

ALLEGHANY ROAD OVER OREGON CREEK BRIDGE REPLACEMENT



2018 OUTSTANDING LOCAL STREETS & ROADS PROJECT NOMINATION

PROJECT LOCATION: Alleghany Road over Oregon Creek in Tahoe National Forest, Northern Yuba County, California

AWARD CATEGORY: Efficient and Sustainable Bridge Maintenance, Construction and Reconstruction

MANAGING AGENCY: County of Yuba, Public Works Department

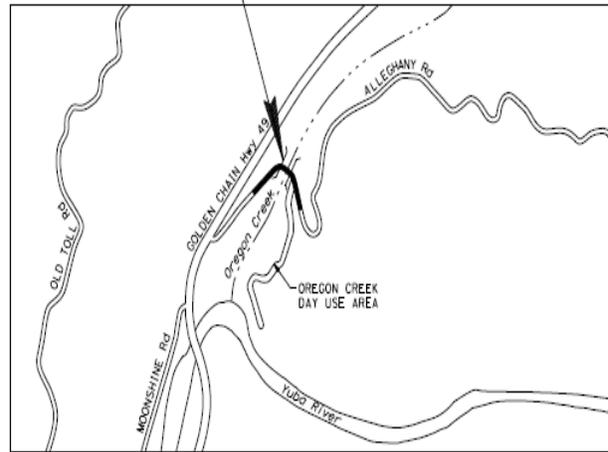
SUBMITTED BY: Mike Lee, P.E., Director of Public Works
915 8th Street, Suite 125
Marysville, CA 95901

PROJECT NARRATIVE

The Alleghany Road over Oregon Creek Bridge Rehabilitation Project involved rehabilitating the historic wooden covered truss bridge in the Tahoe National Forest in northern Yuba County. The bridge is listed in the Caltrans Historic Bridge Inventory as a Category 1 Historic Bridge. The bridge is also listed in the National Register of Historic Places (NRHP 75000499). The bridge was closed to vehicular traffic due to possibility of “catastrophic collapse”.

The Caltrans Bridge Inspection Reports (BIR) designated the existing bridge as structurally deficient due to substantial loss of section in lower timber chords, and determined the Sufficiency Rating to be 19.6. The County requested that Quincy Engineering, Inc. conduct an Alternatives Study to describe options for rehabilitating or replacing the bridge in order to provide a safe creek crossing. Six alternatives were studied, including rehabilitation, complete replacement with a new structure on a new alignment, and rehabilitation of the existing while constructing a new bridge. These alternatives were presented to the County and discussed on August 17, 2011. The County selected alternative was to rehabilitate the existing bridge (utilizing complete disassembly), with no adjacent new crossing.

**LOCATION OF CONSTRUCTION
ALLEGHANY ROAD BRIDGE
BR. NO. 16C-0017**



VICINITY MAP

NTS



While there is conflicting information on the construction date, the covered bridge was most likely constructed in 1871 by Thomas Freeman. On June 18, 1883 the English Dam on the Middle Fork of the Yuba River gave way. The resulting flooding floated the bridge from its foundation, turned it

around, and carried it approximately 150 feet downstream. Freeman hired work crews to move the bridge and secure it back on its foundation. Unable to right the bridge to its original orientation, the work crews reinstalled the bridge backwards and it remains so today.

The existing bridge is a single-span covered timber Howe Through-Truss bridge approximately 77 feet long and 17' wide. The bridge roof system is covered in corrugated metal and extends beyond the ends of the bridge over non-structural "sheds" for total length of 101'. The interior clear width is approximately 14'-4" between the trusses, and 11'-0" between the wheel guards.

The bridge is supported on rock and concrete wall type abutments. The eastern abutment retains its original stacked rock support system, while the western abutment has been modified with the addition of a concrete face sometime prior to 1938. The purpose of this addition is not known. The depth of these rock walls is not known, nor is it known if they are founded on rock. Existing roadway approaches are gravel and approximately 15'to16' wide.

IMPROVEMENTS TO PRESERVATION, SAFETY, ACCESS TO, AND OVERALL QUALITY

The purpose of the project was to rehabilitate the existing bridge so that vehicle and pedestrian traffic can once again use the structure. The need was based on the fact that severe decay had occurred in many bridge members reducing the load carrying capacity and safety components of the bridge.

The existing bridge was closed to vehicular traffic since the bridge was determined unsafe for traffic. The bridge was last inspected by Caltrans in 2006. During this inspection it was classified as structurally deficient and functionally obsolete with a sufficiency rating of 19.6. As a result of this classification, the bridge became eligible for replacement or rehabilitation under the Federal Highway Bridge Program (HBP). The existing timber covered truss bridge had various structural issues including decay, primarily in the bottom chord. This condition necessitated its closure to vehicular traffic. The proposed project was necessary to improve public safety by providing a safe river crossing for all passenger sized vehicles as well as small Forest Service fire trucks.

In addition to providing an alternate route for the public as well as firefighting crews in an emergency situation, the completion of this project also opened up vehicular access to parts of the Oregon Creek day-use recreation area that were once only accessible by foot.

While many timber elements suffered from decay, the primary load carrying trusses were able to be preserved in their original condition and retrofitted to allow for a full structural rehabilitation that maintained the historical significance of the bridge.

INNOVATIVE AND UNIQUE FEATURES

This project was unique in that it was the rehabilitation of one of the oldest covered bridges in the State of California. Rehabilitation of this nearly 150 year-old covered bridge created the opportunity to sustainably maintain its historical significance through the re-use and rehabilitation of the primary load carrying trusses. Additionally, the original rock stacked abutments that supported these trusses were able to be strengthened and restored in place.

Tension rods were utilized to effectively pre-compress the original mortise and tenon joint to regain the joint's structural capacity while also increasing the overall load carrying ability of the original truss. In addition to strengthening these historic trusses, the tension rods provided a convenient way to connect new floor beams that would allow for the historic looking reconstruction of the wooden bridge deck complete with wheel runners and guards.

While the historic trusses were strengthened with tension rods, the original rock stacked abutment foundations were reinforced with a shear beam cantilever pile cap supported by cast-in-drilled-hole concrete piles allowing for the historic foundation to remain in place as façade appearing to do all the “work” supporting the bridge, while the new foundation system was concealed.

MODEL FOR OTHERS TO FOLLOW

Because of its uniqueness, this project serves as a model for other agencies to follow. The following methodologies were used in the removal and rehabilitation of the bridge;

- ✓ Truss match-marking
- ✓ Strut & Tie modeling
- ✓ Portable & Expandable debris containment
- ✓ Brace & Strap rigging
- ✓ Steel template plates
- ✓ Photographic documentation
- ✓ Tie-Rod tensioning devices

can be used in future bridge rehabilitation of the same nature.

This project effectively demonstrated that “original” structures can be successfully rehabilitated to create, in this case, an alternate safety route for the public and emergency vehicles, create access to a National Forest recreational area, and preserve historical significance.

POSTIVE OUTCOMES ARE SUSTAINABLE

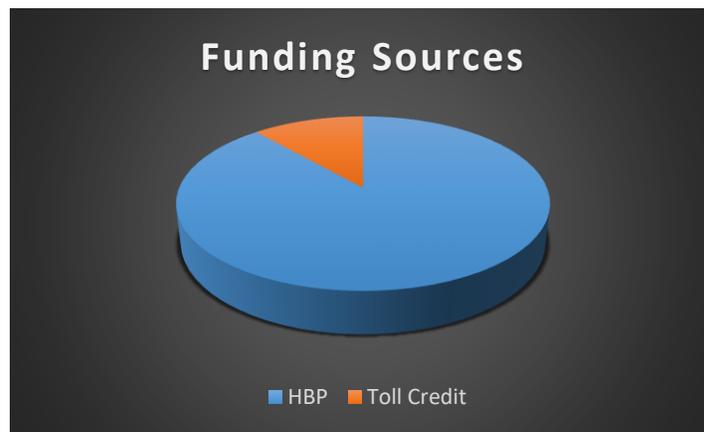
The completion of this project reopened an alternate route in a high fire zone where access by Forest Service vehicles is critical. The bridge has been returned to service for vehicle loads up to the 35,000lb two-axle Forest Service Fire vehicle. The rehabilitation work addressed all bridge deficiencies while

leaving the bridge self-supporting. Legal and permit truck traffic are restricted from the bridge, however the bridge can carry the typical fire service vehicle used by the forest service.

COST EFFECTIVENESS

Original Contract Amount	\$1,700,000.00
Final Construction Cost	\$1,724,894.53

The Federal Highway Bridge Program (HBP) funded a portion of the bridge replacement project cost. The Federal contribution for the project cost was 88.53% (HBP) with the remaining 11.47% from Toll Credit funds.



The purpose of the Highway Bridge Program is to replace or rehabilitate *public highway* bridges over waterways, other topographical barriers, other highways, or railroads when the State and the Federal Highway Administration determine that a bridge is significantly important and is unsafe because of structural deficiencies, physical deterioration, or functional obsolescence.

POSTIVE ENVIRONMENTAL EFFECTS

The repairing and reuse of materials in this project such as the wooden pine beams and preserving the rock stack abutments, not only led to the preservation of the historical nature of this bridge, but also contributed to its environmental sustainability.

Many precautionary efforts were taken during construction to protect the environment including enhanced water BMP's to maintain the water quality of Oregon Creek.



DEMONSTRATE EFFECTIVE COLLABORATION AND PARTNERSHIP

In order to achieve success in preserving the historical nature of the bridge, this project required cooperation from the County, CM and design teams, contractors, and all stakeholders including the US Forest Service. The original wooden trusses had to be carefully removed in one piece in order to preserve their historical significance.

Additionally, a temporary support system for the existing rock stack abutment had to be designed and installed by the contractor to allow for the installation of the new foundation system and the retrofit of the existing.

Both the removal of the trusses and bracing of the original abutments involved significant coordination and teamwork between the CM team, designer and contractor to ensure the preservation and historical significance.

To ensure that the historical nature of the bridge was properly preserved, the team had a consultation with the State Historic Preservation Officer to discuss the historical significance of the bridge.

Architectural Historian, Kara Brunzell, MA, of Brunzell Historical was on site during critical elements to ensure that the bridge's historical significance was not compromised and any improvements were in keeping with time period of the bridge's original construction. Ms. Brunzell participated in the following project activities:

- ✓ Identified historical materials
- ✓ Assisted construction manager in development of specific treatment plan for historic trusses and other historical materials
- ✓ Provided training to crew members
- ✓ Planned and executed match-marking for truss members
- ✓ Observed and photographed demolition, truss relocation, truss rehabilitation, and other activities at various stages of the project

Lastly, none of this could effectively be accomplished without utilizing US Forest Service Day use area as a staging and laydown area. In the end, all stakeholders worked in a cooperative and supportive manner from beginning to end.

RESULTS ARE PUBLICALLY VERIFIABLE AND MEASURABLE

Before rehabilitation, this bridge was closed to vehicular traffic due to its rating and being a threat to public safety. The project now provides benefits to the community as a transportation facility with improved connections to recreational resources, as well as improved access for fire emergency vehicles.

THE EXTENT TECHNOLOGY IS INVOLVED IN INNOVATIVE WAYS IN THE PROJECT

The methodology for the rehabilitation of this bridge was essentially a “back to basics” approach. In era of computer programs, spreadsheets, and other structural design aides; this historic structure called out “remember the fundamentals” and “let history be your guide”. To that end, the retrofit strategy didn’t utilize a fancy new approach, or a new-fangled gizmo – it was basic structural behavior and phenomena.



Utilizing design ideas/concepts from our Roman ancestry and the western settlers of centuries gone by allowed for the current paradigm of structural analysis to be reinvented. In the same way that this structure was restored, so too were the basics of structural engineering and bridge construction.

When these basics of structural engineering and bridge construction were mixed with the contemporary methodologies it yielded a retrofit strategy that efficiently and effectively allowed for the economic restoration of this historical icon.

PROJECT ADVANCES THE LEAGUE AND CSAC’S PRIORITIES AND GOALS FOR THE LOCAL STREET AND ROAD SYSTEM PRESERVATION

The purpose of this project was to improve public safety by providing safe and cost effective solutions for traffic to cross Oregon Creek while preserving the historic nature of the structure. Achievements by the County in ensuring the safety and mobility of the traveling public and emergency responders, has and will yield positive results for the local community.

The Alleghany Road over Oregon Creek Bridge Replacement Project has accomplished its goals of improved safety, mobility and accessibility for vehicles, pedestrians, and emergency vehicles with the reopening of an alternate route.



