Missoula County Bridge Rehabilitations Preliminary Engineering Report

- *Petty Creek Road Clark Fork River Bridge*

Prepared For: Missoula County Public Works

Prepared by: Christopher Agro, PE

Reviewed by: Charlie Brisko, PE
Date: 03/19/2025

Morrison-Maierle
1055 Mount Avenue
Missoula, MT 59801

Morrison Maierle
engineers ▪ surveyors ▪ planners ▪ scientists

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1. INTRODUCTION

Missoula County has a need to rehabilitate the Petty Creek Road Bridge which crosses the Clark Fork River. The structure has its own unique needs that mostly include deficiencies in the concrete bridge deck. The structure has been reviewed by Morrison Maierle using available as-built plans, documented bridge inspection reports, and a field visit to the site. Potential rehabilitation efforts have been analyzed for effectiveness, constructability, service life, public need, and cost. Preferred rehabilitation efforts are suggested.

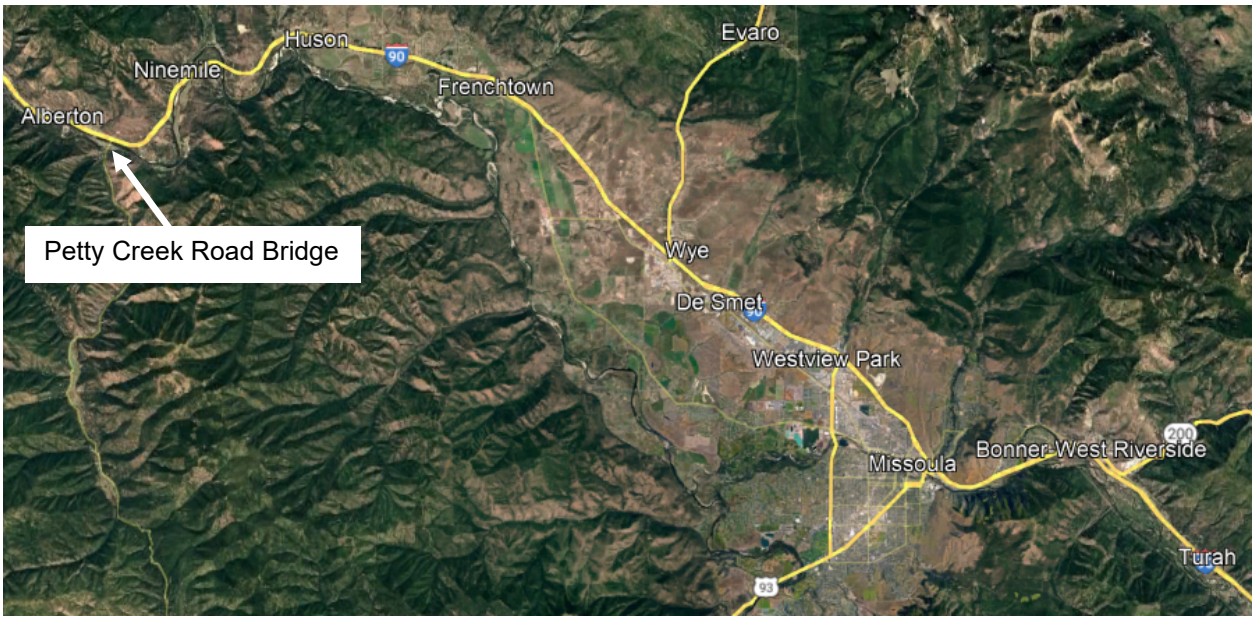

FIGURE 1: LOCATION MAP

Bridge rehabilitation is a common and successful way to extend the service life of a structure while limiting costs. Often certain aspects of the bridge can be in deteriorated condition and threaten the safety of the bridge while most others are in satisfactory condition. In these cases, it is much more cost effective to rehabilitate the aspect in deteriorated condition rather than replace the entire structure.

2. BRIDGE OVERVIEW

The Petty Creek Road structure at milepost 0.9 was originally constructed in 1964. The three-span bridge is 456.9-feet in length and 27.9-feet wide. The structure is a continuous span steel two girder system with truss floorbeams and a concrete deck. The cast-in-place concrete deck is showing signs of deterioration and has a condition rating of 5 (Fair) as of the 2023 Montana Department of Transportation (MDT) bridge inspection. Inspections note the presence of delaminations, spalls, and transverse cracking in the concrete bridge deck. The inspection report noted the following repair suggestions; remove debris identified underwater at Bent 3, remove debris on bearings, remove debris on girders, cut trees and brush impacting bridge, repair deck spalls, and remove debris from bridge deck.

FIGURE 2: PETTY CREEK ROAD BRIDGE GENERAL VIEW

FIGURE 3: PETTY CREEK ROAD BRIDGE DECK

A field visit conducted by Morrison Maierle confirmed these deficiencies and Morrison Maierle recommends making these repairs. Overall, the structure appears to be performing well and the main structural deficiency is the concrete deck. The 2023 MDT bridge inspection noted the following in the deck:

- 28 square feet of spalls with 3 square feet of exposed rebar and 8 square feet of unsound patches
- 1,531 square feet of delaminations
- Abrasion/wear in wheel paths
- 480 square feet of developing jump cracks
- Full depth cracks in the soffit of span 1 every 5 feet

3. REHABILITATION OPTIONS

There are three suitable methods to repair the existing concrete deck. See Appendix A for detailed cost estimates.

1. Mill and Overlay [$1,015,000]
    a. Hydromill the existing top of deck down approximately 2” (enough to remove most of the anticipated chlorides in the deck).
    b. Repair any spalls or delaminations still present in the deck using MDT’s Class A and Class B repair methods.
    c. Pour a concrete overlay equal in thickness to the milling depth.
    d. Groove the new overlay.
    e. Crack seal curbs.

2. Localized Deck Repairs [$450,000]
    a. Repair all known spalls and delaminations in the deck using MDT’s Class A and Class B repair methods.
    b. Crack seal bridge deck surface.

3. Deck Replacement [$4,230,000]
    a. Remove existing deck and railing entirely down to existing steel girders and stringers.
    b. Clean the tops of existing steel girders and stringers.
    c. Cast a new concrete deck with epoxy reinforcing steel and strip seal expansion joints.
    d. Cast new concrete barrier rails or steel bridge rail.
    e. Groove and crack seal the new deck.

4. DISCUSSION AND RECOMMENDATION

Degradation of reinforced concrete bridge decks is caused by several factors. Wheel traffic alone causes deficiencies such as abrasion and wear. More significant degradation can progress from minor cracks in the concrete as they allow moisture into the deck and can lead to freeze-thaw damage. Additionally, cracks can allow salts from anti-icing/deicing efforts to penetrate the deck and cause chloride-induced corrosion which is a leading contributor to the degradation of reinforced-concrete bridge decks. The reinforcing steel corrodes, and the expansive products of this corrosion further fracture the concrete. MDT has standard methods for sampling and testing concrete bridge decks for chloride penetration using core samples. While the County does not use deicing salts on this structure, its proximity to the interstate could make it susceptible to chloride-induced corrosion. Chloride testing would provide a better overview of the condition of the deck and would assist in determining the best repair method.

Further inspection of the deck surface could also help determine the best repair method. A common method for measuring spalls and delaminations is to sound the surface using the chain drag method. This was most likely done by MDT during the routine inspection; however, it is useful to obtain an up-to-date and detailed inspection of the surface. This would accurately mark areas for localized repairs or be helpful in determining if a full mill and overlay is warranted and comes at a minimal cost.

The potential detour for a full bridge closure is approximately 1.5 hours (48 miles) using Southside Road to the east. Therefore, full bridge closure is not preferred at this site. The roadway width on the bridge is 24.5 feet. Although it slightly increases the overall cost of the rehabilitation, a full deck mill and overlay could be completed in phases that would maintain continuous one-way traffic on the bridge. Isolated deck repairs could also be completed while maintaining continuous one-way traffic. Due to the configuration of the bridge superstructure members, girder-floorbeam-stringer, phased construction of a deck replacement option is most likely not feasible and full bridge closure with detour would be necessary. Accelerated Bridge Construction (ABC) techniques such as precast concrete deck panels or high early strength concrete could reduce closure time or allow for short-term nighttime closures. ABC techniques could increase the construction costs by 2 to 4 times the estimated cost.

The recommended repair is to mill and overlay the existing concrete deck. While it has a higher cost than performing localized repairs it also has multiple benefits, such as, a smoother riding surface, better protection for long term service life, removes concrete that may have chloride penetration, repairs abrasion and wear in wheel paths, and it is more visually appealing to users. Full deck replacement is not warranted currently. Chloride sampling and detailed surface inspection of the deck would help determine if mill and overlay is more suitable than localized repairs and would provide guidance for mill and overlay depths.

5. APPENDIX A – COST ESTIMATES

COST ESTIMATE

Prepared By: Morrison Maierle

Missoula County Bridge Rehabilitations
Preliminary Engineering Report

Petty Creek Road Clark Fork River Bridge - Mill and Overlay

Job No.	674015		
Computed	CCA	Date	1/15/2025
Checked	CEB	Date	3/19/2025
Sheet No.	1	Of	1

ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
DECK MILLING	SY	1244	$142	$176,648
CONCRETE OVERLAY	CY	69	$1,800	$124,200
CRACK SEALANT	SY	220	$50	$11,000
DECK GROOVING	SY	1140	$30	$34,200
CLASS A REPAIRS	SY	44	$816	$35,904
CLASS B REPAIRS	SY	5	$1,500	$7,500
TRAFFIC CONTROL	LS	1	$50,000	$50,000
DESIGN ENGINEERING, BID DOCS, AND PUBLIC INTEREST	LS	1	$100,000	$100,000

BASE CONSTRUCTION SUBTOTAL		**$539,452**
MOBILIZATION (20%)		$107,890
	SUBTOTAL	**$647,342**
CONTINGENCIES (40%)		$258,937
CONSTRUCTION ENGINEERING (12%)		$108,754
TOTAL ESTIMATED COST		**$1,015,033**

COST ESTIMATE

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Petty Creek Road Clark Fork River Bridge - Localized Deck Repairs

Job No.	674015		
Computed	CCA	Date	1/15/2025
Checked	CEB	Date	3/19/2025
Sheet No.	1	Of	1

ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
CRACK SEALANT	SY	1245	$16	$19,920
CLASS A REPAIRS	SY	174	$816	$141,984
CLASS B REPAIRS	SY	5	$1,500	$7,500
TRAFFIC CONTROL	LS	1	$25,000	$25,000
DESIGN ENGINEERING, BID DOCS, AND PUBLIC INTEREST	LS	1	$45,000	$45,000

BASE CONSTRUCTION SUBTOTAL		**$239,404**
MOBILIZATION (20%)		$47,881
	SUBTOTAL	**$287,285**
CONTINGENCIES (40%)		$114,914
CONSTRUCTION ENGINEERING (12%)		$48,264
TOTAL ESTIMATED COST		**$450,463**

COST ESTIMATE

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Petty Creek Road Clark Fork River Bridge - Deck Replacement

Job No.	674015		
Computed	CCA	Date	1/15/2025
Checked	CEB	Date	3/19/2025
Sheet No.	1	Of	1

ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
REMOVE DECK	SY	1416	$428	$606,048
NEW DECK CONCRETE	CY	303	$1,600	$484,800
EPOXY REINFORCING STEEL	LB	90830	$3.20	$290,656
36" CONCRETE BARRIER RAIL	LF	915	$250	$228,750
DECK GROOVING	SY	1140	$30	$34,200
CRACK SEALANT	SY	1245	$50	$62,250
STRIP SEAL DECK JOINTS	LF	54	$780	$42,120
TRAFFIC CONTROL	LS	1	$100,000	$100,000
DESIGN ENGINEERING, BID DOCS, AND PUBLIC INTEREST	LS	1	$400,000	$400,000

BASE CONSTRUCTION SUBTOTAL		**$2,248,824**
MOBILIZATION (20%)		$449,765
	SUBTOTAL	**$2,698,589**
CONTINGENCIES (40%)		$1,079,436
CONSTRUCTION ENGINEERING (12%)		$453,363
	TOTAL ESTIMATED COST	**$4,231,387**