

# Memorandum

Date: August 21, 2024 (Updated on August 29, 2024)

Subject: Benefit Cost Analysis for Sespe Creek Overflow Railroad Bridge Repair Alternatives

To: Amanda Fagan  
Director of Planning and Sustainability, VCTC

From: Julina Corona, P.E.  
Project Manager, RailPros

---

## Background

This memorandum addresses the Benefit-Cost Analysis (BCA) requested by FEMA for evaluating three repair alternatives for the Sespe Creek Overflow railroad bridge. The bridge suffered damage during the January 2023 storms, which resulted in the washout of three of its 15 spans. A subsequent storm in February 2024 further compromised the bridge structure.

The three alternatives evaluated include:

1. Partial Bridge Repair: Replacing the three washed-out spans in accordance with Consensus-Based Codes, Specifications, and Standards (CBCSS).
2. Complete Bridge Replacement: Replacing all 15 spans (addressing damages from both the January 2023 and February 2024 storms) to meet CBCSS, including raising the bridge.
3. In-Kind Repair: Replacing the three washed-out spans with in-kind materials from the original 1969 construction.

The rough order of magnitude estimates provided in this analysis are intended for FEMA's use in further comparison.

## Alternative Design Assumptions and Analysis

### Alternative 1: Partial Bridge Repair (CBCSS)

Description: This alternative proposes replacing the three washed-out spans with two longer spans while adhering to CBCSS. The repair elevation would be limited to match the existing top-of-rail elevation of the remaining bridge segment.

**Limitations:** This alternative does not meet the hydraulic design criteria established by SCRRRA due to elevation constraints. Specifically, the water surface during a 50-year event and the energy grade line during a 100-year event exceed the allowable limits, posing potential flood risks. The proposed bridge repair segment will be designed to resist hydrostatic pressure, making the structure resilient if ever inundated.

#### Alternative 2: Complete Bridge Replacement (CBCSS)

**Description:** This alternative involves replacing the entire bridge, raising it by approximately 3.5 to 4 feet to meet hydraulic design criteria. The raised track would gradually approach the original ground line, avoiding impacts to nearby railroad crossings and bridges.

**Cost Consideration:** This is the most expensive alternative, accounting for the full replacement of all 15 spans and the necessary track adjustments at both bridge approaches to accommodate the raising of the bridge. However, it does not consider potential impacts to the adjacent levee, which could substantially increase costs if triggered.

**Benefits:** This alternative provides the highest level of resilience against future storm events and fully complies with hydraulic design criteria.

#### Alternative 3: In-Kind Repair

**Description:** This alternative proposes an in-kind replacement of the three washed-out spans using materials and designs consistent with the original 1969 construction. The estimate includes optional channel grading, which is essential for the structure's stability. Under Clean Water Act (CWA), project compensatory mitigation is required for permanent physical loss of area, ecological degradation, and temporal loss resulting from creek bed reconstruction. Additional cost impacts related to the compensatory mitigation will need to be considered.

**Cost Consideration:** The cost of this alternative without the Option is 11.9% lower than Alternative 1, excluding the necessary channel grading. However, it is important to note that without this grading, the structure is likely to fail.

**Limitations:** This alternative does not address the significant changes in channel grade since 1969 and does not raise the bridge. This repair without creek reconstruction would be vulnerable to failure due to scour in the next large storm event. Additionally, due to known soil conditions, driving piles may not be feasible, further complicating construction.

## Recommendation

After evaluating the three alternatives, the proposed repair is Alternative 1. Although it does not fully meet the hydraulic design criteria, it balances cost-effectiveness with improved resilience over the in-kind repair approach. The cost of Alternative 1 is 31.8% of the cost of a full bridge replacement and only 11.9% higher than the in-kind repair excluding the channel regarding.

Based on the analysis, Alternative 1 is recommended as it offers an optimal balance of cost-effectiveness and enhanced performance. This option provides significant improvements to the current situation and addresses many of the identified concerns. While it represents a substantial step forward in mitigating potential issues, it's important to note that, as with any infrastructure project, some residual challenges may remain, particularly during extreme weather events. Ongoing monitoring and adaptive management strategies will be crucial to ensure long-term resilience and effectiveness.

## Sespe Creek Bridge Repair Cost Alternative Tables

### Alternative 1: Consensus Based Codes, Specifications and Standards (CBCSS) Partial Bridge Repair Replacement of 3 Washed Out Spans with 2 Longer Spans

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
General Requirements	Traffic Control, Mobilization, Demobilization, Erosion Control	LS	1	\$ 807,444.00	\$ 807,444.00
Concrete	Reinforcing Steel and Cast-in-Place Concrete	LS	1	\$ 1,251,411.50	\$ 1,251,411.50
Metals	Miscellaneous Iron and Steel	LS	1	\$ 8,086.50	\$ 8,086.50
Earthwork	Site Clearing and Excavation	LS	1	\$ 1,271,525.00	\$ 1,271,525.00
Exterior Improvements	Furnish and Install of Cofferdam/Temporary Improvement	LS	1	\$ 39,000.00	\$ 39,000.00
Transportation (Rail Grade Highway Crossings)	Temporary Crossing and K-rail Installation/Removal	LS	1	\$ 15,000.00	\$ 15,000.00
Transportation (Track Construction)	Furnish and Install New Track, Ties, Sub-Ballast, and Insulated Joints	LS	1	\$ 124,094.00	\$ 124,094.00
Transportation (Railroad Bridges)	Furnish and Install Girders, decking, Rip Rap, Elastomeric Bearings, and Hardware	LS	1	\$ 3,615,559.32	\$ 3,615,559.32
Finished	Graffiti-Resistant Coating	LS	1	\$ 53,029.00	\$ 53,029.00
<b>Total</b>					<b>\$ 7,185,149.32</b>

### Alternative 2: Full Bridge Replacement for 15 Spans

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
General Requirements	Traffic Control, Mobilization, Demobilization, Erosion Control	LS	1	\$ 807,444.00	\$ 807,444.00
Concrete	Reinforcing Steel and Cast-in-Place Concrete	LS	1	\$ 4,753,161.75	\$ 4,753,161.75
Metals	Miscellaneous Iron and Steel	LS	1	\$ 36,389.25	\$ 36,389.25
Earthwork	Site Clearing and Excavation	LS	1	\$ 1,271,525.00	\$ 1,271,525.00
Exterior Improvements	Furnish and Install of Cofferdam/Temporary Improvement	LS	1	\$ 39,000.00	\$ 39,000.00
Transportation (Rail Grade Highway Crossings)	Temporary Crossing and K-rail Installation/Removal	LS	1	\$ 15,000.00	\$ 15,000.00
Transportation (Track Construction)	Furnish and Install New Track, Ties, Sub-Ballast, and Insulated Joints	LS	1	\$ 320,862.00	\$ 320,862.00
Transportation (Railroad Bridges)	Furnish and Install Girders, decking, Rip Rap, Elastomeric Bearings, and Hardware	LS	1	\$ 15,284,647.00	\$ 15,284,647.00
Finished	Graffiti-Resistant Coating	LS	1	\$ 53,029.00	\$ 53,029.00
<b>Total</b>					<b>\$ 22,581,058.00</b>

### Alternative 3: In-Kind Replacement for 3 Washed Out Spans

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
General Requirements	Traffic Control, Mobilization, Demobilization, Erosion Control	LS	1	\$ 807,444.00	\$ 807,444.00
Concrete	Reinforcing Steel and Cast-in-Place Concrete	LS	1	\$ 1,250,494.00	\$ 1,250,494.00
Metals	Miscellaneous Iron and Steel	LS	1	\$ 8,086.50	\$ 8,086.50
Earthwork	Site Clearing and Excavation	LS	1	\$ 2,355,498.00	\$ 2,355,498.00
Exterior Improvements	Furnish and Install of Cofferdam/Temporary Improvement	LS	1	\$ 39,000.00	\$ 39,000.00
Transportation (Rail Grade Highway Crossings)	Temporary Crossing and K-rail Installation/Removal	LS	1	\$ 15,000.00	\$ 15,000.00
Transportation (Track Construction)	Furnish and Install New Track, Ties, Sub-Ballast, and Insulated Joints	LS	1	\$ 124,094.00	\$ 124,094.00
Transportation (Railroad Bridges)	Furnish and Install Girders, decking, Rip Rap, Elastomeric Bearings, and Hardware	LS	1	\$ 1,769,409.00	\$ 1,769,409.00
Finished	Graffiti-Resistant Coating	LS	1	\$ 53,029.00	\$ 53,029.00
<b>Total</b>					<b>\$ 6,422,054.50</b>
<b>OPTION 1</b>					
Optional Grading	Emergency Embankment Grading, Rip Rap, Structural Backfill	LS	1	\$ 15,441,675.20	\$ 15,441,675.20
<b>Total with Option 1</b>					<b>\$ 26,219,759.70</b>

8/21/2024