetation removal and replanting effects

Prior to construction, the riparian vegetation in the immediate construction zone on the river banks will be removed. Decreases in riparian vegetation will create physical changes in the environment which cumulatively decrease the survivorship of juvenile salmonids that use the area (Bjornn & Reiser, 1991), in part because these changes in cover can influence the macroinvertebrate prey assemblage through decreased shading and increased water temperatures

(Meehan & Bjornn, 1991). Riparian vegetation that overhangs and shades the water surface is important to maintain for CCV steelhead juvenile rearing success as these areas offer refuge and resting areas in margin habitat. Riparian plants also provide leaf litter which is a source of nutrients for the benthic ecosystem and macroinvertebrate prey. Vegetation removal is therefore expected to reduce natural cover, reduce habitat complexity, and alter the ecosystem immediately near the Merced River Bridge to the detriment of rearing CCV steelhead.

However, these adverse effects to the habitat are expected to be temporary, since Caltrans proposes to replant the disturbed area with native riparian plants once the project is complete. Replanting will occur on the north bank of the Merced River near the 99-SB lane. Replanting the lost vegetation decreases the negative effects of the vegetation removal, since replanting shortens the amount of time new plants will need to grow to sizes that replace the habitat value lost by removing established plants, compared to the amount of time needed for natural recolonization. There will still be a period of time where cover and complexity over/near the aquatic habitat will be less compared to what existed prior to the implementation of the project, and during that time there will be negative impacts to rearing CCV steelhead.

3) In-water temporary trestle structure effects

The temporary trestle structure, with bents supported by steel pipe piles, will occupy substrate and water column habitat in the Merced River until removed. The piles are expected to somewhat affect the freshwater migration corridor for both juveniles and adults, since they will be in place in and obstruct the water column. Obstructing water flow creates new turbulence streams in the river through the construction area where none existed before and the turbulence is likely to persist a limited extent downstream. Juvenile fish may be unable to swim against the river velocities during high flow events and may be swept against the piles and be injured, or they may get caught up by the turbulence created by the piles and become disoriented. Any injury or disorientation experienced by juvenile CCV steelhead is expected to slightly increase their individual risk of predation, as predators are expected to capitalize on disoriented prey. Adult CCV steelhead are not expected to be affected by the temporary trestle because adults are powerful swimmers that should be well capable of avoiding the piles and going around them during their upstream/downstream movements, especially since the pile rows are in line with the river flow, and each row will be spaced 20 feet apart.

The adverse effects of the temporary trestle to juvenile steelhead will persist as long as the piles remain in the water. Current construction projections indicate the temporary trestle may be in place in one work window, will potentially stay in place over two winters, then be removed during the third work window. Once the project is completed and the temporary trestle will be completely removed, adverse effects will no longer affect the freshwater migration corridors critical habitat PBF. To restore the river bottom, Caltrans plans to fill any holes created by pile removal with spawning-sized gravel. This should restore the benthic habitat affected by the project so there are no lasting adverse effects for the placement of the trestle.

The current Merced River Bridge also occupies and affects CCV steelhead critical habitat. The footing supports of the Merced River SR-99 Bridge are in the river channel, but usually only interact with the water and river flow during flood events. As artificial structures, their existence does not benefit steelhead and their occupation of critical habitat prevents natural processes from

occurring locally. No changes or additions to the bridge footings are proposed in the project description, so the amount of habitat affected by the current bridge footings is not expected to change with the implementation of the proposed action, but the Merced River Bridge is expected to continue creating negative impacts to critical habitat in perpetuity.

4) Overwater structure effects

The MER-99 Merced River Bridge is an existing structure over the Merced River and has not previously been evaluated in the Section 7 consultation process. This opinion reviews the impacts of widening the deck of the bridge so that an additional lane of traffic may be used. The current bridge covers approximately 680 square meters of the Merced River corridor, after the widening it will cover 1060 square meters (+17.4ft widened for the entire structure). This will decrease the amount of light the vegetation and river ecosystem below received compared to current conditions.

Overwater structures affect the amount of light that reaches the water column and the bottom of a waterway, which limits or prevents riparian and aquatic plant growth underneath and around the structure. Such limitations have cascading effects on the benthic ecosystem immediately underneath the structure. This changes the type and amount of prey available to rearing CCV steelhead. Also, the shade created by artificial structures is drastic or sharp compared to that cast by overhanging vegetation (i.e., low and wide structure create stark high light and low light areas in the water column/substrate, verse the gradual and diffuse shading created by tree leaves). Predators may hide in the low light areas to ambush juvenile CCV steelhead coming in from bright light areas with greater success (Helfman, 1981). In some cases, overwater structures can serve as novel roosting or nesting for piscivorous birds (PFMC, 2014), however since this bridge serves highway traffic, birds are not expected to associate with the structure and increased bird predation rates are not expected to increase due to the proposed action.

These adverse effects are currently acting on the critical habitat immediately below the bridge deck, however the expansion the bridge deck will increase the amount of water surface covered by its shadow, therefore adverse effects associated with overwater structures is likely to proportionally increase compared to current conditions.

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). 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 future environmental conditions in the action area 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).

2.6.1 Agricultural Practices

Agricultural practices in the San Joaquin Valley Basin continue to adversely affect riparian and wetland habitats through upland modifications of watersheds. Agricultural use of water also reduces the amount of water that flows into the Delta, and increases the siltation in the water that does enter the system. Unscreened agricultural diversions throughout the region entrain fish, including protected juvenile salmonids. Grazing activities from dairy and cattle operations generally degrades the water quality of available salmonid habitat by increasing erosion and sedimentation while also introducing nitrogen, ammonia, and other nutrients into the watershed in far excess of natural inputs. Stormwater and irrigation discharges related to both agricultural and urban activities contain numerous pesticides, herbicides, and other pollutants that adversely affect salmonid reproductive success and survival rates through sublethal effects, and also reduce the amount and diversity of their macroinvertebrate prey species (Dubrovsky *et al.* 1998; Daughton 2003; Gronberg, 2004).

2.6.2 Increased Urbanization

Increases in urbanization and development of rural lands can impact habitat by altering watershed characteristics, changing local water use patterns and amounts, and altering stormwater runoff patterns and constituents. Human population growth is predicted for California in the near future, with a significant portion of the growth to occur in the San Joaquin Valley. For example, the General Plans for the cities of Modesto, Turlock, and Merced all anticipate accommodating increased populations over the next several decades (City of Merced, 2012; City of Modesto, 2008; City of Turlock, 2012). For example the City of Turlock expects an increase in population of 35,000 individuals compared to their 2012 population estimate, a 50% increase over current conditions. An increased human population is expected to place additional strain on necessary resources, including natural gas, electricity, and water needs. Public infrastructure works such as wastewater sanitation plants, roads and highways, and public utilities can be expected to expand to accommodate the needs of the greater population. Some of these actions, particularly those which are situated away from waterbodies, would not require Federal permits, and thus would not undergo review through the ESA Section 7 consultation processes with NMFS for interactions with anadromous resources.

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 diminishes the value of designated or proposed critical habitat for the conservation of the species.

The most recent CCV steelhead status review concluded that the DPS is still threatened with a high risk of becoming endangered (NMFS, 2016), due in large part to the continued blockage of the majority of their spawning and rearing habitat high in the Sierra Nevada and to the

widespread degradation of the freshwater habitat still accessible below CCV rim dams. These threats are expected to persist or even increase as the human population continues to grow, along with land development and freshwater demands also expected to increase in the CCV. Such trends are likely to suppress the recovery potential of the DPS despite recovery or conservation efforts, based on the scale of past and present adverse habitat changes compared to restorative recovery actions. Climate change is anticipated to continue to increase in-river temperatures and to produce greater swings in California precipitation patterns, with low water year types and warmer-than-average temperatures becoming more frequent and extreme compared to past data, adversely affecting the recovery of the CCV steelhead DPS. The amount of available surface water of the Merced River would likely decrease and become unsuitably warm for CCV steelhead use more often during periods important to juvenile use as climate change progresses.

CCV steelhead juveniles are expected to be harassed and change their behaviors when their use of the action area overlaps with June and July construction, while water temperatures are still tolerable. Interruption of rearing behaviors like foraging or resting will somewhat decrease individual growth rates and the likelihood of survival to adulthood. During impact pile driving, juveniles remaining within the area will experience hydroacoustic pressure waves beyond injurious thresholds and are likely to become injured or die. The time period of overlap between construction activities and juvenile outmigration within the **in-water and near water pile driving work window (June 15th through October 1st)** is expected to be short, overlap is reasonably expected until the second week of July, if overlap occurs at all. Based on current information, the CCV steelhead population from the Merced River is a Core 2 population that is not considered a significant producer of anadromous *O. mykiss* juveniles. It is likely that even under the best conditions the Merced River produces only a few CCV steelhead juveniles each year, likely so low in number that outmigrating juveniles are not reliably recorded in ongoing juvenile salmonid monitoring programs. Adults are not expected to be adversely affected by the project.

Steelhead juveniles will also experience adverse effects through project impacts to their critical habitat in the action area. The river margin habitat used by juvenile steelhead in particular will be impacted by the project. The replacement and continued occupation of riprap to stabilize the river bank effectively removes functional acreage from their critical habitat in perpetuity, though the total amount affected is relatively small. The project also requires removal of riparian vegetation within the immediate construction footprint, which decreases the complexity and functionality of the critical habitat in the short term, replanting efforts are expected to restore the removed vegetative cover in the long term. The temporary in-water trestle is not expected to be a passage barrier to juveniles or adults, though it is expected to change flow dynamics and velocities through the pile network while it is in place and may adversely affect a few juveniles through disorientation. The trestle may also alter the sediment composition downstream of the pile lines, but these changes are not expected to last after the piles are removed as holes will be filled with gravel and natural sedimentation processes resume. The expansion of the overwater structure, though already existing and casting shade, will increase the total amount of artificial shade over the Merced River. While vegetative shade is considered to have beneficial effects to rearing steelhead, the drastic shadows cast by artificial structures impart negative effects, such as altering the benthic prey base, changing the vegetative cover, and increasing the effectiveness of ambush predators. These adverse effects of overwater structures are expected to decrease the likelihood of survival of juvenile steelhead using the area under the overwater structure.

The adverse effects associated with project implementation are likely to occur despite Caltrans' employment of several BMPs and AMMs designed to reduce the adverse impacts to both CCV steelhead and their critical habitat. However, many of the adverse effects are temporary, expected to occur only during the construction phase, and even then are expected to affect only a small number of juveniles. The adverse effects to the critical habitat is likely to slightly decrease juvenile survivorship and the DPS' success in the Merced River over the long term. Considering that Merced River CCV steelhead population's estimated contribution to the viability of the DPS is small, the adverse impacts of this project are not expected to affect the likelihood of survival or recovery potential of the CCV steelhead DPS in a meaningful way, even in addition to adverse effects associated with interrelated/interdependent actions, the environmental baseline, the cumulative effects, and taking into account the current status of the species. Therefore, it is NMFS's opinion that execution of Caltrans' MER-99 LMWP (10-0Q121) as proposed is unlikely to appreciably reduce the survival or recovery of the CCV steelhead DPS or diminish the value of its designated critical habitat in the action area.

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's biological opinion that the proposed action is not likely to jeopardize the continued existence of CCV steelhead, or destroy or adversely modify its designated critical habitat.

2.9 INCIDENTAL TAKE STATEMENT

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

2.9.1 Amount or Extent of Take

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

Take via harassment and indirect harm of CCV steelhead juveniles is expected to occur when Caltrans undertakes construction activities near, in, and over the Merced River while juveniles are outmigrating and rearing in the action area. Juveniles are expected to use the area until in-river temperatures surpass critical thresholds (over 73 °F), sometime between June to July.

Juveniles are expected to react to construction-related disturbances by changing their behaviors and experiencing sublethal physiological effects, to the detriment of their survival potential.

Take via harassment, harm, and mortality of juvenile CCV steelhead is also expected to occur due to in-water impact pile driving. No attenuation measures or underwater sound control measures are proposed, so underwater SELs are expected to reach injury and mortality thresholds within a limited distance around the driven piles. Using a vibratory hammer to set each pile before using the impact pile driving is expected to cause juveniles to leave the area but will decrease the likelihood they will stay within the mortality and injury threshold distances (however this scenario does not removal all chance that a mortality or injury will occur.)

It is impossible to estimate the number of juvenile CCV steelhead that will be taken by the project, since a population estimate for the Merced River is not currently available. Furthermore, collection surveys by CDFW have not resulted in consistent counts of outmigrating juveniles. Instead, NMFS will utilize the amount of area affected by hydroacoustic pressures above effective quiet as a surrogate for take of juvenile CCV steelhead harassed, harmed, or killed by both pile driving. Since disturbance-type harassment is the largest type of incidental take in this case, the distances estimated as affected by impact pile driving will be used over distances estimated affected by general construction. The number of individual CCV steelhead using the affected distances within the Merced River should be limited during the months of June and July. If Caltrans adequately controls harmful underwater sound to within or below the threshold distances estimated in Table 4, the number of taken individuals should not exceed anticipated levels considered in this opinion.

There are three distances at which different types of take outcomes occur, each conferring different levels of harm. Within 6 meters of the driven pile, peak underwater SELs are expected to exceed levels (206 dB or more) which are likely to kill fish occupying waters within the 6 meter threshold. Out to 631 meters of the driven piles, the daily cumulative SEL will be 187 dB or more given the 17,000 strikes per day, and are expected to cause injury to fishes within that distance. Finally, underwater SELs will be elevated above ambient conditions (above 150 dB RMS) out to 4,642 meters from the pile driving location and are expected to cause stress and harassment to fish within that radius. Hydroacoustics should be monitored by Caltrans to assure estimated take levels do not extend beyond these threshold distances during construction activities and pile driving. If underwater sound levels are recorded as being exceeded at the following distances, the amount of take given for the project has also been exceeded:

Table 6. Hydroacoustic Threshold Distances from pile driving, and likely outcome to fish if exceeded.

Hydroacoustic threshold	Maximum allowable distance from driven pile	Likely outcome to individual fish
206 dB peak	6 meters or less	Mortality
187 dB SEL cumulative (17,000 strikes)	631 meters or less	Injury
150 dB RMS	4,642 meters or less	Harassment (behavioral changes)

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 CCV steelhead or destruction or adverse modification of their critical habitat.

2.9.3 Reasonable and Prudent Measures

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

- 1) Measures shall be taken by Caltrans to minimize the extent of disturbance and injury to CCV steelhead caused by construction activities, pile driving, and equipment operation in the action area, related to both direct and indirect effects, as discussed in this opinion.
- 2) Measures shall be taken by Caltrans to reduce the extent of degradation and alteration to the CCV steelhead critical habitat in the action area, related to both direct and indirect effects of this project, as discussed in this opinion.
- 3) Caltrans shall prepare and provide NMFS with a monitoring plan that includes: a) monitoring and evaluation of the implementation and performance of construction/site AMMs and BMPs chosen to conserve and protect CCV steelhead individuals, and their critical habitats in the action area; and b) a monitoring plan to document and record the incidental take of listed species associated with this project (i.e. the ecological surrogate identified) to ensure incidental take does not exceed expected levels.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and Caltrans must comply with them in order to implement the RPMs (50 CFR 402.14). Caltrans 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 the 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. For the purposes of this opinion, the terms and conditions stated below apply only to aspects of the work that were evaluated in the effects analyses, (i.e. those which occur near, in, and over the Merced River Bridge at PM 31.08), those that are expected impacts on CCV steelhead or their designated critical habitat.

- 1) The following terms and conditions implement RPM 1:
 - a. **All in-water work and near water pile driving** will be restricted to the stated work window of **June 15th to October 15th**.
 - b. A qualified fisheries biologist will be present during the first two and last two weeks of the in-water work window to survey the stream for CCV steelhead within the hydroacoustic distance thresholds if river temperatures are below 73°F.

- c. The fisheries biologist or another qualified environmental professional will assure Caltrans' compliance with proposed BMPs, AMMs, and the terms and conditions of this opinion.
- d. Construction equipment will not be refueled and maintenance will not be performed on the equipment or vehicles within 100 feet of the Merced River to minimize the chance of project-related pollution being introduced into the aquatic environment.
- e. Caltrans shall include in project bid packages to contractors (if applicable) specific requirements that address the implementation of the AMMs/BMPS identified as necessary to reduce and limit the amount of take, and that the required environmental monitoring to ensure AMM/BMP performance is maintained throughout construction. The **in-water/pile driving work window** of **June 15th through October 15th** shall be included as part of the construction schedule of activities, and the **daily work schedule** during this period shall be limited to the hours of **0800 to 1800** while water temperatures are below 73°F during this period to limit the extent of harassment experienced by fish.

2) The following terms and conditions implement RPM 2:

- a. Any material excavated from the area (i.e., the existing riprap) will be stockpiled where associated sediments cannot be washed back into the stream.
- b. Sediment control devices and erosion BMPs such as silt fences will be established and maintained in all work areas, staging areas, stockpiles, and other disturbed ground areas to minimize the possibility project activities will increase local and downstream in-stream turbidity.
- c. All vegetation removal shall be limited to the absolute minimum amount required for construction access and structure placement. Clearly mark or flag with construction tape which trees/vegetation are to be removed, which are to be trimmed, and which are to be protected, in order to conserve riparian vegetation not planned for removal.
- d. Remaining trees shall be protected from damage during construction activities and riprap replacement to ensure their continuing survival. Protective measures may include wrapping trunks with burlap or creating a scaffold buffer of scrap timber around the trunks, if trunk damage is expected during riprap installation.
- e. Riparian vegetation removed for construction will be replanted in kind following construction completion in similar nearby locations.
- f. Disturbed areas that were graded to minimize surface erosion and siltation during construction will be re-contoured and stabilized at the end of each construction year to avoid erosion and sediment mobilization into the Merced River during high flow and rain events.
- g. The replacement of riprap on the river bank shall be limited to the extent riprap currently exists, or less, in total area occupied.

- h. Voids created by the riprap boulders shall be filled by smaller diameter rocks/gravel when below the OHWM to avoid creating piscivorous predator ambush habitat throughout the riprapped area, in accordance to Caltrans specifications and standards.

3) The following terms and conditions implement RPM 3:

- a. In the course of monitoring and evaluating the construction of the project, Caltrans shall contact and coordinate with NMFS within 24 hours after an incidental take surrogate is observed exceeded, or suspected of being exceeded, so that coordination with NMFS can occur to reduce take back down below issued levels.
- b. If adult CCV steelhead are observed as being harassed, injured, or killed during construction, Caltrans shall cease construction activities and contact NMFS to coordinate on how to proceed with the project in a manner to avoid recurrence of individuals being taken.
- c. Updates and reports required by these terms and conditions shall be sent to:

San Joaquin River Branch Chief – Erin Strange
California Central Valley Office
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814

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).

- Caltrans should continue to work cooperatively with other State and Federal agencies, private landowners, governments, and local watershed groups to identify opportunities that can augment already occurring riparian restoration efforts in waterways that support anadromous fishes within the San Joaquin River Basin and the Delta. Doing so would aid restoration of the functionality of existing critical habitats in general, and improve the recovery probability of CCV steelhead.
- Use woody vegetation removed during the course of the project to establish benthic complexity on the restored bank under the Merced River Bridge to jump start habitat recovery and improve juvenile fish survival through the riprap area of the waterway. Doing so would improve the functionality of existing critical habitat in the action area, and improve the habitat quality for CCV steelhead juveniles.
- Use biodegradable oil in equipment and onsite vehicles. Doing so will reduce the amount of construction equipment contamination resultant from the project, and available critical

habitat quality will be better maintained, in support of CCV steelhead, CV spring-run Chinook salmon, and sDPS green sturgeon recovery.

2.11 REINITIATION OF CONSULTATION

This concludes formal consultation for Caltrans' MER-99 NB LMWP 10-0Q121.

As 50 CFR 402.16 states, reinitiation of formal consultation is required 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 agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

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 Caltrans to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by Caltrans, and also the descriptions of EFH for Pacific Coast salmon (PFMC, 2014) contained in the fishery management plans developed by the Pacific Fisheries Management Council (PMFC) and approved by the Secretary of Commerce.

3.1 ESSENTIAL FISH HABITAT AFFECTED BY THE PROJECT

The geographic extent of Pacific 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 Middle San Joaquin-Lower Merced-Lower Stanislaus watershed, HUC# 18040002, for all runs of Chinook salmon that historically or 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). In the action area, the complex channel and floodplain habitat HAPC occurs.

3.2 ADVERSE EFFECTS ON ESSENTIAL FISH HABITAT

3.2.1 Adverse effects from pile driving

The temporary access trestle over the Merced River requires eight, 24-inch diameter steel pile piles to be placed below the OHWM, and eight piles to be placed on land near the Merced River. Pile driving generates underwater sound pressures that can injure, kill, and disturb fishes in the affected water body (as discussed in Section 2.5). The magnitude of the effect on individual salmon exposed to underwater sounds from pile driving will depend on their size and physical condition, the physical environment (water temperature, depth, substrate type, channel contour, etc.), the buoyance state of the fish, and the type and material of the pile being struck. Harmful underwater pressure waves affect large areas, at locations far from where the pile driving is occurring, however underwater pressure waves only persist in the environment for a short time after a pile is struck. Individual fish that have perished, sustained injury, or changed their behaviors may experience lasting negative outcomes even after pile driving activities cease,

however the harmful conditions dissipate quickly and therefore have only temporarily change EFH.

3.2.2 Adverse effects from bank stabilization and protection

In the action area, riprap already exists from previous bank stabilization actions. However, as part of this proposed project, Caltrans proposes to remove the current riprap for access during construction and then replace it in the same manner, in the same area, for the continued stability of the bank. Alteration of riverine habitat due to shoreline stabilization and protection against flooding events results in varying degrees of change in the physical, chemical, and biological characteristics of the available riparian habitat. Usually vegetation removal and confining the stream channel is involved, and results in homogenization of the margin/shoreline habitat and increases the degree of channelization of water body. It also is likely to reduce the hydrological connectivity and availability of off-channel habitat and floodplains that remain, or at least prevents the creation of such areas (PMFC, 1998). HAPC affected: complex channel/floodplain.

3.2.3 Adverse effects of roadway construction and further urbanization

The proposed lane widening on MER-99 will increase the amount of impervious surface. Developing natural areas and increasing urbanization alters the land surface, vegetation, and hydrology of EFH watersheds through habitat loss and modification. The adverse, long-lasting effects of urbanization on stream ecology are second only to agriculture, even though urban areas occupy less surface by percentage than farmland (Paul & Meyer, 2008). Slight increases in impervious surfaces compared to current hard surface cover may be small-scale and relatively minimal, however the significance of small-scale increases occurring across a single watershed have large cumulative adverse outcomes. The impervious surfaces in a watershed may quickly divert rainwater into the receiving stream, increase the volume of runoff a stream would otherwise receive from a storm, increase the peak discharge rates, and potentially increase the frequency and severity of local flooding. The amount of impervious surfaces can also adversely influence stream temperatures by transferring surface heat to streams to a greater degree compared to agricultural and forested areas, by an additional 10 to 12 °C in some cases. In addition, construction activities in salmon watersheds can have detrimental effects through the runoff of sediments, nutrients, heavy metals, pollutants, and pesticides.

3.2.4 Adverse effects of overwater structures

The SR 99 Merced River Bridge is an overwater structure already in place, however the proposed project will fill more space between the two highway bridge decks. In this situation, the overwater structures adversely affect EFH by changing the ambient light availability. The bridge casts a shadow and shades the Merced River below, and because the bridge runs diagonally northwest to southeast, the shadow moves across the river throughout the day. Shade and shadow affects both plants and animal communities below the structure, being the single most important factor affecting aquatic plants, therefore the benthic community will likely offer less benthic prey species for rearing juvenile Chinook. Also, fish rely on visual cues for prey capture and predator avoidance. Reduced-light conditions caused by overwater structures limit the ability of juveniles to perform these essential activities as effectively as well-light areas, decreasing their foraging

ability (and decreasing prey abundance), and potentially increasing their chance of mortality due to predation (Helfman, 1981).

3.3 ESSENTIAL FISH HABITAT CONSERVATION RECOMMENDATIONS

Pile driving: Concerns are addressed by current Caltrans BMPs and AMMs incorporated into the proposed action, or are addressed by Section 2.9.4 Terms & Conditions. There are no additional CR's NMFS recommends for adverse pile driving effects.

Bank stabilization EFH CRs (to protect or improve complex channel/floodplain HAPC):

- 1) Consider the physical, chemical, and biological stream processes the placement of riprap is potentially affecting, incorporate offset measures into final stabilization design, especially considering the cumulative effects of existing and proposed armoring actions along the banks of the Merced River. Determine if 'softer' approaches would be equally suitable to protect the Merced River Bridge (e.g., beach nourishment, vegetative plantings, placement of embedded large woody material, or tree revetment (FEMA, 2009)). Use these methods in preference over hard armoring and introduced rock material such as riprap.
- 2) Reduce the amount of riprap to be replaced and minimize the area of riprap placement to the extent possible. Remove riprap material no longer in use as bank protection from the river banks and appropriately dispose of them.
- 3) If riprap must be used, vegetate the riprapped area with appropriate local riparian species where possible (areas with full access to sunlight) above and below the OHWM.

Roadway Construction/Urbanization: Many concerns are addressed to the extent practicable in current Caltrans BMPs and AMMs incorporated into the proposed action or are addressed by Section 2.9.4 Terms & Conditions. Additional EFH CRs include:

- 4) Protect existing riparian buffer zones of appropriate width around available EFH on all streams that include or influence EFH. Whenever practicable, establish new riparian buffer areas by planting or other restoration actions.
- 5) Whenever feasible, remove impervious surfaces and replace them with specially designed pervious surfaces.
- 6) To minimize potential increases in stream temperatures compared to areas without impervious surfaces, plant additional trees/vegetation to provide shading and temperature regulation along the borders of the impervious surfaces, even outside of the riparian zone, on cut banks, road fills, bare shoulders, etc.
- 7) Use Low Impact Development construction designs and treatment trains to regulate stormwater temperatures and pollution loads before flowing off impervious surfaces such as roadways and entering the watershed.

Overwater structures EFH CRs:

- 8) Ensure the overwater structures do not support the occupation/perching of piscivorous birds and fish, periodically check to see if the local overwater structures may be disproportionately contributing to the predation of juvenile salmon and design offset solutions.

Fully implementing these EFH CRs would protect, by avoiding or minimizing the adverse effects described in Section 3.2, above, up to approximately 49 acres of designated EFH for Pacific Coast salmon.

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 CR. 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 CRs 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 CRs, 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 CRs 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 CRs 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 CRs (50 CFR 600.920(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

4.1 UTILITY

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are Caltrans. Other interested users could include citizens of affected areas, and others interested in the conservation of the affected DPS. Individual copies of this opinion were provided to Caltrans. This opinion will be posted on the Public Consultation Tracking System website. 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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