



## **California High-Speed Rail** **BRIEFING: SEPTEMBER 9, 2020 AGENDA ITEM #3**

**TO:** Acting Chairman Richards and Board Members  
**FROM:** Joe Hedges, Chief Operating Officer  
**DATE:** September 9, 2020  
**RE:** Road 27 Construction/Repair Issues

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### **Summary**

The California High-Speed Rail Authority (Authority) coordinated Road 27 closure with Madera County to maximize adjacent community east-west motility. Construction began on October 17, 2016 with an initial construction completion date of June 2018. However, construction and associated road reopening has been delayed over two years due to stalled utility relocations and recent precast girders post-tension strands nonconformance.

- **Utilities:** Bridge embankment completion requires multiple utility relocations. PG&E and Madera Valley Water Company (MVWC) utility relocations have experienced delays. The origin of these delays is the result of the Authority's decision to modify the guideway alignment avoiding a potential, substantial Intrusion Protection Barrier (IPB) change order. The first resulting impact was supplemental Right-of-Way (ROW) acquisition. The supplemental ROW acquisition was necessary to relocate utilities. Currently, the Authority possesses adequate land to relocate utilities for reopening the roadway. The Authority was further precluded from relocating utilities because of its inability to record PG&E land rights conveyance and lack of an MVWC Utility Relocation Agreement (Agreement). As a result of a recent agreement, PG&E utility relocation has been completed. MVWC design review is complete with signature approval pending Agreement finalization. Upon final MVWC Agreement, utility relocations will commence followed-by bridge embankment construction.
- **Post-tension strands:** Prior to post-tension strands nonconformance, the Design-Build contractor, Tutor Perini/Zachry/Parsons, Joint Venture (TPZP), was proceeding with superstructure construction. Foundational abutments are complete, girders installed, and deck installation pending. Beginning Fall 2019, TPZP notified the Authority of multiple post-tension strand failures. TPZP immediately halted work and structurally shored the structure ensuring safety. The Authority issued quality nonconformances to initiate contractor lead forensic engineering root-cause analysis and corrective-action. TPZP is accountable as the engineer of record and builder to make repairs ensuring public safety. The Authority is providing stringent contract management, and repairs are being made to the Authority's and BNSF Railway's (BNSF) satisfaction. The Authority must obtain permission from BNSF to conduct work on the structure over their property. BNSF requires this to ensure continued movement of goods through their corridor. In November 2019 and January 2020, TPZP submitted

emergent girder strand replacement plans to stabilize the structure. The Authority approved, and TPZP repaired the two effected girders as an emergent and temporary repair. In June 2020, TPZP submitted the "Completion Workplan" to commence ultimate bridge repair and resume superstructure construction. The Completion Workplan directs structure quality verification and installation of all new strands, including temporary strands and those that did not previously fail. The Authority contracted experts from Corven Engineering, Inc. for additional root-cause review and mitigation. Further, the Authority consulted Caltrans expertise to apply lessons learned from the San Francisco – Oakland Bay Bridge eastern span replacement project and confirm Authority corrective actions. The Authority approved the Completion Workplan, with Coven Engineering, Inc.'s and Caltrans' consensus. BNSF review is underway with approval anticipated September 2020.

Most construction predecessor activities are complete. The current critical path to roadway and superstructure completion is confirming root cause for recent strand failures and final MVWC Utility Relocation Agreement. The current TPZP baseline schedule for roadway reopening is Summer 2021. I am personally monitoring progress to expedite construction and roadway reopening. I will provide regular status reports until completion. There are no other structures underway that have experienced similar issues.

## **Background**

Road 27 travels over BNSF tracks and is one of two roads providing access to emergency and other commercial services for hundreds of people in the adjacent community. It is in the Northern Extension and was not included in the original scope of Construction Package (CP) 1. The road was closed to begin preparing for construction on October 17, 2016, with completion initially scheduled for June 2018. The road closure reduced access for the community to only Country Club Drive. Traffic on this route has generally increased and the road is bisected by a BNSF railway crossing that, when in use, cuts off access completely. The Authority adjusted the traffic flow on Country Club Drive to address community members' issues/concerns, including placement of a temporary traffic light in June 2017. Additionally, a series of issues in utility relocations and a recent quality issue have delayed the road re-opening. The local community has expressed frustration in person, in writing and via other stakeholder communication with Central Valley Authority staff at the lack of visible construction and no clear end to the road closure. In August 2018 and July 2019, the Authority held community meetings to explain the utility issues and construction updates. The last update provided to the community stated the road would reopen in February 2020.

## **Utility Relocations**

Water and electrical utilities must be moved to allow construction on the roadway and proposed high-speed rail guideway. The existing electrical line is parallel with Road 27 and is located south of BNSF railway and must move west. The existing water line is to the north of BNSF tracks and must move west to outside the embankment footprint. In Fall 2016, construction of the structure commenced prior to utility relocations. Traditionally, utilities are moved before construction begins. Consequently, utility relocation designs and necessary agreements have delayed construction as follows:

- ***Redesign Required Rework & Supplemental ROW.*** PG&E completed design approval in December 2016. In June 2017, the Authority redesigned guideway to avoid two miles of IPB and \$25 million in associated costs. The redesign necessitated additional PG&E review/approval and supplemental ROW acquisition and land rights conveyance prior to utility relocation. Currently, the Authority possesses adequate land to relocate utilities for reopening the roadway. Additionally, PG&E requires relocation commence within six months of design approval and land rights conveyance. The Authority produced new designs and concurrently refreshed designs older than six months to comply with current PG&E standards. The PG&E design approval needed to reopen the roadway is forecasted for July 2020. Further, PG&E and the Authority finalized an agreement (Temporary Grace Period to Convey Replacement Land Rights) in April 2020 that suspended land conveyances allowing utility relocation commencement.

- **Extensive Water Line Relocation Negotiations.** Since 2016, the Authority has been negotiating the Agreement with MVWC on oversight of Authority relocation of their water line. Initial negotiations included discussion of MVWC conducting design reviews. To expedite design reviews ahead of reaching agreement on general oversight terms, MVWC contracted separately with the Design-Build Contractor to complete design reviews via a third party. MVWC design review is complete with signature approval pending Agreement finalization. Work is currently unscheduled. Upon final Agreement, utility relocations will commence followed-by bridge embankment construction.

## Post-Tension Strands

Post-tensioning tendons are a key structural support element for girders. Post-tensioning involves placing tendons, comprised of strands, through each girder and then applying tension to provide consistent support through the girders. In April 2019, TPZP installed and tensioned post-tensioning strands at Road 27. In two separate instances in fall 2019, TPZP notified the Authority of post-tension strand failures in two girders. In both instances: 1) work was halted; 2) the bridge was structurally shored ensuring safety; and 3) the Authority directed a temporary tendon replacement workplan. Upon Authority approval of each plan, TPZP temporarily replaced the failed strands pending root-cause investigation and final superstructure corrective action plan approval. The Authority issued quality nonconformances to initiate TPZP led forensic engineering root-cause analysis and corrective-action. TPZP hired Wiss, Janney, Elstner Associates, Inc. (WJE), to investigate the cause of the issue. WJE concluded failure was due to moisture presence in the ducts and prolonged delayed grouting post tendon stressing. This resulted in corrosion and the possibility of hydrogen embrittlement and/or hydrogen-assisted cracking. Furthermore, the Authority initiated additional corrective action ensuring enhanced quality control, assurance and verification. Additional details of the Authority's response to strand failure and quality issues include:

- **Issued Stop-Work Order & Required Tendon Replacement.** On October 22, 2019, TPZP notified the Authority of Girder D strand failures. TPZP's engineer of record completed an initial assessment. This initial assessment concluded the structure was safe and stable, but further analysis followed. Upon conclusion of the further analysis and conservatively ensuring structural safety, the Authority issued a stop work order on November 4, 2019 pending TPZP's submission of tendon replacement workplan and Authority's approval. On November 7, 2019; the Authority and BNSF approved the tendon replacement workplan, and TPZP temporarily replaced failed tendons and installed additional shoring. Temporary tendon replacement concluded on November 15, 2019. On November 12, 2019, TPZP identified additional strand failures in Girder B. The Authority required a separate tendon replacement workplan. On December 4, 2019, the Authority and BNSF approved the Girder B tendon replacement plan. However, BNSF's November 15, 2019 through January 1, 2020 moratorium on work across or over their tracks delayed TPZP's repairs. TPZP completed temporary tendon replacements in January 2020.
- **Required Superstructure Completion Workplan.** As a condition of its approval of Girder B and Girder D replacement plans, the Authority issued a complete suspension of all bridge superstructure work. The Authority required TPZP to submit a Completion Workplan. TPZP contracted WJE to conduct a root-cause analysis and to assist with Completion Workplan development. In March 2020, WJE issued their findings to TPZP. TPZP submitted its initial Completion Workplan to the Authority and BNSF. This Completion Workplan addresses tendon repair (duct inspection and repair, tendon replacement and corrosion protection, and grouting) and superstructure construction resumption. In April 2020, the Authority notified TPZP of Completion Workplan inadequacies. Also, the Authority required placement of all new strands as a condition of its approval, including temporary installed strands along with those that did not previously fail. In June 2020, TPZP submitted a revised Completion Workplan. In review of TPZP's Completion Workplan, the Authority hired Corven

Engineering, Inc., a nationally recognized expert in pre-stress/post-tension to assist with its review and approval. BNSF review is underway with approval anticipated September 2020.

- **Confirmed Corrective Action.** As part of the Authority's review; it recognized corrosion, duct moisture, delayed grouting, and hydrogen embrittlement as similar root-causes encountered on the San Francisco – Oakland Bay Bridge eastern span replacement (Bay Bridge) project. The Authority consulted Caltrans' expertise to apply lessons learned from the Bay Bridge project and confirmed the Authority's corrective actions. Caltrans concurred, and indicated design was not likely a root cause.
- **Conducted Audits & In-Depth Issue Review.** The Authority applied its Lean/Six-Sigma practices in conducting Quality Control, Assurance and Verification audits as described below:
  - Independent of strand failures, the Authority's Rail and Operations Delivery Branch (Rail) and Engineering Branch (Engineering) conducted Audit 2019-006. Rail and Engineering scheduled this audit to begin September 2019 as part of the Rail Audit Plan. The audit assessed CP 1 PCM's oversight ability to verify and validate system requirements. This audit was issued in December 2019 and resulted in 13 nonconformances. Four nonconformances were specific to Road 27. The majority of nonconformances were relative to TPZP's Independent Site Engineer (ISE) performance. The ISE is responsible to verify and validate TPZP's Quality Control and Assurance Programs.
  - As a result of Audit 2019-006 and strand failure, I directed an additional CP 1 quality audit which resulted in a top-to-bottom Authority quality review. In February 2020, Engineering conducted Audit 2020-010 to further review CP 1's ISE and PCM quality performance, along with the Authority's Quality Branch oversight. The audit highlighted nonconformances in identifying root causes and effective corrective actions.
  - Since October 2019, six NCRs have been issued in response to post-tensioning strand failure, with three being converted to a Corrective Action Report (CAR). The CAR process ensures root cause documentation, and in-depth corrective action.
  - The Chief Operating Office is ensuring timely NCRs/CARs response issued to TPZP, PCM, and Rail Delivery Partner (RDP). Additional responses are expected to be complete by June 2020.
  - Further, the Authority reviewed Audit 2020-011 of CP 4 to compare to the CP 1 audits and concluded no similar ISE issues exist across CPs. In June 2020, Engineering issued a bulletin (BULL-PDEB-15) to clarify the role and expectations for ISE in quality and testing across all three CPs.

### **Prior Board Action**

Nothing specific to Road 27 issues addressed in this memorandum.

### **Discussion**

The current status of Road 27 issues is as follows:

#### **Utility Relocations**

We continue to make significant progress on our utility relocations so that, once work is complete on the structure itself, we can complete work on the embankments (areas leading up to it and away from the structure itself) for the road to be reopened as soon as possible. The Authority and PG&E continue to work together.

Although additional work with PG&E is necessary, no further work with PG&E is required for the opening of Road 27. Negotiations with MVWC continue.

## **Post-Tension Strands**

The Authority began pre-construction work on Road 27 the week of August 3, 2020. Over multiple dates in August 2020, pre-construction work crews determined that additional corrosion issues were present on multiple strands (of the 180 total on the structure) due to the presence of water previously identified. These strands were among the temporary replacements installed in November 2019 and January 2020. While the corrective action plan has always called for all strands on all 4 girders be replaced, the Authority is conducting further analysis before repair work can be completed. The Contractor's initial analysis suggests that the contractor did not repair the damaged vent tubes until July 2020. Early analysis shows that water may have gotten into the damaged vent tubes between the time the strands were replaced in November and when the tubes were repaired in July. The Authority is verifying this analysis.

The Chief Operating Officer has initiated several steps towards resolving the Road 27 strand issues.

- All girders are fully supported on temporary supports to ensure the safety of workers.
- Daily checks of strands;
- Broken strands have been removed and sent for analysis to confirm root cause;
- Testing will be done to identify/verify possible source of water intrusion;
- A full-time on-site superintendent and quality inspector have been assigned to the site during all strand repair work;
- External third-party engineering experts, Corven Engineering, Inc., will provide additional root-cause analysis review;
- The PCM's quality manager was replaced;
- A Principal Engineer was reassigned for quality control;
- Additional expert staff are being added to the CP 1 construction team for quality inspections; and
- We are partnering with Caltrans to bring on quality control engineers to provide additional expertise and assistance with quality reviews.

Further, the Authority is committed to working with the community throughout this process. Staff has already met with several supervisors, and notified residents in writing of the causes for delay. The Authority continues to look for ways to move the project forward and mitigate existing impacts but safety is always the top priority and the structures will only open once it is safe to do so.

The next steps for Road 27 include:

- Reach concurrence with BNSF on a workplan to move forward with construction.
- Complete repair work by end of October.
- Continue our work with Madera Valley Water Company on utility relocation issues.
- Continue construction of the structure with an anticipated roadway re-opening date of Summer 2021.
- Continue communication with the impacted communities so they are aware of the next steps and anticipated completion date.

## **Legal Approval**

No legal concerns with this informational item.

## **Budget and Fiscal Impact**

Road 27 is part of the 119-mile Central Valley Segment (CVS) from Madera to Poplar Avenue. The CVS has a budget of \$12.4 billion including contingencies, and that budget was adopted by the Board in May 2019. The costs of Road 27 are funded within this existing budget.

<b>REVIEWER INFORMATION</b>	<b>SIGNATURE</b>
Reviewer Name and Title: <b>Brian Annis,</b> <b>Chief Financial Officer</b>	Signature verifying budget analysis: <b>Original Signed September 3, 2020</b>
Reviewer Name and Title: <b>Alicia Fowler,</b> <b>Chief Counsel</b>	Signature verifying legal analysis: <b>Original Signed September 3, 2020</b>

**Recommendations**

This item is informational.

**Attachments**

No attachments