BEAVERHEAD COUNTY

Preliminary Engineering Report

Anderson Lane Bridge over the Beaverhead River
(MDT Bridge # - 02209)

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BEAVERHEAD COUNTY PRELIMINARY ENGINEERING REPORT
ANDERSON LANE BRIDGE OVER THE BEAVERHEAD RIVER
(MDT BRIDGE # - 02209)

List of Appendices

ANDERSON LANE BRIDGE OVER THE BEAVERHEAD RIVER (MDT# - 02209)

I. Executive Summary

The Anderson Lane Bridge is the primary access to an area serving agricultural, residential and recreational users. The bridge provides access to numerous residences, several agricultural operations, State lands, BLM lands, and is a critical cut-across route through this section of the Beaverhead River Valley. Currently, the bridge serves an estimated 100 residential, recreational and agricultural vehicles per day during regular season though in peak season the traffic is likely higher. Additionally, the bridge acts as an informal fishing access to the Beaverhead River.

The limited load capacity, structural condition and limited width of the bridge create a serious threat to overall public safety and represents a liability to the County. The existing bridge has a National Bridge Inventory (NBI) Sufficiency Rating of 24.1, structure appraisal rating of 3, substructure rating of 5, superstructure rating of 5, deck rating of 5 and posted load limit of 6 tons for Type 3 trucks. The superstructure, consisting of a steel pony truss is incapable of supporting legal loading. The steel truss members exhibit deformations due to collision damage at several areas. Steel floor beams and stringers exhibit corrosion and isolated areas of section loss. The steel truss bearings are in poor condition and likely non-functional. The concrete deck is in fair condition due to transverse cracks, surface abrasion at wheel lines and areas of exposed reinforcing near the floor beams on the deck underside. The mass concrete abutments and wingwalls exhibit spalling, abrasion and large full height vertical cracks. Abutment 1 had an undermined section which was temporarily repaired in 2020. Repairing or rehabilitating the Anderson Lane Bridge to meet current standards would include replacement of the bridge superstructure; widening of the structure; installation of standard bridge rail and approach rail. Furthermore, at 98 years old, the bridge is at the end of its useful life. Due to undesirable environmental impacts, high cost, and limited remaining life; it is in the best interest of the County to replace the bridge rather than conduct repairs or rehabilitation. A new structure would have a useful life of 75 to 100 years and require substantially less maintenance.

Several bridge replacement alternatives were investigated during the preparation of the Preliminary Engineering Report. The prescreening selection process revealed single-span precast, prestressed concrete bulb tee beams and steel girder beams w/concrete deck to be acceptable bridge superstructure alternatives. Bridge substructure alternatives investigated included driven piling and cast-in-place concrete spread footings. The alternatives were evaluated with a comparative analysis, which examined initial cost, operation and maintenance costs, technical feasibility and environmental impacts. The preferred alternative for the Anderson Lane Bridge is a full bridge replacement with a new, 130-foot single-span, prestressed concrete bulb tee beam superstructure on a driven pile foundation resulting in a total contracted project cost of $1,834,038.

An Environmental Assessment (EA) has been prepared for this project in accordance with Montana Environmental Policy Act (MEPA) guidelines. All necessary stream permits will be obtained from relevant agencies prior to construction and any requirements will be adhered to. The replacement structure will be located in the same general location as the existing bridge and will have a span of 130 feet and a useable width of 24 feet. The new structure will accommodate all loading requirements, increase public safety, improve waterway efficiency and conform to current County Bridge Standards. A new structure at this location will ensure residential, farming, ranching and commercial users will have continued access to the area for years to come.

II. Problem Definition

A. Area Served by the Bridge

1. Location of Bridge

Please refer to Figures 1, 2 and 3 within Appendix I for a location map, site map and topographic map of the project site.

Anderson Lane crosses the Beaverhead River approximately 1.1 miles west along Anderson Lane from the Montana Highway 41 intersection. Anderson Lane is a County maintained gravel thoroughfare classified as a local road and is a primary east-to-west connector route in the Beaverhead Valley north of Dillon. The bridge is located in Township 6 South, Range 8 West, and Section 22; at latitude 45°18'18.20" North and longitude 112°33'47.60" West; and at an approximate elevation of 4,960 feet.

2. Physical Characteristics of the Area

a) Localized Topography

The bridge is located on a short tangent section of Anderson Lane with horizontal curves at both approaches. The road generally travels in an east to west direction and is bounded by MT Highway 91 to the east and MT Highway 41 to the west. The total road length of Anderson Lane is 5 miles between these points and the road is posted at 35 MPH. The roadway at the bridge has been built up through the Beaverhead River floodplain and is relatively flat but increases in grade to get to the bridge approaches at both ends.

Figure 1: Existing bridge crossing

The Beaverhead River floodplain is approximately 4 miles wide at the bridge. The floodplain is bounded to the east and west by benches, which rise to heights of around 200 feet above the floodplain elevation.

b) Geology and Seismic Activity

According to the Hydrogeologic Investigation of the Lower Beaverhead Study Area Beaverhead County, Montana Groundwater Modeling Report (Butler and Abdo, 2013), the geologic framework in the bridge area ranges from Mississippian to Quatenary in age. The bedrock surrounding the valley consists of crystalline metamorphic rock. The floodplain area consists of relatively young and shallow Quatenary deposits are comprised of clays, silts, sands and gravels.

There is active seismic activity in the bridge area. As described in Butler and Abdo: *"The structural controls in the Beaverhead River Basin include the northeast-trending Ruby Fault Zone along the basin's southeast side, and the northeast trending faults within the river valley….The July 2005 Dillon earthquake and other recent seismic activity indicates that some of the faults in the basin are active."* The southern portion of Beaverhead County is located on the Intermountain Seismic Belt and in the middle of the Centennial Tectonic Belt. Each year, several hundred tremors are reported in the area. Refer to Appendix V for a map of recent seismic events in the general bridge area.

c) Soils

Review of NRCS USDA Soil Maps indicate the parent soil material at the bridge site is classified as Beavrock, occasionally flooded-Threeriv, frequently flooded complex, 0 to 4 percent slopes. Generally, these soils are considered to be fair to good subgrade material (Primarily AASHTO Classification A-1). Information is available describing physical and chemical properties of the soils typically found within the unit. An important property of the soils that may affect the project is the propensity of the soils to corrode concrete and steel. Therefore, each of these properties was analyzed. The soil within the primary bridge area is rated as "low" risk of corrosion to concrete and "high" risk of corrosion to steel. A report listing the risk of corrosion to concrete and steel is included in Appendix IV.

Review of available well log information in the general area provided additional information for possible subgrade conditions. In general – review of the well logs from the MBMG Groundwater Information Center Groundwater Information Center (GWIC) yield the following for possible subsurface conditions:

- 0-5 feet: Overburden/topsoil
- 5-30 feet: Sandy gravels
- 30-55 feet: Tan Clay
- 55-60 feet: Claystone
- 60-70 feet: Gravels

Refer to Appendix I of this report for an area soil map. Detailed soil information and well logs can be found in Appendix V.

d) Land Use and Vegetation

Adjacent property in the vicinity of the bridge consists exclusively of private property with four different landowners. The properties in the vicinity of the bridge are primarily agricultural operations classified by the NRCS as “farmland of local importance”. The nearest residence to the bridge is located about 1400 feet east of the structure. At their nearest, haying operations are present 200 feet northwest of the bridge.

There is an irrigation diversion structure spanning the full width of the Beaverhead River located just upstream of the bridge. This diversion provides flow to the Staudaher – Bishop Ditch and crosses under the existing roadway in a large culvert approximately 65 feet from the east bridge abutment. The water rights for this ditch go back to 1877 and the ditch water is currently utilized for irrigation and stock watering. The diversion is a “pin and plank” style diversion that utilizes boards to control water flow into the headgate.

Figure 2: View of Staudaher – Bishop Diversion (courtesy of MDT)

A pullout and parking area is located near the Staudaher – Bishop Ditch Headgate. The public also utilizes this location as a fishing access location and boating access, though this is not an official Montana FWP fishing access location.

Figure 3: Aerial View of Bridge and Adjacent Irrigation Infrastructure

Vegetation in the direct vicinity of the bridge consists of native grasses and willows.

e) Hydrology and Flow Management

The Beaverhead River is formed by the confluence of the Red Rock River and Horse Prairie Creek at Clark Canyon Reservoir. Its watershed extends to the Continental Divide at the border between Montana and Idaho, and it drains a large portion of southwest Montana. The basin is confined by the Ruby Mountains to the east, Pioneer Mountains to the west, and Tendoy, Snowcrest and Blacktail Mountain Ranges to the south. Primary tributaries downstream of the reservoir include Grasshopper Creek, Blacktail Deer Creek and Rattlesnake Creek. The Beaverhead River combines with the Big Hole River to form the Jefferson River approximately 43 miles downstream of the Anderson Lane Bridge.

Clark Canyon Dam finished construction in 1964 for the purpose of storing and regulating water for downstream irrigation use. Other practical functions of the dam and reservoir include flood control and recreation. The irrigation uses downstream of the dam are significant. From the recent 2017 Beaverhead River Channel Migration Mapping Report, completed by DTM Consulting and Applied Geomorphology for the Ruby Valley Conservation District explain on Page 21, *"The Clark Canyon Water Supply Company (CCWSC), which serves over 28,000 acres of irrigated lands, lists 70 diversion points from the Beaverhead River. Most of the water is used to irrigate alfalfa and grass hay with a smaller fraction of cereal grain, potatoes, and irrigated pasture (CCWSC, 2004). The Montana Department of Natural Resources and Conservation Water Rights data lists approximately 500 claimed Points of Diversion from the Beaverhead River, including 358 headgates."* During the summer and fall months, flows in the Beaverhead River are considerably reduced due to high irrigation demand.

Review of the previously referenced Beaverhead River Channel Migration Mapping report indicates that there is a history of channel impact activities in the channel reach downstream of the bridge, from Page 56, "*Reach 9 consists of the 6.6 miles of river downstream of Anderson Lane Bridge, ending near Staudaher East Side Ditch. Immediately below the bridge the channel appears to have been straightened prior to 1955. The river locally flows against a low terrace on the east valley wall, but otherwise occupies a wide, broad floodplain. In general, Reach 9 hosts a meandering channel through a cottonwood corridor with variable tree densities. There are numerous historic cutoffs, avulsions, and areas of high avulsion risk (Figure 56). The entire reach shows a major loss of riparian cover since 1955 and 1979."*

An inactive U.S. Geological Survey (USGS) gaging station (Gage # 06018000) was historically located at the bridge site and was active from 1951-1953 and from 1964-1983. The watershed area at the bridge is 3,484 square miles. A hydrologic study was completed for the Beaverhead River in 2017 by the DNRC, titled Beaverhead River Floodplain Study – Phase II - Beaverhead River Hydrologic Analysis. This report completed a full study using a multitude of method and techniques, including specific hydrology at the bridge location. The studies recommended results for the 2, 25, 50 and 100-year flood events. The estimated flows are shown in the table below:

Storm Event	Design Flow (CFS)
Q2	585
Q25	1460
Q50	1710
Q100	1960

Refer to Appendix III for supporting hydrologic information.

f) Historic Flooding, Ice Jams and Floodplains

Review of both previously referenced reports, Beaverhead River Channel Migration Mapping and Beaverhead River Floodplain Study – Phase II, indicate that flooding events in the Beaverhead River have been impacted significantly from the installation of the dam. Prior to 1964 (construction of the Clark Canyon Dam), flood events over 10-year return interval were commonplace. After 1964 – flood events were relatively rare and the hydrology of the river had been altered substantially. Since the construction of the dam, no recorded flow event has occurred above the 50-year flood occurrence.

Historically, flooding on the Beaverhead River was caused by flows driven by spring snowmelt and also periodic flooding in late winter from ice jams. The Beaverhead River Channel Migration Mapping report indicates, on Page 4, that *"Downstream of Dillon, the river is slightly perched above the floodplain area to the west. Ice jams are common. With potential contributing factors, such as woody debris jamming, sediment slugs, tectonic deformation, or ice jams, dramatic change could potentially occur virtually anywhere on the floodplain."* Most of the reported ice jams on the Beaverhead River occur in the Twin Bridges area. There are no reported ice jams at the bridge vicinity.

While the site is not currently located in an approved mapped FEMA Floodplain area, Montana DNRC/FEMA have completed a floodplain study on this reach of the Beaverhead River and is scheduled to be effective at a future date in 2022.

3. Users of the Bridge

a) Use of Structure

The Anderson Lane Bridge primarily serves residential, agricultural, and recreational users. The existing structure is the only County-maintained connector between MT Highway 41 and MT Highway 91 and is centrally located in the valley. It is heavily used by agricultural producers on a daily basis. Private property in the vicinity of the bridge is utilized primarily for grazing and cropland production. Residents, farmers, and ranchers typically cross the bridge on a daily basis to access their property, transport agricultural produce or cattle to market, utilize local services in Dillon, travel to work, and/or take children to school. Historically, prior to the load limit deficiencies restricting traffic, the Anderson Lane Bridge was used during the cattle shipping season by ranchers transporting equipment, cattle and materials. There are no waste management services in the area, as such, residents and businesses (including agricultural operations) utilize the bridge on a regular basis to access County managed waste disposal sites.

Agriculture is the primary driver of the Beaverhead County economy – with both cattle ranching and crop production being extremely critical for the livelihood of many County residents. Water for agricultural operations assisting both ranching and hay production activities has historically been used since the late 1800's from the Beaverhead River. Current irrigation methods consist of a combination of flood, wheel line and pivot. Recent water conservation efforts have resulted in a progression towards pivot irrigation. The primary crop production in these irrigated areas is alfalfa hay, however grass hay, spring wheat and potatoes are also harvested.

Local ranch manager, Robert Van Deren, indicates, *"We would like to see a new bridge that carry the weight of loaded semi-truck and trailers over the river. This would help our neighbors living on one side of Anderson Lane avoid a trip to Dillon to get a semi-load of hay, grain, cattle, cake, etc to the other side of the river on Anderson Lane."*

Local rancher and primary water right holder of the Staudaher – Bishop Irrigation Ditch/Diversion, Ed Malesich, indicates*, "I am writing to express my strong support for the proposed Anderson Lane bridge replacement project….Part of my interest in the project lies in the fact that our irrigation ditch passes under Anderson Lane within 50 ft of the east end of the bridge, also our diversion dam is less than 200 ft upstream from the bridge. I feel both of these need to be addressed during construction of the new bridge…"*

In addition to the residents and agricultural operations, closure of the bridge would have a significant effect on recreational users. A considerable tract of State Trust land (nearly 20 square miles) is located west of the bridge near Bond. BLM lands are also located west of these State Trust Lands. The existing bridge also lies in big game Hunting District 340, which gives hunters opportunities to pursue multiple species of game including black bear, antelope, deer, elk and moose. The bridge provides public river access to fisherman and is highly utilized throughout the spring, summer and fall months. Closure of the existing bridge would severely limit the recreational opportunities on the nearby state and federal lands and the river corridor itself.

Refer to Appendix IV for documentation from bridge users.

b) Number of Users

No formal traffic counts on Anderson Lane have been completed by either Beaverhead County or the Montana Department of Transportation (MDT). On their most recent bridge inspection report, MDT noted the Average Daily Traffic (ADT) as 100 vehicles, which is a default value they typically utilize for low volume roadways with no data available. Discussion with the Beaverhead County Road Department indicate that the road generally sees around 100 ADT as a baseline for residents, agricultural operations and use as a cut across route. The numbers increase substantially in the summer and fall months, likely up to 150-200 ADT, with increased recreational activity and as a primary farm-to-market route for hay and potato farmers. Many fishing guide services utilize the road as a cut across route for access to the Big Hole, Beaverhead and Ruby Rivers. It should be noted that the Beaverhead Valley has experienced and continues to experience growth, especially in rural areas.

c) Growth Areas and Population Trends

According to Montana's Census and Economic Information Center, the population of Beaverhead County increased 1.4% between 2010 and 2020. This trend has been observed in numerous recreational and agricultural communities throughout the state. As stated earlier, Anderson Lane is the only direct east to west route to this area of the Beaverhead River Valley north of Dillon. As such, traffic over the Anderson Lane Bridge is expected to increase in the future. Refer to Appendix V of this report and the Grant Application for correspondence from Beaverhead County and other Agencies.

B. Evaluate Condition of Existing Bridge

1. History

The Anderson Lane Bridge is a single-lane, single-span steel pony truss bridge on a mass concrete foundation. The bridge has a total span of 100 feet and clear span of 96 feet. The total deck with is 16.33 feet and the usable width is 15.5 feet. The clear opening between the bottom of the truss and the Beaverhead River streambed is approximately 9 feet.

MDT Historian, Jon Axline, has provided documentation based on the Montana Historic Property Record (Site 24 BE 2062) about the history of the bridge. The following summarizes the history of the existing Anderson Lane Bridge, *"Floods in February 1923 washed out the old Beaverhead River bridge and significantly damaged Anderson Lane. The damage was bad enough that postal authorities threated to discontinue the mail route on Anderson Lane unless the road was repaired. County forces began work on improvements to Anderson Lane in September 1923. On September 15, 1923, the Beaverhead County commissioners met to open bids for the construction of two steel bridges, one across the Beaverhead River on Mooney Road and the other on Anderson Lane. The commissioners received bids from seven contractors, including William P. Roscoe and the Security Bridge Company. The panel chose to award the contract for both bridges to Angus McGuire and Evarts Blakeslee for their low bid of $15,687. Bridge engineer George Metlen (formerly of the State Highway Commission) and County Surveyor C. R. Kellogg provided advice on the best proposal to the commissioners. The bridge's design [Warren style pony truss] was developed by engineer Charles A. Kyle in 1915 for the Montana State Highway Commission. In early December 1923, the county commissioners, along with Blakeslee and contractor R. T. Wempel (who had bid on the project in September) visited the Anderson Lane construction site to inspect the bridge's concrete abutments. On February 4, 1924, the commissioners formally accepted the bridge from McGuire and Blakeslee and authorized final payment for the structure. With the acceptance of the bridges, there were no longer any wooden bridges across the Beaverhead River in Beaverhead County."*

The bridge substructure consists of a reinforced cast-in-place mass concrete foundation. Concrete wingwalls are present at each corner and extend out 7 feet at a 45-degree angle. No original bridge plans are available and the bridge foundation is unknown. Based on recent undermining of Abutment 1, no piles or other supports appeared visually present under the abutment footing.

The bridge superstructure consists of a single-span steel riveted Warren pony truss. The truss is 10' tall and is comprised of a variety of "built up" steel members from channel and angle components utilizing riveted steel lattice bracing. The truss floor system consists of transverse steel floor beams (S20x65.4) which are spaced at 16.67' on center. There are seven lines of longitudinal steel stringers (S12x25) spaced at 30" on center which riveted to the floor beams via a steel connection angle. Timber nailers (4" x 6") are through bolted to the top of the stringers to provide support to the deck components. Underside truss bracing is present and consists of steel angles (L3x2.5x1/4"). Truss sway bracing is present and consists of steel angles (L4x3x5/16 and L3x2.5x1/4). The truss has four points of contact at the bearing areas on the concrete abutments aligned under the lower truss chord. The bearings consist of original fixed bearings at Abutment 1 and roller nest (expansion) bearings at Abutment 2.

Figure 4: General view of steel Pony truss superstructure.

The bridge deck is not original to the bridge and consists of a steel stay-in-place form with a 6” depth cast-in-place reinforced concrete deck. No wearing surface is present. Actual construction date of the deck is unknown but estimated around the mid-1980’s.

Substandard bridge rail is comprised of original steel angle sections (L2x2x¼" and L3.5x2x¼") attached to the truss verticals. No bridge approach rail is present.

Signing present on the bridge consists of object markers at each bridge corner and 6-ton bridge load postings on each approach to the bridge.

Some noted improvements have occurred since original construction of the bridge in 1924. The largest improvement was replacement of the original deck (assumed to be timber) with a concrete deck. It is unknown the exact date of this replacement, but based on conversations with the County, likely occurred in the 1980’s. In 2019, MDT conducted an underwater inspection of the bridge and identified considerable undermining under the north abutment (up to 2’ vertical and 2.5’ horizontal) and sent a plan of action notification to the County. Beaverhead County crews installed riprap mitigation in this undermining location to help arrest the progress of this material loss.

Figure 5: View of undermined Abutment 1 in 2019 (courtesy of MDT)

Figure 6: View of mitigated undermining area at Abutment 1 with riprap in 2022.

Other improvements have included periodic replacement of object markers and installation of the load posting signs.

An ancillary crossing of Anderson Lane over the Staudaher – Bishop Ditch, within the improvement area of this structure, is located 60’ to the southeast of the existing bridge and consists of an older 6’ span corrugated steel pipe. The headgate access road and subsequently informal fishing access crosses over a 6’ diameter “boiler pipe” that is attached to the headgate at the start of the Staudaher – Bishop Ditch.

Figure 7: View of corrugated steel pipe crossing for Staudaher – Bishop Ditch under Anderson Lane. The other pipe in the foreground is the boiler pipe crossing under the access road that is attached to the headgate. Note steepness and roadside safety hazard of the open ditch section.

Please refer to the photos of the existing bridge included in Appendix II of this report. The photos depict the existing bridge from both approaches, profile views of the structure and any relevant deficiencies.

2. Condition of Bridge

a) Overall County Bridge Needs

Beaverhead County is 5,500 square miles in size with hundreds of miles of streams. It is the headquarters of the Beaverhead-Deerlodge National Forest, the Dillon Field Office of the Bureau of Land Management, and the University of Montana-Western. Dillon also forms the center of Montana's largest cattle and hay producing areas and is one of the top agricultural centers in the state.

The County is responsible for maintaining a total of 129 bridges (34 minor and 95 major). With its limited resources, monitoring the condition of the bridges is a substantial task for the County. Due to the County’s population steadily increasing and aging bridge inventory, the County has developed a pro-active attitude toward bridge replacements.

In 2003 the County first utilized TSEP matching funds to evaluate all county-maintained bridges, prioritize bridge improvements, and develop a plan of action. The Bridge Evaluation and Capital Improvement Plan Report was completed and adopted in 2004. The report assessed the condition of each bridge maintained by the County and ranked the bridges in order of greatest need for replacement or rehabilitation. In 2004 Beaverhead County submitted a TSEP grant application in order to obtain assistance with projects outside the County’s bridge budget. The application was successful and allowed the County to replace a bridge in Lima. After seeing the results of this TSEP Grant Application, the County submitted a grant application in 2008. The 2008 grant application was also a success and provided funding for three bridge replacements in the Dillon area. The County submitted successful grant applications in 2010 and 2018, which helped funded the replacement of five bridges in the County.

Recently, the County utilized MCEP matching funds to update its bridge inventory and bridge capital improvement plan. The Capital Improvement Plan gave the County a defensible basis upon which to make decisions regarding the allocation of financial resources, provided a mechanism to schedule capital projects with regard to financial limitations, and assisted in identifying potential outside funding sources in light of overall needs and available resources. A copy of the 2022 Beaverhead County Bridge Evaluation and Capital Improvement Plan can be found as an Appendix to the TSEP Grant Application.

The 2022 Beaverhead County Bridge Evaluation and Capital Improvement Plan provides a ranking to determine the most critical bridges. The Anderson Lane Bridge was ranked #1 priority for improvements. It was determined to seek assistance from the Montana Coal Endowment Program on the Anderson Lane Bridge. The bridge was chosen due to poor structural condition, load limiting superstructure, and narrowness.

Table 3 from the Beaverhead County *2022 Bridge Evaluation and Capital Improvement Plan Update* has been included below and summarizes the County's plan to address its bridge needs over the next five years (FY 2022 through 2026).

TABLE 3 - BEAVERHEAD COUNTY - 2022 BRIDGE INVENTORY								
	2022 BRIDGE PRIORITY RANKING AND 5-YEAR BRIDGE CIP							
PRIORITY RANKING	COUNTY BRIDGE NUMBER	COUNTY ROAD NAME	FEATURE CROSSED	PROPOSED IMPROVEMENT	COST	FUNDING SOURCE	SOURCE CONTRIBUTION	COMMENTS / TIMING REQUIREMENTS
BRIDGE REPLACEMENT PRIORITIES								
1	071-D	ANDERSON LANE	BEAVERHEAD RIVER	NEW BRIDGE	$1,800,000	MCEP/County	$750,000 $1,050,000	APPLY 2022 CONSTRUCT 2024+
2	B56-D	CORINNE TRAIL - DECKER LANE	HORSE PRAIRIE CREEK OVERFLOW	BRIDGE REHAB	$20,000	COUNTY	$20,000	2022
3	089-W	BIG SWAMP CREEK ROAD	BIG HOLE RIVER	NEW BRIDGE	$1,600,000	MDT Off System	$800,000 $800,000	2026+
4	063-W	UPPER N. FORK ROAD	N FK BIG HOLE RIVER	NEW BRIDGE	$200,000	COUNTY	$200,000	2023
5	064-W	UPPER N. FORK ROAD	N FK BIG HOLE RIVER	NEW BRIDGE	$200,000	COUNTY	$200,000	2023
6	008-L	LIMA DAM ROAD	RED ROCK RIVER	NEW BRIDGE	$200,000	COUNTY	$200,000	2024
7	052-L	BRUNDAGE LANE	RED ROCK RIVER	NEW LIGHTWEIGHT DECK	$50,000	COUNTY	$50,000	2024
8	010-D	BANNACK BENCH ROAD	HORSE PRAIRIE CR	NEW BRIDGE	$400,000	FUTURE MCEP	$200,000 $200,000	APPLY 2024 CONSTRUCT 2026+
9	004-D	TAYLOR CREEK ROAD	GRASSHOPPER CREEK	NEW BRIDGE	$500,000	FUTURE MCEP	$250,000 $250,000	APPLY 2024 CONSTRUCT 2026+
10	084-L	STEEL BRIDGE LANE	RED ROCK RIVER	NEW BRIDGE	$600,000	TBD	TBD	TBD - Low volume
11	-	RYAN CANYON ROAD	BEAVERHEAD RIVER	NEW BRIDGE	$700,000	TBD	TBD	TBD - Low volume
12	049-D	OLD STAGE ROAD	LOCAL DRAINAGE	NEW BRIDGE	$500,000	FUTURE MCEP	$250,000 $250,000	TBD
13	B54-D	ROAD TO LEADOR (324)	HORSE PRAIRIE CREEK	NEW BRIDGE	$500,000	MDT Secondary	$500,000	Secondary Road System Upgrades

b) Present Condition and Capacity

Please refer to the photos of the existing bridge included in Appendix II of this report. Many of the most critical deficiencies are displayed in these photos.

The Montana Department of Transportation (MDT) typically inspects all structures with clear spans (coping to coping) over 20 feet. At a total clear span of 96 feet, MDT regularly inspects the Anderson Lane Bridge. The most recent National Bridge Inventory (NBI) Rating Form for Anderson Lane Bridge was obtained from the Montana Department of Transportation (MDT) and is included in Appendix II of report. The MDT Initial Assessment Form includes the NBI Sufficiency Rating, NBI Appraisal Ratings and NBI Element Condition Ratings for the structure. The MDT structure number is 02209.

The routine and fracture critical bridge inspection for the Anderson Lane Bridge was last performed by MDT in July 2020. The following is a summary of the MDT Rating Report for the Anderson Lane Bridge over the Beaverhead River:

Sufficiency Rating:	24.1
Inventory Load Rating:	6 tons
Operating Load Rating:	8 tons
Existing Posting:	6 tons

<u>Appraisal Ratings (Item #)</u>	
Structure Rating (67):	3
Deck Geometry (68):	7
Approach Roadway Alignment (72):	6
Waterway Adequacy (71):	8

<u>Element Condition Ratings</u>	
Bridge Deck (58):	5
Superstructure (59):	5
Substructure (60):	5

<u>Bridge Safety Features</u>	
Bridge Railings (36A):	0
Transition Railings (36B):	0
Approach Guardrail (36C):	N
Approach Guardrail Ends (36D):	0

The Appraisal Ratings and Element Condition Ratings are assigned on a scale of 0 to 9; with 9 points assigned to the best possible condition. A bridge is considered structurally deficient if it has a rating of four or less on the deck (Item 58), superstructure (Item 59), or substructure (Item 60) or an appraisal of two or less on waterway adequacy (Item 70) or structural evaluation (Item 67).

The Sufficiency Rating (SR) is a measure of the overall integrity of the structure and is based upon a scale of 0 to 100 with 100 being the best rating. The Montana Department of Transportation recommends that a bridge be replaced when the SR is 50 or less, rehabilitated or replaced for an SR between 50 and 80 and that no/minor improvements need be made for an SR above 80.

The Anderson Lane Bridge is a single-span steel pony truss bridge on a concrete foundation with a concrete deck. The bridge was originally constructed in 1924.

The concrete deck is in fair condition due to transverse cracks at 3’ to 4’ spacing, surface abrasion at wheel lines and areas of exposed reinforcing near the floor beams on the deck underside. The steel stay-in-place form is heavily corroded with considerable areas of section loss. Earthen material and gravel accumulation has occurred at the bridge edges and centerline.

Figure 8: General view of concrete deck. Note transverse cracking and material build up.

Figure 9: View of deck underside with area of exposed and corroded reinforcement. Note lack of steel stay in place form (courtesy of MDT)

The mass concrete foundation is in fair condition at both abutments. Both abutments exhibit spalling and abrasion along the top portion of the abutment. Abutment 1 exhibits large spalls up to 4” deep along the interface of the bearing seat and face of abutment over the entire abutment length. Abutment 1 also has full height vertical cracks up to 1/16” wide. Abutment 2 exhibits 1/4” wide vertical cracks propagating from the bearing locations. The bridge wingwalls presented considerable vertical and diagonal cracking, up to 1” wide. The undermining that was previously identified in the 2019 underwater inspection at Abutment 1 has been repaired with placed riprap (refer to Section II.B above for more information on undermining and repairs).

Figure 10: Typical view of spalling and abrasion over length of top surface of abutment.

Figure 11: View of 1” wide crack in Abutment 2, north wingwall, typical of wingwall cracking (courtesy of MDT)

Figure 12: View of Abutment 2 full height vertical cracking up to 1 ½" wide adjacent to the south bearings (courtesy of MDT)

Overall, the superstructure condition is rated as fair – thought there are components of the superstructure that are in poor condition. As shown in the most recent MDT inspection report: The primary truss members were in fair condition due to deformation due to traffic impacts causing up to 1" deformation at multiple members on both trusses. The truss members have minor pack rust forming at the lower gussets with coating failure and minor surface corrosion with negligible section loss throughout.

Figure 13: View of 1" distortion in north truss vertical, common in several areas throughout (courtesy of MDT)

The steel floor beams are in satisfactory condition and exhibit coating failure on the bottom half of the members with minor surface corrosion and negligible section loss.

Figure 14: View of coating failure with corrosion on floorbeam, typical (courtesy of MDT)

The steel stringers are generally in fair condition with coating failure and minor surface corrosion and negligible section loss. The end stringers typically exhibit minor section loss with 1/16" pitting in the web above the bottom flange and isolated pitting up to 1/8" as well as one location with advanced section loss of the stringer web up to 100% of the web thickness.

Figure 15: View of 100% section loss through web of Stringer 7 at Abutment 2 (courtesy of MDT)

The steel gusset plates were in fair condition with approximately 50% of the gusset plates having coating failure with minor surface corrosion and negligible section loss. The lower gusset plates had pack rust formation up to 1/4" between the primary members and the gusset plates and pitting up to 1/8".

The moveable steel bearings at Abutment 2 were in poor condition and typically had roller nests that were translated in the opposite direction of the expanded bearings beyond the span side limits of the masonry plate with the first roller at the edge of the masonry plate and no longer under the shoe plate. The bearings had isolated areas of coating failure on all surfaces with surface corrosion and pitting up to 1/16". The steel fixed bearings at Abutment 1 were in poor condition with the bearings partially being pushed off the back of the abutments and rotating into the embankment fill with loss of bearing and bent anchor rods, and typically had isolated areas of coating failure with minor surface corrosion and up to 1/16” section loss.

Figure 16: View of the south expansion bearing – roller nest extending 2 ½” past masonry bearing plate (courtesy of MDT)

It is estimated that 40% of the superstructure components exhibited coating failure with minor surface corrosion typical in these areas.

Figure 17: General view of bridge underside, note coating failures typical.

All object markers and signs are present and in satisfactory condition, with some twisting/lean of signage. The roadway shoulder embankments are steep and somewhat loose with minimal vegetation near the bridge. The existing substandard steel bridge rail exhibits collision damage and heavy corrosion. Approach rail is not present. The gravel approach road surfacing is in good condition, with minor washboarding.

Anderson Lane crosses the Staudaher-Bishop Ditch about 60’ southeast of the existing bridge in a 6’ steel culvert and will need to be replaced as part of this project due to the increase in road elevation and poor condition of the existing crossing. Additionally, the pipe will be lengthened to attach to the headgate at the diversion structure. This will allow the existing open ditch section, which is a roadside safety hazard (shown in the aerial image below) to be covered. Improvements to the headgate are out of the scope of this project as are improvements to the diversion structure itself, though it has been noted that the elevation of the existing culvert crossing is too high and should be lowered to allow the diversion structure to function better (with less backwater).

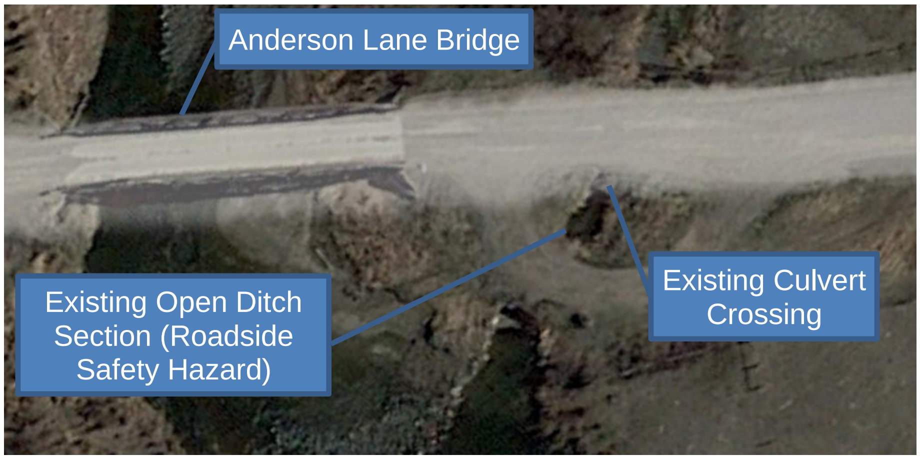

Figure 18: View of Staudaher-Bishop Ditch crossing location

The Beaverhead River channel in the bridge vicinity is in fair condition, with poor channel alignment through the bridge caused by a bend in the channel at the bridge location, which has resulted in scour and undermining at Abutment 1, which has previously been discussed. Abutment protection was added in 2020 to Abutment 1 as a result of the undermining. No other abutment protection is present at the bridge. The private landowner located upstream of the structure has installed riprap bank protection on the southeast bank.

Figure 19: View of the Beaverhead River upstream of the bridge. Note diversion structure and flow impacting north riverbank.

Overall, the condition of the bridge is poor-to-fair based on the condition of all the primary bridge components (deck, superstructure and substructure). The condition of these components is largely a function of the age of the nearly 100-year-old structure. The condition of these components, along with the very low load posting of 6 tons, has resulted in a low sufficiency rating of 30.4. Therefore, the Anderson Lane Bridge is not a good candidate for repair or rehabilitation and would be best suited for complete replacement.

C. Need for Project and Problems to be Solved

1. Current and Future Bridge Standards

The Anderson Lane Bridge is currently posted at 6-tons for all traffic. This posting currently restricts county road maintenance vehicles, concrete trucks, agricultural equipment, fire trucks and other heavy vehicles from crossing the bridge safely. Due to the existing bridge condition, public traffic exceeding the posted limits must detour approximately 18 miles (bridge end to bridge end). The full detour map can be seen in Figure 5 of Appendix I. Additionally, the bridge does not meet County standard for bridge width.

In 2012 the Beaverhead County Commission adopted an update to their Road and Bridge Standards that utilizes AASHTO and MDT guidelines for bridge construction and specifies accepted methods for the hydraulic design of the waterway. The primary purpose of the Bridge Standard is to lend a measure of uniformity to future bridge projects within the County by specifying minimum road approach widths, bridge widths, design floods, freeboard, design loads, preferred construction materials, minimum freeboard, etc. The document also outlines the County’s policy on whether an existing structure should be replaced with a culvert or a bridge.

All new bridges shall be constructed as two-lane structures capable of handling HS 20-44 live loads. New bridges shall be capable of passing the 50-year storm event with 2-feet of freeboard at a minimum and the 100-year event with 1-foot of freeboard if possible. The freeboard is required to allow large debris or ice chunks to safely navigate under the structure. New bridges shall have a useable width of 28 feet between rail faces. However, as Anderson Lane is in the area of a low volume road (less than 400 ADT), Beaverhead County has preferred a useable width of 24 feet between rail faces as a cost savings measure. Discussions with the County Commission indicate 24 feet is appropriate for this bridge as standard practice for new bridges on local county roads with an ADT under 400 shall be 24 feet wide. The existing Anderson Lane Bridge does not meet current bridge standards. A copy of the Beaverhead County Bridge Standards is included as an Appendix to the TSEP Grant Application.

2. Safety Considerations

The existing bridge is incapable of carrying heavy truck traffic due to the load limiting superstructure condition. If the bridge is not replaced soon, the entire bridge will continue to deteriorate; creating even more of a safety concern and liability for the County. Although historic in nature, the bridge is 98 years old and is at the end of its useful life. The replacement structure should be constructed to handle current legal loading requirements and ensure two lane travel.

With a current useable width of 15.5 feet, the current Anderson Lane Bridge is too narrow to properly handle two-way travel or oversized vehicles. Beaverhead County has decided to utilize a 24-foot-wide bridge width primarily for safe passage of two vehicles simultaneously.

The current bridge rail configuration is substandard steel rail connected to truss vertical elements and appear original to the 1924 bridge. Because of this, impacts could be sustained directly on the steel trusses, which could lead to catastrophic failure of the entire bridge due to the superstructure being classified as fracture critical. The steel rail and primary truss members have considerable collision and impact damage, which have created locations of distortion and tears in the steel

Figure 20: View of substandard original bridge rail, with area of damage (Courtest of MDT)

members. The bridge rail terminates at the bridge ends without approach rail. As such, new bridge rail and approach rail sections as required by MDT, AASHTO, and the County Bridge Standards should be installed to increase overall safety.

Because the bridge rail composition is substandard, the width is narrow and curves are present on each side of the bridge, vehicle accidents are more prone to occur. The MDT Safety Engineer was contacted regarding crash data at the bridge site and reported that no documented vehicular crashes have occurred at the bridge site in the past 10 years. However, it is possible that unreported accidents have occurred at the bridge site given that crash damage is present at several locations on the structure.

Local residents, Tracy and Sharon Sawyer, indicate *"Anderson Lane Bridge is narrow and the approaches from both directions offer limited visibility because of the corners…Improvements to the bridge will help alleviate some of the congestion and improve safety for all who use Anderson Lane."*

Local rancher, Ed Malesich of Malesich Ranch Company indicates, *"As you are well aware the current 100-year old bridge has begun to show its age and has developed some structural issues. This single lane bridge and Anderson Lane has seen increased traffic from more people living along the route and has seen increased truck traffic as well. It is the only east/west route between Hwy's 41 and 91 north of Dillon. My family travels personally across Anderson Lane Several times a week…"*

Refer to Appendix IV for letters of support and letters from emergency and service organizations detailing safety issues.

3. Alternative Routing Options

Anderson Lane serves as a primary east-west connection route in the area north of Dillon. The local community uses Anderson Lane to access residences, agricultural operations, businesses, public lands and as a cut-across route. During construction, all traffic, including emergency vehicles, will be forced to detour around the bridge. The identified detour route will consist of the nearest bridge end to bridge end route capable of handling legal loads and without going through local streets in Dillon. From the east bridge approach, this consists of traveling east from the bridge for 1.1 miles on Anderson Lane, then 7.3 miles south on Highway 41, then 5.7 miles north on Highway 91, then 3.9 miles east on Anderson Lane to the bridge end. The total detour from the one end of the bridge to the other end of the bridge is approximately 18 miles. Refer to Appendix I of this report for the detour route figure.

Local ranch manager, Robert Van Deren indicates *"For us, it is about 5 miles less mileage to take Anderson Lane when going to or coming from Highway 41".*

Beaverhead County High School Transportation Supervisor, Jack Bergeson indicates, *"This bridge has been an issue for our route several times in the past and has caused us to reroute the bus. This causes increased costs that have not been budgeted for and prolonged travel time for students that live on either side* *of the bridge. The replacement of the bridge would certainly benefit the school, students and families that live on Anderson Lane."*

Please refer to the correspondence letters in Appendix IV of this report for more information regarding alternative routing options.

4. Impact on Public and Emergency Services

It has been estimated that closure of the Anderson Lane Bridge would inconvenience approximately 100 vehicles per day in addition to seasonal and recreational use. Medical, fire and law enforcement personnel would also be directly impacted from accessing those served by the Anderson Lane Bridge. As noted, the Anderson Lane Bridge is a primary County maintained access to numerous residences, agricultural operations, State of Montana lands and federal BLM lands. Public and emergency services would have to travel additional distances up to 18 miles if the current bridge were to close.

Ron Nielsen of Beaverhead EMS indicates, *"The bridge that crosses the Beaverhead River located along Anderson Lane is old, uneven and rough. Traveling across the bridge requires a significant reduction in speed, in order to avoid being bounced around…the condition of the bridge is unsafe.".*

Please refer to the correspondence letters in Appendix IV of this report for more information regarding public and emergency services.

5. Utilities Location or Relocation

A file search of the State Hazard Mapping (DEQ) and State Digital Atlas (NRIS) revealed <u>no</u> underground storage tanks, petroleum leak sites, or related facilities in the project vicinity.

An overhead power line and underground phone line are located northeast of the roadway. It is unlikely that these lines will be impacted due to construction activities, however close coordination will occur with the utility owners during survey and pre-design.

The power utility owner at the site, Vigilante Electric wrote, *"Vigilante Electric is in full support of your efforts to replace the bridge on Anderson Lane. We have recently rebuilt the powerlines along that route and the bridge replacement appears necessary."*

Prior to construction, a detailed inspection will be undertaken by contacting a utility location service. If underground utilities are located within the affected area, they will be relocated. Typically, such relocations are completed by the utility company at no cost to the County. Due to the tight footprint of the bridge in relation to private property, stream alignment and adjacent irrigation structure, a public detour bridge is not reasonably feasible. To facilitate construction of this larger replacement structure, a work bridge or platform for contractor use only will likely be required. Public traffic will be detoured around the project during construction.

6. **Floodway**

While the site is not currently located in an approved mapped FEMA Floodplain area, Montana DNRC/FEMA have completed a floodplain study on this reach of the Beaverhead River which is scheduled to be effective at a future date in 2022. The draft floodplain mapping indicates that the bridge will be located in a mapped Zone AE FEMA Floodplain (Draft Panel 300001 1437 C), a zone in which Base Flood Elevations have been determined. As the proposed bridge replacement will be located within a designated floodplain, a County Floodplain Development Permit will be required. Upon completion of the project, a Letter of Map Revision (LOMR) will be required to be submitted to Montana DNRC and FEMA.

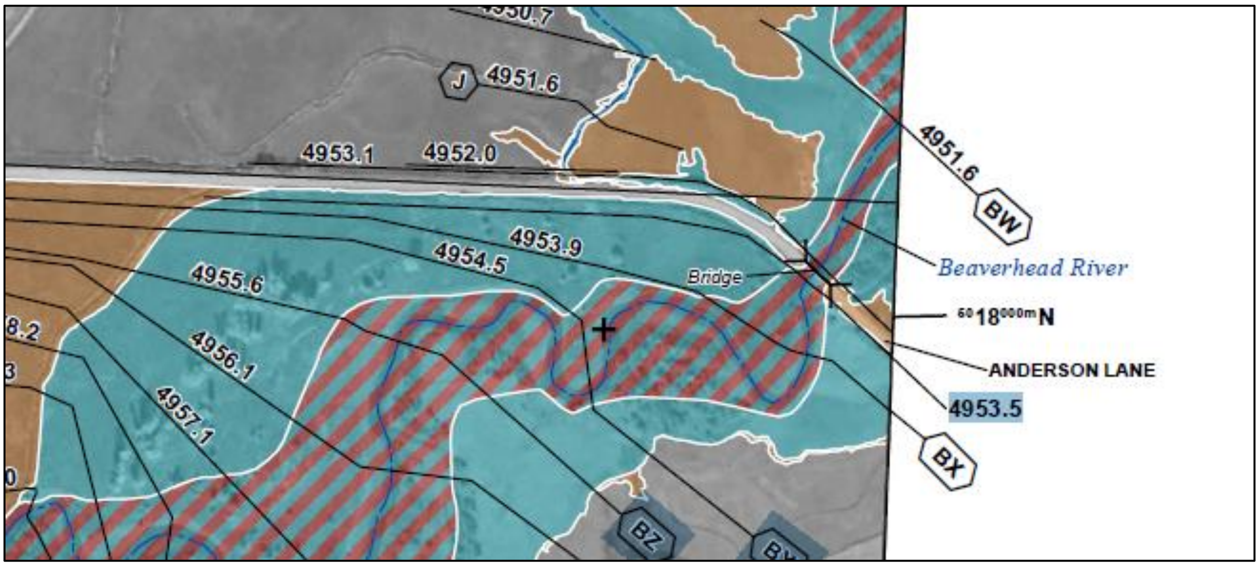

Figure 21: View of proposed FEMA Zone AE floodplain at the Anderson Lane Bridge Location

The design flows for Beaverhead River at the bridge location are displayed in the table below:

Storm Event	Design Flow (CFS)
Q2	585
Q25	1460
Q50	1710
Q100	1960

Refer to Section II.A.2.f of this report for more detail on ice jams and historic flooding events. Refer to Appendix III for preliminary hydrologic and hydraulic calculations. A detailed hydraulic analysis will be performed prior to final design in order to more accurately verify the required dimensions of the structure opening.

D. Environmental Considerations

The Montana Environmental Policy Act (MEPA) requires state government to coordinate state plans, functions and resources to achieve various environmental, economic and social goals through the use of a systematic, interdisciplinary analysis of state actions that have an impact on the human environment. This is accomplished through the use of a deliberative, written environmental review. For this type of project, an Environmental Assessment (EA) is initiated to determine the potential significance of impacts to the human environment. If the EA determines the proposed action will have significant impacts, then either an Environmental Impact Statement (EIS) must be prepared or the effects of the proposed action must be mitigated below the level of significance and documented in a mitigated EA.

An EA must document the purpose and need for the proposed action, the affected environment, an analysis of alternatives including a No-Action alternative and analysis of the impacts to the human environment of the different alternatives, including an evaluation of appropriate mitigation measures. An EA has been prepared for this project in accordance with MEPA guidelines. In addition, this report serves as a supplement to the EA. Please refer to Appendix V for the attached Environmental Assessment and letters from environmental agencies for supporting documentation of the information presented below.

In order to complete a systematic, interdisciplinary analysis of the project, letters were written to various governmental agencies soliciting comment on any potential environmental impacts, whether beneficial or adverse, which would result from the proposed project. The agencies that were contacted are listed below. See Appendix V for a copy of the EA and comments from the agencies describing the project and any possible environmental impacts.

- Montana Department of Fish, Wildlife and Parks
- Montana Department of Natural Resources and Conservation
- Montana Department of Environmental Quality
- Montana Department of Transportation
- State Historical Preservation Office
- Beaverhead County Floodplain Administrator
- Beaverhead County Planning Office
- U.S. Fish and Wildlife Service
- U.S. Army Corps of Engineers
- Montana Natural Resource Information System
- Montana Sage Grouse Habitat Conservation Program

MEPA also requires public involvement to allow interested and affected individuals, organizations and agencies to be included in the decision-making process. In order to give members of the public the opportunity to be involved in the environmental review, a public meeting was held at:

- Office of the Beaverhead County Commission; Dillon, MT; April 11, 2022 at 1:30 p.m.

In addition, as part of the grant application submittal, a public hearing was conducted at:

- Office of the Beaverhead County Commission; Dillon, MT; April 25, 2022 at 1:30 p.m.

Public notice for these meetings/hearings, which included invitations for written comments, were published in the Dillon Tribune, the newspaper of record for Beaverhead County. Additionally, these public notices were published on the County website. The County reached out directly to 98 landowners in the area seeking input on the project and received good support for the project. The meetings/hearings detailed the inventory process, sought comment on the Environmental Assessment, presented the Preliminary Engineering Report (in draft format) and allowed a venue for public comment. Written comments (and comments received at the public meetings) were documented and added to the EA. Responses to each comment were also documented and added to the EA. According to MEPA, agencies must consider substantive comments to EAs prior to making final decisions about the adequacy of the analysis in the EA, modifications to the proposed action and the necessity of preparing an EIS.

1. Land Use/Important Farm Land/Formally Classified Lands

<u>Affected Environment:</u>
Any modification to, or replacement of, the existing bridge will be constructed in the same approximate location, but with an increased bridge span and usable road width. To the extent possible, all modifications due to the increased bridge width or road approaches will be constructed in the existing 60-foot County road easement. Additional temporary construction easements will be obtained during the design phase, if necessary.

The Anderson Lane Bridge over the Beaverhead River is located in a rural area with primarily undeveloped adjacent agricultural properties. Preliminary investigations indicate that the surrounding lands are designated by the NRCS as Farmland of Local Importance in the immediate vicinity of the bridge. Existing farmlands are not located in the direct impacted vicinity of the bridge, and at the nearest appear to 200 feet to the northwest of the bridge. There is an irrigation diversion structure spanning the full width of the Beaverhead River located just upstream of the bridge. This diversion provides flow to the Staudaher – Bishop Ditch and crosses under the existing roadway in a large culvert approximately 65 feet from the east bridge abutment. The ditch provides water for several agricultural operations in the Beaverhead Valley. Farmlands in the vicinity of the bridge appear to be irrigated alfalfa and grass, though potato farming operations are also common further from the bridge. As the structure replacement will likely be located within the 60-foot County easement and is not tillable land, no negative impact is anticipated.

No forested lands are directly accessed by the bridge.

If the bridge is not improved and becomes closed, farming and ranching operations would be forced to detour to different roadways in order to access their grazing land and haying operations. A new structure will ensure access to the area for another 75 years.

<u>Environmental Consequences:</u>

The area of disturbance is negligible; therefore, the permanent adverse impacts from the project are also negligible. Construction may cause temporary dust, silt, and erosion problems resulting in short-term adverse impacts. If the bridge is not improved and becomes closed, all land uses would be negatively impacted. A new structure will ensure access to the area for 75 years resulting in permanent beneficial impacts to the area.

Mitigation:
The proposed design of the bridge and roadway approach alignments will minimize permanent impacts to land uses by avoiding encroaching on land to the extent possible.

The Contractor will be required to erect silt fence (or other preferred FWP BMP techniques) along the banks to prevent silt and construction debris from entering the stream. The disturbed areas will be seeded to promote re-vegetation. To minimize silt and erosion problems typically associated with bridge construction, construction will likely be scheduled during the late summer or early fall when flows are minimal and minimize disturbance on any native fish and aquatic organism species. If the bridge is not improved and becomes closed, agricultural operations would be forced to detour to different roadways in order to access their agricultural interests and grazing allotments.

The necessary stream permits will be obtained prior to construction and the Contractor will be required to adhere to all guidelines set forth by these documents. The Contractor will also be required to water the construction site as necessary throughout the project in order to mitigate any temporary dust problems.

2. **Floodplains**

Affected Environment:
While the site is not currently located in an approved mapped FEMA Floodplain area, Montana DNRC/FEMA have completed a floodplain study on this reach of the Beaverhead River which is scheduled to be effective at a future date in 2022. The draft floodplain mapping indicates that the bridge will be located in a mapped Zone AE FEMA Floodplain (Draft Panel 300001 1437 C), a zone in which Base Flood Elevations have been determined.

Environmental Consequences:
Based on information gathered from preliminary hydraulic calculations, local residents, and County personnel, the hydraulic capacity of the existing structure is not a primary concern. No environmental issues associated with floodplains have been identified at this time.

Mitigation:
Since the proposed bridge construction will be in a designated floodplain at the time of construction, a County Floodplain Development Permit will be required. The purpose of the floodplain permit, administered by the County Floodplain Administrator with assistance from the Montana DNRC, is to prevent new construction from adversely affecting the 100 and 50-year floodplains in the County. Upon completion of the project, a Letter of Map Revision (LOMR) will be

required to be submitted to Montana DNRC and FEMA. Thus, the acquisition of a County Floodplain Permit serves as mitigation for this issue.

3. Wetlands

Affected Environment:
Based on information from the USFWS Survey National Wetlands Inventory and review of site conditions and photographs, there appear to be freshwater emergent and riparian wetlands in the vicinity of the project.

A wetland delineation will be performed to document any jurisdictional wetlands at the site vicinity during the design phase of the project. The entire footprint of the proposed construction disturbance will be evaluated for the presence of wetlands and those wetlands will be delineated and mapped in accordance with the Corps 1987 Delineation Manual (and applicable Regional Supplement). Wetlands boundaries will be flagged in the field and numbered. Flag numbers and locations will be surveyed using a sub-meter GPS and depicted on the delineation map.

Environmental Consequences:
Minimal impacts to wetlands are anticipated as a result of the proposed construction alternatives.

Mitigation:
The Contractor will be required, to the extent feasible, to avoid wetlands in and around the project site that may be affected by construction activities. The Contract will require the Contractor to minimize wetland disturbance wherever possible and implement BMPs to avoid impacts such as material inputs and sedimentation to wetlands or the Beaverhead River. At this time, and based upon the preliminary information available, Beaverhead County anticipates that less than one-tenth of an acre of wetlands will be disturbed as a result of the proposed project. However, the potential for wetland disturbance will be evaluated in more detail during the design phase to determine if compensatory mitigation is required.

4. Cultural Resources

Affected Environment:
As a general rule, all bridges that are 50 years or older are considered eligible for listing on the National Register of Historic Places.

The Anderson Lane Bridge was originally constructed in 1924 according to the Montana Historic Property Record for the Anderson Lane Bridge (Site 24 BE 2062). While some modifications have occurred over the life of the bridge, most notably a concrete deck replacement, the bridge still retains historic integrity. Recent discussions with Jon Axline, MDT Historian, confirm the bridge is a historically significant structure and is eligible for listing on the National Register of Historic Places. He recommends the bridge be recorded to Historic American Engineering Record (HAER) standards if the existing bridge is to be replaced.

Other sites noted by SHPO in the general location of the bridge replacement project include a historic road.

The proposed bridge extents should not extend far beyond the existing bridge extents and very little previously undisturbed ground should be impacted. Refer to Appendix V for correspondence.

Environmental Consequences:
No environmental consequences have been identified at this time if the structure is documented as recommended.

Mitigation:
SHPO has stated that this bridge is eligible for the National Registry and subsequent discussions with Jon Axline, MDT Bridge Historian, confirm this. Mr. Axline recommends the bridge be recorded to Historic American Engineering Record (HAER) standards which involves photographing and documenting the design of the bridge. The HAER recordation serves as mitigation for the bridge replacement.

In addition to the HAER recordation of the bridge, given the historic road in the area, a cultural resources inventory will be performed prior to construction to ensure no cultural resources are impacted.

5. Biological Resources

Affected Environment:
The Beaverhead River and its associated corridor support wildlife and plant populations; therefore, careful consideration to the stream habitat and effects that the proposed bridge will have on the surround habitat and stream will be considered.

A database search conducted using the Montana Natural Heritage Program website and by the USFWS found thirteen possible species of special concern in the area: Spotted Bat, Hoary Bat, Columbia Plateau Pocket Mouse, Grizzly Bear, Great Blue Heron, Burrowing Owl, Ferruginous Hawk, Greater Sag-Grouse, Long-Billed Curlew, Westslope Cutthroat Trout, Mealy Primrose, Woolly-Head Clover and Ute Ladies' - tresses.

Based on a review of the Montana Sage Grouse Habitat Conservation Program Mapper (https://sagegrouse.mt.gov/ProgramMap), the proposed project is not mapped in an Executive Order (EO) Area for Sage Grouse Habitat. As such, Sage Grouse are not anticipated to be adversely affected by this work.

Jake Martin of the United States Fish and Wildlife Service notes the project would be located in an area where the federally threatened grizzly bear may be present. The Service therefore recommends implementation of the following (or similar) conservation measures to manage potential bear attractants and reduce the risk of human-grizzly bear conflicts related to this project:

- Promptly clean up any project related spills, litter, garbage, debris, etc.
- No overnight camping within the project vicinity, except in designated campgrounds, by any crew member or other personnel associated with

this project.

- Store all food, food related items, petroleum products, antifreeze, garbage, personal hygiene items, and other attractants inside a closed, hard-sided vehicle or commercially manufactured bear resistant container.
- Remove garbage from the project site daily and dispose of it in accordance with all applicable regulations.
- Notify the Project Manager of any animal carcasses found in the area.
- Notify the Project Manager of any bears observed in the vicinity of the project.

The Beaverhead River supports aquatic wildlife populations; therefore, careful consideration to the stream habitat and effects that the proposed bridge will have on the stream will be considered. Based on past projects on the Beaverhead River, in order to minimize any long term affects to spawning trout, all in-stream work should take place between mid-July and late-October. Necessary stream permits will be obtained prior to construction and the Contractor will be required to adhere to all guidelines outlined in these documents.

<u>Environmental Consequences:</u>
Silt and debris in the river could adversely affect fish habitat; therefore, a bridge replacement/rehabilitation alternative that impacts the streambed and banks as little as possible is desirable. Some bridge designs can constrict the natural channel flow of the river, increase erosion and affect bedload movement both upstream and downstream of the structure. Therefore, single-span bridges with natural stream bottoms are desirable for waterways such as the Beaverhead River.

<u>Mitigation:</u>
The contractor will erect silt fence (or other FWP preferred BMP methods) along the stream banks to prevent silt and construction debris from entering the stream. Care will be taken when removing the existing bridge in order to minimize any adverse effects to the streambed and banks. Disturbed areas will be seeded to prevent erosion and promote re-vegetation. Alternatives such as single-span bridges or other configurations with allowances that hold native bed material will help reduce streambed impacts.

The USFWS and USACE have no immediate concerns about the proposed bridge replacement. All necessary stream permits will be obtained prior to construction and the Contractor will be required to adhere to all guidelines outlined in these documents.

The proposed project is not expected to have any significant permanent adverse effects on vegetation and wildlife. No significant migratory bird nesting areas or eagle species are anticipated to be affected by the proposed project. Any temporary construction effects on plant species will be re-seeded to promote re-vegetation and reduce erosion. All necessary stream permits will be acquired prior to construction, and the Contractor will be required to adhere to the permit documents, including guidance on protection or mitigation measures that the USACE feels are reasonable and prudent.

6. Access to and Quality of, Recreational and Wilderness Activities, Public Lands, Waterways and Public Open Space

Affected Environment:
The Anderson Lane Bridge serves, on average, 100 vehicles per day including primary access to private residences, agricultural operations and properties, State of Montana lands (nearly 20 square miles), BLM lands and access for recreation at the bridge crossing itself. Closure of the bridge would impact access to (and quality of experience of) recreational activities, public lands and waterways, and public open space for local residents, hunters, fisherman, hikers, birders and other recreationalists.

Environmental Consequences:
As long as the bridge remains open, no environmental consequences have been identified.

Mitigation:
The replacement of the Anderson Lane Bridge serves as the primary form of mitigation for this issue. A new structure will ensure access to the area for another 75 years.

7. Socio-Economic/Environmental Justice Issues

Affected Environment:
The Anderson Lane Bridge provides primary access to numerous residences, agricultural operations and recreational opportunities. The proposed project will allow residents, agricultural operations and employees to continue to have the most direct access to their properties and places of employment. If the bridge is not improved and becomes closed, individuals would be forced to detour to different roads for access. A new structure will ensure access to the area for 75 years.

Environmental Consequences:
No adverse environmental consequences have been identified at this time.

Mitigation:
Replacement of the Anderson Lane Bridge would serve as the primary form of mitigation for this issue. Proposed improvements will ensure access to the area for the next 75 years.

8. Lead Based Paint and/or Asbestos

Affected Environment:
There is no known asbestos at the site due to the primary structural components being constructed of steel and concrete. It is not known if lead-based paint is present at the site, though minimal paint is present on the existing steel truss structure.

Environmental Consequences:
If properly mitigated, no adverse environmental consequences have been identified at this time. Beneficial impacts include removing any hazardous

materials, if present, from the project location and disposing of them at an approved facility.

Mitigation:
Mitigation for lead-based paint is served by removing the existing steel components from the site.

Recent requirements from Montana DEQ require an inspection for asbestos (performed by an accredited inspector) prior to any demolition taking place. This inspection may be waived depending on the type of bridge structure and its components.

E. General Design Requirements

Work to rehabilitate, or replace fully, the existing structure would be required to safely allow two-way travel, increase load capabilities to handle legal levels, add necessary bridge and approach rail, and conform to all other County's Bridge Standards. The standards require that new bridges or culverts handle HS20-44 live loads and have a minimum width of 28 feet. However, for low volume roads such as Anderson Lane, Beaverhead County has preferred a useable width of 24 feet between rail faces as a cost savings measure. Discussions with the County Commission indicate 24 feet is appropriate for the bridge. The edges of the bridge should be protected with bridge rail, conforming to County standards in order to provide adequate structural capacity to prevent a vehicle from leaving the bridge deck in the event of a collision. Approach guardrail with end sections, as required by MDT and AASHTO design standards, should be installed.

A full hydraulic analysis will be performed during preliminary design to ensure the structure will adequately pass the 100-year flood event with a minimum of two feet of freeboard, which will be required by the Beaverhead County Floodplain Hazard Management Regulations as the bridge will be located in a FEMA Zone AE floodplain. Freeboard is necessary to allow large objects to pass freely under the bridge during high water events. The preliminary analysis for this PER utilized HY-8 software and USGS topographical data to perform hydraulic calculations used to estimate the flood elevations at the crossing. This information is beneficial in determining the preliminary span and height required for the proposed alternatives.

Additionally, the replacement structure must not adversely impact the natural passage of aquatic species in the Beaverhead River. FWP, USACE and the USFWS generally recommend that new bridges and culverts don't encroach on or constrict the active channel, pass the 100-year flood event (if possible), have approaches that rise to meet the bridge to discourage sediment entrainment and have active curbing for the length of the bridge that precludes sediment or road fill on the bridge from being deposited into the stream.

III. Mitigation Options: Present Concerns & Existing Bridge Deficiencies

A. No Action

Deferring maintenance (or other corrective actions) for the existing crossing would lead to further deterioration of the entire structure. Closing the bridge permanently is not a favorable or beneficial option as it serves as the primary County-maintained access for users heading east and west of the bridge. Closing the bridge is not a feasible or practical option. As such, this ‘do nothing’ option will <u>not</u> be considered further.

B. Structure Repair and Rehabilitation

Structure repair generally consists of work items and methods that can be implemented with the goal of restoring the existing substructure and superstructure components to conditions that approximate the original intent of the crossing. Supplementary work such as the addition of approach guardrail and superstructure retrofits to accommodate bridge railing may also fall under the repair mitigation category.

While repair work typically focuses on restoring the original features and functionality of the existing structure, rehabilitation efforts are generally more extensive and can include work to augment the load capacity, hydraulic conveyance, safety and/or reliability of an existing bridge crossing without the potentially higher costs of full structure replacement.

Repairing or rehabilitating the Anderson Lane Bridge to meet current standards would include replacement of the bridge superstructure to accommodate legal loads; widening of the structure to meet County standards (which would subsequently include deck removal and replacement and widening of the bridge substructure); installation of standard bridge rail; and installation of bridge approach guardrail. Any efforts to remediate the existing Anderson Lane Bridge through repairs and rehabilitation efforts should be considered <u>extremely extensive</u> due to the type and amount of work involved. Furthermore, at 98 years old, the bridge is at (or functionally past) the end of its useful life which can be seen in the deteriorating condition of the steel and concrete components. Additionally, rehabilitation of the structure exhibits unknowns related to the concrete substructure in terms of sufficient depth, adequate capacity and settlement potential. Because the original structure needs significant work on all bridge components, as well as addressing safety issues, it is in the best interest of the County to focus on replacing the entire bridge rather than simply conducting repairs or rehabilitating the bridge. For these reasons, this preliminary engineering report does not consider structure repair or rehabilitation in further detail.

C. Full Structure Replacement

Full structure replacement would involve complete demolition of the existing bridge abutments as well as removal and disposal of the existing superstructure and deck components. This option is usually advantageous when repairing or rehabilitating (refer to *Structure Repair and Rehabilitation*) an existing bridge/culvert is not economically viable, technically feasible, or when the repair of one or more major bridge elements in poor condition does not make economic sense. For example, full replacement might be more advantageous than structure repair or rehabilitation in a situation where the existing bridge configuration does not pair well with the site hydraulics or where design requirements imposed by the stream channel and/or the roadway approach configuration limit the potential benefits, which might be realized by retrofitting/rehabilitating the existing crossing. Full replacement may also be warranted when repair or rehabilitation costs and efforts involved are similar to those of full replacement alternatives.

Full structure replacement alternatives will be designed to optimize economics, stream channel hydraulics and roadway geometry while meeting (at a minimum) the County Bridge Standards for floodway passage, minimum freeboard and useable bridge width. A new bridge will offer upgraded superstructure performance/capacity to support legal loads. A new bridge would provide a useful life of 75 to 100 years and require substantially less maintenance. As such, alternatives (and components) for both full replacement of the existing structure (as well as present and future repair cost comparisons) will be analyzed in greater detail in the subsequent discussions.

IV. Prescreening of Alternatives for Replacement

A. Superstructure Alternatives

Introduction

The structural and geometric complexities of the superstructure make it one of the most challenging portions of a bridge to design. In order to simplify the screening process, two basic components of the superstructure will be examined; the deck and beams; as well as single vs. multiple span configurations. Although there are many combinations possible, past experience along with site characteristics have narrowed the suitable field to the following alternatives. Each will be examined in detail to more accurately compare them with the other alternatives.

1. Beams

a) Steel

This alternative utilizes steel I-beams or steel plate girders. The traditional steel girder and applicable deck system does not provide for the ease of installation associated with precast concrete members, though, many companies now supply a modular steel bridge system with preassembled bridge sections for spans from 20 to 150 feet. The modular bridge systems come preassembled in sections and offer the advantage of a quick installation compared to typical steel stringers. However, in long spans that exceed 120 feet, the traditional steel girder system and deck system are preferable to modular steel bridge systems with preassembled bridge sections. Steel beam systems are typically lighter than concrete beams sized for equivalent spans, sometimes allowing for the use of excavators rather than cranes for installation. Therefore installation costs may be reduced. Steel modular systems have a projected service life of 50 to 100 years if a hard surfacing (asphalt or concrete) is placed over the modular structure and if maintained properly. Service life will be diminished, and maintenance costs increase for steel modular superstructures with a gravel wearing course. Traditional steel bridge systems with a cast-in-place concrete deck have a projected service life of 75 to 100 years.

b) Composite Concrete Trideck or Bulb Tee Beam

This alternative involves the use of precast, prestressed concrete beams. Two types of precast beams are typically utilized for County bridge applications. Trideck beams are desirable for spans of 20-62 feet due to their relatively shallow depth of 1'-4" to 2'-3". Bulb Tee beams with depths of 2'-11" to 4'-8" are utilized for larger spans of 62-135 feet. Beams are typically placed with a crane, then welded together at intervals recommended by the supplier. A preformed channel between the beams is filled with non-shrink grout. A concrete backwall is later poured on-site and, if necessary, intermediate steel diaphragm members are installed. The main advantage realized with this system is the convenience of a concrete deck that is integral with the beams. Precast beams can be set on pile, drilled shaft, or spread footing foundations. The projected service life for this alternative is 75 to 100 years if maintained properly.

c) Prestressed Concrete I-Beam

This alternative involves the use of Type 1, MT28, Type A, Type IV and Type M72 precast, prestressed concrete I-beams. Each of these types are standard AASHTO shapes for various span lengths and loading requirements. Type 1 beams are used for spans up to 60 feet, Type MT28 for spans up to 70 feet, Type A for 60-95 feet, Type 4 for 95-120 feet and Type M72 for 120-150 feet. Each type is capable of accommodating HL-93 loading meeting County Bridge Standards. Concrete I-Beams do not lend themselves to a rapid bridge installation because a cast-in-place deck must be formed and poured separately. Precast concrete or steel stay-in-place deck forms can be utilized rather than precursor wood forms to speed up the construction process. The projected service life for this alternative is 75 to 100 years if maintained properly.

d) Precast, Prestressed Concrete Slab

This alternative utilizes precast, prestressed concrete slabs that are normally cast at concrete plants where the environment and curing process can be controlled and prestressing tension can be applied to the prestressing cables. Slabs are cast in a variety of lengths. Solid slabs come in depths of 10 to 16 inches and widths of up to 6 feet. They are fastened together with welded plates and a grouted shear key. Precast slabs are fastened to abutments with reinforcing dowels or blockouts. Precast slabs are ideal for relatively short spans of 30 feet or less where superstructure depth must be minimized for hydraulic reasons. Precast concrete slabs are not used for spans greater than 35 feet due to the increased depth needed which results in an uneconomical shipping weight. For longer spans the use of Trideck or Bulb Tee precast beams is recommended. The projected service life for this alternative is 75 to 100 years if maintained properly.

e) Treated Timber Stringer

This alternative involves sawn and treated timber stringers. Timber bridges typically may be constructed without erection equipment or specialized skilled workers. Spans of under 30 feet are generally preferred on timber bridges due to strength limitations. Treated timber bridges typically have a service life of 30 to 50 years. Therefore, they have longevity concerns and require maintenance costs not associated with steel or concrete structures.

f) Glued-Laminated Timber Stringers

This alternative utilizes glued-laminated timber stringers. Glued-laminated stringers are manufactured in a variety of sizes that are not governed by the size or defects of the tree. Glued-laminated stringers are typically used for spans less than 60 feet due to the large deflections experienced. The main disadvantage with glued-laminated stringers is they require more maintenance than the steel or concrete alternatives and have a limited useful life. A bituminous surface course should be placed on all structures with glued-laminated stringers in order to prevent frequent contact and weathering associated with water exposure. Glued-laminated stringer bridges typically have a service life of 30 to 40 years. Therefore, they have durability issues and require maintenance costs not present with steel or concrete structures.

2. **Decks**

a) Cast-in-Place Concrete Deck Slab

This alternative involves the use of a cast-in-place reinforced concrete slab functioning as the entire superstructure. Cast-in-place deck slabs are utilized for short spans without the use of steel or concrete stringers. Cast-in-place deck slabs are typically utilized when the depth of the structure must be kept to a minimum. This alternative can be costly as the efforts of shoring, building forms and reinforcing steel are expensive and labor-intensive activities. Cast-in-place deck slabs are designed to provide all the structural support and therefore do not require stringers. Cast-in-place deck slabs are generally utilized on high volume and high-speed roads that necessitate heavy live loads and smooth riding surfaces. Due to their high cost and unrealized design benefits, cast-in-place deck slabs tend to be excessive for bridges on low traffic, rural, county roads. The projected service life for this alternative is 75 to 100 years if maintained properly.

b) Cast-in-Place Composite Concrete Slab

This alternative involves a concrete slab rigidly interlocked to supporting stringers so that the combination functions as a single unit. Steel shear studs or hoops assist the composite action. Concrete slabs can be cast on steel or concrete beams. The cost of in-place concrete casting can be uneconomical for small structures but is generally cost-effective for bridges spanning over 100 feet. The projected service life for this alternative is 75 to 100 years if maintained properly.

c) Precast, Prestressed Concrete Slab

This alternative utilizes precast, prestressed concrete slabs that are normally cast at concrete plants where the environment and curing process can be controlled and prestressing tension can be applied to the prestressing cables. Slabs are cast in a variety of lengths. Solid slabs come in depths of 10 to 16 inches and widths of up to 6 feet. They are fastened together with welded plates and a grouted shear key. Precast slabs are typically attached to abutments with reinforcing dowels. Precast slabs are ideal for relatively short spans of 35 feet or less where superstructure depth must be minimized for hydraulic reasons. Precast concrete slabs are not used for spans greater than 35 feet due to the increased depth needed which results in an uneconomical shipping weight. For longer spans the use of Trideck or Bulb Tee precast beams is recommended. The projected service life for this alternative is 75 to 100 years if maintained properly.

d) Treated Timber Glued-Laminated Panels

This alternative involves the use of treated timber Glued-Laminated panels. The treated timber glued-laminated deck panels are usually 5-8 inches thick and 3-5 feet wide. The panels are typically utilized in combination with either steel girders or timber/glued-laminated stringers. They must either be bolted through the beam flange or attached with clips extending under the flange. Both methods are extremely labor intensive and require a significant amount of time and hardware. Glued-laminated panels can be used with or without a wearing surface. However, without a wearing surface glued-laminated panel decks offer poor skid resistance. This alternative requires a relatively minor amount of maintenance primarily consisting of replacing the wearing surface. The projected service life for glued-laminated panels is 40-50 years if a wearing surface is installed and maintained.

e) Treated Timber Planks

Treated timber planks are the oldest and simplest type of timber deck. They are often utilized on short spans. The planks must either be bolted through the beam flange or attached with clips extending under the flange. Treated timber planks are not as strong as other deck types and thus require narrower beam spacing. Depending on treatment type and wood grade, projected service life for treated timber planks is 30 to 50 years.

f) Untreated Timber Planks

This alternative involves the use of 3 to 6 inch thick and 10 to 12 inch wide untreated timber planking. The planks are generally placed flat, laid in the transverse direction and spiked to supporting beams. Untreated timber planks are not watertight and give little protection to supporting beams from the effects of weathering. They are not practical with asphalt surfaces because large deck deflections will cause deteriorated and cracked asphalt. This deck alternative will not be examined further due to its low service life and high maintenance costs.

g) Corrugated Steel Deck Panels

This alternative utilizes steel corrugated deck panels. Corrugated steel planks are advantageous because of their light weight and high strength. Steel deck planks are available in a variety of sizes and gauges in order to meet span requirements. The corrugations should be filled with asphalt or concrete, which may not be feasible in remote areas. Deck panels surfaced with asphalt and concrete can generally be expected to have service lives ranging between 50 and 100 years. This range depends on environmental and traffic conditions as well as the gauge of steel. Past experience with corrugated steel decks indicates that they do not perform well on bridges that experience large beam deflections, which tend to cause the asphalt or concrete to pop out.

For structures located on low speed and low volume county roads, it is also possible to fill steel deck corrugations with sand and gravel. Surfacing a metal deck with a gravel wearing course often represents an initial capital construction cost savings. However, soil moisture contact and gravel point loading on the deck increase future maintenance costs and the frequency of repair work required. Galvanized panels are typically recommended in soil-contact applications such as this. Research conducted by the American Galvanizers Association (AGA) provides guidelines to approximate the service life of galvanized steel protection in soil-contact environments. Based on past experience; typical thicknesses of galvanizing (zinc coating in mils) available on industry standard steel bridge decking; and taking into account the variability of soil moisture and acidity levels; an estimated deck service life of 30 to 40 years is used in this analysis for soil-surfaced corrugated steel deck panels. Refer to the AGA's *Service life of Galvanized Steel Articles in Soil Applications* (2011, www.galvanizeit.org) for further information on galvanization and estimates for the estimated longevity of zinc-coated metal in contact with soil.

3. Single-Span vs. Multi-Span Superstructures

a) Single-Spans

In locations where crossings are less than 120 feet in span, single-span installations are generally more economical than multi-span structures. These superstructures can usually be installed with commonly-available construction equipment and universal construction methodologies. If sequenced properly, construction progresses quickly and a new bridge can be completed in as little as two to three weeks. Aside from the potential for shortened construction durations, the primary advantage of a single-span bridge is that streambed disturbances and dewatering are minimized. Single-span structures lend themselves well to bridge crossings with environmental issues such as sensitive aquatic habitats or wetlands. Most permitting agencies (MFWP, USFWS, Army Corps) prefer single-span alternatives (where possible and cost-effective).

Although certain manufacturers produce concrete beams and steel girder systems in spans up to—and exceeding—160 feet, single-span bridge crossings over 135 feet in length are usually not cost effective for County bridge replacements. For these longer crossings, multi-span structures are typically more appropriate.

b) Multiple-Spans

A cost savings may be realized by utilizing multiple spans for crossings of over 135 feet. One advantage of a multi-span bridge is a shallower girder depth and shorter superstructure panels that are more easily transported to the site and maneuvered into place. Multi-span bridge alternatives are comparatively expensive for spans less than 100 feet. The added expense of additional bents due to additional excavation, shoring, formwork, driven piles, drilled shafts and reinforcing steel, typically overshadows any savings in superstructure costs realized by utilizing shorter superstructure spans. Past experience has shown multi-span alternatives to be less economical than comparable single-span bridges for total lengths of less than 135 feet. Typically, multi-span structures are used for crossing lengths where vertical floodway clearance(s) and roadway approach heights are a design consideration. In shorter span superstructures, stringer/girder webbing depths can be minimized in order to maximize freeboard.

Superstructure Summary

Steel and precast concrete superstructures each have the advantages of rapid construction, durability and reduced environmental concerns. Future maintenance costs for these superstructure alternatives are expected to be on the lower end of the spectrum. Although timber structures are aesthetically pleasing, they have span limitations and are not as durable as steel or concrete. Solid sawn timber and glued-laminated superstructures will not be examined further due to span constraints. A full replacement option would require the new bridge superstructure to span approximately 130 feet to cross the Beaverhead River and provide a floodway equivalent to the natural conditions. While 130 feet is on the upper end of a practical single-span structure, replacement of a single-span bridge with a two-span bridge is generally disapproved by FWP and other agencies. As such, only single-span systems will be evaluated in a cost comparison. Superstructure alternatives that will be examined further include Precast, Prestressed Composite Concrete Bulb Tee Beams and Steel Modular Bridge Systems. Superstructure systems will need to have a concrete deck driving surface to minimize sedimentation into the river.

B. Substructure Alternatives

Introduction

A bridge substructure consists of two primary components: abutments and bearings. Determining the type of substructure is largely based on a geotechnical analysis. A detailed geotechnical analysis will be completed during the final design to determine the best substructure system for this site and structure. Silts and clays typically require the use of pile supported substructures due to the relatively low bearing pressure support, whereas shallow bedrock may necessitate spread footings because piles will not penetrate the dense rock. Gravels are normally suitable soils for both pile supported or spread footing foundations. In scour-critical locations, piles are recommended for foundation support. In areas of high seismic activity, like the Anderson Lane Bridge, seismic analysis in design should be considered for viable substructure selection and bearing design.

1. Driven Pile Foundation

This alternative utilizes steel H-piles, steel pipe piles, micro-piles, or round timber piles. Piles are used when the soil under a concrete footing cannot adequately support the substructure and in areas that may be prone to high stream velocity and have scour concerns. Timber piles are typically less expensive than steel piles. However, timber piles are usually used on small bridge projects where the load carried by the piles is relatively small. Timber piles are also utilized when soils lacking solid end bearing are present. Bearing is attained by friction along the piling perimeter resulting from soil displacement. One significant disadvantage of timber piles is their ability to deteriorate and decay when constantly exposed to a wet environment. Another is the impracticality of splicing piles if bearing is not attained in the supplied length. Timber piles can also be problematic during installation due to the soil displacements they cause. Steel pipe piles (open-ended) and H-piles generally have smaller end-contact areas and are easier to drive.

Steel piling is typically the preferred pile alternative. Steel H-piles are desirable when harder soils or soft bedrock is present, as they tend to penetrate better than pipe pile. Steel pipe piles are typically fitted with driving cones that displace larger amounts of soil. Because of their strength and soil displacement, steel round piles may be used for either end bearing on bedrock or alluvial gravels or friction bearing in silts or clays.

The use of diesel hammers or drop hammers is required for driving piles. Drop hammers are seldom used, primarily because they apply high impact stresses on piling and exert low levels of energy. This results in piles being driven more slowly—and with more pile damage—as compared to diesel pile hammers. Diesel hammers are entirely self-contained and use the combustion of diesel to drive piles. The choice of driving methods is normally determined by the contractor’s availability of equipment.

2. Spread Footing Foundation

This alternative utilizes cast-in-place reinforced concrete footings and abutments. Spread footings are used when geotechnical conditions, such as shallow bedrock, exist that do not allow for sufficient pile lengths to be driven, typically a minimum of 10 feet. When footings are installed on soil that has poor load bearing characteristics, undesirable vertical settlement may occur. Countermeasures such as riprap are required to protect abutments when they are at risk from scour. The actual construction of spread footing foundations can be expensive as placing formwork is a labor-intensive process and costly. Cribbing, shoring and dewatering are typically required.

3. Concrete Grade Beam

This alternative utilizes cast-in-place or precast concrete grade beams which are typically placed on geocell earth stabilizing material. The geocell material is placed on prepared subgrade and filled with course granular material. The concrete grade beams are typically three feet wide and three feet deep, depending on local soils and the weight of the superstructure. A heavy superstructure or loading configuration may result in excessive settlement with the grade beam foundation.

Since this foundation system does not involve the use of a deep foundation, the key for proper functionality is to increase the bridge span and add riprap to protect the abutments from scour. This system also necessitates quality subgrade material to ensure suitable bearing pressures. Grade beam foundations are typically not well suited for low vertical clearance sites that typically require the grade beams to be located at or below the groundwater elevation, which would require significant dewatering. This alternative will <u>not be examined further</u> due to scour potential, unknown soil conditions and high anticipated loading.

4. Drilled Shaft Foundation

This alternative involves the use of a cylindrical structural column that transmits loads directly to soil or rock. A casing is typically set in place with the interior material bored and then the casing is filled with reinforced concrete. Shaft foundations are typically considered when spread footings cannot be placed on suitable soil or rock strata within a reasonable depth or obstructions are present preventing driven piling. Drilled shaft foundation construction is typically more expensive than piling installation due to the specialized equipment, additional construction timeframe and construction expertise that are required. This alternative will <u>not be examined further</u> due to high costs relative to the driven pile foundation.

5. Geosynthetic Reinforced Soil – Integrated Bridge System (GRS-IBS)

This alternative utilizes an integrated abutment/wingwall/roadway approach system as the foundation bearing support for prefabricated or modular bridge superstructures. The GRS-IBS system can also be utilized to construct roadway approaches, headwalls and wingwalls for culvert structures. Generally, this substructure system consists of layers of geotextile fabric, which are sandwiched between multiple layers of 8”-minus (free-draining) backfill. Rows of CMU blocks are installed at the face(s) of the abutment/wingwalls to support the backfill and minimize scour.

This substructure system can be especially advantageous in dry crossing applications. Based on experience, the GRS-IBS system is best suited for situations where the site and stream drainage do <u>not</u> have a history of high-velocity flood flows and/or scour problems. The GRS-IBS system can also be beneficial in locations (and for projects) in which a concrete spread footing and stem wall substructure systems are being considered. Additionally, the GRS-IBS system can also be utilized in conjunction with concrete grade beam foundations.

Since this foundation system does not involve the use of a deep foundation, the key for proper function is to increase the bridge span and add riprap to protect from scour. This alternative will only be examined further if site characteristics are suited, minor differential settlements (+/- 2”) are tolerable and scour is not an issue at the proposed site. Due to the resultant substructure loading as well as lateral stream migration and scour which are potential issues at this site, GRS-IBS foundations will not be considered in further detail.

Substructure Summary

The soil and stream characteristics in the project area typically determine the most suitable substructure alternative(s). Prior to final design, a geotechnical evaluation will be performed at the site to determine the most efficient foundation system. Generally, timber piles are used for friction bearing, steel H piles are used for end bearing, round steel pipe piles are used for end bearing or friction bearing and shallow bedrock requires spread footings. Due to site, geologic, stream channel and environmental constraints, this alternative analysis will continue to examine only pile supported and spread footing foundations. The cost difference between steel pile types is reasonably similar and therefore pipe piles will be examined based on suspected soils in the site. A spread footing foundation will be examined further as it could potentially be utilized in shallow bedrock or dense gravel conditions.

C. Culvert Alternatives

Introduction

In many cases, a culvert rather than a new bridge may best accomplish the replacement of an existing structure. Culvert alternatives are often desirable due to short installation times, simple construction required and straightforward engineering. Additionally, ordinary guardrails can be utilized instead of costly and labor-intensive bridge rail. However, culverts tend to experience problems associated with debris collection, fish passage and scour from high velocity flows and should be designed using a detailed hydraulic analysis. Several types of culverts are typically considered when replacing bridges within Beaverhead County.

1. Corrugated Metal Culvert

This alternative involves the use of round or arch corrugated metal pipe (CMP) culverts. Corrugated metal pipes are used to replace bridges where hydraulic flows are insignificant and no environmental concerns are present. Montana Fish Wildlife and Parks and Army Corps of Engineers personnel tend to discourage these in areas where any disturbance to the streambed may adversely affect aquatic life.

2. Structural Plate Steel Pipe Arch Culvert

Structural plate or multi-plate pipe arch culverts are constructed of corrugated structural steel, which is shaped with an internal arching machine. Multi-plates are available in spans of up to 20 feet and heights of 14 feet. Super Spans up to 50 feet are available from other manufacturers; however, they require a reinforced concrete thrust block cast along the top of each side of the structure. Multi-plates are manufactured in 4 to 5 feet sections and fastened with coupling bands. Seams are lapped so the overlap is pointing downstream. Installation is performed in place, roughly 1 to 2 feet below the streambed elevation. The arch or squashed design is desirable over conventional round pipes due to its minimized height, which results in increased hydraulic capacity. The disadvantages associated with multi-plate culverts are aesthetics, streambed impact and labor intensive installation. Montana Fish Wildlife and Parks personnel tend to discourage these in areas where any disturbance to the streambed may affect aquatic life and therefore multi plate pipe arch culverts are typically only utilized on irrigation canals or over intermittent or dry drainages.

3. Structural Plate Steel Arch Culvert

This alternative employs the use of bottomless structural plate or multi-plate steel arch culvert. Steel arch culverts are manufactured in spans from 6 feet to 30 feet at various heights. These culverts do not have the low vertical clearance properties seen with aluminum box culverts but they are more cost effective. Thus, they are only used at sites that have sufficient vertical clearances. Steel arch culverts typically require 1 to 3 feet of fill over the top in order to spread the load and maintain structural stability. At hydraulically insufficient sites, this option may not be feasible. The culverts are used with steel or concrete footing pads that are buried 2 to 3 feet below grade and therefore are utilized on streams that require minimal disturbance to the streambed or aquatic life.

4. Aluminum Box Culvert

This alternative employs the use of bottomless structural plate aluminum box culverts. Aluminum box culverts are manufactured in spans from 9 feet to 26 feet at various heights. Box culverts have a high width-to-height ratio, which allow large volumes of water to pass through a low profile section. They typically require at least 1.4 feet of fill over the top of the culvert in order to spread the load and maintain structural stability. This may rule out design of the culvert at hydraulically insufficient sites. Aluminum box culverts are available with aluminum or concrete footing pads that are buried 2 to 3 feet below grade and therefore are utilized on streams that require minimal disturbance to the streambed or aquatic life. Construction time is minimal with aluminum box culverts as the entire unit can be preassembled then transported to the site and placed with most lifting equipment.

5. Concrete Box Culvert

This alternative involves single or multiple concrete box culverts. Concrete box culverts may be buried just below the stream invert and require significant streambed disturbance. If culverts are not buried below the streambed, scour problems may result. Montana Fish Wildlife and Parks personnel tend to discourage concrete box culverts in areas where any disturbance to the streambed may affect aquatic life. Therefore, concrete box culverts are typically only utilized on irrigation canals or over intermittent or dry drainages unless baffles are added to the floor. Multiple cell culverts tend to catch debris and should be used for specific cases where flows are low and debris in the area is minimal.

Culvert Summary

For long span requirements at the crossing, hydraulic requirements, site characteristics, and the stringent environmental requirements associated with the Beaverhead River, make culvert alternatives unfeasible. For these reasons, culvert alternatives will not be examined further.

Prescreening Analysis Summary

The prescreening analysis ruled out culvert alternatives due to site constraints, hydraulic conveyance and environmental concerns. Bridge replacement alternatives that will be examined further include **Single Span** configurations of the **Precast, Prestressed Concrete Bulb Tee Beams** and **Steel Modular Bridge Systems with Concrete Deck** superstructures and the **Driven Pile** or **Spread Footing** substructure alternatives. Each of these superstructure types is capable of spanning the required length and meeting the design requirements.

V. Analysis of Technically Feasible Alternatives

A. Hydraulic & Hydrologic Design Recommendations

Preliminary sizing of the bridge options was done in accordance with the County Bridge Standards. Full hydrologic and hydraulic analysis will be performed during final design.

The proposed bridge design will accommodate the County Floodplain Regulation requirement of the 100-year event of 1960 cfs with 2 feet of freeboard. Additionally, the new structure will expand the existing hydraulic opening of the bridge on the west side of the structure to reduce erosion and scour potential. A spill-through channel configuration is best-suited for this application and consists of matching the channel base width and utilizing riprap at a 2:1 slope tying into the abutment. A preliminary hydraulic analysis using HY-8 was performed and used to size the replacement structure opening configuration.

A hydrologic study was completed for the Beaverhead River in 2017 by the DNRC, titled Beaverhead River Floodplain Study – Phase II - Beaverhead River Hydrologic Analysis. This report completed a full study using a multitude of methods and techniques, including specific hydrology at the bridge location.

The approximate estimated stream slope of 0.5% used for the initial hydraulic design calculations was determined from review of a topographic map of the area.

Preliminary hydraulic calculations have indicated that generally retaining the existing crossing channel configuration, but widening the structure to the west with 2:1 riprapped slopes at both abutments results in a total structure span length of 130 feet and produces the following freeboard:

Proposed Bridge Hydraulics		
Storm Event	**Flow**	**Freeboard**
25-year	1460 cfs	3.03 ft
50-year	1710 cfs	2.66 ft
100-year	1960 cfs	2.32 ft

The estimated hydraulics of the recommended replacement bridge structure span of 130-feet meets or exceeds the minimum 100-year with 2 foot of freeboard design criteria. The final design stage will involve a complete hydraulic analysis using survey information and a more detailed HEC-RAS hydraulic model. Refer to Appendix III for supplementary information on hydraulics.

B. Structural Design Components

The subsequent discussions consider the bridge as being composed of two distinct elements: 1) the superstructure consisting of the stringers, deck, etc. and 2) the substructure consisting of either a pile supported or spread footing foundation, wingwalls, etc. To simplify the alternative analysis and remain conservative at this planning stage, each substructure option was determined to be interchangeable with each superstructure option. Thus; they will be discussed separately during the alternatives analysis. During the final design stage, the proposed alternative components will be reanalyzed to ensure that the selected bridge configuration for the crossing is still viable and in the best interests of the County, local stakeholders and the environment.

Please refer to the figures in Appendix I for plan and profile views of the proposed replacement configurations.

C. Superstructure Alternatives

Each superstructure alternative presented herein has been assigned a number designator. For example, superstructure Alternative 1 consists of Precast, Prestressed Concrete Bulb Tee Beams.

1. Precast, Prestressed Concrete Bulb Tee Beams – Alternative 1

This alternative would utilize precast, prestressed concrete bulb tee beams to form the superstructure system of the bridge. The deck is cast as an integral part of the beam; thus, alleviating the need to cast a deck in the field. There would be six beams and each would have a width of 4'-6", which would result in a total deck width of 27’-4” and useable width of 24’-0”. The bulb tee beams would be 4'-8" deep to span the required 130 feet. Curb mounted barrier rail would be installed for safety and drainage protection. The road would have to be raised approximately 2.6’ at the existing crossing location for this alternative.

This beam system simply involves setting the beams in place, welding them together and grouting the seams between adjacent beams. The final step involves casting concrete end diaphragms.

The use of a prestressed, precast concrete bulb tee system allows for the quick and efficient installation of the superstructure. The quality control of this alternative can also be closely monitored as the beams are cast in a controlled environment and cured in a steam chamber.

Construction of the concrete bulb tee beam superstructure including placement and installation can be completed in 2-3 weeks. This alternative is essentially maintenance free and has a projected service life of 75 to 100 years.

2. Steel Modular Bridge System – Alternative 2

This alternative would utilize a steel modular bridge system with a cast-in-place concrete deck. Preliminary design indicates a cast-in-place concrete deck as the preferred deck type for a steel modular steel bridge, as precast concrete panel decks are considerably more expensive. The decking system will be compositely tied to the steel modular resulting in a stronger and more efficient structure design. The steel girders would need to be approximately 5 feet deep to span 130 feet. Installation of the decking system is fairly labor intensive and time consuming since the deck must be formed in-place after the steel beams are set in place. The deck thickness is assumed to be 8 inches. Curb mounted barrier rail would be integrated into the overall design of the deck and would accommodate a useable width of 24 feet. The road would have to be raised approximately 3.6’ at the existing crossing location for this alternative.

This alternative would require a relatively minor amount of maintenance. The steel girders would be constructed with A588 weathering steel which would not require periodic painting. The projected service life for this alternative is 75 to 100 years if maintained properly.

D. Substructure Alternatives

A complete geotechnical analysis will be performed during the final design process to determine the most efficient and cost effective alternative. Each substructure alternative is designated by a letter (e.g. Alternative A).

1. Driven Pile Abutments with Concrete Caps and Wingwalls – Alternative A

Based on information gathered from site visits and from USDA soil maps, soils in the area primarily consist of Beavrock, occasionally flooded-Threeriv, frequently flooded complex, 0 to 4 percent slopes (depending on depth and location). Based on nearby well logs and the engineer’s experience in the project area, steel pipe piles are best suited for these conditions. Based on anticipated loading, five piles per abutment at a total depth of 55 feet will be assumed.

Installation of steel piles is a fast and efficient process that typically takes one to two days per abutment. Following installation of the piles, a cast-in-place concrete cap will be constructed to provide bearing for the superstructure. Once the superstructure is in place, the concrete wingwalls can be installed. It is estimated that each wingwall will be supported by a driven pile and will be around 8 feet long and 8.5 feet tall. These wingwalls will be cast-in-place concrete.

Geotextile fabric and riprap will be placed against each abutment and wingwalls in order to protect against scour. This alternative will require little maintenance and has a projected service life of 75 to 100 years.

2. Cast-in-Place Concrete Spread Footing, Abutment Wall and Wingwalls – Alternative B

A cast-in-place concrete spread footing may be a viable alternative, if suitable bearing soil materials are encountered, dewatering is feasible and scour can be effectively mitigated. However, driven steel piles may be necessary should the geotechnical investigation determine that there is a significant amount of clay, silt, or sand in the site vicinity.

The construction of spread footings typically has a greater impact on the stream than driven pile foundations as the footings must be placed three to six feet below the stream bed for scour protection. The construction of concrete spread footings and abutment walls is labor intensive and time consuming as the footings and walls must be formed and poured separately. Additionally, the curing period required for the concrete following each pour adds to the total construction time. Once the spread footings and abutment walls are complete and cured, the superstructure can be installed. Following installation of the superstructure, the wingwalls can be formed and poured. It is estimated that the wingwalls will be 12 feet long and 9 feet tall. Due to potential groundwater, dewatering could be potentially challenging and costly.

Riprap at 2:1 slopes underlain with a geotextile fabric will be placed against each abutment in order to protect against scour. This alternative will require little maintenance and has a projected service life of 75 years.

E. Schematic Layout

Schematic drawings of Replacement Alternatives 1 through 2 are provided as figures in the Appendices. Each of these figures depicts a replacement superstructure alternative along with the possible driven pile or spread footing substructure alternatives. The remaining alternatives discussed in the screening process were not deemed to be viable (or economically feasible) replacement options. All figures are included in Appendix I of this report.

F. Regulatory Compliance and Permits

Regardless of the selected alternative, the proposed improvements for the Anderson Lane Bridge will be designed in accordance with the Beaverhead County Bridge Standards and applicable AASHTO and MDT design guidelines. The Engineer will work closely with the County during the design process and the final design will be presented to Beaverhead County and the Montana Coal Endowment Program for approval prior to soliciting bids.

Regardless of the preferred alternative, the project will be constructed in accordance with state and federal stream permitting guidelines. The construction of the new structure will require permits from the Montana Department of Fish, Wildlife and Parks (124 Permit), the Montana Department of Environmental Quality (318 Permit), U.S. Army Corps of Engineers (404 Permit) and a local County Floodplain Permit.

At this location, the Beaverhead River is not considered a navigable water body; therefore, neither a State Land Use Easement nor License will be required. A stormwater discharge permit from the DEQ will not be needed as construction activities are not anticipated to disturb more than one acre.

In the interest of public health and safety, a traffic control plan outlining the proposed signage and barricades will be required of the Contractor prior to the commencement of construction.

G. Land Requirements

All alternatives will be constructed in essentially the same location as the existing bridge; thus, allowing all roadwork to be completed in existing county right-of-way. The current right of way consists of a 60-foot wide section of County road easement. If temporary easement or right-of-way are required to construct improvements, the County will work with the adjacent landowner(s) to procure access during the design phase. A public detour route will be available around the project area during construction.

H. Environmental Considerations

Bridge construction projects typically cause silt and construction debris to enter the waterway beneath the structure. However, steps can be taken to minimize the amounts of silt, sediments and construction debris that enter the Beaverhead River. One of the most important environmental considerations for this project includes minimizing the effects of sedimentation in the creek from construction. Unfortunately, temporary adverse effects to water quality cannot be completely avoided. However, in a project such as this, additional steps will be taken to keep silt and sedimentation in the river to a minimum. The contractor will be required to place silt fence (or other BMP mechanisms) along the stream banks. The type of structure and duration of the project schedule should be considered in order to reduce environmental impacts.

The U.S Fish and Wildlife Service, Montana Fish Wildlife and Parks and the U.S. Army Corps of Engineers have suggested a strong preference toward the use of single-span bridges to minimize the environmental impacts of the replacement. In the case of this bridge replacement, in addition to the bridge currently being as single-span structure, the replacement of a longer single-span structure would allow more natural flow of the river as it approaches the bridge; thus, reducing erosion and scour and allowing natural material bed load movements upstream and downstream of the bridge. This is especially important with the large irrigation diversion structure located upstream. Typically, driven pile foundations cause less disturbance to the streambed because of the minimal amount of excavation required (as opposed to the spread footing abutment).

All necessary stream permits will be acquired prior to construction and the contractor will be required to abide by the conditions set forth by these permits (e.g. silt fence). All disturbed areas will be re-seeded at the end of the project to promote re-vegetation and reduce erosion.

I. Construction Problems

The Anderson Lane Bridge is located approximately 61 miles southeast of Butte. It is anticipated that due to the distance from Butte, Zone Pay in Montana Prevailing wages will be required. This means that a substantial increase over the base salary rate for employees will be required. The distance of the bridge site from common construction supply centers will increase the delivery cost of materials as well.

A geotechnical investigation will be required which may have an effect on the cost of the bridge replacement project. The design and construction price may increase should the geotechnical analysis determine that a standard foundation design is not feasible. For instance, a geotechnical study may determine that the soils in the area of a particular bridge are extremely poor and necessitate a specialized design for foundation support.

J. Cost Estimates

1. Project Costs

Cost estimates have been prepared for each superstructure and substructure alternative. The estimates include costs associated with engineering, administration, legal and construction activities. Cost estimates are based on past bid tabs on similar projects and quotes received from suppliers. A contingency item has been included as well to account for any unforeseen expenses.

In an effort to standardize the cost estimates for each bridge alternative, the superstructure estimate was assumed to include all additional roadwork necessary to transition between the existing road and new bridge superstructure, providing and installing the girders and deck, installation of end diaphragms, installation of curb-mounted bridge rail and approach rail. Superstructure alternative costs are outlined in variants of Table 1. As discussed previously, each superstructure is designated by a number. For example, Alternative 1 consists of Precast Bulb Tee Beams. Table 1-1 describes the opinion of probable cost for Superstructure Alternative 1. Likewise, Table 1-2 describes the estimated cost of Superstructure Alternative 2.

Analogous to the numbers designating each superstructure, substructure alternatives are each assigned a letter (e.g. Substructure Alternative B). All costs associated with riprap placement is included in the prices of the substructure alternatives. Costs associated with structure excavation and backfill are also included. The substructure estimates include costs for cast-in-place concrete for pile caps, wingwalls, etc. The substructure costs for Alternatives A and B are outlined in Tables 2-A and 2-B of this section, respectively. Separating the superstructure and substructure cost estimates along these lines will allow the various alternatives to be interchanged and compared on a fair basis.

The costs common to the project: removal of existing bridge; embankment; gravel surfacing; object marker installation; geotechnical investigation; etc. are compiled separately in Table 3, as these items are unrelated to the selection of the bridge superstructure and bridge substructure alternatives.

A contractor's mobilization fee, construction contingency set-aside, engineering design and construction management fees and an administrative fee has been added to the cost provided on Table 5. The mobilization fee, approximately 10% of the total construction cost, accounts for bonding, insurance, transportation of labor and equipment and other costs that are typically not included in the other bid items. A 10% (approximate) value accurately reflects the rates commonly utilized by contractors for bridge projects of this nature. The PER cost estimate also applies contingency and inflationary factors. The contingency factor (approximately 15%) was applied to consider potential constructability issues and the potential for unknown factors to arise, such as unforeseen geotechnical conditions. Cost estimating guidance from the Montana Department of Transportation recommends and substantiates the use of a 15% contingency allowance for low-risk bridge projects. The construction inflation factor is based on the Engineering News-Record (ENR) average Construction Cost Index to account for rising costs between the writing of this report and construction of the project (currently anticipated in 2024). The estimated engineering fee accounts for all preliminary design, final design, field surveying, construction documents and permitting. The administrative fee accounts for all clerical, secretarial and legal costs.

2. Present Worth Analysis

Following each cost estimate is a present worth analysis which details costs over the life of the structure. The analysis is completed for each of the replacement alternatives proposed for replacement of the existing bridge. Each bridge alternative will be designed for a useful life of 75 years, which conforms to standards set by AASHTO and followed by MDT. All costs used in the Operation and Maintenance (O&M) assumptions are in today's dollars, as this category is broken out over a 75-year period and inflation over that period cannot be projected.

TABLE 1-1

OPINION OF PROBABLE COST

Superstructure Alternative 1 - Prestressed Concrete Bulb Tee Beams

Item No.	Description	Unit	Quantity	Price	Amount
1	Prestressed Concrete Bulb Tee Beams (130' Span)	SF	3,555	$143	$508,366
2	Steel Bridge Barrier Rail w/Curbs	LF	264	$235	$62,040
3	Approach Guardrail	EA	4	$5,000	$20,000
TOTAL CONSTRUCTION COST					**$590,406**

PRESENT WORTH ANALYSIS			
Maintenance Description	**Frequency (years)**	**Cost per Repair**	**Total Cost**
Patching and Repair of Beam Joints/Deck	25	$3,000	$6,000
Maintenance of Bridge Rail	25	$5,000	$10,000
Maintenance of Approach Guardrail	25	$1,500	$3,000
Useful Life (years)	75		
Superstructure O & M			$19,000
CAPITAL COSTS			$590,406
TOTAL (75 YEAR COST)			**$609,406**

TABLE 1-2
OPINION OF PROBABLE COST
Superstructure Alternative 2 - Steel Modular Bridge System

Item No.	Description	Unit	Quantity	Price	Amount
1	Steel Modular Bridge (130' span)	SF	3,555	$150	$533,250
2	Cast-In-Place Concrete Deck	CY	88	$1,400	$123,200
3	Steel Bridge Barrier Rail w/Curbs	LF	264	$235	$62,040
4	Approach Guardrail	EA	4	$5,000	$20,000
5	Additional 6" Gravel Surface Course (from Additional Road Raising of 1' compared to Alternative 1)	CY	75	$40	$3,000
6	Additional Road Embankment/Base Course (from Additional Road Raising of 1' compared to Alternative 1)	CY	300	$35	$10,500
TOTAL CONSTRUCTION COST					**$751,990**

PRESENT WORTH ANALYSIS			
Maintenance Description	**Frequency (years)**	**Cost per Repair**	**Total Cost**
Repair and Renovation of Deck	25	$4,000	$8,000
Maintenance of Bridge Rail	25	$5,000	$10,000
Maintenance of Approach Guardrail	25	$1,500	$3,000
Useful Life (years)	75		
Superstructure O & M			$21,000
CAPITAL COSTS			$751,990
TOTAL (75 YEAR COST)			**$772,990**

TABLE 2-A
OPINION OF PROBABLE COST
Substructure Alternative A - Driven Pile with Concrete Cap & Wingwalls

Item No.	Description	Unit	Quantity	Price	Amount
1	Structural Excavation	CY	275	$30	$8,250
2	Structural Backfill (Imported)	CY	220	$55	$12,100
3	Cast-in-Place Concrete	CY	60	$1,150	$69,000
4	Furnish and Drive Steel Piles (10@ 55' [50' Driven])	LF	550	$180	$99,000
5	Random Riprap	CY	280	$120	$33,600
TOTAL CONSTRUCTION COST					**$221,950**

PRESENT WORTH ANALYSIS

Maintenance Description	Frequency (years)	Cost per Repair	Total Cost
Patching and Renovating Concrete	25	$15,000	$30,000
Repair and Restructuring of Riprap	25	$7,000	$14,000
Useful Life (years)	75		
Substructure O & M			$44,000
CAPITAL COSTS			$221,950
TOTAL (75 YEAR COST)			**$265,950**

TABLE 2-B
OPINION OF PROBABLE COST
Substructure Alternative B - Spread Footing, Abutment & Wingwalls

Item No.	Description	Unit	Quantity	Price	Amount
1	Structural Excavation	CY	550	$30	$16,500
2	Structural Backfill (Imported)	CY	450	$55	$24,750
3	Cast-in-Place Concrete	CY	115	$1,150	$132,250
4	Dewatering	LS	1	$42,000	$42,000
5	Random Riprap	CY	300	$120	$36,000
TOTAL CONSTRUCTION COST					**$251,500**

PRESENT WORTH ANALYSIS

Maintenance Description	Frequency (years)	Cost per Repair	Total Cost
Patching and Renovating Concrete	25	$20,000	$40,000
Repair and Restructuring of Riprap	25	$7,500	$15,000
Useful Life (years)	75		
Substructure O & M			$55,000
CAPITAL COSTS			$251,500
TOTAL (75 YEAR COST)			**$306,500**

TABLE 3
OPINION OF PROBABLE COST
Common Costs

Item No.	Description	Unit	Quantity	Price	Amount
1	Removal and Disposal of Existing Bridge & Culverts	LS	1	$95,000	$95,000
2	6" Gravel Surface Course	CY	250	$40	$10,000
3	Roadway Embankment/Base Course	CY	750	$35	$26,250
4	72" Dia Steel CSP Culvert	LF	90	$280	$25,200
5	Object Markers & Steel Posts	EA	4	$230	$920
6	Fencing	LS	1	$2,000	$2,000
7	Seeding/Erosion Control	LS	1	$1,000	$1,000
8	Cultural Resource Inventory	LS	1	$3,500	$3,500
9	Historic Bridge Mitigation (Includes HAER)	LS	1	$7,500	$7,500
10	Geotechnical Investigation	LS	1	$16,000	$16,000
11	Asbestos Investigation	LS	1	$900	$900
12	Wetland Delineation	LS	1	$5,000	$5,000
13	Hydraulic Modeling (LOMR, No-Rise Analysis)	LS	1	$25,000	$25,000
14	FEMA LOMR Fee	LS	1	$8,500	$8,500
TOTAL CONSTRUCTION COST					**$226,770**

K. Basis for Selection of the Preferred Alternative

Table 4, on the following page, presents a ranking of each alternative based on a comparative evaluation. Refer to the table for a summarization of the selection process. Superstructure alternatives explored in the cost analysis phase included precast, prestressed concrete bulb tee beams and steel modular bridge systems. Alternative 1, a concrete bulb tee beam superstructure has a present worth savings of approximately $163,584 over Alternative 2, a steel modular bridge system with concrete deck. Both alternatives are relatively equal when comparing technical feasibility, environmental impacts, and construction time. Therefore, the steel modular bridge system (Alternative 2) can be ruled out as it is simply more expensive than the prestressed concrete bulb tee beams (Alternative 1).

Substructure alternatives explored were driven pile with concrete cap foundations and cast-in-place concrete spread footing options. It is apparent that costs are very similar and essentially negate each other. However, the substructures are quite different in technical feasibility, environmental impacts, and construction time. Spread footing foundations require significant disturbance to the streambed as they should be installed below the scour elevation, which necessitates significant dewatering. The decision of the preferred substructure is largely based on environmental considerations, anticipated soil conditions, and construction time. Pairing the best alternatives results in the preferred 130-foot span concrete bulb tee beam (Alternative 1) and the driven pile foundation (Alternative A) presents a cost savings of approximately $161,584 over 2-A and $191,134 over 2-B. Alternative 1-A and 1-B are similar in cost but Alternative 1-A is more technically feasible and site appropriate.

Thus, largely based on long term viability and cost, the preferred option for mitigation of the present concerns and existing bridge deficiencies consists of the full **Structure Replacement** of the existing Anderson Lane Bridge utilizing a **Precast, Prestressed Concrete Bulb Tee Beam Superstructure** supported on a **Driven Pile Foundation**. When including the common cost, the total estimated cost for the preferred alternative is **$1,039,126.** The total cost for the preferred alternative including contingency, inflation, engineering, etc. is shown on Table 5 and is **$1,834,038.**

TABLE 4
Basis For Selection

	Superstructure Alternatives		Substructure Alternatives		
	1	2	A	B	
	Prestressed Concrete Bulb Tee Beams	Modular Steel Bridge System w/Concrete Deck	Driven Pile Foundation	Concrete Spread Footing Foundation	Common Costs
Construction Cost	$590,406	$751,990	$221,950	$251,500	$226,770
O & M Costs	$19,000	$21,000	$44,000	$55,000	-
Useful Life	75 years	75 years	75 years	75 years	75 years
75 Year Present Worth	$609,406	$772,990	$265,950	$306,500	$226,770
Cost Effectiveness	+1	0	+1	0	-
Technical Feasibility	+1	+1	+1	0	-
Environmental Impacts	0	0	0	-1	-
Construction Time	+1	+1	+1	0	-
Total	+3	+2	+3	-1	-

Replacement Alternative	**Total Initial Cost w/Common Costs**	**75 Year PW w/Common Costs**
Prestressed Concrete Bulb Tee Beams w/ a Driven Pile Foundation	$1,039,126	$1,102,126
Prestressed Concrete Bulb Tee Beams w/ a Spread Footing Foundation	$1,068,676	$1,142,676
Modular Steel Bridge w/Concrete Deck and Driven Pile Foundation	$1,200,710	$1,265,710
Modular Steel Bridge w/Concrete Deck and Spread Footing Foundation	$1,230,260	$1,306,260

Recommended Alternative: Prestressed Concrete Bulb Tee Beams with a Driven Pile Foundation

VI. Detailed Description of the Preferred Alternative

A. Site Location and Characteristics

Refer to Appendix I, which includes a Preliminary Schematic Figure and Preliminary Site Plan Figure for the preferred alternative.

The replacement structure will be located in essentially the same location as the existing bridge. The useable bridge width will be 24 feet and the overall length will be increased to 130 feet (from the existing 100 feet). The increased width will allow for two-way travel. The increased span will allow for the proper placement of riprap and environmentally friendly spill-through channel configuration. All bridge work will be completed with only minimal interference to the stream. Work in the streambed vicinity is anticipated to include removing the existing bridge abutments and keying in new riprap.

The roadway approaches will be vertically aligned to provide a smooth transition to the new bridge deck elevation and will require roadwork over approximately 500 feet (250 feet from each bridge end). It is anticipated that the roadway in the bridge vicinity will need to be raised approximately 2.6 feet in order to meet the County freeboard requirements. The roadway width at the bridge will be 24 feet with a crown to provide adequate drainage off the structure. The new roadway improvements are anticipated to be located within the County right-of-way.

During construction, the roadway at the bridge will be closed and traffic will be redirected to a marked detour route around the project site. The construction of the bridge is anticipated to occur over a period of 90 days.

B. Design Criteria

Refer to Appendix I, which includes a schematic drawing for the selected alternative.

The replacement structure will provide sufficient roadway width at the bridge to ensure two-way travel, remedy existing structural concerns, adequately handle proposed loading requirements, provide structurally adequate bridge rail and approach end sections and conform to applicable MDT, AASHTO and County Bridge Standard requirements. The preferred alternative will be constructed with a precast, prestressed concrete bulb tee beam superstructure with driven pile foundation.

The precast, prestressed concrete bulb tee beam bridge will span 130 feet and will be 27 feet and 4 inches wide. Curb mounted bridge barrier rails on each side will allow for a useable width of 24 feet. The replacement structure will handle the 100-year flood event with approximately 2.32 feet of freeboard. Five steel piles per abutment will be driven to an estimated average depth of 55 feet to provide foundation stability. Cast-in-place concrete pile caps will be installed on the piles with a bearing system placed on top of the caps to provide an adequate bearing configuration and remain functional in extreme temperature fluctuations. A cast-in-place concrete end wall will be installed at the bridge ends. The precast bulb tee beams will allow for sufficient live loading meeting County standards. The proposed bridge will be designed for a 75-year useful life, but with an anticipated life closer to 100 years. Bridge rail and guardrail end sections as required by the County Bridge Standards will be integrated into the design and construction of the preferred alternative.

C. Environmental Considerations

The Montana Environmental Policy Act (MEPA) requires state government to coordinate state plans, functions and resources to achieve various environmental, economic and social goals through the use of a systematic, interdisciplinary analysis of state actions that have an impact on the human environment. This is accomplished through the use of a deliberative, written environmental review. For this type of project, an Environmental Assessment (EA) is initiated to determine the potential significance of impacts to the human environment. If the EA determines the proposed action will have significant impacts, then either an Environmental Impact Statement (EIS) must be prepared or the effects of the proposed action must be mitigated below the level of significance and documented in a mitigated EA.

An EA must document the purpose and need for the proposed action, the affected environment, an analysis of alternatives including a No-Action alternative and analysis of the impacts to the human environment of the different alternatives, including an evaluation of appropriate mitigation measures. An EA has been prepared for this project in accordance with MEPA guidelines. In addition, this report serves as a supplement to the EA. Please refer to Appendix V for the attached Environmental Assessment and letters from environmental agencies for supporting documentation of the information presented below.

In order to complete a systematic, interdisciplinary analysis of the project, letters were written to various governmental agencies soliciting comment on any potential environmental impacts, whether beneficial or adverse, which would result from the proposed project. The agencies that were contacted are listed below. See Appendix V for a copy of the EA and comments from the agencies describing the project and any possible environmental impacts.

- Montana Department of Fish, Wildlife and Parks
- Montana Department of Natural Resources and Conservation
- Montana Department of Environmental Quality
- Montana Department of Transportation
- State Historical Preservation Office
- Beaverhead County Floodplain Administrator
- Beaverhead County Planning Office
- U.S. Fish and Wildlife Service
- U.S. Army Corps of Engineers
- Montana Natural Resource Information System
- Montana Sage Grouse Habitat Conservation Program

MEPA also requires public involvement to allow interested and affected individuals, organizations and agencies to be included in the decision-making process. In order to give members of the public the opportunity to be involved in the environmental review, a public meeting was held at:

- Office of the Beaverhead County Commission; Dillon, MT; April 11, 2022 at 1:30 p.m.

Public notice for this meeting, which included invitations for written comments, were published in the Dillon Tribune, the newspaper of record for Beaverhead County.

Additionally, these public notices were published on the County website. The meetings/hearings detailed the inventory process, sought comment on the Environmental Assessment, presented the Preliminary Engineering Report (in draft format) and allowed a venue for public comment. Written comments (and comments received at the public meetings) were documented and added to the EA. Responses to each comment were also documented and added to the EA. According to MEPA, agencies must consider substantive comments to EAs prior to making final decisions about the adequacy of the analysis in the EA, modifications to the proposed action and the necessity of preparing an EIS.

1. Land Use/Important Farm Land/Formally Classified Lands

Affected Environment:
Any modification to, or replacement of, the existing bridge will be constructed in the same approximate location, but with an increased bridge span and usable road width. To the extent possible, all modifications due to the increased bridge width or road approaches will be constructed in the existing 60-foot County road easement. Additional temporary construction easements will be obtained during the design phase, if necessary.

The Anderson Lane Bridge over the Beaverhead River is located in a rural area with primarily undeveloped adjacent agricultural properties. Preliminary investigations indicate that the surrounding lands are designated by the NRCS as Farmland of Local Importance in the immediate vicinity of the bridge. Existing farmlands are not located in the direct impacted vicinity of the bridge, and at the nearest appear to 200 feet to the northwest of the bridge. There is an irrigation diversion structure spanning the full width of the Beaverhead River located just upstream of the bridge. This diversion provides flow to the Staudaher – Bishop Ditch and crosses under the existing roadway in a large culvert approximately 65 feet from the east bridge abutment. The ditch provides water for several agricultural operations in the Beaverhead Valley. Farmlands in the vicinity of the bridge appear to be irrigated alfalfa and grass, though potato farming operations are also common further from the bridge. As the structure replacement will likely be located within the 60-foot County easement and is not tillable land, no negative impact is anticipated.

No forested lands are directly accessed by the bridge.

If the bridge is not improved and becomes closed, farming and ranching operations would be forced to detour to different roadways in order to access their grazing land and haying operations. A new structure will ensure access to the area for another 75 years.

Environmental Consequences:
The area of disturbance is negligible; therefore, the permanent adverse impacts from the project are also negligible. Construction may cause temporary dust, silt, and erosion problems resulting in short-term adverse impacts. If the bridge is not improved and becomes closed, all land uses would be negatively impacted. A new structure will ensure access to the area for 75 years resulting in permanent beneficial impacts to the area.

Mitigation:
The proposed design of the bridge and roadway approach alignments will minimize permanent impacts to land uses by avoiding encroaching on land to the extent possible.

The Contractor will be required to erect silt fence (or other preferred FWP BMP techniques) along the banks to prevent silt and construction debris from entering the stream. The disturbed areas will be seeded to promote re-vegetation. To minimize silt and erosion problems typically associated with bridge construction, construction will likely be scheduled during the late summer or early fall when flows are minimal and minimize disturbance on any native fish and aquatic organism species. If the bridge is not improved and becomes closed, agricultural operations would be forced to detour to different roadways in order to access their agricultural interests and grazing allotments.

The necessary stream permits will be obtained prior to construction and the Contractor will be required to adhere to all guidelines set forth by these documents. The Contractor will also be required to water the construction site as necessary throughout the project in order to mitigate any temporary dust problems.

2. Floodplains

Affected Environment:
While the site is not currently located in an approved mapped FEMA Floodplain area, Montana DNRC/FEMA have completed a floodplain study on this reach of the Beaverhead River which is scheduled to be effective at a future date in 2022. The draft floodplain mapping indicates that the bridge will be located in a mapped Zone AE FEMA Floodplain (Draft Panel 300001 1437 C), a zone in which Base Flood Elevations have been determined.

Environmental Consequences:
Based on information gathered from preliminary hydraulic calculations, local residents, and County personnel, the hydraulic capacity of the existing structure is not a primary concern. No environmental issues associated with floodplains have been identified at this time.

Mitigation:
Since the proposed bridge construction will be in a designated floodplain at the time of construction, a County Floodplain Development Permit will be required. The purpose of the floodplain permit, administered by the County Floodplain Administrator with assistance from the Montana DNRC, is to prevent new construction from adversely affecting the 100 and 50-year floodplains in the County. Upon completion of the project, a Letter of Map Revision (LOMR) will be required to be submitted to Montana DNRC and FEMA. Thus, the acquisition of a County Floodplain Permit serves as mitigation for this issue.

3. Wetlands

Affected Environment:
Based on information from the USFWS Survey National Wetlands Inventory and review of site conditions and photographs, there appear to be freshwater emergent and riparian wetlands in the vicinity of the project.

A wetland delineation will be performed to document any jurisdictional wetlands at the site vicinity during the design phase of the project. The entire footprint of the proposed construction disturbance will be evaluated for the presence of wetlands and those wetlands will be delineated and mapped in accordance with the Corps 1987 Delineation Manual (and applicable Regional Supplement). Wetlands boundaries will be flagged in the field and numbered. Flag numbers and locations will be surveyed using a sub-meter GPS and depicted on the delineation map.

Environmental Consequences:
Minimal impacts to wetlands are anticipated as a result of the proposed construction alternatives.

Mitigation:
The Contractor will be required, to the extent feasible, to avoid wetlands in and around the project site that may be affected by construction activities. The Contract will require the Contractor to minimize wetland disturbance wherever possible and implement BMPs to avoid impacts such as material inputs and sedimentation to wetlands or the Beaverhead River. At this time, and based upon the preliminary information available, Beaverhead County anticipates that less than one-tenth of an acre of wetlands will be disturbed as a result of the proposed project. However, the potential for wetland disturbance will be evaluated in more detail during the design phase to determine if compensatory mitigation is required.

4. Cultural Resources

Affected Environment:
As a general rule, all bridges that are 50 years or older are considered eligible for listing on the National Register of Historic Places.

The Anderson Lane Bridge was originally constructed in 1924 according to the Montana Historic Property Record for the Anderson Lane Bridge (Site 24 BE 2062). While some modifications have occurred over the life of the bridge, most notably a concrete deck replacement, the bridge still retains historic integrity. Recent discussions with Jon Axline, MDT Historian, confirm the bridge is a historically significant structure and is eligible for listing on the National Register of Historic Places. He recommends the bridge be recorded to Historic American Engineering Record (HAER) standards if the existing bridge is to be replaced.

Other sites noted by SHPO in the general location of the bridge replacement project include a historic road.

The proposed bridge extents should not extend far beyond the existing bridge extents and very little previously undisturbed ground should be impacted. Refer to Appendix V for correspondence.

Environmental Consequences:
No environmental consequences have been identified at this time if the structure is documented as recommended.

Mitigation:
SHPO has stated that this bridge is eligible for the National Registry and subsequent discussions with Jon Axline, MDT Bridge Historian, confirm this. Mr. Axline recommends the bridge be recorded to Historic American Engineering Record (HAER) standards which involves photographing and documenting the design of the bridge. HAER recordation serves as mitigation for the bridge replacement.

In addition to the HAER recordation of the bridge, given the historic road in the area, a cultural resources inventory will be performed prior to construction to ensure no cultural resources are impacted.

5. Biological Resources

Affected Environment:
The Beaverhead River and its associated corridor support wildlife and plant populations; therefore, careful consideration to the stream habitat and effects that the proposed bridge will have on the surround habitat and stream will be considered.

A database search conducted using the Montana Natural Heritage Program website and by the USFWS found thirteen possible species of special concern in the area: Spotted Bat, Hoary Bat, Columbia Plateau Pocket Mouse, Grizzly Bear, Great Blue Heron, Burrowing Owl, Ferruginous Hawk, Greater Sag-Grouse, Long-Billed Curlew, Westslope Cutthroat Trout, Mealy Primrose, Woolly-Head Clover and Ute Ladies' - tresses.

Based on a review of the Montana Sage Grouse Habitat Conservation Program Mapper (https://sagegrouse.mt.gov/ProgramMap), the proposed project is not mapped in an Executive Order (EO) Area for Sage Grouse Habitat. As such, Sage Grouse are not anticipated to be adversely affected by this work.

Jake Martin of the United States Fish and Wildlife Service notes the project would be located in an area where the federally threatened grizzly bear may be present. The Service therefore recommends implementation of the following (or similar) conservation measures to manage potential bear attractants and reduce the risk of human-grizzly bear conflicts related to this project:

- Promptly clean up any project related spills, litter, garbage, debris, etc.
- No overnight camping within the project vicinity, except in designated campgrounds, by any crew member or other personnel associated with this project.
- Store all food, food related items, petroleum products, antifreeze, garbage, personal hygiene items, and other attractants inside a closed,

hard-sided vehicle or commercially manufactured bear resistant container.
  - Remove garbage from the project site daily and dispose of it in accordance with all applicable regulations.
  - Notify the Project Manager of any animal carcasses found in the area.
  - Notify the Project Manager of any bears observed in the vicinity of the project.

The Beaverhead River supports aquatic wildlife populations; therefore, careful consideration to the stream habitat and effects that the proposed bridge will have on the stream will be considered. Based on past projects on the Beaverhead River, in order to minimize any long term affects to spawning trout, all in-stream work should take place between mid-July and late-October. Necessary stream permits will be obtained prior to construction and the Contractor will be required to adhere to all guidelines outlined in these documents.

Environmental Consequences:
Silt and debris in the river could adversely affect fish habitat; therefore, a bridge replacement alternative that impacts the streambed and banks as little as possible is desirable. Some bridge designs can constrict the natural channel flow of the river, increase erosion and affect bedload movement both upstream and downstream of the structure. Therefore, single-span bridges with natural stream bottoms are desirable for waterways such as the Beaverhead River.

Mitigation:
The contractor will erect silt fence (or other FWP preferred BMP methods) along the stream banks to prevent silt and construction debris from entering the stream. Care will be taken when removing the existing bridge in order to minimize any adverse effects to the streambed and banks. Disturbed areas will be seeded to prevent erosion and promote re-vegetation. Alternatives such as single-span bridges or other configurations with allowances that hold native bed material will help reduce streambed impacts.

USFWS and USACE have no immediate concerns about the proposed bridge replacement. All necessary stream permits will be obtained prior to construction and the Contractor will be required to adhere to all guidelines outlined in these documents.

The proposed project is not expected to have any significant permanent adverse effects on vegetation and wildlife. No significant migratory bird nesting areas or eagle species are anticipated to be affected by the proposed project. Any temporary construction effects on plant species will be re-seeded to promote re-vegetation and reduce erosion. All necessary stream permits will be acquired prior to construction, and the Contractor will be required to adhere to the permit documents, including guidance on protection or mitigation measures that the USACE feels are reasonable and prudent.

6. Access to and Quality of, Recreational and Wilderness Activities, Public Lands, Waterways and Public Open Space

Affected Environment:
The Anderson Lane Bridge serves, on average, 100 vehicles per day including primary access to private residences, agricultural operations and properties, State of Montana lands (nearly 20 square miles), BLM lands and access for recreation at the bridge crossing itself. Closure of the bridge would impact access to (and quality of experience of) recreational activities, public lands and waterways, and public open space for local residents, hunters, fisherman, hikers, birders and other recreationalists.

Environmental Consequences:
As long as the bridge remains open, no environmental consequences have been identified.

Mitigation:
The replacement of the Anderson Lane Bridge serves as the primary form of mitigation for this issue. A new structure will ensure access to the area for another 75 years.

7. Socio-Economic/Environmental Justice Issues

Affected Environment:
The Anderson Lane Bridge provides primary access to numerous residences, agricultural operations and recreational opportunities. The proposed project will allow residents, agricultural operations and employees to continue to have the most direct access to their properties and places of employment. If the bridge is not improved and becomes closed, individuals would be forced to detour to different roads for access. A new structure will ensure access to the area for 75 years.

Environmental Consequences:
No adverse environmental consequences have been identified at this time.

Mitigation:
Replacement of the Anderson Lane Bridge would serve as the primary form of mitigation for this issue. Proposed improvements will ensure access to the area for the next 75 years.

8. Lead Based Paint and/or Asbestos

Affected Environment:
There is no known asbestos at the site due to the primary structural components being constructed of steel and concrete. It is not known if lead-based paint is present at the site, though minimal paint is present on the existing steel truss structure.

Environmental Consequences:
If properly mitigated, no adverse environmental consequences have been identified at this time. Beneficial impacts include removing any hazardous materials, if present, from the project location and disposing of them at an approved facility.

Mitigation:
Mitigation for lead-based paint is served by removing the existing steel components from the site.

Recent requirements from Montana DEQ require an inspection for asbestos (performed by an accredited inspector) prior to any demolition taking place. This inspection may be waived depending on the type of bridge structure and its components.

D. Cost Summary of Selected Alternative

The following table itemizes the Engineers opinion of probable contracted cost for the preferred alternative. This assumes all work items are contracted to a contractor, outside of the surface course and roadway embankment items, which will be completed by the County.

TABLE 5
OPINION OF PROBABLE COST
Anderson Lane Bridge - Total Project Costs

Item No.	Description	Unit	Quantity	Price	Amount
1	Mobilization	LS	1	$115,550	$115,550
2	Prestressed Concrete Bulb Tee Beams (130')	SF	3,555	$143	$508,366
3	Steel Bridge Barrier Rail w/Curbs	LF	264	$235	$62,040
4	Approach Guardrail	EA	4	$5,000	$20,000
5	Structural Excavation	CY	275	$30	$8,250
6	Structural Backfill (Imported)	CY	220	$55	$12,100
7	Cast-in-Place Concrete	CY	60	$1,150	$69,000
8	Furnish and Drive Steel Piles (10@ 55' [50' Driven])	LF	550	$180	$99,000
9	Random Riprap	CY	280	$120	$33,600
10	Removal and Disposal of Existing Bridge & Culverts	LS	1	$95,000	$95,000
11	6" Gravel Surface Course	CY	250	$40	$10,000
12	Roadway Embankment/Base Course	CY	750	$35	$26,250
13	72" Dia Steel CSP Culvert	LF	90	$280	$25,200
14	Object Markers & Steel Posts	EA	4	$230	$920
15	Fencing	LS	1	$2,000	$2,000
16	Seeding/Erosion Control	LS	1	$1,000	$1,000
17	Cultural Resource Inventory	LS	1	$3,500	$3,500
18	Historic Bridge Mitigation (Includes HAER)	LS	1	$7,500	$7,500
19	Geotechnical Investigation	LS	1	$16,000	$16,000
20	Asbestos Investigation	LS	1	$900	$900
21	Wetland Delineation	LS	1	$5,000	$5,000
22	Hydraulic Modeling (LOMR, No-Rise Analysis)	LS	1	$25,000	$25,000
23	FEMA LOMR Fee	LS	1	$8,500	$8,500
	DIRECT CONSTRUCTION SUBTOTAL				**$1,154,676**
	2024 Construction Cost[2]				**$1,346,816**
	Construction Contingency				**$202,024**
	Engineering				**$235,556**
	Preliminary Engineering				**$15,000**
	Administration/Legal				**$34,642**
	TOTAL				**$1,834,038**

1. Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

2. The 2024 construction cost includes a construction inflation factor based on the Engineering News-Record (ENR) average Construction Cost Index to account for rising costs between the writing of the PER and construction of the project (currently anticipated in 2024)

3. The construction contingency (approximately 15%) was applied to consider potential constructability issues and the potential for unknown factors to arise, such as unforeseen geotechnical conditions. Cost estimating guidance from the Montana Department of Transportation recommends and substantiates the use of a 15% contingency allowance for low-risk bridge projects.

County Completed Items

The following table itemizes the Engineers opinion of probable cost for the Anderson Lane Bridge Replacement.

TABLE 6 OPINION OF PROBABLE COST Total Project Costs			
Administrative Line Items	**MCEP Cost**	**County Cost**	**County In-Kind**
Personnel	$0	$4,000	$0
Office Costs	$0	$500	$0
Professional Services	$0	$27,142	$0
Legal Costs	$0	$1,000	$0
Audit Fees	$0	$1,000	$0
Travel and Training	$0	$1,000	$0
Loan Fees	$0	$0	$0
Load Reserves	$0	$0	$0
Interim Interest	$0	$0	$0
Bond Counsel and Related Costs	$0	$0	$0
SUBTOTAL	**$0**	**$34,642**	**$0**
Construction Line Items	**MCEP Cost**	**County Cost**	**County In-Kind**
Land Purchase Costs	$0	$0	$0
Preliminary Engineering	$0	$15,000	$0
Engineering Design Services	$76,592	$64,742	$0
Construction Management	$0	$94,222	$0
Construction Costs	$673,408	$637,158	$36,250
Contingency	$0	$202,024	$0
SUBTOTAL	**$750,000**	**$1,013,146**	**$36,250**
TOTAL	**$1,834,038**		

VII. Recommendations and Implementation

A. Funding Strategy

Beaverhead County has in the past and continues to demonstrate serious efforts to seek out, analyze and secure the firm commitment of all known sources of alternative funding for bridge improvements. However, sources of funding for bridge projects within the State of Montana are extremely limited. The vast majority of all bridge replacements are funded by bridge mills assessed through local property taxes. The following is a list of sources that were identified in the Bridge Evaluation and Capital Improvement Plan as potential funding sources for bridges:

- Levy the maximum amount of bridge mills allowed by state law
- Bridge Depreciation Reserve Fund
- County CIP Fund
- PILT Payments and Timber Receipts
- Optional Motor Vehicle Tax
- Local Option Motor Fuel Excise Tax
- Oil and Gas Lease Funds
- Rural Improvement Districts
- General Obligation Bonds
- Revenue Bonds
- Impact Fees
- MDT Secondary Road Program
- MDT Bridge Replacement and Rehabilitation Program (HBRRP Off-System)
- Federal Lands Access Program (FLAP)
- Federal Hazard Elimination Program (STPHS)
- Montana Coal Endowment Program (MCEP)
- Montana Board of Investments Intercap Program
- Federal Emergency Management Agency (FEMA)
- Secure Rural Schools Program - Resource Advisory Committee (RAC)
- Bridge and Road Safety Accountability Act (BRSAA)
- Economic Development Administration (EDA)

In reviewing the aforementioned list, the County has determined that most of these funding sources are simply not feasible. However, some have been investigated as potential funding sources. Beaverhead County considered contacting the Montana Fish, Wildlife and Parks and the DNRC for funding assistance, but while they are typically in support of bridge replacement projects, they rarely contribute to County bridge replacement projects.

Several past Beaverhead County bridge projects have utilized HBRRP, FEMA, RAC, FLAP and EDA funds. The Montana Department of Transportation allocates monies to Counties through the off-system bridge program (MDT HBRRP). Though the County has in the past submitted nominations for the Anderson Lane Bridge under this program, but the bridge condition has deteriorated to the point of needing immediate replacement. FEMA allocates monies for bridge replacements that serve to increase public safety in flood prone areas with the Pre-Disaster Mitigation Grant Program. The County recently replaced three structures on Blacktail Creek with new bridges to enhance hydraulic capacity and reduce flooding in the city of Dillon. RAC funds were utilized by Beaverhead County to replace the Birch Creek Bridge in 2011 and the Argenta Road

Bridge in 2013. The county also utilized FLAP funds for the replacement of six bridge on the Big Sheep Creek Road in 2016 and 2017. The county used EDA funding (in combination with TSEP funds) to replace two bridges on Rock Creek Road over the Big Hole River in 2021.

It is the opinion of Beaverhead County that, with the exception of the Montana Coal Endowment Program, there are no other viable sources of funding available for the replacement of the Anderson Lane Bridge outside of the County bridge budget. The County proposes to fund half of Anderson Lane Bridge replacement through grant monies received from the Montana Coal Endowment Program. The remaining portion of the estimated project cost would be funded through the Beaverhead County Bridge Budget.

B. **Implementation**

This project will be scheduled to begin in the late summer of 2024 and is anticipated to occur in a contract period of 90 days. Constructing the bridge in this time frame will allow construction to occur when flows in the Beaverhead River are minimal and will avoid brown trout spawning periods. The County intends to implement this project with a Contractor performing all work. The project schedule is included following the Public Participation section of this preliminary engineering report.

C. **Public Participation**

The public has been involved and supportive throughout the entire process. The County took on a significant outreach effort and directly mailed 98 letters to residents and businesses in the area served by the Anderson Lane Bridge. Additionally, the County contacted emergency services for their support and comments. There is a great deal of public support for the proposed project. No letters received were against the project. The support ranges from affected private property owners to local agricultural operations to local schools to state representatives. Please refer to Appendix IV for letters of support.

Two public meetings/hearings were held at the Office of the Beaverhead County Commission. The first meeting was for the draft Environment Assessment and the second hearing was for the draft PER and Grant Application. Both of these were advertised in the local newspaper and placed on the County website to ensure maximum exposure. Minutes from the meeting and hearings as well as the public notices and newspaper articles are included as an Appendix of the MCEP Grant Application.

BEAVERHEAD COUNTY – ANDERSON LANE BRIDGE OVER THE BEAVERHEAD RIVER
QUARTERLY PROJECT IMPLEMENTATION SCHEDULE

TASK	QUARTERS, 2023				QUARTERS, 2024			
	1st J F M	2nd A M J	3rd J A S	4th O N D	1st J F M	2nd A M J	3rd J A S	4th O N D
PROJECT START UP								
Sign TSEP Contract			X					
Prepare Management Plan			X					
Establish Project Files			X					
Submit Signature & Depository Forms			X					
Submit Budgetary Resolution			X					
PROJECT DESIGN								
Advertise for & Select Engineer		**COMPLETED**						
Commence Final Design			X					
Complete Project Design				X X X	X			
Submit Plans to TSEP					X			
Prepare Bid Documents					X X			
Finalize Acquisition (N/A)								
ADVERTISEMENT FOR CONST. BID								
Review Contract Requirements						X		
Public Bid Advertisement						X X		
Open Bids & Examine Proposals						X		
Request Contr. Debarment Review						X		
Select Contractor & Award Bid						X		
Conduct Pre-Const. Conference						X		
Issue Notice to Proceed to Contractor							X	
PROJECT CONSTRUCTION								
Begin Construction							X X X	X
Monitor Engineer & Contractor							X X X	X
Conduct Labor Compliance Reviews							X X	X
Hold Const. Progress Meetings							X X	X
Final Inspection								X
PROJECT CLOSE OUT								
Submit Final Drawdown								X
Determine Audit Requirements								X
Project Completion Report								X
Submit Conditional Certification								X
Submit Final Certification								X