

COUNTY ENGINEERS ASSOCIATION OF CALIFORNIA (CEAC)

OUTSTANDING LOCAL STREETS AND ROADS PROJECT AWARDS PROGRAM

Efficient and Sustainable Bridge Maintenance, Construction and Reconstruction Projects

REPLACING THE HICKMAN ROAD BRIDGE

CONNECTING COMMUNITIES, PRESERVING A CRITICAL REGIONAL ROAD SYSTEM, AND PROVIDING POSITIVE EFFECTS TO THE ENVIRONMENT



PROJECT OVERVIEW

In 1964, the Hickman Road Bridge was constructed to improve the connection between the City of Waterford and the community of Hickman, as well as to maintain a major regional north-south roadway in the central part of Stanislaus County. The bridge is located just south of the City of Waterford and crosses the nearly 150-mile-long Tuolumne River that flows between the two communities.

The original structure consisted of a seven-span concrete box girder with concrete abutment and pier walls supported on pile caps founded on driven piles. Starting with the statewide seismic retrofit program in 1997, several structural and seismic evaluations were conducted on the former bridge and found the bridge to be scour critical and seismically deficient. Over the bridge's almost six decades of service, the pile caps at the piers located adjacent to the main channel of the river (Piers 4, 5, and 6) had become undermined during high-flow events, which degraded the pier foundations and led to the bridge's status of being scour critical. Because the continual degradation of the Tuolumne River channel, there was no practical solution to repairing the scour damage at these piers.

The bridge's scour critical status, coupled with the fact that the bridge did not meet existing seismic design criteria, meant the bridge was eligible for replacement under the Highway Bridge Program (HBP) and Local Seismic Safety Retrofit Program (LSSRP). LSSRP funding had been secured to retrofit the former bridge in 2007, however HBP funds were not secured until late 2012. As a result, in 2014, plans were put in place by Stanislaus County to replace this critically important bridge.



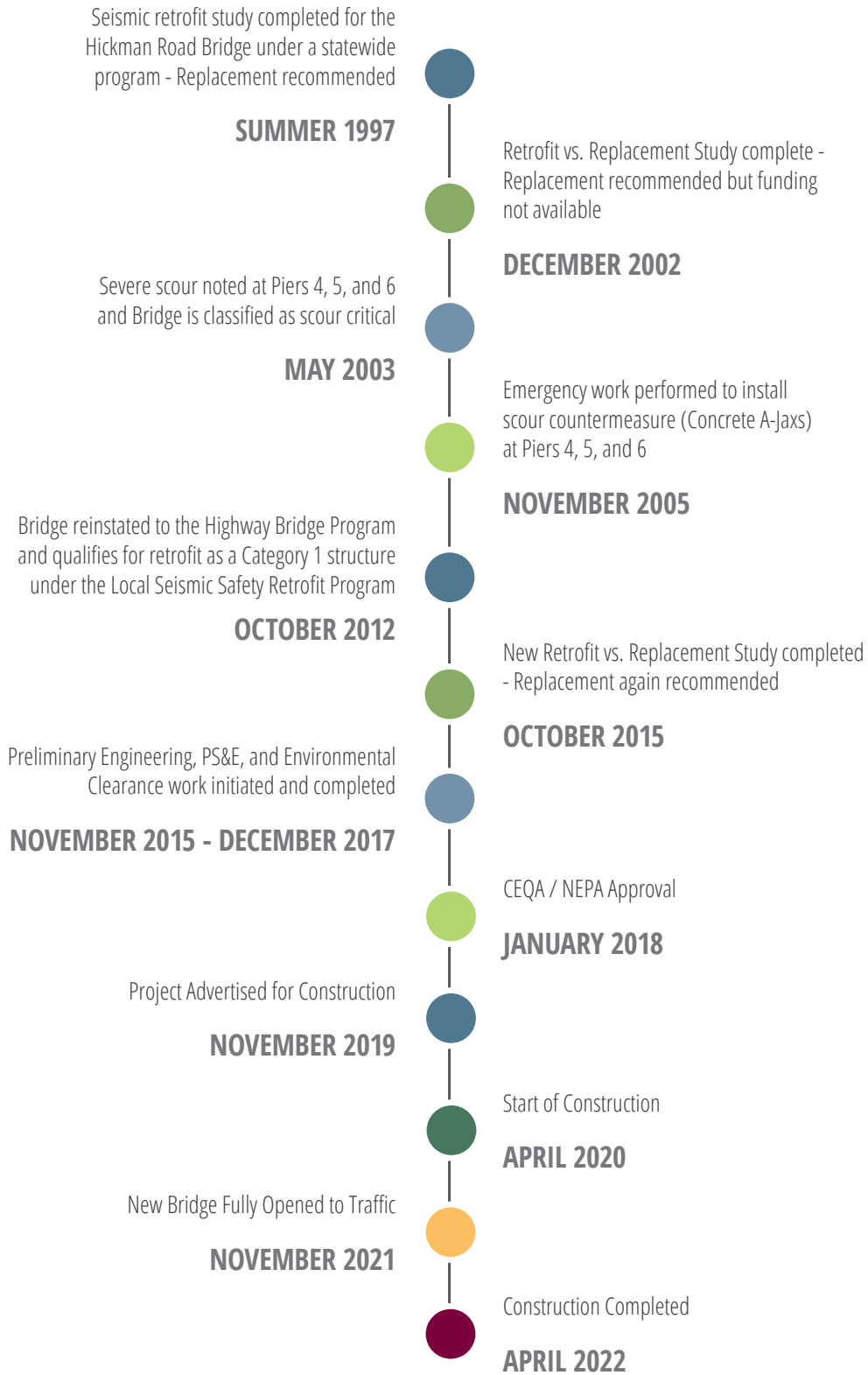
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The old bridge was replaced with a 750-foot long, 75-foot tall, five-span, cast-in-place, post-tension concrete box girder structure, supported by seat abutments at each end and intermediate two-column piers. Each pier is supported by two large-diameter cast-in-drilled-hole piles, ranging in diameter from 100 to 125 inches, and measuring up to 125 feet in depth. The bridge features two 12-foot traffic lanes, two 8-foot shoulders, and one 5-foot sidewalk. Additionally, 960 feet of roadway was reconstructed to conform the new bridge to the existing Hickman Road alignment.



PROJECT TIMELINE



Project Highlight #1 Preserve the Communities' Bridge Connection

The Hickman Road Bridge serves as a vital connection between the City of Waterford and the Community of Hickman. A viable bridge crossing was needed because:

- All of the first responders that serve both communities are located north of the bridge in the City of Waterford and need the bridge to access business and residents to the south in Hickman.
- A magnet school, located in Hickman, draws students from the City of Waterford who need the bridge to get to school.
- One of the largest employers in the area is a commercial wholesale nursery, Frantz Nursery, located south of the Tuolumne River and uses the Hickman Road Bridge to ship their products all across the State of California via State Route 120 located north of the Tuolumne River.
- Due to the ongoing degradation of the pier foundations, the old bridge had to be closed when flows in the Tuolumne River exceeded 15,000 cubic feet per second (cfs) per the Plan of Action dated 12/01/2005. The former bridge was closed several times since 2005 due to flows in the Tuolumne River exceeding 15,000 cfs; including 2017.
- The average daily traffic count of Hickman Road is approximately 6,800 vehicle per day with 15% being trucks and a major regional north-south roadway in the central part of Stanislaus County.
- The shortest detour length available when the bridge is closed is approximately 10 miles.

PRESERVED LOCAL STREET AND
ROAD SYSTEM

Challenge

MAINTAIN USE OF EXISTING TUOLUMNE RIVER CROSSING DURING CONSTRUCTION

Keeping the old bridge open and operational during the construction of the replacement bridge was a key element to the design of this project.

Solution

MINIMIZE ROAD CLOSURES REQUIRED FOR CONSTRUCTION

Because the Hickman Road Bridge is such a critical piece of infrastructure in this area and a reasonable detour was unavailable for rerouting traffic, a structural assessment was conducted early in the development of the project that determined the former bridge was structurally sound enough to remain in service until the new bridge was open. The existing bridge remained in service until the new bridge was opened to traffic in 2021 with the exception of 3 weeks in 2017 when the flows of the Tuolumne River exceeded 15,000 cfs.

The replacement bridge was set on an alignment just upstream of the old bridge allowing all of the bridge construction work and the bulk of the road construction work to be completed while the old bridge and roadway remained in services. **With a constant eye towards minimizing disruptions, the Hickman Road Bridge was opened to traffic after only 17 months of construction. The only closure utilized was a two-week full closure of Hickman Road to construct the road approach conforms.**



Project Highlight #2 Improve Safety and Access of the Communities

The Hickman Road Bridge was used not only by vehicles, but also by pedestrians and bicyclists. There was not a viable detour available for pedestrians or bicyclists since the shortest detour length was 10 miles.

Challenge

NON-VEHICULAR USE SAFETY

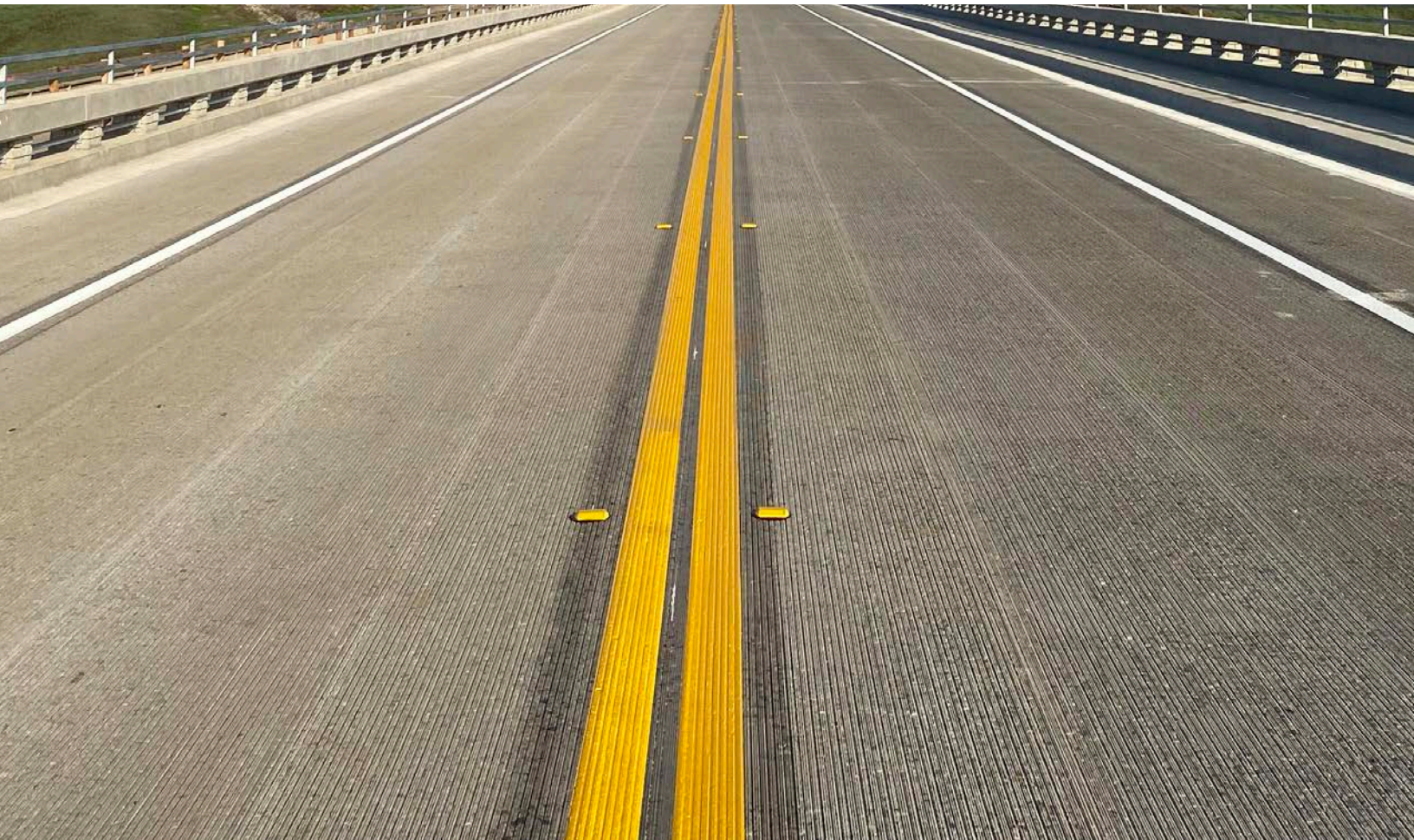
The clear width of the old bridge was only 28 feet wide supporting two 12-foot lanes and two 1-foot shoulders. The bridge barrier included a curb with a width of 2 feet and a railing height of 30 inches above the deck (24 inches above the curb). Pedestrians were walking across the bridge on the curbs and bicyclists were crossing the bridge in the travel lanes, making their crossing of the bridge extremely dangerous.

Solution

MULTI-MODAL FEATURES

The replacement bridge included two 8-foot wide shoulders for bicyclists, one 5-foot sidewalk for pedestrians, and a concrete bridge barrier with pedestrian railing. **These multi-modal features significantly improved the safety for pedestrians and bicyclists using the bridge.** In addition, the access to each community by pedestrians and bicyclists was greatly improved.

IMPROVED SAFETY, ACCESS, AND
OVERALL QUALITY OF THE LOCAL
STREET AND ROAD SYSTEM



Project Highlight #3 Improve Local Water System for the Future

During the design effort for the replacement structure on Hickman Road, the City of Waterford was working on a project to connect their water system to the overextended and under performing water system in the community of Hickman.

Challenge

IMPROVE HICKMAN WATER SYSTEM RELIABILITY

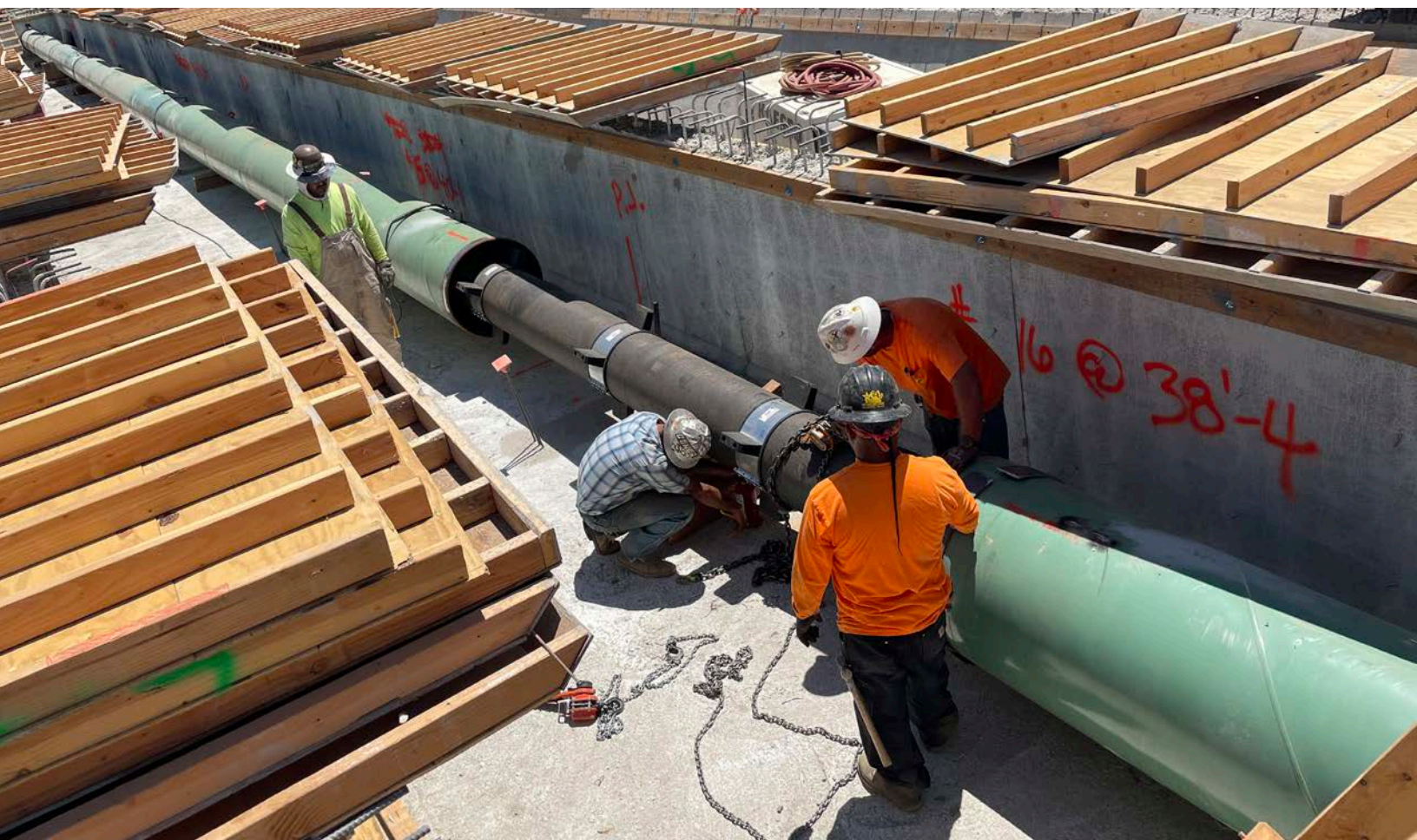
The City of Waterford needed a facility to carry a 16-inch diameter water force main across the Tuolumne River and into the Community of Hickman in order to improve the reliability of Hickman's water system and provide adequate fire flow protection.

Solution

CONNECT TO WATERFORD WATER SYSTEM

Through a joint agreement between Stanislaus County and the Community of Hickman, the replacement bridge was designed to support this important waterline across the Tuolumne River. The force main was installed in a welded steel pipe casing to protect the surrounding environment and multi-use trail below the bridge from potential damage due to a pipe leak, and to obtain the construction permits from the California Department of Fish and Wildlife, State Lands Commission, and Central Valley Flood Protection Board. **The addition of the 16-inch diameter water force main to this bridge replacement project, significantly improved the reliability of the water system in the Community of Hickman and associated quality of life.**

PROVIDING CONTINUOUS,
POSITIVE, SUSTAINABLE
OUTCOMES



Project Highlight #4

Addressing the Ongoing Degradation of the Tuolumne River Channel

Due to mining activities within the Tuolumne River channel near the bridge, the scour analyses, performed as part of the engineering effort for the replacement bridge, indicated that during the lifespan of the replacement bridge, the channel of the Tuolumne River could be expected to degrade up to 25 feet below the current river invert elevation at the bridge site.

INNOVATIVE AND UNIQUE BRIDGE DESIGN TO ACCOMMODATE RIVER CHANNEL SCOUR

Challenge

ONGOING TUOLUMNE RIVER CHANNEL SCOUR

The continual degradation of the Tuolumne River channel required special attention in selecting the bridge span configuration and pier foundation type for the replacement bridge. The challenge was to slow down the flow velocities in the river and provide a foundation type that would address the anticipated 25 feet scour and prevent a repeat of having the new bridge being classified as scour critical at some point during its lifespan.



Solution

MITIGATE AND ACCOMMODATE FUTURE SCOUR

In order to reduce flow velocities of the Tuolumne River through the bridge crossing, longer spans are being used for the replacement bridge to reduce the number of obstructions (piers) within the Tuolumne River channel. The new bridge is a 5-span structure as opposed to the 7 spans of the former bridge. This reduces the total number of piers within the river channel by two thus opening the waterway of the river and slowing down velocities.

To address the 25 feet of scour, the two-column piers of the replacement bridge are supported on deep foundations. Each pier is supported by two large-diameter cast-in-drilled-hole (CIDH) piles, ranging in diameter from 100 inches at

the shorter piers (Piers 2 and 5) to 125 inches at the taller piers (Piers 3 and 4). Each CIDH pile is on the order of 125 to 130 feet in depth so as to be founded well below the total future scour of 25 feet. In addition, the upper 25 feet of soil embedment was neglected in determining the capacity of the CIDH piles and were designed as columns in this region.

The slower flow velocities in the river and the pier foundation design allows the new bridge to accommodate 25 feet of scour through its lifespan.

Project Highlight #5 Selecting a Cost-Effective Project

This \$19-million project was funded through the HBP, Caltrans LSSRP, and transportation funds created by local sales tax measures from Stanislaus County and the City of Waterford.

Challenge

SPEND FUNDS WISELY

Selecting the most cost-effective solutions for a project of this magnitude was a challenge in itself.



Solution

DETERMINE COST EFFECTIVE BRIDGE TYPE AND ROAD ALIGNMENT

As part of the preliminary engineering effort for this project, project alternatives and analyses were conducted to select the most appropriate solution (bridge type and road alignment) for the replacement bridge. The factors used to determine the most appropriate structure type and road alignment included right of way impacts, speed of construction, project costs, maintaining traffic across the Tuolumne River, and environmental impacts / mitigation costs. Three structure types were considered: Cast-In-Place Post-Tensioned Box Girder; Precast Prestressed California Wide Flange Girder; and Structural Steel Plate Girder. In order to maintain traffic along the existing Hickman Road, two road alignments, one on each side of the old bridge, were considered; an Upstream Alignment and Downstream Alignment.

COST-EFFECTIVE PROJECT

Due to the height of the bridge above the Tuolumne River Channel (approximately 75 feet) the size of the crane needed to lift the elements of either the Precast Prestressed California Wide Flange Girder or Structural Steel Plate Girder bridge alternatives required substantial working pad / trestle areas creating significant impacts to the creek channel environment and associated mitigation costs. As a result, these alternatives were cost prohibitive. **The Cast-In-Place Post-Tensioned Box Girder alternative saved the project approximately \$2 million in temporary construction and mitigation costs.**

The City of Waterford and Stanislaus County had existing right of way for the downstream alignment, however there were a significant number of Elderberry bushes just downstream of the old bridge which would have generated sizable mitigation cost to the project for the Valley Elderberry Longhorn Beetle (VELB). **The right of way (ROW) costs for the upstream alignment were reviewed against the VELB mitigation costs, and ultimately the upstream alignment was chosen, saving the project another half million dollars in VELB mitigation costs.**

Project Highlight #6 Coordinating with Multiple Project Stakeholders

There were multiple stakeholders interested in the replacement of the Hickman Road Bridge over the Tuolumne River. They included:

Stanislaus County	Client/Project Lead/Owner
City of Waterford	Owner
Caltrans	Project Funding/Oversight
State Lands Commission	Jurisdictional Agency
Central Valley Flood Protection Board	Jurisdictional Agency
California Department of Fish and Wildlife	Regulatory Agency
US Army Corps of Engineers	Regulatory Agency
Central Valley Water Quality Control Board	Regulatory Agency

EFFECTIVE COLLABORATION AND PARTNERSHIP

Challenge

MANY STAKEHOLDERS

With this myriad of project stakeholders, managing each stakeholder’s project interests concerns, and agenda was key.



Solution

COMMUNICATION

An effective communication plan was implemented to keep all of the stakeholders involved and in line with the project objectives. The communication plan included the following elements:

PROJECT DEVELOPMENT TEAM MEETINGS. Monthly project development team (PDT) meetings were held throughout the course of the project design. The meeting was led by the prime design consultant team and attended the appropriate subconsultants, Stanislaus County, City of Waterford, and Caltrans (as appropriate). The purpose of the meetings was to spearhead the direction of the project, address issues as they came up during the course of the project, look ahead to upcoming activities to identify upcoming challenges and long lead times, and keep the project moving forward and on schedule.

CITY COUNCIL MEETINGS. Two City Council Meetings were held during the course of the development of the project at the City of Waterford council chambers to inform them about the project features and progress. Items of interest to the City were the replacement bridge itself, and having a reliable connection to the Community of Hickman, the installation of the watermain in the bridge, and work in and around the City of Waterford River Park and the River Park Trail.

PUBLIC OUTREACH WORKSHOP. A public outreach workshop was held during the development of the project to inform the public from the City of Waterford and Community of Hickman about the features of the project and solicit input from them on features they were interested in. The vast majority of the public participants at this meeting were interested in having improved access by pedestrians and bicyclists across the bridge and the watermain connection between the City of Waterford and Community of Hickman.

PERMIT APPLICATION MEETINGS/CORRESPONDENCE. Several construction permits were required to construct the replacement bridge. They included the typical regulatory permits from California Department of Fish and Wildlife, US Army Corps of Engineers, and Central Valley Water Quality Control Board, but also a permit from the Central Valley Flood Protection Board and an update to the lease agreement between Stanislaus County and the State Lands Commission. For each instance a pre-application meeting was held with each agency to inform them of the

project and verify the requirements of the application. Once the application process began, there were several and frequent correspondence with each agency until the permit / updated lease agreement was obtained. In addition, the Central Valley Flood Protection Board meeting was attended on the date that the Hickman Road Bridge permit was to be approved in case questions arose during the approval process. This portion of the communication plan greatly assisted in successfully obtaining the required construction permits and updated lease agreement.

RIBBON CUTTING CEREMONY. To celebrate the opening of the new bridge with the local community, a ribbon cutting ceremony was held. At the ceremony, the Stanislaus County Public Works Director, Dave Leamon, and other dignitaries were given an opportunity to discuss the success of the project. More importantly, however, local residents were given an opportunity to speak. One such speaker was a mother from the Community of Hickman that stated she and her family had crossed the former bridge several times with bicycles and by walking and were terrified each time. She went on to express her appreciation of the bike lanes and sidewalk allowing her and her family to cross the bridge without the use of a car.

Having an effective communication plan allowed this project to develop such that it met the needs of the project owners, Caltrans, regulatory and jurisdictional agencies, and local community.



Project Highlight #7 Improvements to Local Environment

As with all bridges crossing rivers and creeks, impacts to the natural environment within the waterway are inevitable. Construction of bridge foundations, piers, and abutment walls within the waterway of the Tuolumne River channel were needed to support the new bridge structure.

POSITIVE EFFECTS ON THE ENVIRONMENT

Challenge

MINIMIZE ENVIRONMENTAL IMPACTS

Minimizing the impacts of the replacement bridge and providing mitigation to the impacts that cannot be avoided.

Solution

LEAVE PROJECT SITE IN IMPROVED CONDITION

In order to minimize the environmental impact of the new bridge four aspects were incorporated into the project design:

MINIMIZED BRIDGE FOUNDATIONS IN THE TUOLUMNE RIVER CHANNEL. The new bridge is a 5-span structure as opposed to the 7 spans of the former bridge. This reduces the total number of piers and pier foundations within the river channel by two. The reduction of the number of piers in the Tuolumne River channel produced a net loss in permanent environmental impacts to the Tuolumne River channel at project completion.

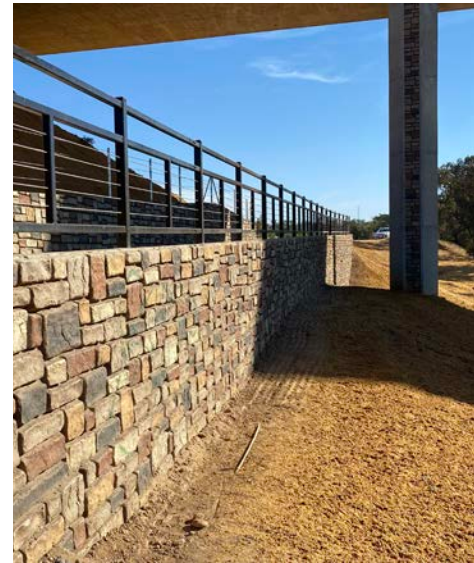
MINIMIZED AND MITIGATED FOR PLANT REMOVAL. To the extent possible, the project document limited the size of the construction area and contractor layout area to help minimize the number of established trees and plants needing to be removed. The Elderberry bushes that were to remain at the project site were protected with high visibility fencing. The project contractor was responsible for maintaining the fencing and protecting the bushes in place.

For the Elderberry bushes that had to be removed, mitigation credits were purchased by Stanislaus County for their removal. In addition, mitigation planting was performed as part of the project to address the removal of native Maple, Walnut, Oak and Willow trees.



INCORPORATED BAT HOUSES ON THE REPLACEMENT BRIDGE. During the design and environmental clearance effort for this project, it was discovered that roughly 6,000 bats had taken residence on the former bridge, specifically under the east deck overhang, between the bridge’s east exterior girder and the exterior bridge-mounted communication conduits. This led to considerations for how these bats could make the new bridge their home at the completion of construction. Bat houses mounted to both exterior girders of the replacement bridge were incorporated into the design of the new bridge, allowing for ideal roosting conditions – a place where they can give birth to and raise their young. Within a few months after the completion of the new bridge, bats had already begun residing in the new bat houses.

RESTORED TO RIVER CHANNEL. As part of this project, the existing concrete A-JAX scour countermeasures associated with the protection of the old bridge were removed resulting in approximately 500 tons of concrete being removed from the Tuolumne River channel. The voids in the channel bottom resulting from the concrete A-JAXs removal were filled with on-site river gravels and cobbles and the channel grades were restored to natural grades.



Project Highlight #8

Be a Good Neighbor: Preserve the Function, Look, and Feel of River Park and River Park Trail

Construction of the replacement bridge had both temporary and permanent impacts to the adjacent City of Waterford River Park and River Park Trail.

Challenge

MAINTAIN THE PARK AND TRAIL FUNCTION AND AESTHETICS

Minimize the temporary and permanent impacts to the River Park and River Park Trail caused by the construction of the new bridge while using portions of the park and trail to support construction activities. Mitigate for the permanent impacts.

Solution

REESTABLISH PARK AND TRAIL AND IMPROVE ACCESS AND AESTHETICS

Constructing the replacement bridge required the temporary closure of River Park and the portion of the River Park Trail below the existing and new bridge. In addition, the portion of River Park directly adjacent to the new bridge had to be utilized to provide temporary access for construction vehicles to the Tuolumne River channel and to provide a construction staging area for the drill rigs, cranes, and concrete pump trucks needed to construct the northern part of the replacement bridge. The portion of the existing River Park Trail directly below the bridge location had to be fully removed.

To mitigate for these impacts and reestablish the park and trail, the project required the:

- Contractor to maintain the existing park features including the existing park benches, interoperative signage, and portions of the existing irrigation system that were to remain during project construction
- Contractor to protect in place the park plantings that were to remain in place during project construction
- Repair of any damaged park features or plantings that were to remain in place during project construction
- Replanting of the trees and shrubs and the reconstruction of the portions of the existing irrigation system that needed to be removed to support the bridge construction activities
- Reconstruction of the removed River Park Trail

To improve access, the reconstructed trail was designed with an ADA compliant profile, making the new portion of the trail more accessible than what was existing. The removed portion of the existing trail contained a non-ADA compliant vertical dip in its profile.

To improve the aesthetics of the park and trail at the bridge location and prevent a concrete monolith, aesthetics were incorporated into the bridge itself and the retaining walls supporting the new ADA compliant trail. A concrete form liner and concrete staining were used to simulate stacked rock and improve the hardscape aesthetics in and around River Park and the River Park Trail.

PUBLICLY VERIFIABLE, MEASURABLE,
AND REPLICABLE PROJECT USEFUL TO
OTHER CITIES AND COUNTIES



COMPLETED PROJECT

Now that the construction of the new bridge is complete and the existing bridge has been removed, the new Hickman Road Bridge offers a structure that meets current seismic criteria, addresses the Tuolumne River channel degradation issues, provides additional capacity and a safer crossing for vehicles, pedestrians, and bicyclists, carries a new regionally important waterline across the Tuolumne River, provides habitat for an estimated 6,000 bats, and enhances the look and feel of River Park and the River Park Trail.

The new bridge truly preserves and improves the connection between the City of Waterford and Community of Hickman and provides each community with an open space treasure for park users and nature alike.



MODEL PROJECT ADVANCING THE LEAGUE AND CEAC'S PRIORITIES FOR LOCAL STREET AND ROAD SYSTEM PRESERVATION:

- HIGH PROFILE PROJECT
- CRITICAL REGIONAL CONNECTION
- DELICATE ENVIRONMENT
- MULTI-AGENCY COORDINATION
- PUBLIC ENGAGEMENT

TEAM ACKNOWLEDGEMENT

A list of team members and their roles is as follows:

Placer County	Client/Project Lead Agency / Owner
City of Waterford	Owner
Caltrans	Funding/Oversight
State Lands Commission	Jurisdictional Agency
Central Valley Flood Control Board	Jurisdictional Agency
US Army Corps of Engineers	Regulatory Agency
California Dept of Fish and Wildlife	Regulatory Agency
Central Valley Regional Water Quality Control Board	Regulatory Agency
Dewberry Engineers Inc.	Prime Design Consultant
NV5	Construction Management
MCM Construction Inc.	Construction Contractor
Avila and Associates	Hydraulics
Crawford and Associates Inc.	Geotechnical Engineering
North Star Engineering Group Inc.	Survey
Y&C Transportation Consultants	Signal Design
Dewberry Engineers Inc. / LSA	Environmental NEPA / CEQA Clearance and Revalidation





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