1. **Description of Project:**

The County of Stanislaus, Department of Public Works (County) in cooperation with the County of Merced, Department of Public Works, the California Department of Transportation (Caltrans) and the Federal Highway Administration (FHWA) is proposing to replace the River Road over San Joaquin River Bridge (aka Hills Ferry Road over the San Joaquin River) (Br No. 39C-0001) and to construct the necessary approach roadway improvements to accommodate the bridge replacement. Previous studies concluded that bridge replacement was more cost effective than bridge retrofit.

Funding for the proposed project would be achieved through sources related to the FHWA Highway Bridge Program, State of California Local Bridge Seismic Retrofit Account, Bond Match Funds, and local County funds. The proposed project requires compliance with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). The County of Stanislaus is the lead agency for the CEQA process, while Caltrans is the lead agency for the NEPA process.

## Introduction

The existing bridge is 647 feet (ft) long and 32 ft wide. The piers and bents are all aligned parallel to the predominant directions of the San Joaquin River flow during low flows and have variable skews due to the curved alignment. The structure is comprised of three reinforced concrete frames with 18 spans. The bridge was constructed in 1961 as a replacement for the original 1901 wood trestle and steel swing-span truss bridge previously located downstream and constructed as part of old State Route 122. The 1961 replacement project realigned Hills Ferry Road from its original tangent alignment by shifting the river crossing south (or upstream) of the original location along a horizontal curve and closer to the confluence of the Merced and San Joaquin Rivers.

## Purpose and Need

Hills Ferry Road is a rural major east-west connector between Interstate 5 (I-5) and United States Highway 99 (US-99) between the towns of Patterson and Los Banos, California. The existing two-lane road has a posted speed limit of 55 miles per hour (mph), and based on 2012 traffic data has an average daily traffic (ADT) of 4,470. Based on a 3.5-percent annual traffic growth assumption, the estimated 2017 ADT is 5,310. The existing horizontal alignment and superelevation provides a comfortable design speed that exceeds 65 mph for a two-lane conventional highway in accordance with the current Caltrans Highway Design Manual.

The Hills Ferry Road Bridge is subject to damage or collapse in response to seismic activities. The seismic vulnerability or primary deficiency of the bridge is the predicted damage or collapse of the bridge resulting from subsurface liquefaction and lateral spreading of soils, which may also impact the slope stability of the roadway embankments and the channel bank. In addition, in January 2020, emergency action was taken to repair the accelerated bank erosion at the eastern embankment due to the migration of the Merced River channel. Deep local scour at several piers is also a concern, and Caltrans agreed to reclassify the bridge as scour critical in 2018.

The primary objective of the project is to provide long-term safe vehicular access across the San Joaquin River. This objective would be met by replacing the seismically and scour critical inadequate existing bridge. Additional objectives include avoiding or minimizing environmental impacts, reducing right-of-way and land use impacts, meeting ADT requirements, and protecting against bank erosion.

**Bridge Replacement**

The proposed bridge replacement project consists of realigning Hills Ferry Road by shifting the centerline at the crossing location of confluence north (downstream) of the existing bridge centerline on a slightly smaller radius horizontal curve. The northerly shift is sufficient to allow a single stage construction operation for the new two-lane crossing while maintaining vehicular access across the river throughout construction using the old bridge. The proposed replacement crossing would be approximately 750 ft in length and would accommodate a usable roadway width of approximately 34 ft (4-ft shoulder/12-ft lane/12-ft lane/6-ft shoulder). Once construction of the replacement crossing is completed, the proposed alignment would tie into the existing Hills Ferry Road alignment, and the existing bridge and foundations would be removed. (Foundation removal limits would be 2 ft below the existing ground line, per normal practice.) The existing roadway embankments would remain in place; however, the existing asphalt concrete would be removed per standard specifications.

The total length of the proposed improvements including the approach roadways and bridge would be approximately 2,100± ft. The length of the approach roadway improvements at both the west and east ends of the bridge are approximately 600 and 650 ft, respectively. The roadway would be superelevated through the curves at 10 percent. The new roadway section would conform to the existing roadway section at the limits of the proposed project improvements. A design exception was approved by the counties to reduce the project design speed from 60 mph to 55 mph in order to obtain adequate stopping sight distance and to reduce the length of the approaches.

The proposed project replaces the existing bridge with a new crossing that raises the profile approximately 5 ft to allow longer and fewer spans than the existing bridge while maintaining the required freeboard above the anticipated flood events.

The bridge structure would be approximately 750 ft long using a five-span cast-in-place post-tensioned box girder, with a span configuration of 125 ft/166 ft-8 inches/166 ft-8 inches/166 ft-8 inches/125 ft. The new bridge would be supported on reinforced concrete single-column piers with cast-in-drilled-hole (CIDH) concrete piles and reinforced concrete seat type abutments supported on CIDH concrete piles or cast-in-steel-shell concrete piles. The shells for the cast-in-steel-shell piles at the abutments may be driven into place. Abutments would be aligned parallel with the predominant channel flow direction. Falsework would be required in the floodplain and in the low flow channel. The falsework would consist of a mixture of driven piles and possibly timber support pads in the floodplain. Rock slope protection would be required at the abutments to protect the roadway embankments. The excavation required for the rock slope protection near the abutments could be extensive, as it may have to go as deep as the expected scour elevation.

**Construction Activities and Schedule**

The proposed project can be constructed in less than two full construction seasons with a potential to be completed in 15-24 months. In Stage 1, the anticipated construction sequencing would involve construction of the two-lane replacement structure in a single operation north of the existing crossing during the initial "in-water" work window, usually from June 15 to October 31. Concurrent with this operation, construction of the western and eastern approach roadways would be completed.

The project footprint includes an additional 40-ft offset from the fill prism to account for any permanent erosion control measures, drainage features, and possible fencing relocation. It is anticipated that a roadside ditch or bioswale would be required on each side of the roadway to treat runoff.

During the initial stage of construction, traffic operations would be maintained on existing Hills Ferry Road using the existing two-lane bridge. Temporary traffic disruptions could occur depending upon the sequencing used to tie the new alignment into the existing alignment at the project conforms. These disruptions would be more substantial at the eastern approach. At the conclusion of Stage 1, traffic operations would be shifted from the existing alignment to the new alignment and the two-lane replacement structure.

In Stage 2, the removal of the required elements of the existing bridge would be completed. Roadway approach embankments may be left in place to provide additional protection to the abutments during high river flow events. Due to environmental work windows and seasonal constraints, the removal of the existing bridge and any portions of the existing roadway paving may require a second season. Total construction duration is estimated to be less than 21 months but may include two "in-water" work windows.

"In-water" construction activities would consist of new construction and demolition activities, both of which may require diversion or channelizing of the flow and/or construction of temporary work trestles. The need for work trestles and their length would be dependent on the snow and water year that precedes the start of construction. In both 2017 and 2019, there was high water below the bridge (approximately 600 ft from bank to bank) due to snowmelt through June and July. In other low water years, the water surface can be reduced to a 100-ft-wide low water channel by May. For planning and permit purposes, the use of work trestles would be assumed in order to lengthen the available work window. New construction activities would include pier foundation construction; excavation, backfill, and form-reinforce-pour operations for the new bridge substructure elements; and erection (and eventual removal) of an access trestle and falsework/formwork. Removal activities would include demolition of the existing bridge superstructure and substructure elements, including excavation and removal of foundations to approximately 2 ft below grade. Placement of roadway embankment fill at the approaches would occur outside of the ordinary high-water elevation. Form-reinforce-pour operations for the new bridge superstructure would occur above the ordinary high-water elevation.

Two temporary access trestles may be constructed as part of the proposed project construction operations. One trestle would be constructed approximately 90± ft north of the existing bridge centerline to facilitate construction of the replacement structure during Stage 1. A second trestle may be constructed 40± ft south of the existing bridge centerline to facilitate removal of the existing bridge during Stage 2. Both temporary trestles would be removed at the conclusion of the applicable construction stage. The trestle would remain in place to service the construction of the new bridge.

The CIDH concrete piling would likely be constructed using temporary steel casing to keep the drilled holes from collapsing. The casings may be driven, vibrated rotated or oscillated into the soils. If the casings are driven and the water level is high such that water surrounds the casing during driving, then a bubble curtain would likely be required to reduce the magnitude of sound waves through the water in order to protect fish. Due to the expected high-water table during pile construction and possible artesian conditions, slurries would likely be needed within the casings and drilled holes.

Falsework to support the new cast-in-place box girder structure would likely be a combination of driven pipe piling and timber posts on timber pads. The piles would be driven from cranes that would travel on land and on the trestles. Piles would likely be 16-inch-diameter pipe piles at 30-ft centers across the full length of the new bridge construction and at potentially 10-ft centers transversely. Depending on the progress of the contractor, it may be necessary for falsework to remain in place through the winter.

After the new bridge is open to traffic, the existing bridge would need to be removed. For portions of the bridge that are not over water during the removal period, those segments would likely be demolished using hydraulic breakers attached to excavators and the debris would be collected after it falls to the ground. For portions to be demolished over water, the demolition would likely be done from another work trestle built upstream of the old bridge or by working from the deck of the old bridge and working backwards during the removal. Removal methods would depend on whether concrete debris would be allowed to fall in the water or not. If concrete debris is not allowed to fall in the water, then the contractor may have to sawcut the bridge into pieces over water and lift them out with a crane. However, some inwater demolition would be required. Some of the existing piers and pile extensions are likely to be in the water year-round and their removal would require debris to fall in the water. Piers would be removed to the top of footing elevation and piles would be broken off at the mudline.

Construction of the proposed replacement project is tentatively planned to begin in spring of 2021 and be completed by October 2023.