TO: Tom Lagerquist, Parus Consulting

FROM: Patrick Cuthbert

DATE: October 26, 2020

SUBJECT: Biological Assessment of Fisheries Resources Near the Mormon Slough Erosion Repair Project

FISHBIO was contracted by Parus Consulting to assess potential impacts of the Mormon Slough Erosion Repair Project on protected fish species within the project area. The Calaveras River, where the proposed project will occur, has been designated as critical habitat for Central Valley steelhead (*Oncorhynchus mykiss*). Various runs of Chinook salmon (*Oncorhynchus tshawytscha*) may also opportunistically utilize the Calaveras River for spawning, however, they are not believed to occur in numbers that would support a viable population. Findings on both of these species, their critical habitat, and recommendations to avoid and mitigate project effects are presented below.

Project Description

The proposed project would consist of repairs to the north and south banks of the upper segment of Mormon Slough near the Escalon-Bellota Bridge in San Joaquin County, California. Mormon Slough accepts flow from the Calaveras River at Bellota and carries it to the Stockton Diverting Canal, which returns the flow to the Calaveras River (Figure 1). Project activities include excavating to remove compromised material in the channel, and then repairing the channel slope with a variety of materials including soil-filled rock slope protection (RSP), a coarse filter bed, earthfill, and launch rock.

Repair work is being completed by the San Joaquin County Department of Public Works with funding and support from the Department of Water Resources' (DWR) Division of Flood Management under its Flood System Repair Program (FSRP). As such, the repairs will be designed in accordance with DWR's Rural Levee Repair Guidelines (March 2014).

The purpose of the proposed project is to stabilize the channel alignment and preserve the general uniformity of the bank lines in order to preserve the function of the channel and to reduce the potential for further lateral migration of the channel. Currently, the channel is eroding toward State Route 26 on its northern bank and toward neighboring structures and orchards on its southern bank. Field observations show that erosion and undermining of the existing slopes is leading to incremental collapse and/or oversteepening of the slopes, which is considered the most prevalent mode of failure of the system to be addressed by the repair design.

The repairs would consist primarily of installing Rock Slope Protection (RSP), which generally consists of rip-rap of varying size, soil, gravel and a textile fabric above the

ordinary high water mark to prevent downward migration of the soil. To promote growth of vegetation, the RSP voids would be filled with agricultural soil and seeded with grasses (i.e., soil filled RSP). Excavation prior to placement of RSP would generally be limited to removal of loose surface debris from past slope failures, minor grading to produce relatively smooth surfaces to prepare for RSP, or to key the repairs into the existing slopes. After grading, workers would install a coarse sand or gravel filter bed that will seal cracks or openings in the base soil. A base of launch rock would be installed at the lower edge of the filter, and RSP would be laid over the filter bed. The riprap size recommendations differ throughout the channel and include class II, III, and IV with a gravel filter and launchable toe.

This project is scheduled to occur within the summer months, sometime between mid-June and mid-September depending on final design completion and permitting status.

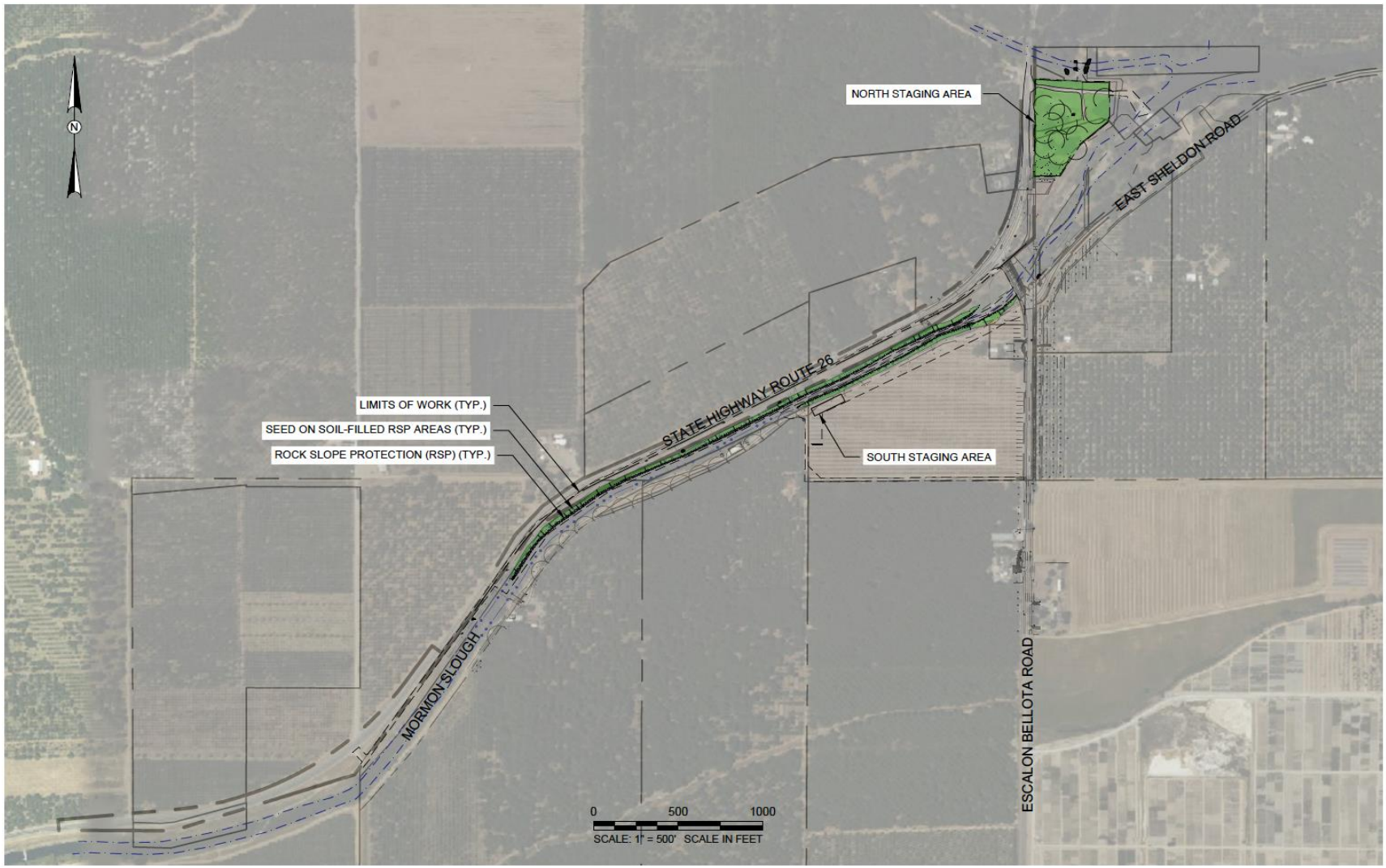

Figure 1. Aerial map of the project area. Map provided by Kleinfelder.

Environmental Setting

The proposed project area is bounded on its north side by Highway 26, and an agricultural access road on its south side controlled by San Joaquin County Flood Control and Water Conservation District (District) and the County. Land use in the area is predominantly agricultural, typified by large orchards surrounding the proposed project area, with State Route 26 in the north. The eastern end of the project area is the Escalon-Bellota Bridge, which is approximately 1,400 feet downstream of the confluence of the Calaveras River and Mormon Slough, where water originating from New Hogan Dam flows into the Slough passing over the Bellota Weir.

Created in 1910 by the U.S. Army Corps of Engineers to convey flood waters to avoid flooding in the City of Stockton, Mormon Slough is a wide channel with steep banks and little to no vegetation. The project area features degraded rip-rap on the north bank adjacent to State Route 26 and an almost vertical wall of loose soils on the south bank through much of the project area. Substrates in the project area consists of mixed gravel and sand/silt with the main channel running close to the southern bank during most of the year at low stream flow. Emergent vegetation is featured in channel though it consists of sandbar willow (*Salix exigua*) on dried areas near the low flow channel. Shaded riparian habitat is limited throughout the project area. Photos of the project area are provided in Attachment A.

Historically, the Calaveras was a river of extremes, flooding in the winter and drying up in summer, with some sections going completely dry and creating disconnected pools. The original Hogan Dam was first built on the river in 1930 in an effort to reign in the dynamic flooding of the Calaveras and protect the City of Stockton, followed by New Hogan Dam, which was completed in 1963 to expand storage capacity of the reservoir from 75,062 to 317,000 acre-feet. The impoundment of New Hogan altered the river's historical flow patterns and provides a more consistent year-round flow of water downstream to the Bellota Weir and Intake Facility.

As part of Stockton East Water District's agricultural water delivery operations, flashboard dams are installed at twelve locations throughout Mormon Slough, beginning April 15 and being removed from the river by November 1. This would effectively occlude all migrating adult salmonids from the project area during the anticipated work window. Juvenile salmonids would both emerge and migrate prior to the anticipated work window and would therefore be unaffected by the project.

Fisheries Resources

Based on data available from the UC Davis PISCES database (UC Davis 2017), native fish known to historically occur near the project area include multiple runs of Chinook salmon, Central Valley steelhead, threespine stickleback, Pacific lamprey, prickly sculpin, riffle sculpin, Sacramento blackfish, Sacramento perch, Sacramento pikeminnow, Sacramento

splittail, Sacramento sucker, Sacramento tule perch, sDPS green sturgeon, thicktail chub, western brook lamprey, and white sturgeon (Table 1).

Non-native species that may be present include American shad, bigscale logperch, black crappie, blue catfish, bluegill sunfish, brown trout, channel catfish, common carp, fathead minnow, goldfish, red shiner, redear sunfish, smallmouth bass, spotted bass, striped bass, threadfin shad, wakasagi, warmouth, white catfish, and white crappie.

Two readily accessible government websites were used to determine the occurrence of critical habitat designations and fish species listed as threatened or endangered by the Endangered Species Act (ESA). The first source was a project-planning tool (Information for Planning and Conservation; IPaC) provided by the U.S. Fish and Wildlife Service (USFWS 2015; accessed September 20, 2020). The location used in the planning tool was a 30-acre area encompassing the designated project area. The IPaC data viewer and automated reporting system indicated that a critical habitat designation for delta smelt was located within the project boundaries.

The second source utilized was the NOAA Fisheries website (NOAA 2015; accessed on September 20, 2020). GIS shapefiles were downloaded from the website and viewed using Google Earth Pro software. All shapefiles of critical habitat designations for ESA listed Chinook salmon stocks, Central Valley steelhead, and sDPS green sturgeon were downloaded. Examination of the shape files revealed that critical habitat for the sDPS green sturgeon includes waterways nearest the confluence with the San Joaquin River, well downstream of the project area. The entirety of the Calaveras River below New Hogan Dam has been designated as critical habitat for Central Valley steelhead. No critical habitat designations were observed for either Central Valley spring-run or Sacramento River winter-run Chinook salmon in the Calaveras River.

Based on this information, this technical memorandum focuses on the following species (Table 2):

- Chinook salmon (*Oncorhynchus tshawytscha*)
- Central Valley steelhead (*Oncorhynchus mykiss*)

Table 1. Non-ESA-listed native fish species that historically utilized habitat near the project area, irrespective of temporal distribution.

Common Name	Species	Origin	Demersal/Pelagic
Chinook salmon – Central Valley fall/late fall-run ESU	*Oncorhynchus tshawytscha*	Native	Pelagic
Pacific lamprey	*Entosphenus tridentatus*	Native	Demersal
Prickly sculpin	*Cottus asper*	Native	Demersal
Riffle sculpin	*Cottus gulosus*	Native	Demersal
Sacramento blackfish	*Orthodon microlepidotus*	Native	Pelagic
Sacramento hitch	*Lavinia exilicauda*	Native	Pelagic
Sacramento pikeminnow	*Ptychocheilus grandis*	Native	Pelagic
Sacramento splittail	*Pogonichthys macrolepidotus*	Native	Pelagic
Sacramento sucker	*Catostomus occidentalis*	Native	Demersal
Sacramento perch	*Archoplites interruptus*	Native	Pelagic
Sacramento–San Joaquin tule perch	*Hysterocarpus traskii*	Native	Pelagic
Thicktail chub	*Gila crassicauda*	Native	Pelagic
Threespine stickleback	*Gasterosteus aculeatus*	Native	Pelagic
White sturgeon	*Acipenser transmontanus*	Native	Demersal

Table 2. Federal/State endangered or threatened species summary table for the construction site.

Species	Listing Status[1]	Listing Agency	Potentially Present During Construction	Potential Habitat Present	Potential to be Impacted
Central Valley steelhead (adult)	FT	USFWS	N[2]	Y	N
Central Valley steelhead (juvenile)	FT	USFWS	N[3]	Y	N
Central Valley spring-run Chinook salmon (adult)	FT / ST	USFWS / CDFW	N[4]	N	N
Central Valley spring-run Chinook salmon (juvenile)	FT / ST	USFWS / CDFW	N[5]	N	N
Sacramento River winter-run Chinook salmon (adult)	FE / SE	USFWS / CDFW	N[6]	N	N
Sacramento River winter-run Chinook salmon (juvenile)	FE / SE	USFWS / CDFW	N[7]	N	N

[1] Listing status: F = Federal, S = State, T= Threatened, E = Endangered
[m] Species is migratory and may be present short-term during migration
[2]Hallock 1989, [3] Moyle et al. 2008, [4] Cramer and Demko 1997, [5] Yoshiyama et al. 1998, [6] Hallock and Fisher 1985, [7] Stevens 1989

Chinook salmon

Fall-run (FR) Chinook salmon are not currently listed under the ESA. They are, however, listed as a Species of Special Concern (SSC) under the California Endangered Species Act (CESA) due to concerns about population size and their dependence on hatcheries. FR Chinook salmon have used the Calaveras River opportunistically, with strays from other basins entering when conditions permit. Adult FR Chinook salmon typically migrate to spawning grounds in the San Joaquin River tributaries from September through December. If present, adult salmon typically spawn upstream of Bellota.

In years that adult salmon migrate into the Calaveras River, juveniles may be produced and may rear in the primary spawning and rearing reach upstream of Bellota until ready to begin their seaward migration. Juvenile salmon migration from the San Joaquin tributaries occurs between January and June, with peak migration during February through May.

Potential to be exposed to project changes

Adult Chinook salmon will not be affected by this project. As previously noted, flashboard dams are installed at twelve locations throughout Mormon Slough, beginning April 15 and being removed from the river by November 1. This would effectively occlude all migrating adult Chinook salmon from the project area during the anticipated work window. Juvenile chinook salmon generally emerge and migrate prior to the anticipated work window between January and June and would therefore be largely unaffected by the project. Further, a rotary screw trap (RST) has been monitoring juvenile salmonid populations on the Calaveras River since 2002. Since the initiation of monitoring, juvenile Chinook salmon have been observed in only 61.1 percent of the monitoring seasons (with only one juvenile Chinook observed during the 2008 monitoring season). Since 2002, only 21,971 individuals (average = 1,156) have been captured at the RST with the majority of outmigrating juvenile Chinook (92.6%) captured between November and May.

This underscores the opportunistic utilization of the Calaveras River by Chinook salmon as the monitoring seasons with the largest number of juveniles encountered in the RST have typically occurred during or immediately after wet water year types (e.g., WY 2006 and 2017). Wet water year types require that New Hogan Dam discharge significant volumes of water than would otherwise be required for flood control operations, allowing Chinook salmon ample time to migrate past Bellota Weir.

Central Valley Steelhead

Steelhead (*Oncorhynchus mykiss*) is a species of salmonid native to California, commonly known by two names: steelhead (the anadromous form) and rainbow trout (the resident/freshwater form). The California Central Valley steelhead has been listed as "threatened" under the ESA since January 2006. Adult anadromous steelhead can be expected to enter freshwater streams between August and November and spawning

typically takes place between December and April. Juveniles begin to emerge from late winter to summer and will then spend between one and three years in freshwater before emigrating in the spring (Williams 2006). Recent habitat modeling conducted by Lindley et al. (2006) suggests that waterways on the floor of the Central Valley are unfavorable spawning and rearing locations for steelhead due to their excessively high summer temperatures. This same study also noted that many of the small tributaries of the San Joaquin are generally too degraded to support viable populations.

Abundance data reveal that populations in the Central Valley are relatively low for naturally occurring steelhead. *O. mykiss* counts at the Red Bluff Diversion Dam from 1967 to 1993 revealed a precipitous decline in returns to the upper Sacramento River. While more recent data are scarce, an updated report from NOAA Fisheries (Good et al. 2005) estimated an average of 3,628 naturally spawning female steelhead occurring in the Central Valley between 1998 and 2000 based on the adipose-fin-clip ratio. While the importance of the Calaveras River for steelhead production is currently unknown, it is classified as a Core 1 watershed which means that it has the potential to support a viable steelhead population. Over-summer snorkel surveys conducted by FISHBIO in 2019 estimated an abundance of 7,392 individual *O. mykiss* representing all life stages in the upper reaches of the Calaveras River between New Hogan Dam and the Bellota Diversion Facility. While this number does not represent the number of "steelhead," it does indicate that the Calaveras River has a robust and resilient *O. mykiss* population, rebounding from a 2017 estimate of abundance of only 1,177 individuals coming off of the 2012-2016 drought.

Potential to be exposed to project changes

Adult *O. mykiss* will not be affected by this project. As part of Stockton East Water District's agricultural water delivery operations, flashboard dams are installed at twelve locations throughout Mormon Slough, beginning April 15 and being removed from the river by November 1. This would effectively occlude all migrating adult *O. mykiss* from the project area during the anticipated June through September work window. Juvenile *O. mykiss* rearing does not occur in the project area and migration during the spring does not overlap with the proposed summer work window. Therefore juvenile *O. mykiss* will not be affected by the project.

Avoidance and Mitigation Recommendations

The planned timing of erosion repair activities will provide an appropriate window in which to work while providing adequate protection for aquatic organisms. The presence of species of concern is expected to be minimal, if at all, during the summer months when repair activities are scheduled to take place. This is due to a lack of overlap between the project window and adult and juvenile migration timing (Table 4), operations of flashboard dams downstream of the project area precluding upstream migration of adult salmonids to the project area during the entire work window, and an absence of spawning and rearing habitat in the project area.

Fine sediments may be incidentally introduced to the river as a result of project activities, but their effect should be negligible as salmonids are not expected to be present in or directly downstream of the project area. Best management practices utilized during construction will be implemented to intercept and capture sediment prior to entering waters of the U.S., as well as erosion control measures along the perimeter of all work areas.

A proposed turbidity standard for the adequate protection of fish and wildlife habitats in California states that turbidity (measured in NTUs; nephelometric turbidity units) should not exceed 20% above natural background turbidity (Bash et al. 2001).

Upon completion of construction activity, the project proponent will ensure all equipment and excess materials would be transported off site using the same routes used for setup. Levee slopes will be seeded to promote re-vegetation and minimize soil erosion. Any damage caused from construction activities to the levee road or surrounding areas would be repaired. The staging area would then be cleaned of any rubbish and all parts of the work area would be left in its original condition.

Table 4. The potential of each species of special concern, their pertinent life stages, and their likelihood of occurrence in the project area.

Species	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Steelhead (adult)												1	1	1	1	1	1							
Steelhead (juvenile)												1	1	1	1	1	1							
Fall-Run Chinook salmon (adult)												1	1	1	1	1	1							
Fall-Run Chinook salmon (juv.)												1	1	1	1	1	1							

Note: White boxes = unlikely to be present in the project area; Gray Boxes = potentially present in the project area; [1] = intended work window.

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Attachment A

Site Photos of the Mormon Slough Project Area

October 2019

Figure 1A. View of the project area looking downstream from the Escalon-Bellota Rd. Bridge.

Figure 2A. Better view of the south bank where evidence of bank shearing has occurred. This has led to the increase of sediment inputs in the thalweg.

Figure 3A. Some repair work (clearing of a work area) appears to be completed on the north bank just below the bridge. Bank dominated by mixed vegetation, primarily composed of willow and Himalayan blackberry.

Figure 4A. Example of current substrate composition present within the work area. Sparse gravel with sandy substrate throughout.

Figure 5A. Due to erosion issues at the bridge, some emergency repairs have already completed directly beneath the bridge and fresh rip-rap has been placed.

Figure 6A. Close up of the instream component of the emergency repair. Rip-rap intrudes into the thalweg, reducing wetted width at base flows.

Figure 7A. Downstream of the primary work area; example of habitat available in the lower end of the worksite. Little overhead vegetation and shaded riparian habitat available along the banks.