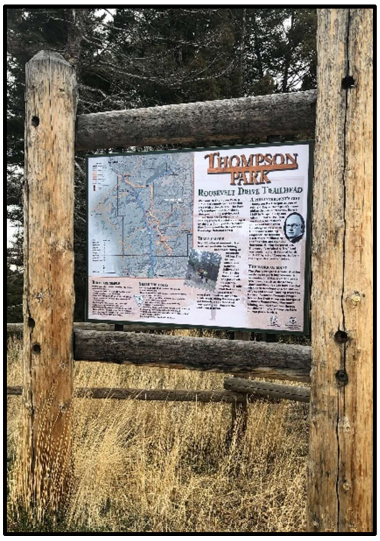

PRELIMINARY ENGINEERING REPORT

Roosevelt Drive Upgrade Study
MT BSilver Bow 2016(9)
IDIQ Contract No. DTFH7015D00007
Task Order No. 69056719F000080

DRAFT

U.S. Department of Transportation
Federal Highway Administration

Prepared for:
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ABBREVIATIONS/ACRONYMS

AASHTO	American Association of State Highway Transportation Officials
ACS	American Community Survey
ADT	Average Daily Traffic
BLM	Bureau of Land Management
BPSOU	Butte Priority Soils Operable Unit
CIP	Capital Improvements Plan
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FPPA	Farmland Policy Protection Act
FWP	Fish, Wildlife and Parks
GIS	Geographic Information Systems
MDEQ	Montana Department of Environmental Quality
MDT	Montana Department of Transportation
MP	Mile Post
MPDES	Montana Pollutant Discharge Elimination System
mph	Miles Per Hour
NEPA	National Environmental Policy Act
NFS	National Forest System
NHP	National Heritage Program
NRCS	National Resource Conservation Service
PASER	Pavement Surface Evaluation and Rating
SOC	Species of Concern
SSD	Stopping Sight Distance
USFS	United States Forest Service
USGS	Unites States Geological Survey
vpd	Vehicles Per Day

PRELIMINARY ENGINEERING REPORT

1.0. INTRODUCTION AND BACKGROUND

Roosevelt Drive provides access to over 73,000 acres of the Beaverhead-Deerlodge National Forest and approximately 40,000 acres of Bureau of Land Management (BLM) lands, primarily in the Highland Mountains south of Butte. The corridor also serves numerous private residences and is highly used by permitted commercial timber, mining, and livestock grazing activities. Residential traffic uses the road year-round. During the winter, Roosevelt Drive is the only ingress/egress road for residents. During the summer, Roosevelt Drive can be accessed from the west by Highland Road and from the south by Fish Creek Road.

Recognizing the deteriorating conditions of the roadway, and the use as a major access to federal lands, the Federal Highway Administration (FHWA), in partnership with Butte-Silver Bow City-County and the United States Forest Service (USFS), developed this planning study to identify potential improvements to the Roosevelt Drive corridor. A key outcome of the study is the development of recommendations intended to address the transportation and access needs of roadway users in the study area. The recommendations define the most critical needs of the corridor and will help the study partners prioritize and allocate resources to address the needs. This study reviews and considers environmental and social issues and aims to reduce planning time and minimize construction costs through the demonstration of feasible improvement opportunities.

The intent of this *Preliminary Engineering Report* is to analyze roadway conditions, identify areas of concern, and develop improvement options for the study corridor. The transportation conditions analysis includes a planning level examination of the corridor based on a variety of information sources and field reviews. Goals and objectives for Roosevelt Drive are also identified based on a comprehensive review of existing and projected transportation conditions. The analysis, together with the stated goals and objectives, influenced the development of potential improvement options intended to address the identified issues and areas of concern.

1.1. STUDY AREA

Roosevelt Drive begins at Montana Highway 2/US Highway 10, approximately two and one-half miles south of Butte, Montana in Silver Bow County. The roadway extends for approximately 4.3 miles and ends at the Roosevelt Drive Trailhead at Thompson Park. The first 2.75 miles of the roadway is functionally classified as a minor collector with the remaining 1.55 miles classified as a local road. **Figure 1.1** presents the study corridor.

The roadway offers recreational access to hiking, biking, camping, hunting, horseback riding, motorized recreation, winter sports, and wildlife viewing opportunities in the Beaverhead-Deerlodge National Forest. Thompson Park, a Congressionally-designated Municipal Recreation Area, is also accessed via Roosevelt Drive. Thompson Park provides access to 25 miles of non-motorized trails, campgrounds, and picnic areas. Several private residences are also located along the last 1.55 miles of the corridor.

Roosevelt Drive provides access to residences, recreational activities in Thompson Park, and commercial activities.

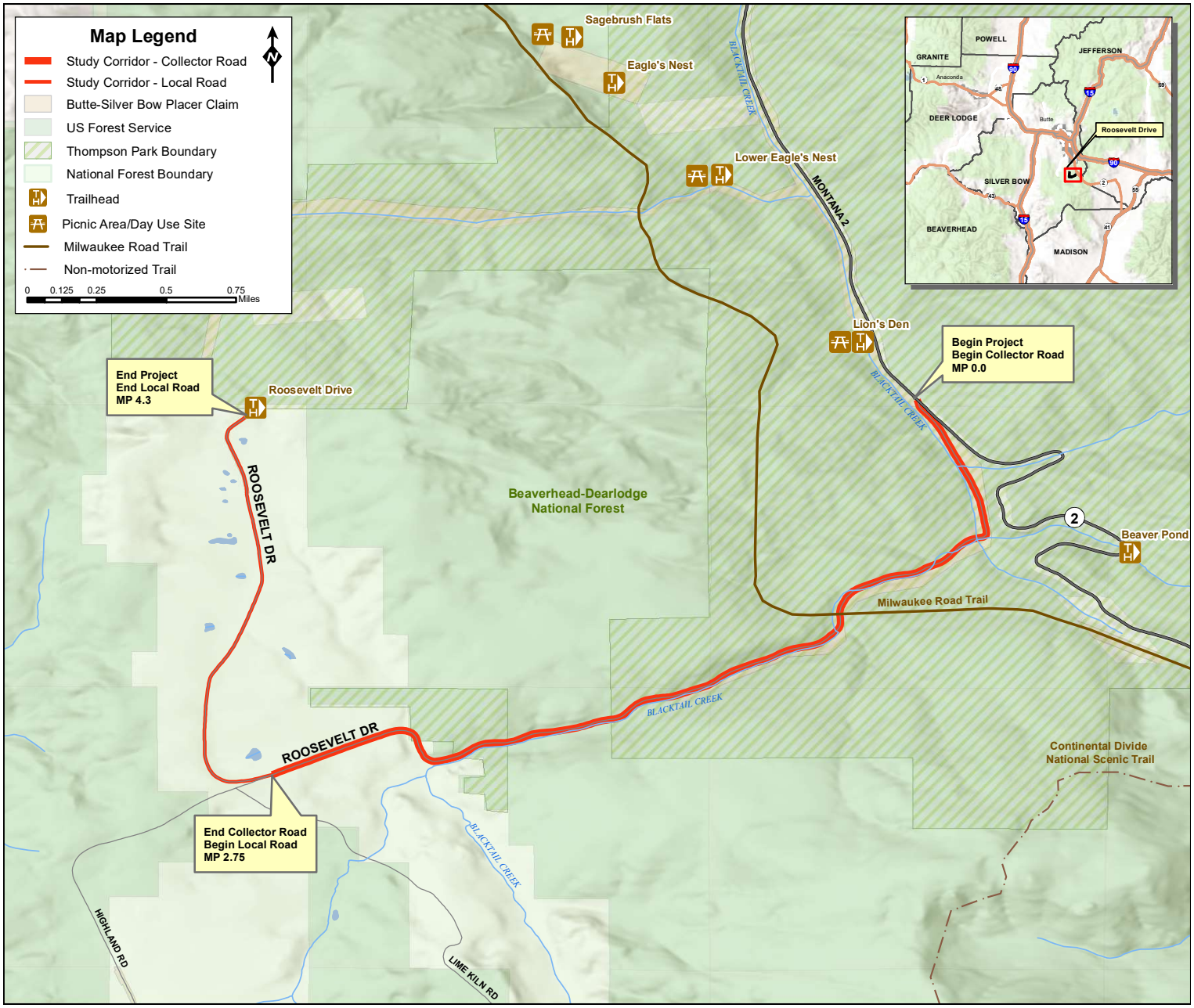


Figure 1.1: Study Area

1.2. Historic Construction and Improvements

Roosevelt Drive was originally used as a mining trail in the early 1900s. As more residences were built and traffic on the dirt road increased, Butte-Silver Bow laid down asphalt millings on the roadway to ease travel. There was no formal design process and as-built plans/drawings of the roadway do not exist. During field review it was observed that the roadway appears to have been paved over the asphalt millings at some point, although no project documentation of this action has been found.

1.3. Existing Plans and Regulations

Several local plans exist with goals and objectives related to the transportation system in the study area. The following provides a summary of existing planning documents relevant to the Roosevelt Drive corridor.

- **Butte-Silver Bow County Growth Policy (2008)** – The *Butte-Silver Bow County Growth Policy*[1] identifies a common community vision for future growth. The policy accounts for the unique setting, population, housing, and economic patterns to provide ways for the community to use land in a way that promotes health, safety, and efficient use of resources. There are two transportation-related goals defined in the Growth Policy: to improve the condition of Butte-Silver Bow's roadway infrastructure; and to provide for improved and ongoing maintenance of existing parks and recreation facilities. Land use and development goals are also defined and may influence future growth in the study area.

- **Beaverhead-Deerlodge Travel Management Plan (2009)** – The *Record of Decision Enacting Forest Plan Travel Management Direction for Certain Areas of the Beaverhead-Deerlodge National Forest*[2] developed and analyzed several alternatives for managing public access and travel within the Beaverhead-Deerlodge National Forest. The report identified a preferred alternative and detailed the anticipated changes to public road access and modifications to the roads, trails, and open space accessible to cars, ATVs, motorcycles, and snowmobiles. No changes were proposed for Roosevelt Drive, however, nearly two miles of routes in the study area were closed to motorized use, specifically the Roosevelt Drive non-motorized trail as shown in **Figure 2.4**.

- **Beaverhead-Deerlodge Land and Resource Management Plan (2009)** – The *Beaverhead-Deerlodge National Forest Land and Resource Management Plan*[3] and the accompanying *Final Environmental Impact Statement*[4] guide all-natural resource management activities and establish management standards for the Beaverhead-Deerlodge National Forest. It describes resource management practices; levels of resource production and management; and the availability and suitability of lands for resource management within the forest. Roosevelt Drive is referenced in the plan as a system road managed by the Forest Service.

- **Butte Highlands Joint Venture Mine EIS (2014)** – The *Final Environmental Impact Statement for the Proposed Butte Highlands Joint Venture Mine*[5] was developed for the Highlands Mine located south of the study area. The mine is primarily accessible by Roosevelt Drive and Highland Road. The report proposes Roosevelt Drive as a haul route for the mine, utilizing the first 2.75 miles of the roadway before connecting to Highland Drive. The report estimates approximately 30 roundtrips by haul vehicles per day, five days a week. To mitigate the proposed impacts, improvements to stream crossings along Roosevelt Drive are proposed to reduce sediment input and provide aquatic organism passage.

- **Butte-Silver Bow Transportation Plan (2016 Update)** – The *Butte-Silver Bow Transportation Plan*[6] offers guidance to support future growth and evolving transportation needs in the Butte-Silver Bow area. The Plan includes an analysis of the existing traffic operations, road networks, transit services, non-motorized transportation systems, and other transportation systems in the community. It also offers recommended improvement projects which address the communities' transportation needs. Roosevelt Drive is located outside the Butte Urban Boundary and is therefore not within the study area boundary for the Transportation Plan. No projects were identified for Roosevelt Drive.

- **Butte-Silver Bow Capital Improvement Plan (2017-2018)** – The *Butte-Silver Bow Capital Improvement Plan and Capital Budget*[7] (CIP) forecasts future spending for all anticipated capital projects. The CIP uses conservative financial forecasts and reflects only those projects with the highest priority and most realistic expectation for completion during the next five years. The Road Department capital budget for fiscal year 2018 is $1.5 million. The budget consists of $847,000 in paving and chip seal projects and $653,000 in new equipment. No specific projects on Roosevelt Drive were scheduled in the CIP for funding over the next five years. Based on this study's findings, the CIP program may be adjusted to make improvements in the Roosevelt Drive area.

Land use policy and development regulation in the study area is governed principally by Butte-Silver Bow. Within the National Forest boundary, land use policy and regulations are dictated by the *Land and Resource Management Plan*. Since the Roosevelt Drive study area falls primarily within County jurisdiction, it is anticipated that projects brought forward in this planning study would be subject to County regulations. However, coordination among federal, state, and local agency staff would be an essential component of any projects that may arise.

1.4. Current and Planned Projects

Improvements to stream crossings along Roosevelt Drive to reduce sediment input and provide aquatic organism passage are proposed to mitigate the impacts of the proposed Highlands Mine south of the study area. If Roosevelt Drive is selected as a haul route for mining activities, the mine will be responsible for improving the roadway as described in the Environmental Impact Statement. No other projects are currently planned for Roosevelt Drive.

2.0. TRANSPORTATION CONDITIONS

The following analysis of transportation conditions includes a planning level examination of the corridor based on a variety of information sources including existing and historic traffic data, vehicle crash history, field measurements and observations, roadway as-built plans, aerial imagery, geographic information system (GIS) data, and input from local stakeholders. This analysis was used to identify areas of concern for the Roosevelt Drive corridor.

2.1. PHYSICAL FEATURES AND CHARACTERISTICS

Roosevelt Drive serves numerous private residences and provides access to public lands for many recreational visitors. The road had deteriorating conditions and is narrow in places with many sharp curves and limited sight distances. The road parallels Blacktail Creek for the first 2.2 miles along rolling terrain adjacent to Blacktail Creek. Butte-Silver Bow is primarily responsible for maintenance on Roosevelt Drive.

2.1.1. Hydraulics

Roosevelt Road crosses Blacktail Creek several times (see **Table 2.1**). Blacktail Creek provides a substantial habitat for westslope cutthroat trout and western toad populations, both of which are listed as sensitive species (see **Section 3** for more detail). Roosevelt Drive also crosses some small, unnamed tributaries of Blacktail Creek as well as several intermittent streams throughout the study area. **Figure 2.1** presents the streams and other waterbodies present within study area.

Table 2.1: Stream and River Crossings

Name	Approximate Location (MP)	Crossing Structure
Blacktail Creek	0.12	Culvert
Blacktail Creek	0.34	Culvert
Blacktail Creek	0.50	Culvert
Blacktail Creek	0.52	Culvert
Blacktail Creek	0.58	Culvert
Blacktail Creek	0.68	Culvert
Blacktail Creek	0.89	Culvert
Blacktail Creek	1.05	Culvert

2.1.2. Bridges

There are no bridges on Roosevelt Drive. However, the trestle for the Milwaukee Road Trail crosses above Roosevelt Drive at MP 1.0. One of the trestle piers is located within the clear zone on the right side of the roadway. This, along with the curvature of the roadway and limited sight distance attributable to the cut slope through this area, pose safety concerns at this location. Blacktail Creek has eroded the land surrounding the piers and has also caused concern for stability of the piers.

2.1.3. Culverts

A total of 25 culverts were identified during the field review. Of those culverts, nine major culverts with a diameter of 30 inches or more were identified. Approximately 56 percent of the culverts were in fair or good conditions. Also noted during the field review was that many of the culverts appear to be undersized to accommodate flow from Blacktail Creek and its tributaries.

Appendix A contains an inventory of each structure and lists the specification and condition of each culvert. **Figure 2.1.** shows the locations of the culverts inventoried. All data contained in the appendices were

collected during field review and may differ from data in inspection reports compiled by Butte-Silver Bow and/or the Forest Service. This analysis does not include a capacity assessment of the culverts nor does it examine whether the culverts pass aquatic organisms.

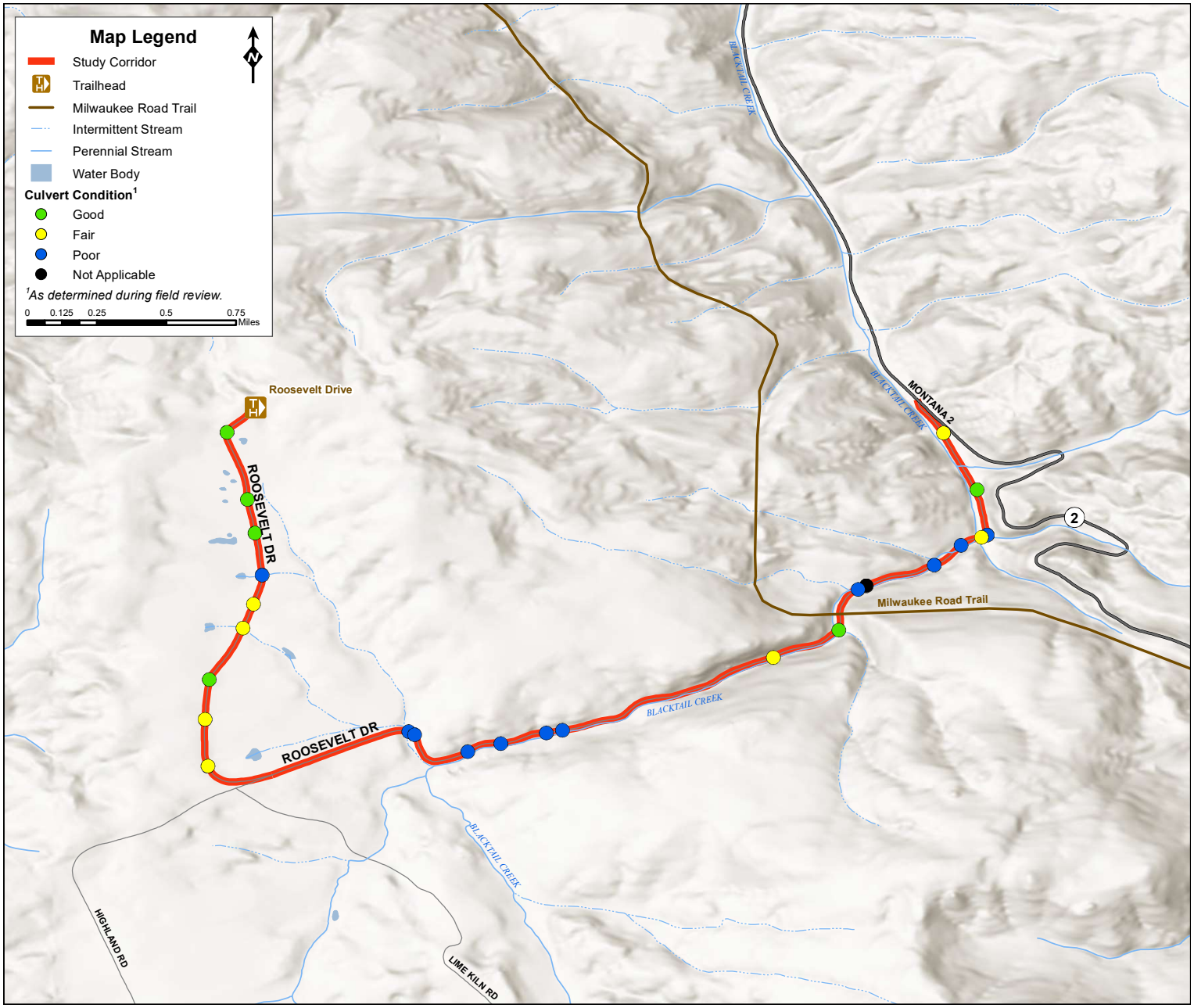


Figure 2.1: Surface Water Features

2.1.4. Access Points

Access points were identified through field review and aerial photography. Based on this review, there are approximately 44 access points along the corridor. Private approaches, recreational accesses, pullout areas, and public roads were all considered access points. The access points were somewhat sporadic along the corridor, with a greater concentration along the last 2.3 miles due to residential driveways. On average, there were 4.5 access points per mile along first 2 miles of the corridor and 15.2 access points

per mile along the last 2.3 miles of the corridor. In total, the corridor has just over 10 access points per mile. **Table 2.2** provides a summary of access point grouped by the collector and local road classifications.

Table 2.2: Access Points Through Study Area

Begin (MP)	End (MP)	Length (mi)	Access Points	Density (app/mi)
0.0	2.75	2.75	18	6.5
2.75	4.3	1.55	26	16.8
Total		**4.3**	**44**	**10.2**

There are a few pullout areas along the corridor used by recreationists as parking spots to access trails and other recreational opportunities, by logging trucks and mining vehicles for passing purposes, and for snow storage during the winter. Most notably, there is a small pullout area at the base of the Milwaukee Trail trestle (MP 1.0) which is used for parking and access to the Milwaukee Trail. Erosion on the hillside where people hike up to the Milwaukee Trail is evident as well, despite signs discouraging the activity. Another point of concern is a small pullout area near MP 2.3 where a trail branches off a s-curve on Roosevelt Drive. Safety concerns associated with limited sight distance and substandard roadway geometry are compounded with inadequate space for roadway users because of parking on the roadside.

2.1.5. Roadway Surfacing

Roosevelt Drive is paved throughout the entire study area. There is a gravel trailhead at the terminus of Roosevelt Drive at the Thompson Park trailhead. Existing roadway widths were determined during field review and were measured from edge of pavement to edge of pavement. Measurements were taken approximately every half mile or when notable changes in pavement width were observed. Based on this evaluation, existing roadway widths range between 18 and 25 feet.

The American Association of State Highway Transportation Officials (AASHTO) *Policy on Geometric Design of Highways and Streets (Greenbook)*[8] recommends a minimum roadway width of 28 to 30 feet, depending on design speed. These standards apply to rural collectors with 400 to 2,000 vehicles per day (vpd). For local roads, the *Greenbook* recommends a minimum width of 26 feet for roads carrying 400 to 2,000 vpd and with a design speed of 40 miles per hour (mph) or less.

Exceptions to these standards are allowed based on topographic constraints, environmental factors, etc., as approved by the road owner and maintainer. The *Greenbook* states that alternate design criteria may be considered for minor collectors that carry 2,000 vpd or fewer in accordance with the AASHTO *Guidelines for Geometric Design of Very Low-Volume Local Roads*[9]. The *Very Low-Volume Local Roads* guidance recommends roadway widths ranging from 18 to 20 feet for new construction of roadways depending on design speed and functional subclass. The guidance also states that the cross-section widths of existing roads need not be modified except in those cases where there is evidence of site-specific safety problems.

Butte-Silver Bow Road Division Standard Drawings[10] also provide area specific guidance for roadway design. A typical collector road has two 12-foot travel lanes and 1-foot shoulders for an overall pavement width of 26 feet. A typical local road is recommended to have two 12-foot travel lanes and no shoulder for an overall 24-foot pavement width. **Table 2.3** summarizes the various requirements for roadway width based on these resources.

Table 2.3: Minimum Roadway Width

Standard	Design Speed (mph)				
	25	30	35	40	45
AASHTO *Greenbook**					
Rural Collector Road	28	28	30	30	30
Rural Local Road	26	26	26	26	28
AASHTO *Very Low Volume Local Roads*					
Minor Access	18	18	18	18	20
Recreational and Scenic	18	18	18	20	20
Butte-Silver Bow Road Division Standard Drawings					
Rural/Suburban Collector Road	26	26	26	26	26
Rural/Suburban Local Road	24	24	24	24	24

**Based on design volume of 400 to 2,000 vpd.*

Pavement condition was also assessed as part of the field review process. A windshield survey of the roadway was performed to assess the existing surfacing condition. The evaluation was completed using methods and standards defined in the Pavement Surface Evaluation and Rating (PASER) documents. Based on this assessment, the pavement is generally in fair to poor condition. Physical deficiencies observed during the evaluation include transverse and longitudinal cracking, alligator cracking, potholing, flushing, rutting, distortion, edge erosion, and failing patches. **Table 2.4** and **Figure 2.2** show the PASER ratings and roadway widths taken approximately every half-mile.

Table 2.4: Pavement Condition and Roadway Width

Begin (MP)	End (MP)	Length (mi)	Width (ft)	Surface Type	PASER Rating	
Collector Road						
0.0	**0.6**	0.6	23	Paved	3	Poor
0.6	**1.1**	0.5	25	Paved	5	Fair
1.1	**1.6**	0.5	22	Paved	4	Fair
1.6	**2.0**	0.4	24	Paved	3	Poor
2.0	**2.5**	0.5	22	Paved	3	Poor
Local Road						
2.5	**2.9**	0.4	22	Paved	4	Fair
2.9	**3.2**	0.3	22	Paved	4	Fair
3.2	**3.7**	0.5	20	Paved	4	Fair
3.7	**4.2**	0.5	18	Paved	4	Fair

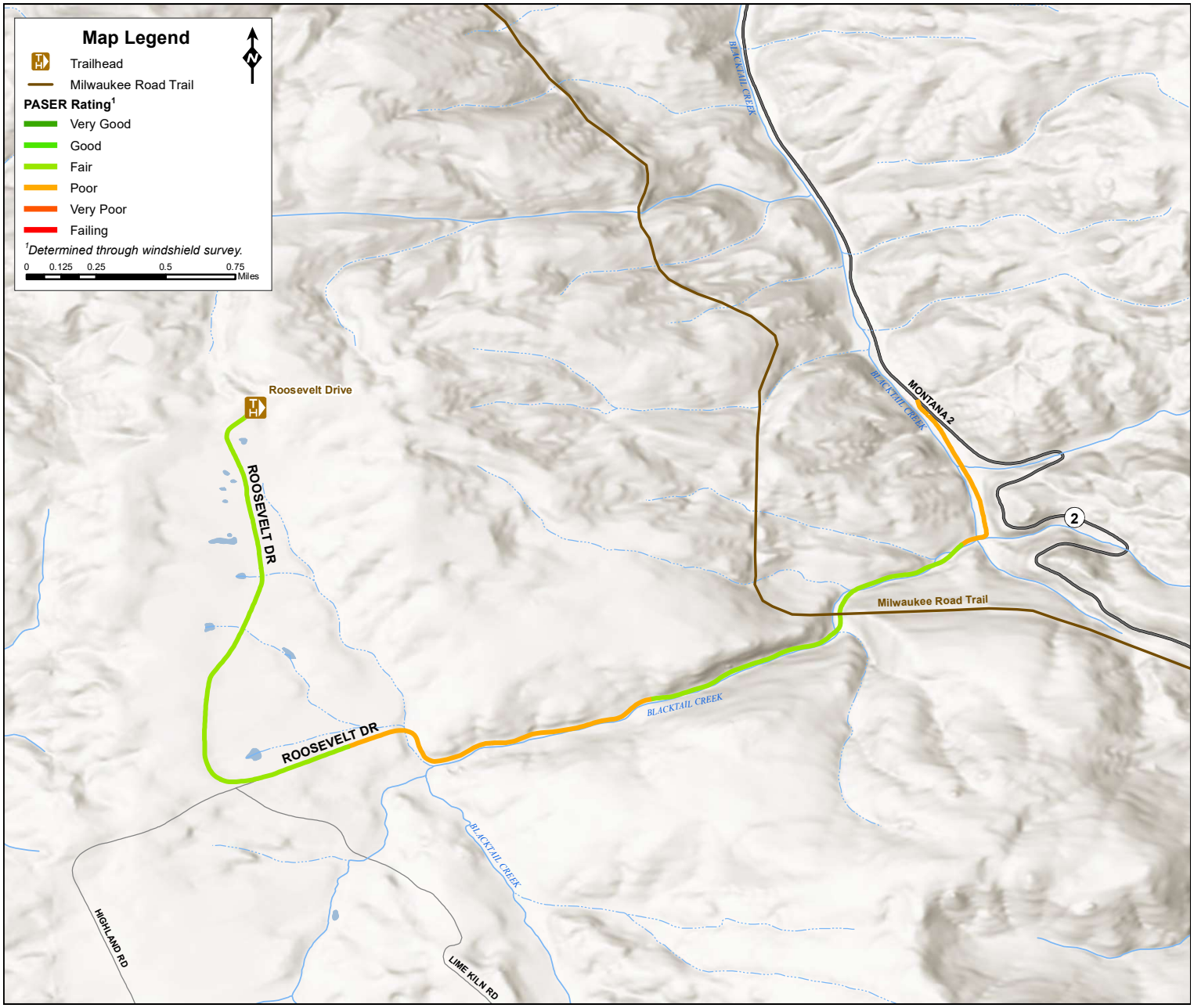


Figure 2.2: Pavement Condition and Roadway Width

2.1.6. Maintenance and Operations

Butte-Silver Bow is primarily responsible for maintenance on Roosevelt Drive. This includes snow removal and general maintenance of the roadway. The existing road conditions and narrow width make it difficult for maintenance vehicles to complete repairs and other maintenance activities. The corridor also connects to areas which are maintained by the Forest Service.

In addition to passenger vehicles and non-motorized modes, heavy vehicles including busses, emergency vehicles, and mining vehicles also use the roadway. The Butte School District uses Roosevelt Drive as a school bus route. The trailhead at the end of the study area is used as a turnaround point. The current road condition hinders the ability for school buses and emergency vehicles to use the roadway, particularly during the winter.

2.1.7. Right-of-Way

Butte-Silver Bow Road Division Standard Drawings require 60 feet of right-of-way for both local and collector roads. Butte-Silver Bow appears to have title for Roosevelt Drive through the study area, however, roadway right-of-way is not well defined. Based on Montana cadastral data, much of the first two miles of Roosevelt Drive lies within Forest Service land boundaries with the road existing in easement. Between MP 2.2 and 3.9, the land adjoining the road is privately owned with Roosevelt Drive passing through several privately-held properties. It appears that Butte-Silver Bow has easements for the roadway on these properties. From about MP 3.9 to 4.3, Butte-Silver Bow owns an approximate 50-foot wide right-of-way. **Figure 2.3** shows the public and private land ownership within the study area based on cadastral data.

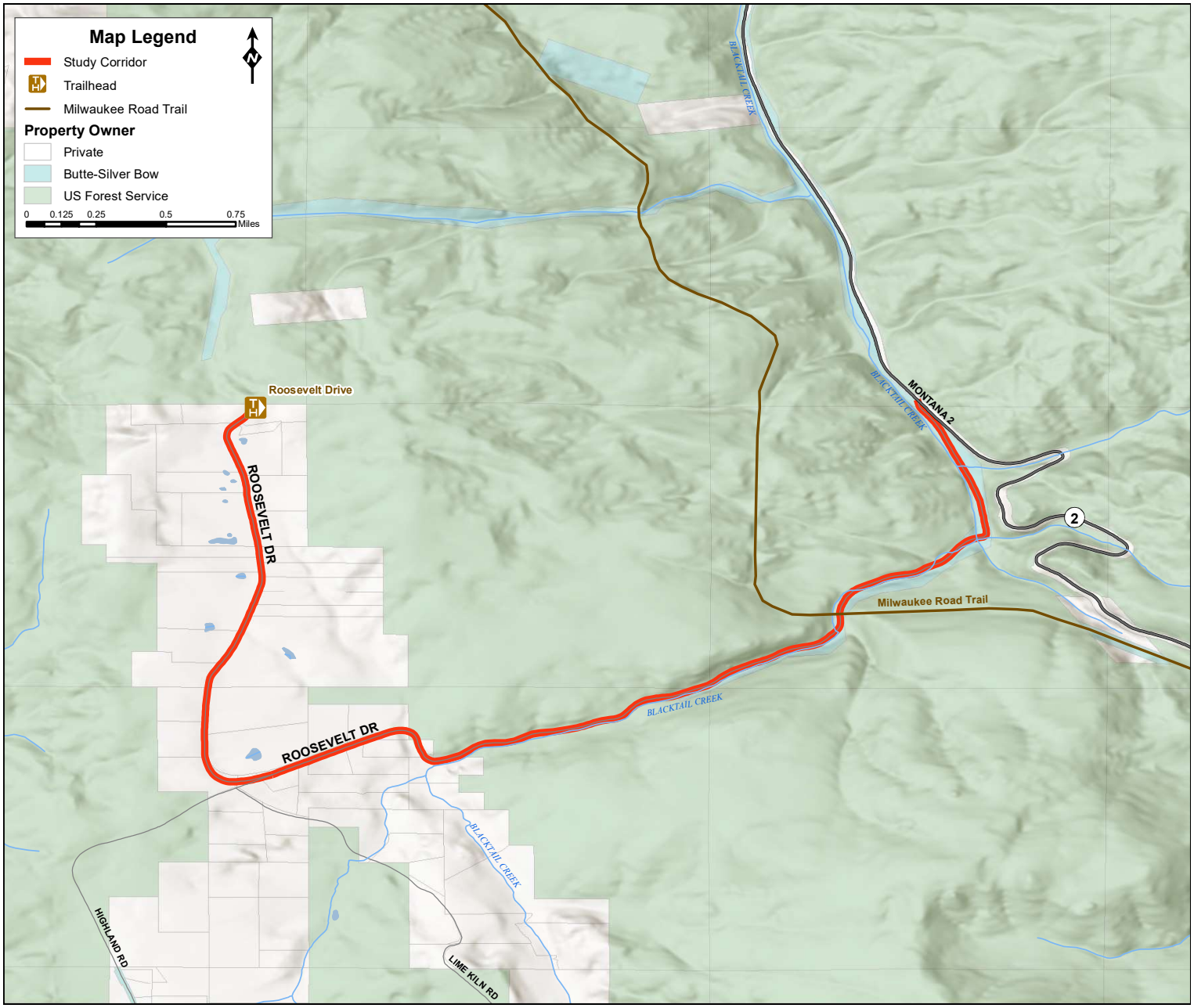


Figure 2.3: Property Ownership

2.1.8. Utilities

Several utilities are located within the study area. Utilities identified include underground and overhead power along with underground fiber optics. The utilities exist along both sides of the roadway and cross the road both underground and above ground in several locations.

2.1.9. Recreational Opportunities

There are numerous recreational opportunities accessed by the corridor. The first 2.75 miles of Roosevelt Drive is highly used by recreationists. Highland Road and Lime Kiln Road stem off Roosevelt Drive and provide access to several recreation opportunities in the Highland Mountain Range. Popular recreation activities include hunting, motorized recreation, hiking, mountain biking, and horseback riding. The first 2.75 miles of Roosevelt Drive are also part of the Adventure Cycling Great Divide Mountain Bike Route. The historic townsite of Highland City and the Highland Lookout are both accessed via Roosevelt Drive and are popular visitor destinations.

The popular Milwaukee Road Rail-Trail crosses Roosevelt Drive via a tressel with piers located within the roadside clear zone.

The remaining 1.55 miles of Roosevelt Drive provides access to private residences and connects to Thompson Park at the Roosevelt Drive Trailhead. Thompson Park is in the National Forest with access to 25 miles of non-motorized trails, campgrounds, and picnic areas. From the Roosevelt Drive trailhead, two trails are accessible: Herman Gulch Trail which is a motorized trail and leads to the Highland Mountains; and the Crook Camp Trail which is accessible by foot, bike, or horse. Other nearby recreation areas include the Continental Divide National Scenic Trail and the Basin Creek Watershed. The Milwaukee Road Rail-Trail also crosses Roosevelt Drive at approximate MP 1.0. The Milwaukee Trail is a four-mile trail which goes through two tunnels and across a trestle (which spans Roosevelt Drive) on the former Chicago, Milwaukee, and St. Paul Railroad. The trail is used year-round and is groomed during the winter. **Figure 2.4** shows the locations of the various recreational opportunities within the study area.

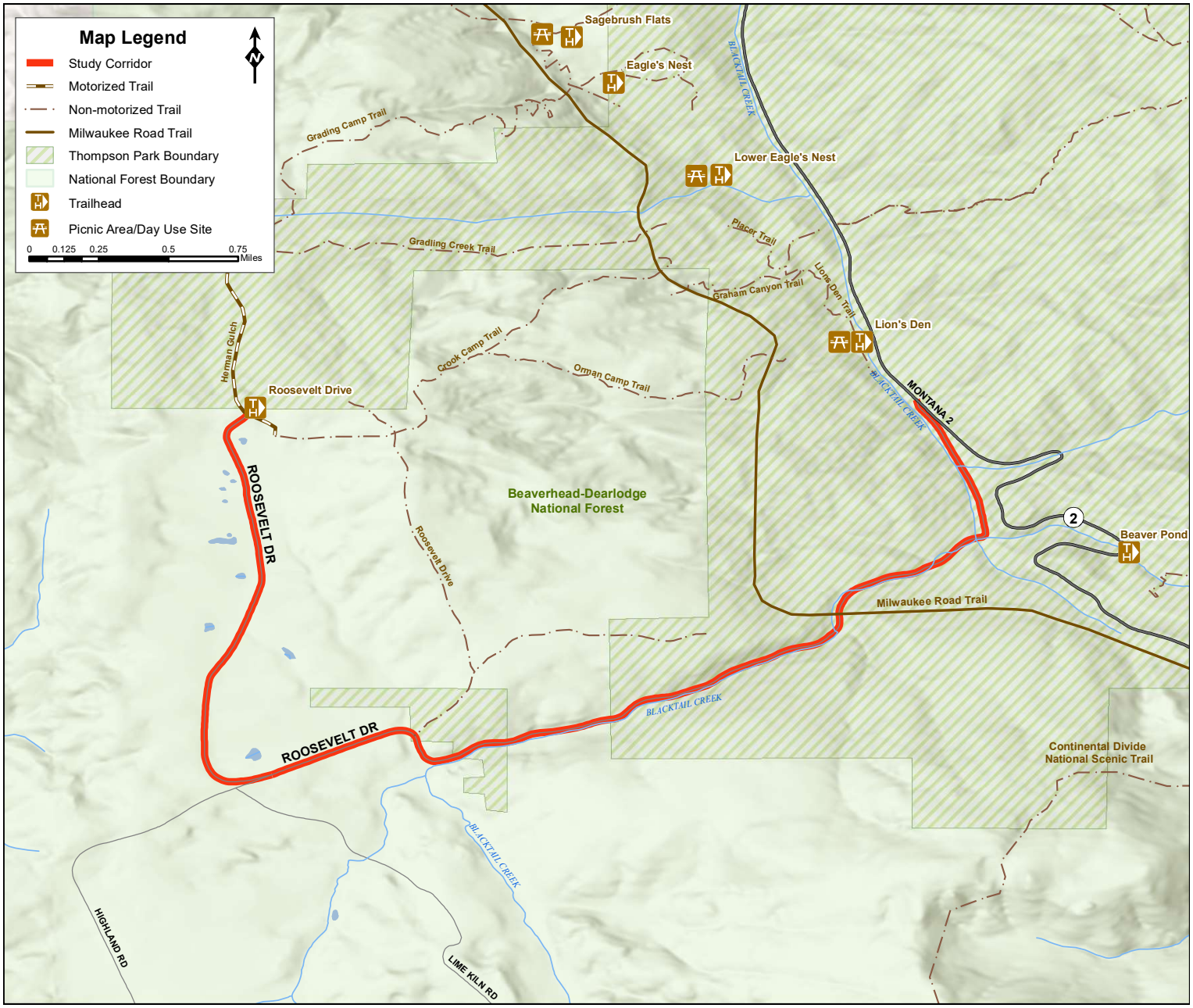


Figure 2.4: Recreational Facilities

2.2. Geometric Conditions

Existing roadway geometrics were evaluated and compared to current standards. As-built drawings were not available for the study corridor, so information obtained from field review and aerial photography was used to document exiting roadway geometrics.

2.2.1. Design Criteria

The *AASHTO Greenbook* specifies general design principles and controls that determine the overall operational characteristics of the roadway. Of critical importance to determining design standards is the design speed. AASHTO's manuals provide guidance for design speed based on facility and operating characteristics; however, some judgment is necessary. A facility's design speed and its operating speed

may differ. The design speed is a selected speed used to determine the various geometric design features of the roadway. The operating speed is the highest overall speed at which a driver may travel on a given section of roadway under favorable weather conditions and prevailing traffic conditions without at any time exceeding the safe speed as determined by the design speed.

Tables 2.5 and **2.6** list current design standards for rural collector roads and rural local roads, respectively, according to AASHTO design criteria. The highway design criteria depend on terrain, area context (i.e., urban or rural), and daily traffic volumes. Based on the definitions provided in the *Greenbook*, the study corridor appears to be of rural context under rolling terrain, with projected traffic volumes between 200 and 1,000 vpd. This correlates to a likely design speed of 40 mph on the first 2.75 miles of the corridor and a design speed of 30 mph on the last 1.55 miles. Note that the speed limit is signed 25 mph along the corridor. For the purposes of this report, a design speed of 40 mph with associated design standards was assumed for the part of Roosevelt Drive that is classified as a collector road and a design speed of 30 mph for the section that is classified as a local road. A final determination of design speed will ultimately be made during project development.

Table 2.5: Geometric Design Criteria – Collector Roads

Design Element			Design Criteria		
			0 to 400 vpd	400 to 2,000 vpd	Over 2,000 vpd
Design Control	Design Speed	Level	40 mph	50 mph	60 mph
		Rolling	30 mph	40 mph	50 mph
		Mountainous	20 mph	30 mph	40 mph
Alignment Elements	Design Speed		30 mph	40 mph	50 mph
	Maximum Grade	Level	7%	7%	6%
		Rolling	9%	8%	7%
		Mountainous	10%	10%	9%
	Vertical Curvature (K-value)	Crest	19	44	84
		Sag	37	64	96
	Stopping Sight Distance (SSD)		200	305	425
	Radius		215	444	758

Table 2.6: Geometric Design Criteria – Local Roads

Design Element			Design Criteria		
			50 to 250 vpd	250 to 400 vpd	400 to 2,000 vpd
Design Control	Design Speed	Level	30 mph	40 mph	50 mph
		Rolling	30 mph	30 mph	40 mph
		Mountainous	20 mph	20 mph	30 mph
Alignment Elements	Design Speed		20 mph	30 mph	40 mph
	Maximum Grade	Level	8%	7%	7%
		Rolling	11%	10%	10%
		Mountainous	16%	14%	13%
	Vertical Curvature (K-value)	Crest	7	19	44
		Sag	17	37	64
	Stopping Sight Distance (SSD)		115	200	305
	Radius		76	214	444

2.2.2. Horizontal Alignment

Elements comprising horizontal alignment include curvature, superelevation (i.e., the bank on the road), and sight distance. These horizontal alignment elements influence traffic operation and safety and relate directly to the design speed of the corridor. AASHTO's design standards for horizontal curves are defined in terms of curve radius, and they vary based on design speed. For a 40-mph design speed (collector road), the minimum recommended radius is 444 feet with a minimum stopping sight distance (SSD) of 305 feet. For a 30-mph design speed (local road), the minimum recommended radius is 214 feet with a minimum SSD of 200 feet.

Horizontal curve radii along the Roosevelt Drive corridor were estimated based on aerial photography. Nine horizontal curves were identified that appear to not meet current AASHTO standards based on design speed. All nine curves are on the portion of Roosevelt Drive that is classified as a collector road. Several of these curves, although substandard in radius, are very short in length and are not necessarily a concern for sight distance. **Table 2.7** provides a summary of the substandard horizontal curves.

Table 2.7: Substandard Horizontal Curves

Milepost	Radius (ft)*	Design Speed Met
0.50	65	15
0.65	375	35
0.86	325	35
0.98	325	35
1.04	225	30
1.13	325	35
1.71	200	25
2.20	150	25
2.33	200	25

**Estimated based on field review and aerial photography.*

2.2.3. Vertical Alignment

Vertical alignment is a measure of the elevation change of a roadway. The length and steepness of grades directly affect the operational characteristics of the roadway. The controlling design limits for vertical curves are SSD, vertical curvature (K-value), and maximum grade. Vertical curves can be placed into two categories: crest and sag. A crest curve is created at the top of a hill or when the grade decreases. Conversely, a sag curve occurs at the bottom of a hill or when the grade increases.

Butte-Silver Bow Road Division Standard Drawings state that the maximum grade for both local and collector streets of rural context shall be 7 percent for flat and rolling terrain and 9 percent for hilly (mountainous) terrain. AASHTO standards state that the maximum allowable grades for a 40-mph design speed on a collector road are 7 percent for level terrain, 8 percent for rolling terrain, and 10 percent for mountainous terrain. For a 30-mph design speed on a local road, the maximum allowable grades are 7 percent for level terrain, 10 percent for rolling terrain, and 14 percent for mountainous terrain.

No vertical curvature data for the roadway was available for review. However, during the field review there was one location (near MP 2.3) observed to have a steep grade leading into a sharp turn. Although the grade is not greater than the maximum allowable grade, this location has exhibited a trend of single-vehicle crashes.

2.2.4. Intersection Alignment

Geometric design of intersections can impact roadway safety by shaping user expectations and defining how to safely move through the intersection where many conflicts exist. There are many design considerations associated with intersections including sight distance, alignment, profile, channelization, and turning movements. There are two primary intersections in the study area, both of which have non-standard geometrics. At the beginning of the corridor, Roosevelt Drive and Highway 2 intersect at an approximate 45-degree angle. The skew of this intersection presents concerns for sight distance, driver confusion, and difficult turning movements. Skewed intersections tend to have more frequent right-angle type crashes. AASHTO design standards recommend angles no more than 15 degrees from perpendicular (i.e. between 75 and 105 degrees). In addition to the sharp skew angle, Highway 2 begins a vertical climb immediately adjacent to the intersection, leading to further sight distance issues.

The intersection of Highway 2 and Roosevelt Drive is a skewed intersection with non-standard geometrics and sight distance issues.

The second intersection, Roosevelt Drive/Lime Kiln Road/Highland Road, is located at MP 2.7. The intersection of these roadways essentially forms a triangle with three separate intersections. At the first point, Roosevelt Drive curves right while Highland Road (also named Moose Creek Road/Shiloh Lane) continues straight ahead. There is a yield sign on the Roosevelt Drive approach leg as it merges with Highland Road. Approximately 500 feet away, where Roosevelt Drive and Lime Kiln Road intersect, the intersection is skewed at a 45-degree angle with two private driveways branching off from the intersection. The community cluster mailbox is also located at this intersection. The third intersection in this “triangle” (Lime Kiln Road and Highland Road) is a typical uncontrolled four-leg intersection. While the intersection experiences typically low traffic volumes, the non-standard alignment and traffic control can result in driver confusion and overall safety concern for users.

The intersection of Roosevelt Drive/Lime Kiln Road/Highland Road essentially forms a triangle with three separate intersections. The intersection is used to access the community mailboxes.

2.2.5. Sight Distance

Sight distance is the length of roadway visible to a driver and is influenced by the geometry of the road (horizontal or vertical curves) and obstacles alongside the road. Sight distance is commonly defined in three ways: passing sight distance, stopping sight distance, and intersection sight distance. In general, the driver of a vehicle should have an unobstructed view and enough distance to perceive, react, and safely stop for or avoid approaching vehicles and other hazards.

Although roadway geometrics are not available, observations during the field review showed locations with limited sight distance due to geometrics or vegetation:

- MP 0.5: Sharp horizontal curve with vegetation
- MP 1.0: Horizontal curve with steep cut slope at Milwaukee Trail trestle.
- MP 1.7: Sharp horizontal curve with steep cut slope
- MP 2.3: Sharp horizontal s-curves with vegetation
- MP 2.9: Compound horizontal/vertical curve

2.2.6. Clear Zone

The FHWA defines a clear zone as the unobstructed, traversable roadside area that allows a driver to stop safely or regain control of a vehicle that has left the roadway. The width of the clear zone is based on traffic volumes, speeds, and slopes. Clear roadsides consider both fixed objects and terrain that may cause vehicles to rollover. Due to the low average daily traffic (ADT), low speed, and rural context of Roosevelt Drive, a clear zone of 7 to 10 feet with recoverable side slopes is recommended by AASHTO. *Butte-Silver Bow Road Division Standard Drawings* recommend 10 feet of clear zone on local and collector roadways. While no cross-sectional data were available to evaluate clear zone distances, the majority of the roadway that parallels Blacktail Creek does not have adequate recoverable side slopes and has minimal clear zones.

2.3. Traffic Conditions

Roosevelt Drive has a varied vehicle mix with residential, commercial, and recreational traffic. The first 2.75 miles of the roadway serves higher traffic volumes and provides connectivity to multiple recreation areas. The last 1.55 miles serves local use and provides access to residential properties and ends at the Roosevelt Drive Trailhead. Passenger cars, heavy trucks/mining vehicles, ATVs, bicycles, and pedestrians are all common on the roadway.

2.3.1. Existing Traffic Volumes

Butte-Silver Bow provided ADT estimates for Roosevelt Drive. The estimates show that the beginning stretch of the corridor has daily traffic volumes of less than 200 vpd. The last 1.55-mile was estimated to have less than 100 vpd. With increased recreation in the summer and in hunting season, the estimated peak season ADT is estimated to range from 500 to 1,000 vpd at the beginning of the study area and 200 vpd at the end of Roosevelt Drive.

To supplement the Butte-Silver Bow estimates, traffic data were collected between July 25 and August 1, 2019 (see **Appendix B**). This week was selected to gather data during a typical summer recreational week. Road tubes were set up at four sites along the corridor: near the beginning of the road (MP 0.1); before the intersection with Lime Kiln Road (MP 2.7); after the intersection with Lime Kiln Road (MP 2.9); at the end of Roosevelt Drive (MP 4.2). **Table 2.8** presents the ADT data collected at these sites.

Table 2.8: Existing Traffic Volumes

Location	Weekday ADT (vpd)	Weekend ADT (vpd)	Combined ADT (vpd)
Beginning of Roosevelt Drive (MP 0.1)	424	432	426
Before Lime Kiln Road (MP 2.7)	350	361	350
After Lime Kiln Road (MP 2.9)	123	83	114
End of Roosevelt Drive (MP 4.2)	24	22	21

As can be seen from the traffic data, volumes decrease with distance along Roosevelt Drive. The data shows that nearly one-third of the traffic volume beginning on Roosevelt Drive does not travel as far as the Lime Kiln Road intersection. The volume drops by more than half again along the roadway past Lime Kiln Road. The traffic at the end of Roosevelt Drive is likely all recreational since the roadway dead ends at the trailhead.

2.3.2. Projected Traffic Volumes

Butte-Silver Bow staff estimated 20-year projected ADT based on population growth and expanded recreation opportunities. On the beginning stretch of the study area, Butte-Silver Bow predicts an ADT of 200 to 500 vpd with a seasonal ADT of 500 to 1,000 vpd. On the last stretch of Roosevelt Drive, ADTs are projected to be near 200 year-round with little seasonal variation.

2.3.3. Heavy Vehicle Traffic

Heavy vehicles are known to use the beginning stretch of Roosevelt Drive. Current estimates show about three percent of vehicles on the roadway being heavy vehicles. Heavy truck traffic is rare on the last stretch of the study area and is projected to remain that way. Heavy truck traffic may increase substantially over the next 20 years if the Highlands Mine opens and chooses to use Roosevelt Drive as a hauling route. The 2015 *Environmental Impact Statement* prepared for the mine approved two hauling routes, one of which uses Roosevelt Drive. The mine owners may choose to use either or both of the routes. Traffic from ore trucks and other mine related vehicles is expected to produce approximately 166 total round trips per week on the first 2.75 miles of Roosevelt Drive.

Supplemental traffic data collected in July/August 2019 shows that heavy vehicles make up a small percentage of the vehicle mix on Roosevelt Drive. **Table 2.9** shows the total heavy vehicles that used Roosevelt Drive over the weeklong data collection period as well as the total percent of the existing vehicle mix. According to the available traffic data, heavy vehicles currently account for less than three percent of total vehicles on Roosevelt Drive.

2.3.4. Alternative Transportation Modes

While there are no dedicated bicycle or pedestrian facilities along the corridor, biking, walking, and running activities are common and could increase with road improvements. The first 2.75 miles of Roosevelt Drive is part of a nationally recognized Great Divide mountain bike route administered by Adventure Cycling. This segment of roadway is used in two major touring/mountain biking events – the Great Divide Ride and the Butte 100. Both events use Roosevelt Drive as access to the Continental Divide National Scenic Trail which joins Lime Kiln Road about 3.5 miles south of Roosevelt Drive. The Butte 100 also utilizes Roosevelt Drive to access an aid station farther up the road. Safety concerns for non-motorists exist due to narrow road widths, sharp curves, limited sight distances, and lack of dedicated facilities. ATVs and other off-highway vehicles are reported to use Roosevelt Drive often to access a popular trail that is used yearlong.

Supplemental traffic data collected in July/August 2019 shows that bicycles make up a small percentage of the vehicle mix on Roosevelt Drive. **Table 2.9** shows the total bicycles that used Roosevelt Drive over the weeklong data collection period as well as the total percent of the existing vehicle mix. According to the available traffic data, bicycles account for less than four percent of total vehicles on Roosevelt Drive. As seen in **Table 2.9**, there appear to be more heavy vehicles and bicycles at the Lime Kiln Road intersection than at the beginning of the study area. It is likely that these higher volumes are attributable to trips concerning the community mailboxes (i.e. a bike traveling to the mailbox and back home or a UPS/mail truck making deliveries).

Table 2.9: Existing Vehicle Mix

Location	Heavy Vehicles		Bicycles	
	Total	(%)	Total	(%)
Beginning of Roosevelt Drive (MP 0.1)	21	0.7	45	1.5
Before Lime Kiln Road (MP 2.7)	26	1.1	50	2.0
After Lime Kiln Road (MP 2.9)	6	0.8	15	1.9
End of Roosevelt Drive (MP 4.2)	4	2.4	6	3.7

2.4. Safety

The Montana Department of Transportation (MDT) provided crash data on Roosevelt Drive from January 1, 2009, to December 31, 2018. Records show 35 crashes occurring within the study area during the crash analysis period. Of the recorded crashes, 2 resulted in serious injuries, 6 resulted in minor injuries, 2

resulted in possible injuries, and 25 resulted in property damage only. A serious injury is defined as an injury, other than a fatality, which prevents the injured person from walking, driving, or normally continuing the activities the person was capable of performing before injury. **Figure 2.5** presents the spatial distribution of the crash data for the 10-year analysis period. Note that this evaluation only includes those crashes reported by a patrolling officer. Given the location and rural context of the roadway, there are likely additional crashes that have occurred which went unreported.

2.4.1. Safety Trends, Contributing Factors, and Crash Clusters

During the 10-year crash analysis period, four crashes occurred per year, on average. Crashes were more common in the winter months with almost 60 percent of crashes occurring between October and February. Approximately half of the crashes occurred on a Saturday or Sunday. Half of the crashes also occurred during the evening hours between 4:00 and 11:00 PM.

All but two crashes involved a single vehicle. The main crash types were fixed object crashes (21) and rollover crashes (10). In the fixed object crashes the driver primarily collided with a ditch (13) or tree (5); one vehicle appears to have collided with the trestle pier for Milwaukee Road Trail. Road surface condition was listed as a contributing circumstance in 18 of the crashes. Six of the crashes (three fixed object, two rollover, and one not-fixed object) involved an impaired driver.

Most of the crashes (21) occurred when the roads were snowy, wet, slushy, icy, or frost covered while 13 occurred under dry road conditions, and 1 when the road was covered with mud or dirt. Most of the crashes (15) occurred when it was cloudy, 14 when it was clear, 5 when it was raining or snowing, and one when it was foggy. Approximately half of the crashes (16) occurred during the daylight while 16 occurred under dark conditions, 2 during dusk, and 1 during dawn.

At MP 0.5 there is a sharp 90-degree curve with vegetation obscuring drivers' sight lines. A cluster of 10 crashes were reported here.

All of the crashes occurred within the first 2.75 miles of the roadway. An analysis of the location of crashes show three key crash clusters. One cluster of 10 crashes occurred at the first 90-degree corner of Roosevelt Drive (MP 0.5). The reported crashes were primarily fixed object crashes (7). In nearly all of the crashes, the driver went off the left side of the roadway and collided with the ditch/embankment. The other crashes were roll over (2) and sideswipe crashes (1). Dark lighting conditions and/or adverse road conditions were reported in most of the crashes.

There is another cluster of 10 crashes at the corner where the trestle for the Milwaukee Road Trail is immediately adjacent to Roosevelt Drive (MP 1.0). This location has a short, but sharp horizontal curve and a steep side cut slope resulting in difficult sight lines. The location of the trestle pier within the roadside clear zone further creates a safety hazard. The crash records show that in one of the crashes in this area, the vehicle collided with the trestle pier, however, evidence of other crashes with the pier were noted during the field review.

Between MP 2.2 and 2.4 there is an s-curve with tight combination horizontal/vertical curves. The steep cut slope, vegetation, and parking along the road limits sight distance at this location.

A cluster of 8 crashes occurred at the s-curve section (MP 2.2 to 2.4). The crashes that were reported in this section were roll over (4), fixed object (3), and sideswipe (1) crashes. The s-curves are tight horizontal curves with limited sight distance due to the steep cut slope

and vegetation. There is also a trail that branches from Roosevelt Drive which is used by hunters and other recreationists near this location. At times there are vehicles parked alongside the roadway at this location which reduces sight distances further and creates additional hazards.

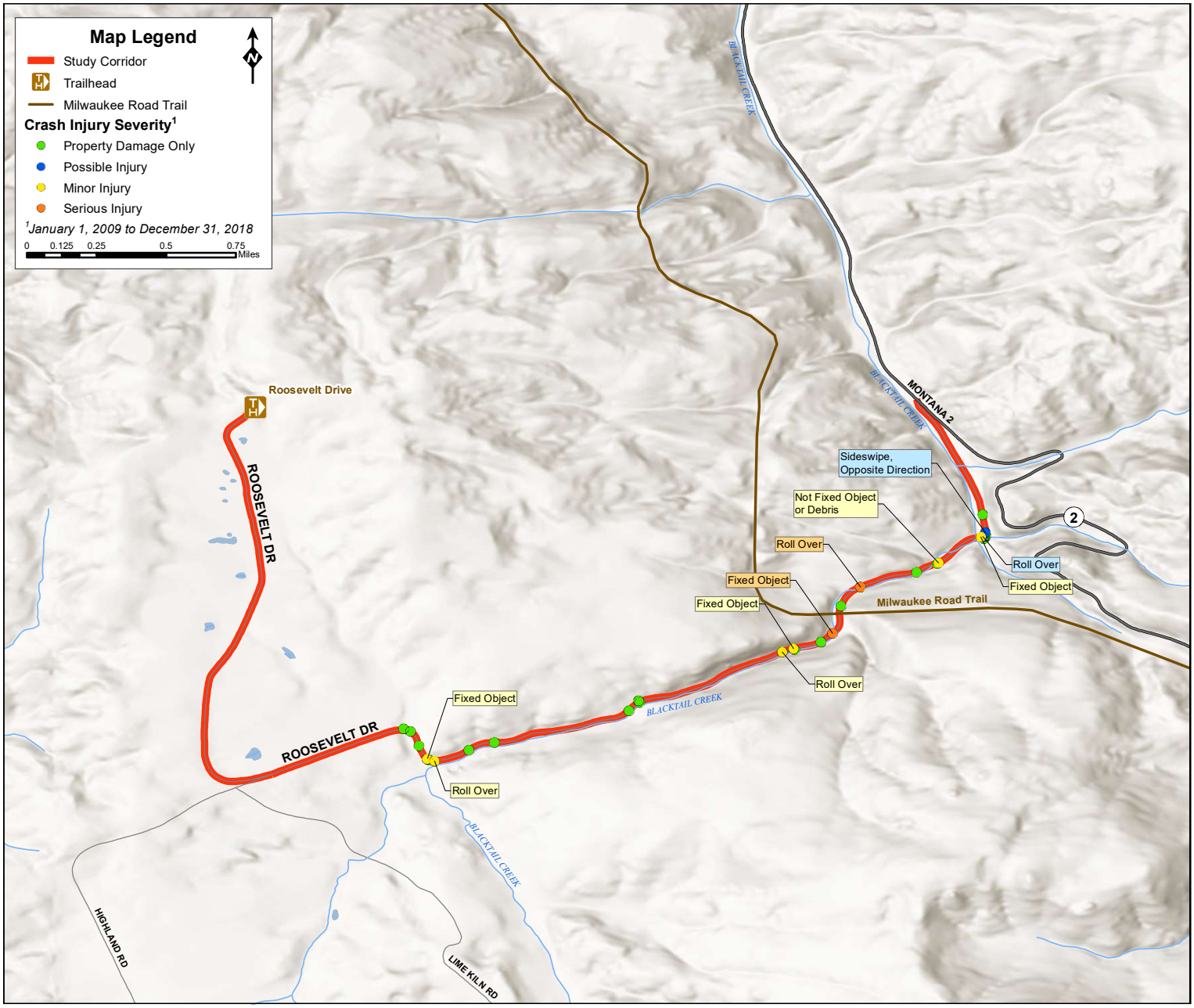


Figure 2.5: Crash Locations

2.5. Other Vulnerabilities

There are locations along the corridor where natural land events, including landslides and erosion, have occurred. The following sections discuss these areas and how they may impact future road design, maintenance, and repair work on Roosevelt Drive. **Figure 2.6** presents these additional vulnerabilities along the study corridor as identified during the field review.

Landslides

Two landslides have occurred within the study area. One started at MP 1.3 and extended along 1,000 feet of Roosevelt Drive encompassing approximately 4.5 acres. A second landslide started at MP 2.0 and extended along Roosevelt Drive for approximately 500 feet encompassing a slide area of about 0.3 acres. Both landslides occurred on the right side of the roadway. The slides have both stabilized and are rated as being of low severity at this time.

Two landslides have occurred in the study area. The slides have been stabilized.

A hazard area for landslides also exists at the eastern end of the study area, beginning at Highway 2 and extending east. The hazard area is categorized as Area 3 or as having potential for rockfall/debris flow near urban areas. The area is especially vulnerable to rockfall hazards if the area were to burn in a forest fire. Development on known slide deposits should be avoided because they are prone to reactivation or have the potential for new slide to develop at the same location.

Drainage/Erosion

Improper drainage on a roadway can lead to serious erosion issues. When water falls on roads and is not removed promptly, the water seeps into lower layers of the pavement, weakens the soil which can compromise the soil's stability and undermine the capacity of the pavement to carry traffic. There were several locations along the corridor observed to have poor drainage during field review. In some locations with poor drainage there were existing culverts built to divert water from the roadway. Some culvert sections have been detached allowing water to pool along the roadside. There were also many locations where culverts were undersized or non-existent. During peak runoff times, floodwaters from Blacktail Creek flow over and across Roosevelt Drive in multiple locations.

Culverts help control drainage to reduce erosion. About 45 percent of culverts in the study area are in poor condition.

Several locations where erosion was occurring causing slope failures, pavement degradation, and sedimentation were documented along Roosevelt Drive. The erosion in most of these locations was caused by improper drainage, although erosion can also be caused by inadequate road design as well as general wear and tear.

Subgrade

As mentioned previously in **Section 2.1.5**, the pavement throughout the study area is generally in poor condition. There are several locations along the roadway where the pavement experiences failures including transverse and longitudinal cracking, alligator cracking, potholing, flushing, rutting, distortion, edge erosion, and failing patches. The cause of these failures is typically a weakened or deteriorating subgrade. This distress on the pavement can be caused by a variety of factors including poor drainage, erosion, frost heave, lack of compaction, or weak materials. In one location, near MP 0.65, an asphalt repair patch was noted as failing likely due to a weak or poorly compacted subgrade.

There are several locations where the pavement experiences failures including cracking, potholing, flushing, rutting, distortion, edge erosion, and failing patches.

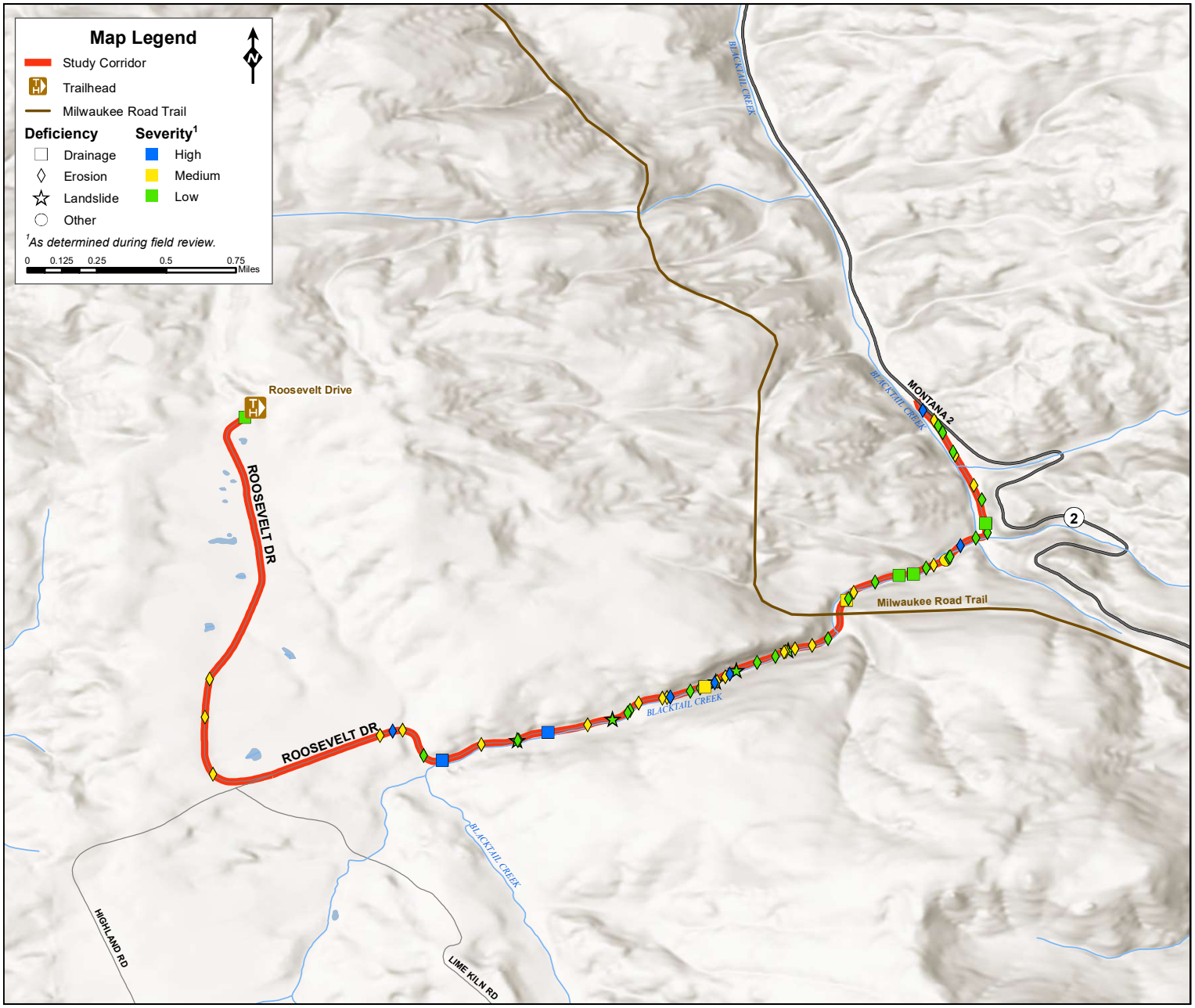


Figure 2.6: Other Vulnerabilities

3.0. ENVIRONMENTAL SETTING

As with any potential roadway improvement project, the current and potential environmental conditions need to be considered. The majority of environmental concerns within the study area that may impact project development relate to Blacktail Creek and the habitat it provides. Blacktail Creek crosses Roosevelt Drive several times throughout the study area. Culverts have been placed to control these crossings however there are locations where culverts are undersized, do not allow fish passage, or erosion from the water has compromised the stability of the roadway. The steam and surrounding wetlands provide a substantial habitat that supports diverse populations of fish and wildlife including westslope cutthroat trout and western toad species which are considered sensitive species by the USFS.

The geologic characteristics of the study area also make it prone to landslide and earthquake hazards. Improvements made to Roosevelt Drive, especially roadway widening, have the potential to trigger geologic events. Geotechnical investigations would be required for reconstruction or significant improvements to Roosevelt Drive to determine potential stability, erosion, and settlement concerns posed by surface geology and soil conditions.

An *Environmental Scan* (see **Appendix C**) has been prepared documenting the current environmental conditions. This section provides a summary of the *Environmental Scan* which includes a planning-level overview of resources and identifies potential constraints and opportunities based on readily available environmental information. Improvement projects forwarded from this planning project which may impact Blacktail Creek, the species supported by the watershed, the land surrounding the roadway, and the nearby populations will need to be considered. Project-level environmental analysis would be required for any improvements forwarded from this study. Information contained in the *Environmental Scan* may be used to support future environmental documentation.

3.1. PHYSICAL ENVIRONMENT

The following sections present an overview of items related to the physical environment of the study area.

3.1.1. Land Ownership and Land Use

The land in the study area is primarily owned by the USFS and private landowners. The privately-owned parcels are not zoned by Butte-Silver Bow; however, the *Butte-Silver Bow Growth Policy Update*[11] classifies these parcels as RD 10 (Rural District 10) and recommends rural residential development with a minimum density of 1 dwelling unit per 10 acres and encourages limited agricultural related uses. Outdoor or seasonal recreational and related commercial uses requiring large land areas are also consistent with land use recommendations for RD 10 areas. The USFS lands in the study area are designated as public/open space in the *Growth Policy Update*. The study area and adjacent lands are primarily used for residential use, grazing, timber activity, mining, and recreation. If any improvement options are forwarded from the study, additional research and coordination would be needed to determine impacts to existing right-of-way or easements on private and USFS lands.

3.1.2. Soil Resources and Prime Farmland

The *Farmland Policy Protection Act* (FPPA) (7 U.S.C. 4201 et. seq.) requires special consideration be given to soils considered as prime farmland, unique farmland, or farmland of statewide or local importance by the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS). The FPPA is intended to minimize the impact Federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. The study area is included in the Deer Lodge National Forest Area soil survey area mapped by the NRCS. Based on the available mapping data, there are no soils classified as prime farmland, unique farmland, or farmland of state or local importance in the study area.

3.1.3. Geologic Hazards

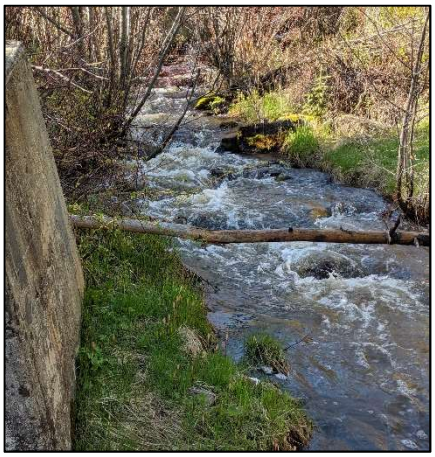
The Butte area is in a moderate to high seismic risk zone and the area has seen several earthquakes ranging from magnitude 0.1 up to 3.0. Two earthquake events (in 1984 and 2005) were recorded near Roosevelt Drive. Both earthquake events were shallow and were of magnitudes under 1.5. Several other earthquake events ranging in magnitude have occurred in the areas surrounding the study area, primarily to the east.

Two talus landslides have occurred within the study area. Talus landslides are characteristically rockfall or rockslidesand are common in areas with aprons of rock debris at the base of cliffs or steep slopes covered by rock fragments. One of the recorded landslides begins near MP 1.3 and extends for approximately 1,000 feet along Roosevelt Drive. The second landslide is located near MP 2.0 and extends for approximately 500 feet along the roadway. A hazard area for landslides also exists at the eastern end of the study area, beginning at Highway 2 and extending east.

Geotechnical investigations would be required for reconstruction or significant improvements to Roosevelt Drive to determine potential stability, erosion, and settlement concerns posed by surface geology and soil conditions.

3.1.4. Surface Waters

The study area lies entirely within the Upper Clark Fork Watershed as delineated by the United States Geological Survey (USGS). Roosevelt Drive parallels Blacktail Creek and crosses the stream several times within the first 2.2 miles of the study area (near MPs 0.5, 0.6, 0.7, 0.9 and 1.1). Blacktail Creek is a perennial, fish-bearing stream. Roosevelt Drive also crosses some small, unnamed tributaries of Blacktail Creek as well as several intermittent streams throughout the study area.



Roosevelt Drive parallels Blacktail Creek for the first 2.2 miles of the study area. Blacktail Creek is a perennial, fish-bearing stream.

Road construction and reconstruction activities such as culvert installation or replacement, placement of fill, or bank stabilization have the potential for impacts to surface waters. Coordination with federal, state, and local agencies would be necessary to determine the appropriate permits based on the improvement options forwarded from this study. Impacts should be avoided and minimized to the maximum extent practicable. Impacts to streams and wetlands may trigger compensatory mitigation requirements.

There are no water bodies within the study area that do not meet water quality standards. However, the *Silver Bow Creek Watershed Restoration Plan*[12] indicates that Blacktail Creek has elevated levels of nutrients from residential development along the river. Excess sediments from road crossings and encroachment on the river are also present. Large areas of coniferous forest killed by pine beetles pose a wildfire threat in the area. A large wildfire could increase sediment load levels in Blacktail Creek and threaten the fish habitat.

In Montana, stormwater management is regulated by the Montana Department of Environmental Quality (MDEQ). A Montana Pollutant Discharge Elimination System (MPDES) general permit is required for stormwater discharges from construction activities that result in the disturbance of equal to or greater than one acre of land area. The applicability of this MPDES permits for Roosevelt Drive would need to be reviewed for any projects brought forward from the study.

3.1.5. Groundwater

Records maintained by the Groundwater Information Center at the Montana Bureau of Mines and Geology show approximately 25 wells are located within the study area. Well depths vary by individual location, but the majority of wells drilled in the study area have been drilled to depths of less than 100 feet. Static water levels vary considerably but generally range from 5 to 40 feet below the ground surface in most locations. Impacts to the groundwater supply should be considered in any improvement option that may be brought forward from the planning study.

3.1.6. Floodplains and Floodways

Roosevelt Drive lies within Zone D as designated by the Federal Emergency Management Agency (FEMA). Areas in Zone D have possible but undetermined flood hazards as no analysis of flood hazards has been conducted. Coordination with the Butte-Silver Bow floodplain administrator will be necessary to determine the need for a floodplain permit if any improvement options are advanced from this study.

3.1.7. Wetlands and Waters of the U.S.

Available data primarily freshwater emergent wetlands, freshwater ponds, freshwater scrub-shrub wetlands, riparian emergent wetlands, and riparian scrub-shrub along Blacktail Creek and other waterbodies in the study area. Wetland delineations would be required if improvement options are forwarded from the planning study that could potentially affect wetlands. Future projects in the study area would need to incorporate project design features to avoid and minimize adverse impacts on wetlands to the maximum extent practicable. Various state and federal water quality permits may be required to implement construction projects on Roosevelt Drive.

3.1.8. Hazardous Substances

The following summarizes potential hazardous sites within the study area:

- **National Priority List (Superfund) Sites:** The Silver Bow Creek/Butte Area Superfund Site is located in and around Butte and includes 26 miles of stream and streamside habitat downstream from Butte. The Butte Priority Soils Operable Unit (BPSOU) is in the Butte portion of the Silver Bow Creek/Butte Area Site. It includes the Town of Walkerville, part of Butte north of lower Silver Bow Creek and west of the Berkeley Pit, and a section of land that extends south from lower Silver Bow Creek to Timber Butte. It includes the contaminated alluvial aquifer that results from BPSOU surface contamination and surface water in lower Silver Bow Creek and Blacktail Creek within the BPSOU boundary. The Roosevelt Drive study area is not within the BPSOU.
- **Hazardous Waste Release Sites:** There are no hazardous waste release sites in the study area.
- **Abandoned and Inactive Mine Sites:** The study area is located within the Basin Creek Mining District. Two abandoned or inactive mine sites exist near the study area but are not likely to be impacted by projects forwarded from this study. An unnamed location and a site named the Clark Property are both lode mine sites. The Butte-Highland Mine, about 5.5 miles southwest of the study area, is an underground gold mine. The mine was first in operation in the early 1900s. The permitting process is underway to resume operation of the mine. The mine may impact traffic on Roosevelt Drive.
- **Underground Storage Tanks:** No underground storage tanks are in the study area.
- **Remediation Response Sites.** No remediation response sites were identified in the study area.
- **Petroleum Tank Releases:** No petroleum tank releases were identified in the study area.

Based on available information, there appears to be a low likelihood of encountering contaminated materials in the study area.

3.1.9. Air Quality

Butte is considered a nonattainment area for particulate matter (PM10). However, the study area is located outside the designated PM10 Nonattainment Area Boundary. Since the study area is considered in attainment for all pollutants, federally-funded transportation projects on Roosevelt Drive by the FHWA would not be subject to conformity requirements.

3.1.10. Noise

Residences in the study area comprise the only sensitive noise receptors that could be affected by roadway improvements on Roosevelt Drive. Detailed noise analyses are often conducted when the potential for noise impacts exists due to substantial changes in roadway design or configuration. However, given the rural environment, low volumes of traffic, and dispersed nature of residences in the study area, noise impacts resulting from potential roadway improvements are unlikely. Construction activities associated with improvements to Roosevelt Drive may result in localized and temporary noise impacts in the vicinity of residences. These impacts can be minimized by incorporating measures to control of noise sources during construction.

3.2. Biological Resources

The following information applies to the biological environment within the study area and reflects a baseline natural resource condition. Depending on the level of detail available through the high-level baseline scan, some of the information is presented at the county level, some at the study area level, and some at the corridor level.

3.2.1. Vegetation

Five vegetation types cover the majority of the Roosevelt Drive study area: mixed broadleaf and coniferous forest, sagebrush, riparian, montane parks and meadows, and low to moderate cover grasses. The Beaverhead-Deerlodge National Forest is dominated primarily by pine and fir species including the lodgepole pine, douglas fir, subalpine fir, and ponderosa pine. Aspen trees are also present in the study area. Willow, alder, birch and red osier dogwood are among the most abundant shrub species in riparian zones.

Invasive weeds are a growing concern in the Beaverhead-Deerlodge National Forest. Grassland/shrubland types on the forest are at high risk of invasion by Canada thistle, whitetop, yellow toadflax, spotted knapweed, and leafy spurge. The Butte-Silver Bow Weed Control District has been active in public education, control, and eradication of noxious weeds. If improvement options are forwarded from the feasibility study, field surveys for noxious weeds should take place before any ground disturbance occurs. Proposed projects should incorporate applicable practices outlined by the Butte-Silver Bow Weed Control District. Any projects forwarded from the feasibility study within the National Forest would need to comply with USFS management policies.

Whitebark pines are designated as a candidate species for listing under the Endangered Species Act (ESA). Whitebark pines are typically found in cold, windy, high elevation or high latitude sites in western North America and as a result, many stands are geographically isolated. Whitebark pines have the potential to occur on high elevation forest lands in the area.

3.2.2. Fish and Wildlife

Blacktail Creek watershed provides a substantial habitat for westslope cutthroat trout. Genetic sampling indicates a 100% pure westslope cutthroat trout population in the river. The westslope cutthroat trout is considered a sensitive species by the USFS and a species of concern (SOC) by Montana.

Montana Fish, Wildlife and Parks (FWP) statewide wildlife distribution data indicate the presence of elk and mule deer along Blacktail Creek. Blacktail Creek also provides an attractive habitat for moose, and they can often be seen along the river during the winter. The wetlands provide important staging, resting, and viewing areas for migratory waterfowl and shorebirds.

If any improvement projects are brought forward from the study, project planners should coordinate with fish and wildlife biologists from Montana FWP and the USFS to gain further insight into issues related to the management of these species, as well as measures for avoiding, minimizing, or mitigating adverse effects on species and habitat.

3.2.3. Threatened and Endangered Species

As noted earlier, whitebark pine, a candidate plant species for listing under the ESA, occurs within the the Beaverhead-Deerlodge National Forest and is typically found in high elevation, upper montane habitat near the treeline. The grizzly bear and Canada lynx are threatened species occurring in Silver Bow County. The wolverine is a proposed for listing species that may occur within mountainous and forested areas of the county. Canada lynx and wolverine have both been observed in the Roosevelt Drive study area based on information from the Montana National Heritage Program (NHP). The grizzly bear could potentially occur in the study area, but there are no recorded observations. Wolverine is the only species documented as having a sustained presence within the study area. Bull trout are also listed as threatened in Silver Bow County but no critical habitat for the species has been designated within the county. Montana NHP data shows no observations of bull trout in Blacktail Creek in the study area. Any improvements forwarded from the planning study would need to undergo review for compliance with the provisions of the ESA. The listing status of species and critical habitat can change over time; therefore, an up-to-date list of potentially affected species and critical habitats should be reviewed for each project.

3.2.4. Other Species of Concern

SOC are native animals or plants that are at-risk due to declining population trends, threats to their habitats, restricted distribution, among other factors. The *Environmental Scan* lists three mammals, five birds, one fish, one amphibian, and one plants considered to be SOC with occurrences in this area of Montana and presents their federal and state statuses. A species occurrence is an area of land or water in which a species is, or was, present. If any projects are brought forward from this study, a thorough review of wildlife sightings databases should be conducted, and habitats near any proposed project sites should be evaluated to determine their suitability for any SOC. Measures to avoid or minimize disturbance of these species or their habitat should be incorporated into project design and implementation.

3.3. Social and Cultural Resources

The following subsections present an overview of the social and cultural environment within the study area.

3.3.1. Demographic and Economic Conditions

Implementing regulations for the National Environmental Policy Act (NEPA) require federal agencies to assess potential social and economic impacts resulting from proposed actions. FHWA guidelines recommend consideration of impacts to neighborhoods and community cohesion, social groups including minority populations, and local and/or regional economies, as well as growth and development that may be induced by transportation improvements. Demographic and economic information presented in this section is intended to assist in identifying populations that might be affected by improvements in the study area.

According to the *American Community Survey* (ACS), a large portion of the population of Butte-Silver Bow identifying as White although the county has a slightly larger minority percentage than Montana's population.

Median household income in Butte-Silver Bow is approximately 25 percent lower than the state median value. Butte-Silver Bow also has higher poverty (18.9 percent) and unemployment (5.9 percent) rates than Montana (14.4 and 4.8 percent, respectively). Butte-Silver Bow's economy has historically been dominated by the mining industry. But declines in the copper mining industry since 1980 have required a more diverse mix of industries to maintain a strong economy in the area. Over the past 40 years, the service and retail sectors have played a more prominent role in the current economy with the majority of the service industry jobs being healthcare related. Increases in recreational visitors to the Butte-Silver Bow area have also helped strengthen the economy.

Title VI of the *United States Civil Rights Act of 1964* and *Executive Order 12898* require that projects receiving federal funds must not result in disproportionately high and adverse effects on minority or low-income populations. For transportation projects, this means that minority or low-income populations must not be disproportionately isolated, displaced, or otherwise subjected to adverse effects. If improvement options are forwarded from the planning study into project development, environmental justice would need to be further evaluated during the project development process. However, demographic data obtained for this study indicates minority and/or low-income populations are not present in the area.

3.3.2. Recreational Resources

In addition to providing residential access, Roosevelt Drive also provides access to over 73,000 acres of National Forest System (NFS) lands within the Beaverhead-Deerlodge National Forest and about 40,000 acres of BLM lands. Roosevelt Drive is highly used by recreationists to access recreation opportunities in the Highland Mountain Range. Popular recreation activities in the area include dispersed camping, hunting, motorized recreation, winter sports, hiking, mountain biking, and horseback riding. The first 2.75 miles of Roosevelt Drive are part of the Adventure Cycling Great Divide mountain bike route. Other nearby recreation areas include the Continental Divide National Scenic Trail, the Basin Creek Watershed, and Thompson Park via the Roosevelt Drive Trailhead. Thompson Park is a congressionally designated Municipal Recreation Area in the NFS with access to 25 miles of non-motorized trails, campgrounds, and picnic areas. The Milwaukee Road Rail-Trail also crosses above Roosevelt Drive at approximate MP 1.0 by abandoned railroad trestle.

Roosevelt Drive provides access to USFS and BLM lands used for recreational activities including hiking, biking, hunting, horseback riding, and winter sports.

Recreation areas may be protected under Section 4(f) of the *US Department of Transportation Act of 1966* if they are publicly owned, open to the public during normal hours of operation, and serve recreation activities as a major purpose as stated in adopted planning documents. Impacts to the Milwaukee Trail and Roosevelt Drive Trailhead should be investigated and appropriately considered in accordance with Section 4(f) if improvement options are forwarded from this study.

Projects may also be subject to Section 6(f) of the *Land and Water Conservation Fund Act* which was enacted to preserve, develop, and ensure the quality and quantity of outdoor recreation resources. However, there are no areas qualifying for Section 6(f) protection within the study area.

3.3.3. Cultural and Historic Resources

Federal agencies are required to consider the effects of their undertakings (including funding, licensing, or permitting the undertakings of other entities) on historic properties and must consult affected American Indian tribes. Available data identified the following tribes with potential interests in Silver Bow County, Montana:

- Apache Tribe of Oklahoma
- Confederated Salish and Kootenai Tribes of the Flathead Reservation
- Fort Belknap Indian Community of the Fort Belknap Reservation of Montana
- Shoshone-Bannock Tribes of the Fort Hall Reservation

Implementing regulations also require agencies to seek ways of avoiding, minimizing, or mitigating any adverse effects on historic properties. A review shows there are no historic properties listed on the National Register of Historic Places within the study area. If any projects are brought forward from the planning study, a cultural resource survey for unrecorded historic and archaeological properties would need to be completed within the area of potential effect defined for each project. Direct and indirect impacts (such as visual, noise, and access impacts) to eligible or listed properties would need to be considered if improvements options are carried forward.

3.3.4. Visual Resources

The study area encompasses a wide variety of settings including the Roosevelt Drive roadway corridor, rural development, national forestland, other public lands, and wetlands. Actions that may have visual impacts include projects on new location or that involve expansion, realignment or other changes that could alter the character of an existing landscape or move the roadway closer to residential areas, parks and recreation areas, historic or other culturally important resources.

4.0. AREAS OF CONCERN SUMMARY

The following is a summary of observed trends and areas for further consideration. These areas were identified through field review, past studies, public databases, and other resources. More discussion has been provided in the previous sections and in the *Environmental Scan*, and it is reiterated here as appropriate.

4.1. TRANSPORTATION CONDITIONS

Section 2 identifies physical features, geometric conditions, traffic conditions, safety trends, and other vulnerabilities within the study area that may be affected by potential future improvements arising from this study. Project-level traffic, geometric, or safety analysis may be required for any improvements forwarded from this project. The following transportation system conditions were noted:

Physical Features and Characteristics

- A total of 25 culverts were identified along the study corridor, 9 of those culverts were 30 inches or larger. Approximately 45 percent of the culverts were in poor condition.
- The section of the corridor which is classified as a collector road does not meet the AASHTO minimum roadway surface width of 30 feet or the Butte-Silver Bow standard of 28 feet. The width is generally 22 to 24 feet for the majority of this section.
- The section of Roosevelt Drive classified as a local road does not meet the minimum roadway surface width of 24 feet (AASHTO and Butte-Silver Bow standard). The width is generally 20 to 22 feet for the majority of this section.
- The majority of the pavement in the corridor is in poor condition.
- Roadway right-of-way in the study area is not well defined.
- Although Roosevelt Drive is primarily used by passenger vehicles and non-motorized transportation modes for residential and recreational access, heavy vehicles including busses, emergency vehicles, and mining vehicles also use the roadway.

Geometric Conditions

- Nine horizontal curves on the portion of Roosevelt Drive that is classified as a collector road were identified as not meeting current AASHTO standards for a 40-mph design speed. All horizontal curves on the local road section of the corridor meet the minimum recommended radius of 214 feet for a 30-mph design speed.
- All vertical curves in the study area appear to meet design standards for maximum vertical grade. Some combination horizontal/vertical curves have known issues with sight distance and winter driving conditions.
- There are two intersections in the study area with poor geometry where user safety is a concern: Highway 2/Roosevelt Drive and Roosevelt Drive/Lime Kiln Road/Highland Road.

Traffic Conditions

- The corridor experiences varied vehicle mix with residential, commercial, and recreational traffic.
- The first 2.75 miles of the roadway is functionally classified as a minor collector and serves approximately 500 to 1,000 vpd.
- The last 1.55 miles is a local road and provides access to residential properties and the Roosevelt Drive Trailhead. Existing traffic volumes are less than 200 vpd.
- Volumes are projected to increase in the future due to population growth and expanded recreation opportunities.
- The proposed Highlands Mine may result in increased haul traffic along the roadway.

- The first 2.75 miles of Roosevelt Drive is part of a nationally recognized Great Divide mountain bike route administered by Adventure Cycling.

Safety

- Records show 35 crashes occurring within the study area between January 1, 2009, to December 31, 2018. Of the recorded crashes, 2 resulted in serious injuries, 6 resulted in minor injuries, 2 resulted in possible injuries, and 25 resulted in property damage only.
- Approximately half of the crashes (16) occurred during the daylight while 16 occurred under dark conditions, 2 during dusk, and 1 during dawn.
- Most of the crashes (21) occurred when the roads were snowy, wet, slushy, icy, or frost covered while 13 occurred under dry road conditions.
- The main crash types were fixed object crashes (21) and rollover crashes (10) and road surface condition was listed as a contributing circumstance in 18 of the crashes.
- All of the crashes occurred within the first 2.75 miles of the roadway and there are three key locations where crashes are clustered: 10 crashes at the 90-degree corner (MP 0.5); 10 crashes at the trestle (MP 1.0); and 8 crashes at the s-curve section (MP 2.2 to 2.4).

Other Vulnerabilities

- Landslides, drainage/erosion issues, and locations with subgrade issues are common concerns on Roosevelt Drive. These events have caused significant road damage.

4.2. Environmental Setting

The *Environmental Scan* identifies physical, biological, social, and cultural resources within the study area that may be affected by potential future improvements arising from the *Roosevelt Drive Upgrade Study*. Project-level environmental analysis would be required for any improvements forwarded from this study. Information contained in the *Environmental Scan* may be used to support future environmental documentation for compliance with the National Environmental Policy Act. The following environmental concerns were noted:

Physical Environment

- The study area and adjacent lands are primarily used for residential use, grazing, timber activity, mining, and recreation.
- There are no soils classified as prime farmland, unique farmland, or farmland of state or local importance in the study area.
- Two landslides have occurred within the study area. A hazard area for landslides also exists at the eastern end of the study area, beginning at Highway 2 and extending east.
- The Butte area is in a moderate seismic risk zone. Two earthquake events were recorded near Roosevelt Drive, both events were shallow and had very low magnitudes.
- Roosevelt Drive parallels Blacktail Creek and crosses the stream several times within the first 2.2 miles of the study area. Roosevelt Drive also crosses some small, unnamed tributaries of Blacktail Creek as well as several intermittent streams throughout the study area.
- Blacktail Creek has elevated levels of nutrients from residential development along the river. Excess sediments from road crossings and encroachment on the river are also present.
- Although mining activity (past and present) exists near the study area, there are no hazardous sites that may be impacted by projects on Roosevelt Drive.
- Butte is considered a nonattainment area for particulate matter (PM10); however, the study area is located outside the designated PM10 Nonattainment Area Boundary.
- Residences in the study area comprise the only sensitive noise receptors that could be affected by roadway improvements on Roosevelt Drive.

Biological Resources

- Fire has been a major influence on the vegetation systems in the Beaverhead-Deerlodge forest. Insects such as mountain pine or Douglas-fir bark beetles have also killed large numbers of trees in the forest.
- Invasive weeds are a growing concern in the Beaverhead-Deerlodge National Forest.
- Blacktail Creek watershed provides a substantial habitat for westslope cutthroat trout. Genetic sampling indicates a 100% pure westslope cutthroat trout population in the river.
- The surrounding area supports diverse wildlife populations including elk, mule deer, moose, migratory waterfowl, and shore birds.
- The grizzly bear, Canada lynx, bull trout, wolverine, and whitebark pine tree are listed as threatened, proposed, or candidates to be listed under the ESA. Canada lynx and wolverine have both been observed in the study area. The whitebark pine, grizzly bear, and bull trout may potentially occur although there are no recorded observations of these species in the study area. Several other SOC have also been observed in the study area.

Social and Cultural Resources

- Demographic data indicates minority and/or low-income populations are not likely present in the area. The economy in the study area has historically been dominated by the mining industry. Service, retail, and recreation sectors have played a more prominent role in the current economy.
- The Milwaukee Road Trail, Roosevelt Drive Trailhead, and other recreation facilities accessed via Roosevelt Drive may be subject to Section 4(f) regulations. No projects qualifying for protection under Section 6(f) have been identified in the study area.

5.0. GOALS AND OBJECTIVES

Goals and objectives were identified based on a comprehensive review of existing information and input from the project team, stakeholders, and the public. Goals and objectives are important in explaining why a potential improvement option may be necessary. The following goals and objectives reflect the existing social, environmental, and engineering conditions and recognize the local and regional use of Roosevelt Drive and the surrounding transportation system. In addition to the goals and objectives, all improvement options should also be sensitive to the availability of funding for recurring maintenance obligations or for the construction of new improvements.

Goal 1: Improve the safety and operation of the roadway facility.

Available crash data and anecdotal information from partnering agencies and locals indicate a need to improve the safety of Roosevelt Drive. There are a number of locations along the corridor with limited sight distance and substandard geometry which can create undesirable conditions. This goal is intended to improve the safety of the roadway in order to meet the needs of the traveling public, both for visitors of Beaverhead-Deerlodge National Forest and local residents. Roadway upgrades and/or management strategies are necessary to achieve a higher level of safety and improved operations for Roosevelt Drive. This can be achieved by improving the roadway to meet current geometric standards (to the extent practicable), providing adequate clear zones, improving sight distances, and improving surfacing conditions.

Objectives:

- Improve roadway elements to meet current design criteria to address identified safety concerns (to the extent practicable).
- Manage travel speeds and provide adequate clear zones to improve operations and safety.
- Provide consistent roadway widths and appropriate surfacing.

Goal 2: Provide a roadway facility that accommodates future traffic growth, recreational activity, and reduces maintenance needs.

Roosevelt Drive provides access to over 73,000 acres of the Beaverhead-Deerlodge National Forest, 40,000 acres of BLM lands, many residences, and several recreation areas. The corridor is used by local and regional traffic including passenger vehicles, commercial vehicles, pedestrians, bicyclists, and others. The number of visitors to the National Forest is expected to grow over time due to increased recreational interest and opportunities. Depending on the accuracy of future growth characteristics as depicted in local planning documents and estimates by Butte-Silver Bow, Roosevelt Drive will realize increased traffic by both motorized and non-motorized transportation modes. As activity on the roadway increases, maintenance needs will also continue to increase. Proper upgrades and regular maintenance of Roosevelt Drive will help ensure the corridor provides adequate access for residents and visitors for many years to come.

Objectives:

- Accommodate existing and future capacity demands.
- Address non-motorized facilities consistent with local planning efforts and recreational needs.
- Provide connectivity to residents and regional users accessing recreational lands.
- Improve and/or upgrade roadway drainage.
- Reduce maintenance needs.

Goal 3: Minimize adverse impacts to the environmental, cultural, scenic, and recreational characteristics of the study area.

The area around Roosevelt Drive provides access to both residential and recreational lands. It is a popular recreational access point for hunting, motorized recreation, hiking, mountain biking, and horseback riding. Because of the location along Blacktail Creek, wildlife and aquatic connectivity are of concern. All improvements should be reviewed for their potential impact to the environmental, scenic, cultural, and recreational aspects of the corridor.

Objectives:

- Minimize adverse impacts to riparian environments.
- Minimize adverse impacts to the wildlife and aquatic organisms.
- Provide reasonable access to recreational sites in the study area.
- Avoid or otherwise minimize adverse impacts to historic, cultural, and archaeological resources that may result from implementation of options.

6.0. IMPROVEMENT OPTIONS

This section contains a list of potential improvements intended to address previously identified issues and areas of concern and are intended to satisfy corridor goals and objectives outlined in **Section 5.0**. The improvement options reflect input from stakeholders and the public, as well as information gathered from a thorough evaluation of the existing and projected conditions of the study corridor. The following steps were applied to develop improvement options:

1. Identify roadway issues and areas of concern based on field review, engineering analysis of as-built drawings, crash data analysis, and consultation with stakeholders.
2. Identify overall corridor goals and objectives.
3. Analyze the information gathered to develop improvement options to address the roadway issues and areas of concern which are consistent with the goals and objectives.

Implementation of improvement options ultimately depends on the availability of funding, personnel resources, right-of-way needs, and other project delivery elements. Planning level cost estimates are listed in 2019 dollars for each improvement option. The cost estimates include engineering, construction, and indirect costs. **Appendix D** contains planning level cost estimates for the options.

A list of considerations related to project development and potential impacts is provided for each option. Potential barriers such as right-of-way, physical features, and environmental conditions may influence the project development process and could add additional time and cost. More detailed project-level analysis would be required for any improvements forwarded from this study. Information contained in this report may be used to support future project development and environmental documentation.

6.1. OPTION 1: REHABILITATION ON EXISTING ALIGNMENT

This option represents the least impactful option for improving the Roosevelt Drive corridor. Rather than reconstructing the entire roadway, a three-inch overlay would be constructed on the existing surfacing. In areas where unstable subgrades exist, isolated subexcavation would occur to restore the structural integrity of the roadway. The roadway would be overlayed with a consistent width of 24 feet on the collector road (MP 0.0 to 2.75) and 20 feet on the local road (MP 2.75 to 4.30).

Throughout the study area, ditches would be established or excavated where possible. Road embankment armoring, or riprap, would also be placed in areas where the creek has eroded the roadway. These improvements would help improve drainage and prevent erosion thereby protecting Roosevelt Drive from further damage caused by Blacktail Creek.

Many of the existing culverts on Roosevelt Drive are undersized or in poor condition. This option includes replacement of all of the culverts serving Blacktail Creek with the exception of the concrete box culvert at MP 0.34. Based on a preliminary evaluation, the new culverts for Blacktail Creek would likely be either round culverts nine feet in diameter, or box culverts with a nine-foot span and six-foot rise. All of the pipes would be countersunk and infilled with streambed material to provide adequate passage for aquatic organisms. Additionally, the minor culverts (those not serving Blacktail Creek) on the remainder of Roosevelt Drive would be reviewed and replaced if needed.

The new culverts would provide adequate passage for aquatic organisms.

The existing horizontal and vertical alignments would be retained with the exception of a few minor adjustments. At three locations (MP 0.12, MP 0.58, and MP 1.05) the roadway needs to raise slightly in

order to facilitate installation of larger culverts for Blacktail Creek. This would result in a short raise in grade and new surfacing on Roosevelt Drive at these locations. Although the horizontal alignment would not be modified in this option, efforts to improve sight distance by clearing brush, trees, and other vegetation within the clear zone would be made as necessary throughout the project. This is especially true at the beginning of the project where Roosevelt Drive and Highway 2 meet. Vegetation at the intersection would be cleared to improve sight distance and warning signs installed on Highway 2 to warn drivers of the approaching intersection. Additional warning signs would be installed along Roosevelt Drive at the locations with substandard horizontal curves to alert drivers of the tight curves ahead. New signing may also be necessary at hazard locations warning for potential rockfall.

Estimated Cost: $3,700,000

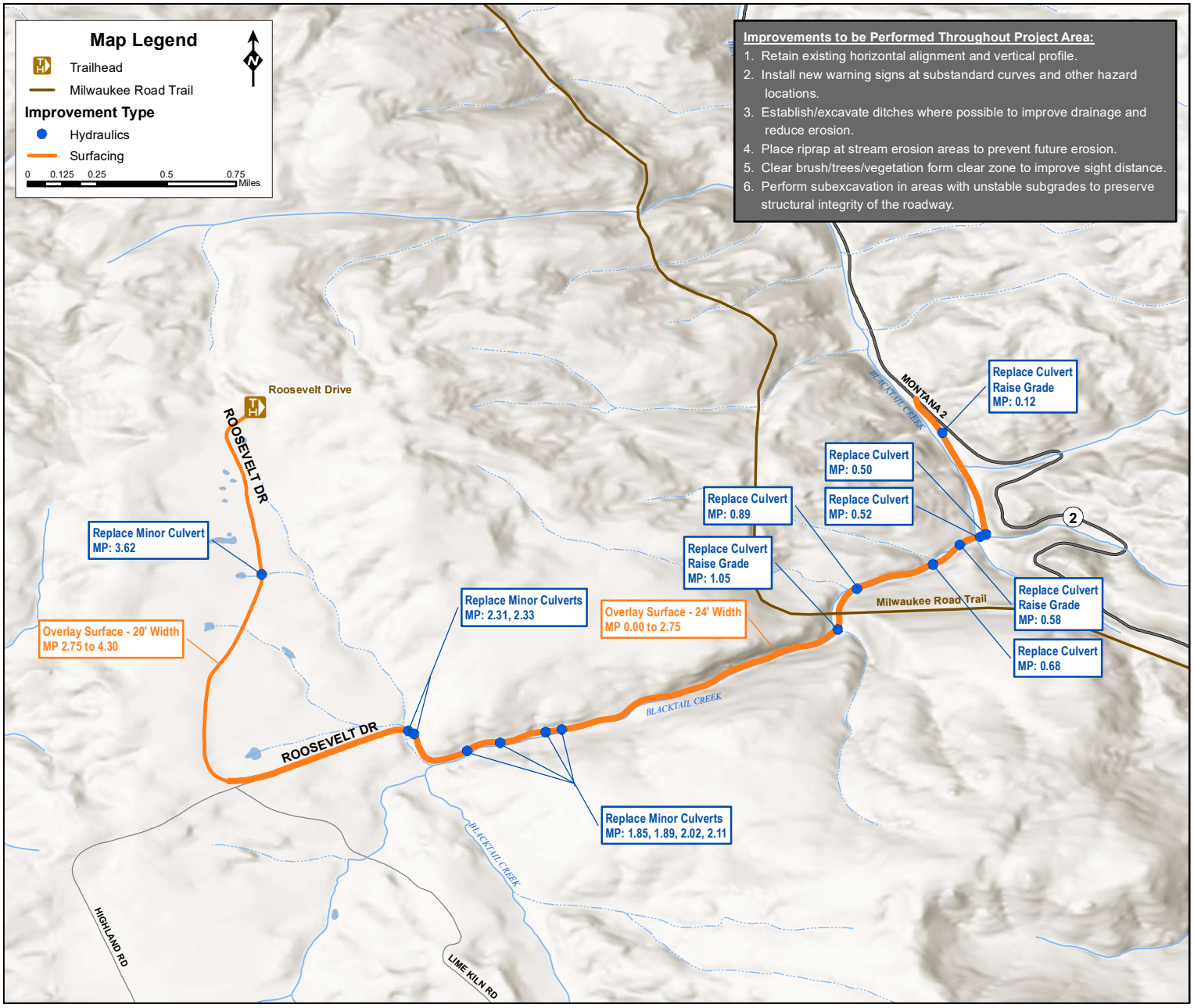


Figure 6.1: Option 1 – Rehabilitation on Existing Alignment

6.2. Option 2: Rehabilitation with Improved Geometrics

This option includes reconstruction of the corridor with minor modifications to the horizontal and vertical alignments. As in Option 1, all of the culverts serving Blacktail Creek would be replaced, with the exception of the concrete box culvert at MP 0.34. Other culverts would be evaluated and replaced/upgraded as needed. A 3-inch overlay of consistent width (24 feet on the collector road and 20 feet on the local road) would be placed with subexcavation in areas with unstable subgrades. Additionally, ditches would be established or excavated where possible and riprap would be placed in areas where the creek has eroded the roadway as discussed in Option 1.

In addition to those improvements proposed in Option 1, modifications to the horizontal and vertical alignments are proposed. The sharp 90-degree curve at MP 0.50 would be improved by reconstructing the curve to meet current standards. To achieve a 40-mph design standard, the roadway would be shifted west approximately 100 feet at the center of the curve. Approximately 400 feet of new road would be constructed, and the Blacktail Creek culvert would be shifted approximately 200 feet downstream. Embankment material would be imported to construct road fill across the stream channel, but the resulting profile would closely match the existing profile. The existing road could be used to facilitate traffic during construction of the new curve.

The 90-degree curve at MP 0.5 would be flattened to achieve a 40-mph design speed.

At the trestle (MP 1.0), Roosevelt Drive would be shifted slightly to the south and the grade would be raised slightly to acquire enough additional width to install guardrail on the north side of the road. Material to construct the embankment would need to be imported for construction of the new curve. The purpose of the guardrail along this curve is to help shield the trestle piers and enhance safety for drivers at this location. A retaining wall is also anticipated on the north side of the roadway to avoid burying the piers in the embankment. Excavation on the south side of the roadway is not recommended due to the presence of additional trestle piers on the south slope.

The horizontal curves on the s-curve section between MP 2.2 and 2.4 would be flattened and a consistent, increasing grade would be established.

In the s-curve section (MP 2.2 to 2.4), the curves would be reconstructed to meet existing standards. Extensive grading would be required to flatten the curves. To meet a 40-mph design speed, the southern curve would be shifted northeast about 150 feet at the center of the curve while the northern curve would be shifted about 100 feet southwest at the center of the curve. A consistent, increasing grade would be set through this reconstructed section, effectively eliminating the two abrupt vertical curves. Material from the grading efforts would be available for any embankment needs at this location. Ultimately, approximately 1,300 feet of new road would be constructed.

The intersection at MP 2.7 would be modified to create a standard, uncontrolled four-way intersection.

The Roosevelt Drive/Lime Kiln Road/Highland Road intersection (MP 2.7) would be improved by creating a standard four-way intersection. To achieve this, the Roosevelt Drive curve between Highland Road and Lime Kiln Road would be obliterated. The leg of Lime Kiln Road which passes by the cluster mailboxes would be improved to match the overlay on Roosevelt Drive. The intersection would have stop control along the minor approaches with advance warning signs.

As in Option 1, efforts to improve sight distance by clearing brush or trees within the clear zone would be made as necessary throughout the project and new warning signs would be installed at the substandard horizontal curves. Additional signing would also be installed as necessary at hazard locations.

Estimated Cost: $6,600,000

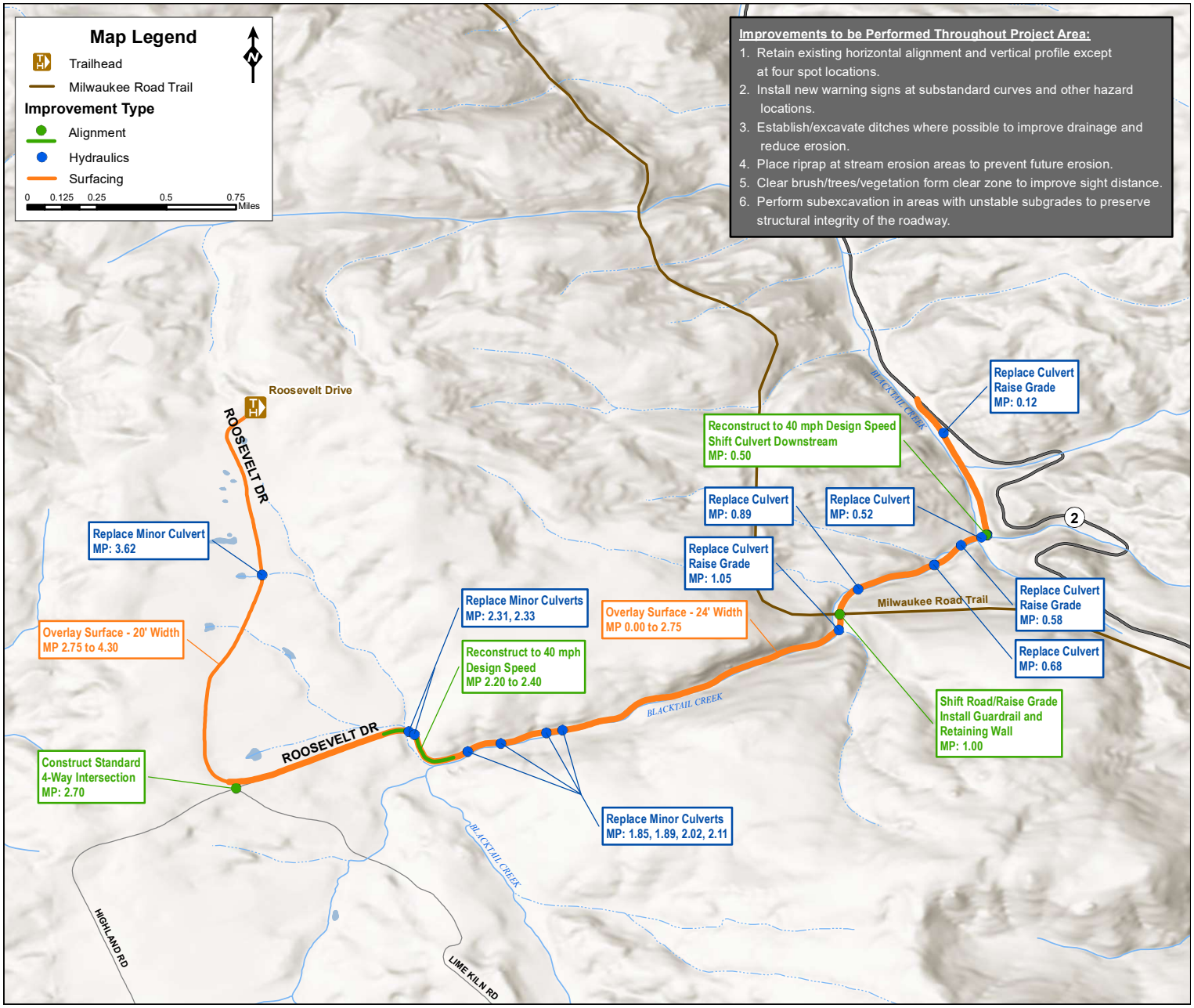


Figure 6.2: Option 2: Rehabilitation with Improved Geometrics

6.3. Option 3: Reconstruction with New Alignment

This option is the most impactful option and would result in reconstruction of the entire roadway. A new alignment for the entire project length would be designed to meet existing standards. The new alignment would be designed to retain as much of the existing road prism as possible. The proposed improvements at the 90-degree curve (MP 0.5), trestle (MP 1.0), s-curve section (MP 2.2 to 2.4), and Roosevelt Drive/Lime Kiln Road/Highland Road intersection (MP 2.7), as discussed in Option 2 would be included in Option 3. The new vertical profile would also be designed to meet applicable design standards with adjustments as needed to provide greater clearance for drainage structures and to provide adequate space between the surface of the water and the roadway to prevent flooding. In the local road section, the vertical profile would be raised to improve drainage and keep ditch flow off the road.

As in both Options 1 and 2, all of the culverts serving Blacktail Creek would be replaced, with the exception of the concrete box culvert at MP 0.34. Other culverts would be evaluated and replaced/upgraded as needed. To further stabilize and control the flow of Blacktail Creek, riprap would be placed in areas where the creek has eroded the roadway. Extensive grading would also occur along the existing cut slopes to generate the additional width required to create ditches and to provide greater separation between Roosevelt Drive and Blacktail Creek. Note that this may not be possible between MP 1.1 and 1.4 where a landslide occurred in the past. When reconstruction occurs, isolated subexcavation in areas with unstable subgrades may also be necessary. The new roadway new surfacing on Roosevelt Drive would be designed to a consistent width of 24 feet on the collector road (MP 0.0 to 2.75) and 20 feet on the local road (MP 2.75 to 4.30).

Estimated Cost: $9,200,000

Riprap would be placed along streambanks to control the flow of Blacktail Creek, stabilize the banks, and prevent further erosion on Roosevelt Drive.

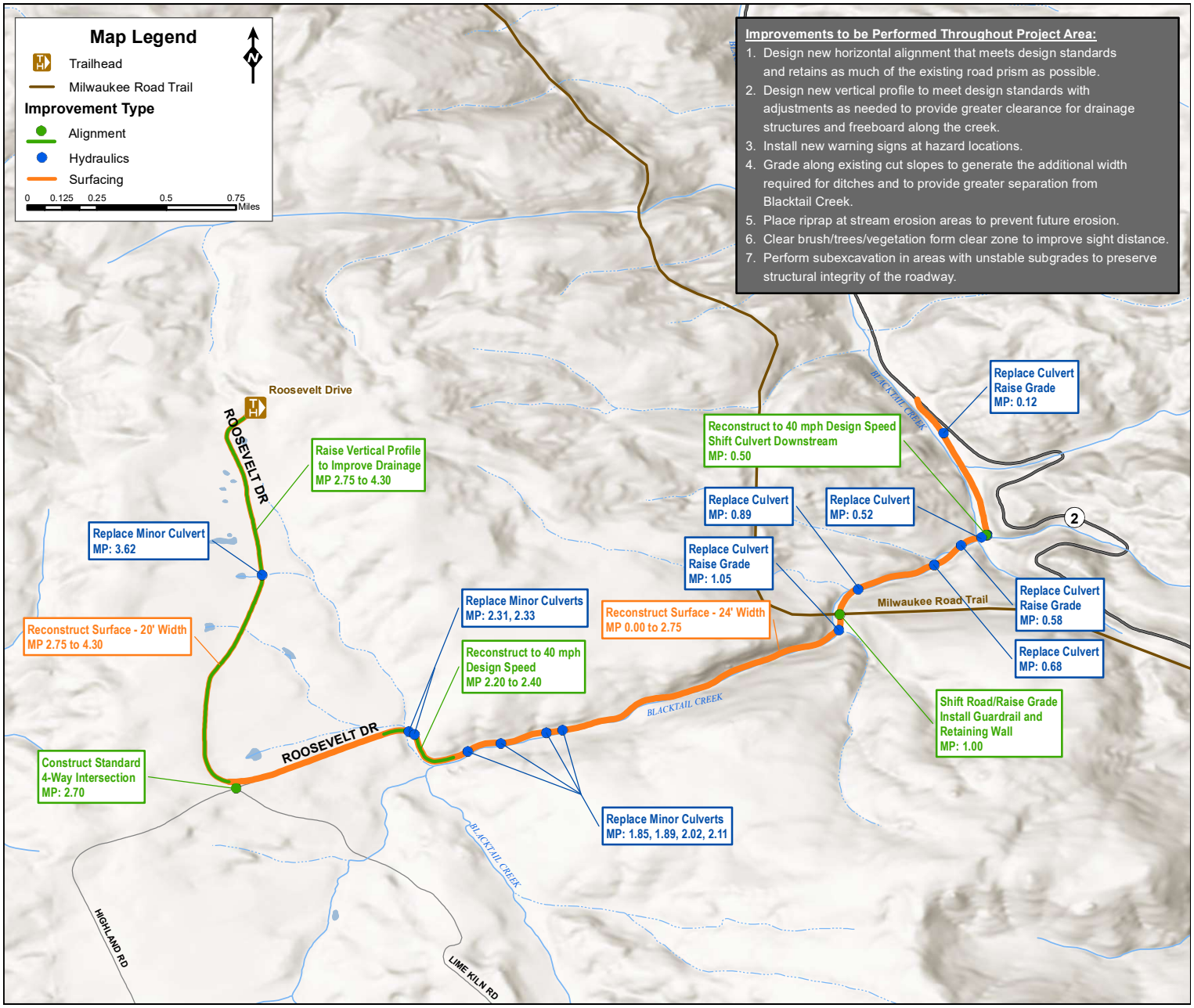


Figure 6.3: Option 3: Reconstruction with New Alignment

6.4. Improvement Options Summary and Recommendations

The surfacing of Roosevelt Drive is old and in poor condition. Poor drainage and erosion caused by Blacktail Creek has led to deteriorated conditions. Areas with poor geometrics and limited sight distances show evidence of safety concerns and crash clusters. In order to preserve access to the residential and recreational lands, improve safety, and accommodate future travel demands, rehabilitation/reconstruction of the roadway is necessary.

Three improvement options were identified for consideration within the study area. The improvement options were identified based on the evaluation of several factors including, but not limited to, field review, traffic and safety evaluation, geometric review, and consultation local agencies. The options vary notably in cost and complexity and are intended to offer a range of potential mitigation strategies to satisfy the goals and objectives developed for the corridor for corridor issues and areas of concern. A summary of how each option address the goals and objectives is provided in **Table 6.1**.

Table 6.1: Goals and Objectives Summary

Goal	Objective	Option 1	Option 2	Option 3
Goal 1: Improve the safety and operation of the roadway facility.	Improve roadway elements to meet current design criteria to address identified safety concerns (to the extent practicable).	✘	~	✓
	Manage travel speeds and provide adequate clear zones to improve operations.	✘	~	✓
	Provide consistent roadway widths and appropriate surfacing.	✓	✓	✓
Goal 2: Provide a roadway facility that accommodates future traffic growth, recreational activity, and reduces maintenance needs.	Accommodate existing and future capacity demands.	~	✓	✓
	Address non-motorized facilities consistent with local planning efforts.	~	~	~
	Provide connectivity to residents and regional users accessing recreational lands.	✓	✓	✓
	Improve and/or upgrade roadway drainage.	~	~	✓
	Provide adequate snow storage and pullout areas.	~	~	✓
	Reduce maintenance needs.	✓	✓	✓
Goal 3: Minimize adverse impacts to the environmental, cultural, scenic, and recreational characteristics of the study area.	Minimize adverse impacts to riparian environments.	✓	✓	~
	Minimize adverse impacts to the wildlife and aquatic organisms.	✓	✓	~
	Provide reasonable access to recreational sites in the study.	✓	✓	✓
	Avoid or otherwise minimize adverse impacts to historic, cultural, and archaeological resources.	✓	✓	✓
	Estimated Cost	**$3.7 M**	**$6.6 M**	**$9.2 M**

✓ - Meets Objective *~ - Partially Meets Objective* *✘ - Does Not Meet Objective*

Option 1 is the least impactful and least expensive option. It addresses the drainage and environmental concerns on Blacktail Creek by replacing/resizing culverts, establishing ditches, and stabilizing embankments. The option would reduce maintenance concerns by providing an overlay on Roosevelt Drive. Minor improvements to safety may be realized by increasing sight distance by clearing roadside vegetation and installing warning signs. Option 1 does not, however, fully address the safety concerns related to substandard roadway geometrics.

Option 2 builds upon Option 1 and provides additional improvements to address substandard roadway geometrics. This option adequately addresses drainage and maintenance concerns and includes spot improvements to address the most critical safety concerns at four spot locations. Without reconstructing the entire roadway on a new alignment, Option 2 makes essential improvements to the existing roadway to satisfy the identified goals and objectives.

Option 3 is the most expensive option and would best address the identified goals and objectives. In addition to improving drainage on Blacktail Creek to the fullest extent practicable, Option 3 includes full reconstruction of Roosevelt Drive for which a new alignment and profile would be designed. The new alignment would be designed to meet appropriate design standards including flattening substandard curves, widening the road bed to provide adequate clear zones, raising the roadway to improve drainage, and providing new surfacing. This option, however, has a larger footprint outside the existing roadbed and may have more adverse impacts on the environment.

6.5. Additional Considerations

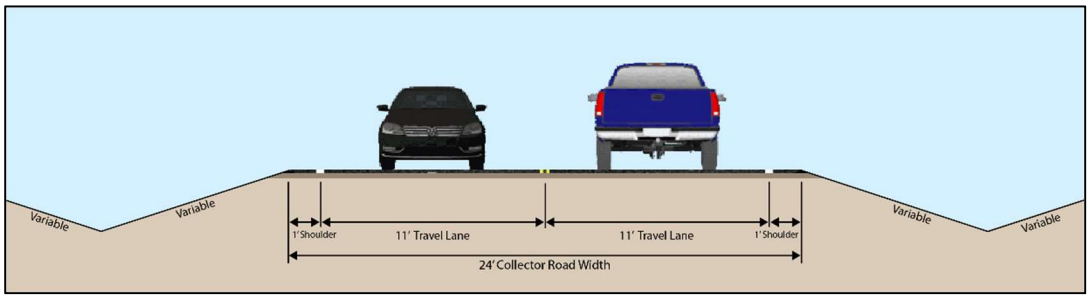
The previous sections identified options to improve the Roosevelt Drive corridor. Several considerations may influence the selection of a preferred improvement option. This section provides a discussion of additional considerations relevant to the development of improvements to the Roosevelt Drive corridor.

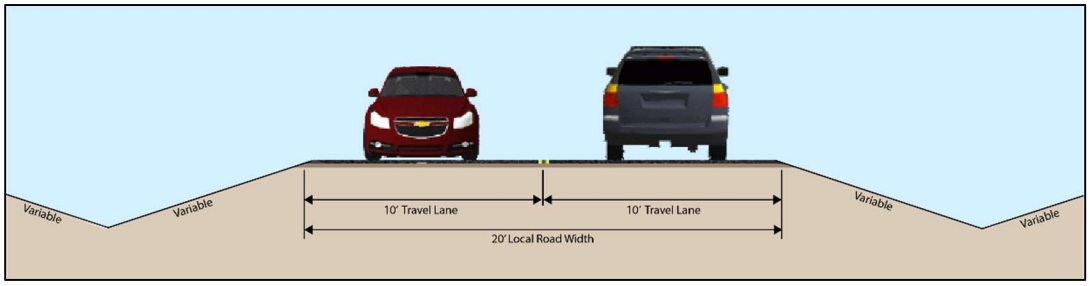
Roadway Width

The current roadway width varies throughout the corridor. The width on the collector portion of the roadway (MP 0.00 to 2.75) ranges from 22 to 25 feet in width and the local section (MP 2.75 to 4.30) ranges from 18 to 22 feet. Based on standards developed by AASHTO and Butte-Silver Bow, the recommended roadway width ranges from 18 to 30 feet (**Table 2.3**). A desire has been expressed to widen the roadway to bring it up to current Butte-Silver Bow road design standards. This would result in a 26-foot width on the collector road section and a 24-foot width on the local road section. Widening to ensure these recommended widths may be difficult and would require full reconstruction.

Since Roosevelt Drive provides access to recreational opportunities, residences, and commercial operations, it is used by a variety of vehicles each with differing design needs. For example, wider surfaces accommodate heavy mining vehicles and commercial logging trucks by providing adequate space for the vehicles to negotiate tight corners and narrow stretches. Wider travel lanes and shoulders are also recommended to safely accommodate the pedestrians and bicyclists who use the corridor. Providing wider roadway sections may also enhance driver safety by improving sight distance, allowing more space for vehicles to maneuver curves, and providing space for snow storage during the winter. Conversely, increasing the roadway width makes the facility more comfortable for drivers and can encourage higher travel speeds, presenting new safety issues. Another drawback to wider roads is that they may encourage roadside parking, especially on Roosevelt Drive due to the recreational nature of the area. This can create roadside hazards and may encourage undesirable recreational uses. Road widening is also costly, so the ultimate decision of roadway width may be cost-dependent.

To preserve the existing character of the roadway, while maintaining safe travel speeds and appropriate use, it is recommended that the new surfacing on Roosevelt Drive be 24 feet in width on the collector portion of the roadway and 20 feet in width on the local portion of the roadway. This would discourage speeding and parking along the roadside while also providing adequate room to accommodate all roadway users and their needs. These widths would be the most easily achieved while also limiting impacts to adjacent lands. If a wider typical section is desired by implementation partners, full roadway reconstruction would be needed and re-evaluation of costs would be necessary.





To preserve the existing character of the roadway, it is recommended that the new surfacing on Roosevelt Drive be 24' on the collector portion of the roadway and 20' on the local portion.

Pullout Areas

Ten pullouts (mostly informal) were documented on Roosevelt Drive during the field review. All ten pullouts are located within the first 2.75 miles of the roadway. Some of these pullouts are located on tight corners while others are creating undesirable recreational use. In these instances, the pullouts may cause safety concerns rather than alleviate them. Pullout areas of particular concern on Roosevelt Drive are the one at the trestle crossing (MP 1.0) and the one on the s-curve section (MP 2.3). An established, wide pullout area exists at the trestle crossing but despite the fencing along the hillside, it is reportedly used as an access point to the Milwaukee Road Trail, which is discouraged by the Forest Service. On the s-curve there is a closed trail access with a small pullout that is used by recreationists, especially during hunting season. Parked cars at this location create roadside hazards and limit sight distance. The pullout areas should either be improved to adequately accommodate users or removed to discourage undesirable use. There are other small pullout areas where discouraged activity has been noted such as hiking and access to undesignated areas.

Some pullouts on Roosevelt Drive may cause safety concerns rather than alleviate them. The pullout areas should either be improved to adequately accommodate users or removed to discourage undesirable use.

Non-Motorists

The first 2.75 miles of Roosevelt Drive is part of the Adventure Cycling Great Divide mountain bike route which is used for the Great Divide Ride and the Butte 100, attracting hundreds of riders each year. There are currently no dedicated bicycle or pedestrian facilities along the study corridor. While traffic volumes are typically low on the roadway, the lack of dedicated facilities coupled with narrow roadway widths and sharp curves causes concern for safety of non-motorists using the corridor. Although recommendations to stripe and provide dedicated non-motorized facilities are not included in the improvement options, the recommendations for a wider roadway and flattened curves would help provide a better facility for non-motorized users. Additional warning signage at areas where non-motorists are often present could also be beneficial.

Blacktail Creek

During field review it was noted that during high water flow events the creek overflows and sometimes overtops Roosevelt Drive causing it to travel through the ditch on the opposite side of the roadway rather than the natural streambed. Since Blacktail Creek crosses Roosevelt Drive several times throughout the study area, the possibility of rerouting Blacktail Creek to exist on only one side of the roadway to prevent overtopping and minimize the number of culverts was discussed. Per Montana stream permitting laws, any redirection of a stream bed must be mitigated by placing a new channel of the same length and grade as was removed. This was determined to be infeasible and too costly in the study area, so the proposed improvement options do not include recommendations to reroute Blacktail Creek.

Instead of rerouting the creek, it is proposed that the culverts serving Blacktail Creek be resized, countersunk, and infilled with streambed material. These improvements would provide adequate passage for aquatic organisms, improve flow, and prevent overtopping. Improvements to replace the existing minor culverts which are in poor condition are also recommended. In addition to replacing culverts, the improvement options include recommendations to establish ditches and place riprap along the embankments. These improvements would help improve drainage and prevent erosion thereby protecting Roosevelt Drive from damage caused by Blacktail Creek and extending the life of the pavement.

Roosevelt Drive/Highway 2 Intersection

At the beginning of the corridor, Roosevelt Drive and Highway 2 intersect at an approximate 45-degree angle. The skew of this intersection presents concerns for sight distance, driver confusion, and difficult turning movements. In addition to the sharp skew angle, Highway 2 begins a vertical climb immediately adjacent to the intersection, leading to further sight distance issues. Although the geometrics of this intersection do not meet current standards, no crashes were reported at the intersection during the 10-year analysis period.

This intersection was evaluated during the field review to identify if any improvements could be made to address geometric concerns. Given that no crashes were reported at the intersection, in addition to site constraints and environmental concerns, it was determined that it would be infeasible to reconstruct the intersection to meet current standards. It is, however, recommended that vegetation be cleared at the intersection as needed to improve sight distance and that advance intersection warning signs be evaluated along Highway 2 to warn drivers of the approaching intersection.

7.0. CONCLUSION AND NEXT STEPS

This study evaluated Roosevelt Drive to gain a better understanding of corridor goals, objectives, constraints, and opportunities. A thorough analysis of applicable information from Butte-Silver Bow, FHWA, USFS, MDT, and other resources was conducted to identify an initial set of improvement options that would address the operational characteristics, safety, and physical conditions of the existing facility. The roadway is in poor condition and rapidly deteriorating due to poor drainage, surfacing, and erosion. In order to preserve access to the residential, recreational, and commercial lands, improve safety, and accommodate future travel demands, rehabilitation/reconstruction of the roadway is necessary. Three potential improvement options were ultimately identified and range in complexity and cost. The level of rehabilitation or reconstruction may depend on consideration of impacts, costs, and needs addressed. **Table 7.1** provides a summary of the three improvement options which may be considered by appropriate project sponsors.

Table 7.1: Summary of Options and Cost Estimate

Option	Description	Estimated Cost
Option 1: Rehabilitation on Existing Alignment	• Retain existing horizontal alignment and vertical profile. • Overlay existing surfacing (24' collector, 20' local) • Replace all Blacktail Creek culverts and minor culverts in poor condition. • Install new warning signs at substandard curves and other hazard locations. • Establish/excavate ditches where possible to improve drainage and reduce erosion. • Place riprap at stream erosion areas to prevent future erosion. • Clear brush/trees/vegetation form clear zone to improve sight distance. • Perform subexcavation in areas with unstable subgrades.	**$3,700,000**
Option 2: Rehabilitation with Improved Geometrics	Option 1 plus geometric improvements: • 90-degree curve (MP 0.5): Reconstruct to 40-mph design speed • Trestle (MP 1.0): Shift road, raise grade, install guardrail and retaining wall • S-curves (MP 2.2–2.4): Reconstruct to 40-mph design speed, constant grade • Intersection (MP 2.7): Reconstruct to standard 4-way intersection	**$6,600,000**
Option 3: Reconstruction with New Alignment	• New horizontal alignment that meets design standards and retains as much of the existing road prism as possible. • New vertical profile to meet design standards with adjustments to provide greater clearance for drainage structures and freeboard along the creek. • Grade along existing cut slopes to generate the additional width required for ditches and to provide greater separation from Blacktail Creek. • Place riprap at stream erosion areas to prevent future erosion. • Perform subexcavation in areas with unstable subgrades.	**$9,200,000**

The ability to develop a project is dependent on the availability of existing and future funding. At the current time funding has not been identified to proceed with a project. Should Butte-Silver Bow elect to proceed with a project, the following steps are needed:

- Identify the option that best meets the safety, environmental, and social needs in the area identified in the study;
- Identify and secure a funding source or sources; and
- Follow appropriate guidelines for project nomination and development, including a public involvement process and environmental documentation that describes any potential impacts and mitigation measures from any proposed action.

Any future project should be consistent with the needs and objectives contained in this study. Should this study lead to a project (or projects), compliance with appropriate funding and environmental regulations will be required. The information presented in this report can serve as a baseline for future project development and to apply for funding support.

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