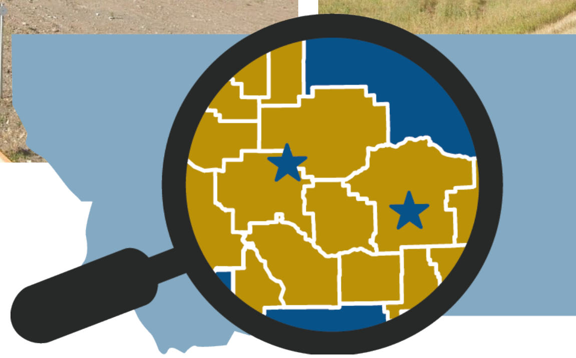
Central Montana Transportation Study

Existing and Projected Conditions Report

US 87 Armington Junction – Otter Creek Canyon Analysis



MONTANA
Department of Transportation

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TABLE OF CONTENTS

Tables

Figures

Appendices

1.0 INTRODUCTION

The Montana Department of Transportation (MDT) is developing the *Central Montana Transportation Study* to create a comprehensive long-term management plan addressing the anticipated impacts of planned development and military activities in the region. The pre-Montana/National Environmental Policy Act (MEPA/NEPA) regional study will be a collaborative process with MDT, the Federal Highway Administration (FHWA), military, local jurisdictions, resource agencies, and the public to identify transportation needs and potential solutions. In addition to evaluations encompassing the entire study area, several subareas were identified, including the *US 87 Armington Junction – Otter Creek Canyon* corridor.

The *Existing and Projected Transportation Conditions* technical memorandum for the *US 87 Armington Junction – Otter Creek Canyon* subarea provides a planning-level overview of transportation conditions within the corridor and identifies potential constraints and considerations that may influence the development of improvement options for the subarea corridor. The planning-level examination addresses demographic and economic conditions affecting traffic volumes, the physical roadway corridor and associated transportation facilities, geometric characteristics, current and projected traffic conditions, and safety conditions. Findings are based on available data, field observations, geographical information systems (GIS) and aerial photography, and input from agencies and stakeholders.

1.1 Subarea

The subarea includes the US Highway 87 (US 87) corridor between Armington Junction and Otter Creek Canyon (Reference Post [RP] 0.0 to 7.1), as illustrated in **Figure 1**. The corridor is located in Cascade County between the cities of Great Falls and Lewistown. The corridor follows Otter Creek as it winds back and forth on both sides of the road through rolling hills. The corridor is also bordered by a railroad on the east for the entire study length.

Safety concerns have been raised in this area due to its narrow width, poor roadside conditions, and limited passing opportunities, compounded by the nearby railroad tracks, Otter Creek, and challenging terrain. As the main route connecting Great Falls and Lewistown, regional growth may increase volume and congestion on this section of US 87.

The corridor runs parallel to the railroad (top) and is surrounded by rolling hills (bottom) for its entire length.

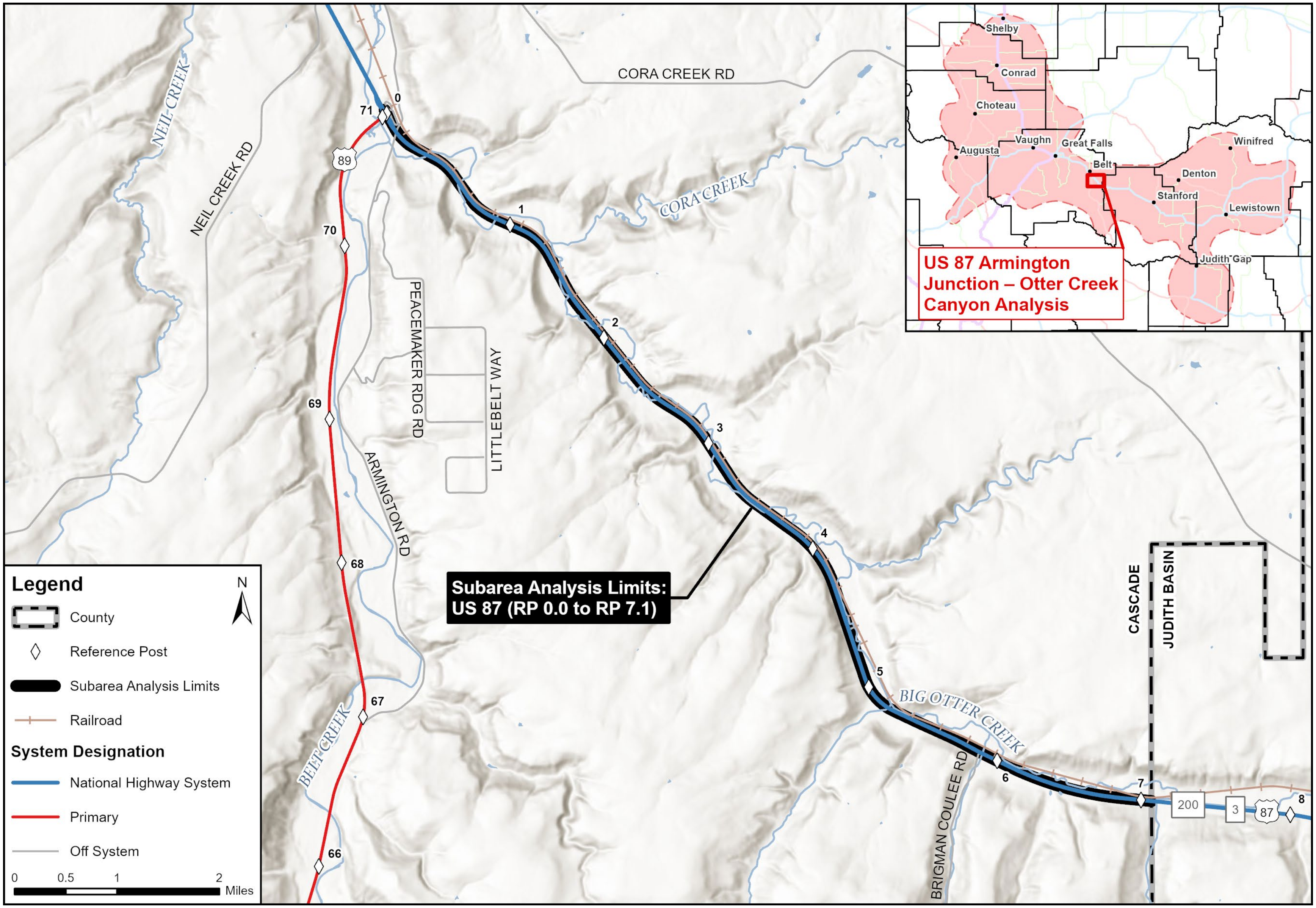

Figure 1: Subarea

1.2 Other Projects and Programs

Multiple federal and state projects and programs relate to transportation and land use within the subarea. The following sections provide a summary of relevant projects and programs associated with the subarea.

1.2.1 United States Department of Defense Projects and Programs

US Air Force Sentinel Project

The US Air Force has proposed the Sentinel[1] system as the replacement for the aging Minuteman III intercontinental ballistic missile (ICBM) system, modernizing the US land-based nuclear triad and extending its capabilities through 2075. The project involves Malmstrom Air Force Base in Montana, F.E. Warren Air Force Base in Wyoming, and Minot Air Force Base in North Dakota. The following details of the Malmstrom Air Force Base project are particularly relevant to this planning effort:

- Acquire easements for the installation and maintenance of 1,277 miles of new utility corridors, including 1.3 miles in the subarea.
- Establish workforce hubs in Great Falls and Lewistown, Montana, two cities linked by US 87.
    - 50–60 acres in size
    - 2,500–3,000 residents during peaks for three to five years
- Establish construction laydown/staging areas in Belt, Lewistown, and Stanford, Montana.
    - About 13 acres in size
    - In place for three to five years

Defense Access Road Program (DAR)

The DAR Program[2] has been an essential partnership between the Department of Defense (DOD) and the predecessors of the FHWA since 1919, ensuring that military needs are considered in the nation's Federal-aid Highway Program. This collaboration continued with the establishment of the FHWA in 1966. The DAR Program helps address the unique transportation needs that arise due to defense activities, such as the access and mobility requirements for military bases and facilities. Under this program, the military can contribute to the costs of public highway improvements necessary to mitigate the impact of their operations on local transportation infrastructure. When a military base identifies a transportation need, it submits the request to the Military Surface Deployment and Distribution Command (SDDC) for evaluation. Once approved by Congress, funds are allocated through the FHWA, and the project follows Federal Highway procedures.

The FHWA collaborates with the Military SDDC to support the US Air Force's ICBM Program. As part of the DAR Program, the DOD provides annual funding for the extraordinary maintenance of transporter erector routes, including tasks such as snow removal and regravelling, to ensure access to missile sites. Since its inception in 1957, the DAR Program has averaged $20 million per year in funding to maintain these critical transportation routes that support the nation's nuclear deterrence capabilities.

The National Defense Authorization Act (NDAA) for Fiscal Year 2024

The National Defense Authorization Act for Fiscal Year 2024[3] authorizes funding for military operations, construction projects, and defense programs, and sets the number of service members for the year. Section 362 establishes new regulations for antenna structure and energy projects with towers over 200 feet located within two nautical miles of active intercontinental ballistic missile (ICBM) facilities. These projects are subject to national security risk assessments by the Department of Defense and may be blocked if risks cannot be mitigated. However, the rule excludes structures built before the Act's enactment, including upgrades that do not increase height. The affected ICBM facilities include Francis E. Warren, Malmstrom, and Minot Air Force Bases, along with their missile fields.

1.2.2 MDT Projects

Anticipated Future Projects

Great Falls Area Bridge Decks – Minor bridge rehabilitation is planned on US 87 between RP 1.5 and RP 3.9, with work expected to begin in 2028. No additional projects or maintenance activities are planned in the corridor at this time.

Ongoing Projects

US 87 (N-57) – Armington Speed Study – MDT received a request in August 2022 for a speed study on US 87 between RP 0.0 and RP 4.0. At the time of this report, no data collection had been reported for the speed study.

Recent Projects

Armington Junction - East – In 2024, MDT completed pavement preservation work on US 87 between RP 0.4 and 7.2. The project included rehabilitating about six miles of roadway with scrub sealing, rut filling, and new pavement markings. Nine bridge decks within the area were also resurfaced, with repairs and safety enhancements made to each deck.

Armington Jct Rest Area Rehab – Completed in 2024, this project included the removal and replacement of interior items such as toilets, sinks, plumbing, and flooring, as well as external improvements like sidewalks, curbs, and benches at the Armington Junction Rest Area on MT 200. The project ensures compliance with ADA, state, and federal building requirements, including Department of Environmental Quality standards for water and wastewater systems.

Belt – N & S - Phase 3 – The Belt N&S project involved the reconstruction of approximately four miles of US 87. The project included widening the roadway to five lanes heading west from the Belt Creek Bridge toward Belt and Great Falls, an area that is outside the subarea boundaries. Phase 3, completed in 2023, included the reconstruction of 0.7 miles of US 87 from RP 0.0 to 0.7. A new roundabout was constructed at the intersection of US 87 and US Highway 89 (US 89).

2.0 DEMOGRAPHICS

This section provides an overview of the socioeconomic characteristics within the subarea. When available, the data includes information from census tract 106, which covers the southeast side of Cascade County, starting just outside Great Falls. Additionally, data from Cascade County was reviewed, along with comparative data from the State of Montana and the United States as a whole.

Demographic and socioeconomic data were analyzed to assess recent trends in population, age distribution, employment, economic status, and commuting patterns. Historical and current demographic trends help define existing conditions and support forecasting methods, as there is a direct relationship between motor vehicle travel and socioeconomic factors. Due to the time lag in the availability of socioeconomic data, this analysis presents the most current information and highlights recent and potential changes within the region.

While the data from census tract 106 and Cascade County reflects the population living in the area surrounding US 87, it may not accurately represent the primary users of the corridor. US 87 is a regional route, frequently used by through traffic and freight for transporting goods. As a result, understanding the demographics of road users is challenging. However, analyzing the demographics of the surrounding areas may provide insight into the characteristics of some of the users in the corridor.

2.1 Population

A review of demographics within the subarea is appropriate to understand historical trends in population and characteristics relevant to transportation planning. Understanding population composition is necessary, as the data may influence the types of improvements identified. For example, an aging population may indicate a need for specific types of transportation improvements such as transit services and/or non-motorized infrastructure improvements. The presence of a disadvantaged population may warrant other considerations.

2.1.1 Historic and Recent Population Trends

From 1970 through 2020, Montana's population has consistently grown at a compound annual growth rate (CAGR) of 0.90 percent. From 2010 through 2022, Montana experienced the 11th highest population growth in the nation, at 13.30 percent. However, Cascade County experienced a population decline from 1970 through 1990. From 2000 through 2020, the population increased, with the county surpassing the population numbers recorded in 1970. **Table 1** provides historical and current population estimates for the county, state, and country.

According to the Central Montana Socioeconomic Report,[4] Cascade County is the fifth most populated county in Montana with 84,601 residents as of 2023.

Table 1: Population Change Since 1970

Area	1970	1980	1990	2000	2010	2020	Compound Annual Growth (1970 – 2020)
Cascade County	81,804	80,696	77,691	80,357	81,327	84,414	0.06%
State of Montana	694,409	786,690	799,065	902,195	989,415	1.1M	0.90%
United States	203.2M	226.5M	248.7M	281.4M	308.7M	331.4M	0.98%

Source: US Census Bureau & Montana Census and Economic Information Center. 1970-2020.

2.1.2 Subarea Population Characteristics

NEPA/MEPA requires federal, state, and local agencies to evaluate the potential social and economic impacts of proposed actions. Guidelines recommend considering effects on neighborhoods and community cohesion, social groups such as minority populations, local and/or regional economies, as well as potential growth and development resulting from transportation improvements. The demographic and economic information provided in this section aims to help identify populations that may be impacted by the proposed improvements in the subarea. **Table 2** summarizes recent population and demographic data for the region along with data for the State of Montana and the whole country for comparison. The data was obtained from the 2019 through 2023 American Community Survey (ACS) 5-Year Estimates,[5] which provide detailed demographic, social, economic, and housing information by combining five years of survey data to offer reliable insights for smaller geographic areas.

Census tract 106 in Cascade County is predominantly White, with 92.8 percent of residents identifying as such, substantially higher than both Cascade County and Montana, as well as the national average. The tract has a notably small African American population at 0.1 percent, and American Indian residents make up 0.5 percent, lower than in Cascade County and Montana but still above the national average. Hispanic or Latino residents also make up a smaller portion of the tract compared to the region and the US average. In terms of age, census tract 106 has a higher percentage of residents aged 65 and older (22.6 percent), higher than both Cascade County and the national average. The disability rate is 11.8 percent, slightly below Cascade County, Montana, and the national average. The sex distribution in the tract skews male, with 58.7 percent male residents, higher than the region and national average.

Table 2: Race, Age, Sex, and Disability Data

Population Characteristics		Census Tract 106	Cascade County	State of Montana	United States
Race	White	92.8%	84.7%	85.7%	63.4%
	African American	0.1%	1.5%	0.5%	12.4%
	American Indian	0.5%	3.5%	5.7%	0.9%
	Asian	1.2%	1.2%	0.8%	5.8%
	Other Race/ Combination of Races	5.5%	9.1%	7.2%	17.5%
	Hispanic or Latino (any race)	4.0%	5.1%	4.4%	19.0%
Age	Under 18	20.6%	22.5%	21.3%	22.2%
	18-64	56.9%	58.2%	59.0%	61.0%
	65 and over	22.6%	19.3%	19.7%	16.8%
Sex	Male	58.7%	51.0%	50.7%	49.5%
	Female	41.3%	49.0%	49.3%	50.5%
Disability Status*	% Persons with Disability	11.8%	15.7%	14.3%	13.0%
	% Disabled (<18 years)	7.7%	6.0%	4.7%	4.7%
	% Disabled (≥65 years)	29.3%	31.2%	32.7%	32.9%
Total Population		**3,773**	**84,601**	**1,105,072**	**332,387,540**

Source: US Census Bureau. 2019-2023. ACS 5-Year Estimates.
**Disability status provided as a percentage of the noninstitutionalized population.*

2.1.3 Population Projections

Census tract 106 in Cascade County experienced a slight population decline from the five-year ACS period ending in 2018 through the period ending in 2023, with a decrease of 0.4 percent, compared to 3.5 percent growth in Cascade County and 6.1 percent growth in Montana. This decline contrasts with the national average growth rate of 2.9 percent. Looking ahead, the population in census tract 106 is projected to continue shrinking, with an estimated decline of 1.6 percent from 2025 through 2035. In comparison, Montana is expected to grow by 4.9 percent, and the national population is projected to increase by 3.8 percent.

Though census tract 106 is expected to face population decline, Cascade County's overall growth trend could be influenced by planned developments, particularly in the Great Falls area. However, it remains uncertain whether this growth will be sustained long-term after these projects are completed. **Table 3** details the past and projected population trends in the region and country.

Table 3: Population Change

Parameter	Census Tract 106	Cascade County	State of Montana	United States
2014-2018 5-year estimate	3,788	81,746	1,041,732	322,903,030
2019-2023 5-year estimate	3,733	84,601	1,105,072	332,387,540
2025 Projection	3,659	82,916	1,160,666	338,016,000
2030 Projection	3,621	82,060	1,199,203	345,074,000
2035 Projection	3,599	81,560	1,217,232	350,861,000
Population Change (2018-2023)	**-0.4%**	**3.5%**	**6.1%**	**2.9%**
Projected Population Change (2025-2035)	**-1.6%**	**-1.6%**	**4.9%**	**3.8%**

Source: US Census Bureau. 2014-2018 and 2019-2023. ACS 5-Year Estimates.
Population Projection REMI. 2021 data vintage year.
US Census Bureau. 2023. National Population Projections Tables Main Series.
Note: Census Tract 106 data is projected based on Cascade County projections.

2.1.4 Housing Characteristics

From the five-year ACS period ending in 2018 through the period ending in 2023, the number of housing units in census tract 106 decreased slightly by 0.4 percent, while Cascade County experienced a larger increase of 4.8 percent, as shown in **Table 4**. In census tract 106, the total number of occupied housing units decreased by 1.4 percent, contrasting with the increase in occupied units in Cascade County (3.6 percent) and Montana (7.0 percent). Notably, owner-occupied units increased substantially in both census tract 106 (4.4 percent) and Cascade County (13.0 percent), aligning with the state's increase of 9.7 percent. Although the number of housing units in the census tract decreased, the average number of bedrooms per home increased by 3.9 percent, slightly surpassing the surrounding region and the national average, allowing for more occupants per home.

Table 4: Housing Occupancy and Tenure Characteristics

Subject		Census Tract 106	Cascade County	State of Montana	United States
2019-2023	Total Housing Units	2,244	39,248	522,939	142,332,876
	Total Occupied Housing Units	1,540	34,909	452,683	127,482,865
	Owner Occupied	1,244	24,490	314,266	82,892,037
	Renter Occupied	296	10,419	138,417	44,590,828
	Total Vacant	704	4,339	70,256	14,850,011
	Share of Owner-Occupied Units	80.8%	70.2%	69.4%	65.0%
	Average Number of Bedrooms	2.72	2.82	2.78	2.72
2014-2018	Total Housing Units	2,254	37,454	505,685	136,384,292
	Total Occupied Housing Units	1,562	33,685	423,240	119,730,128
	Owner Occupied	1,192	21,665	286,553	76,444,810
	Renter Occupied	370	12,020	136,687	43,285,318
	Total Vacant	692	3,769	82,445	16,654,164
	Share of Owner-Occupied Units	76.3%	64.3%	67.7%	63.8%
	Average Number of Bedrooms	2.62	2.75	2.72	2.70
Change in Total Housing Units		**-0.4%**	**4.8%**	**3.4%**	**4.4%**
Change in Occupied Housing Units		**-1.4%**	**3.6%**	**7.0%**	**6.5%**
Change in Owner Occupation Rate		**4.4%**	**13.0%**	**9.7%**	**8.4%**
Change in Number of Bedrooms		**3.9%**	**2.3%**	**2.1%**	**0.6%**

Source: US Census Bureau. 2014-2018 and 2019-2023. ACS 5-Year Estimates.

2.1.5 Personal Travel and Commuting Characteristics

The ACS provides estimates of the total share of workers aged 16 years and older who commute or work at home, transportation modes used by commuters, and mean travel times to work for commuters. **Table 5** presents commuting characteristics for workers in census tract 106 and Cascade County. Similar statistics for the State of Montana and the whole country are provided for comparison.

According to the 2019 through 2023 ACS data, most workers in census tract 106 and Cascade County commute by car, with 66.8 and 77.9 percent driving alone, respectively. Carpooling is also common, with 10.7 percent of workers in the census tract and 10.3 percent in Cascade County. Walking to work is more prevalent in census tract 106 (9.0 percent) compared to Cascade County (2.3 percent). Public transportation use is minimal in both areas. The average commute time in census tract 106 is 26.3 minutes, substantially higher than Cascade County's 16.6 minutes, but comparable to the national average of 26.6 minutes.

Table 5: Mode of Transportation to Work

Subject	Census Tract 106	Cascade County	State of Montana	United States
% Workers 16 Years and Older with Access to 1+ Vehicle	99.0%	97.1%	97.8%	95.7%
Number of Workers 16 Years and Older	1,865	40,658	532,519	157,645,183
% Who Commuted to Work	90.8%	93.0%	88.4%	86.5%
% Who Worked at Home	9.2%	7.0%	11.6%	13.5%
Drove alone (car, truck, van)	66.8%	77.9%	72.0%	70.2%
Carpooled	10.7%	10.3%	9.6%	8.5%
Public Transportation (excluding taxicabs)	0.0%	0.7%	0.6%	3.5%
Walked to Work	9.0%	2.3%	4.0%	2.4%
Bicycled to Work	1.0%	0.7%	1.0%	0.4%
Other means of commuting	3.2%	1.1%	1.2%	1.5%
Mean Travel Time to Work (minutes)	**26.3**	**16.6**	**19.2**	**26.6**

Source: US Census Bureau. 2019-2023. ACS 5-Year Estimates.

2.2 Economic Conditions and Income Characteristics

2.2.1 Employment Industries

Cascade County, home to the City of Great Falls, is a key player in Montana's economy. The county boasts a diverse economic landscape, with major sectors including healthcare, education, retail trade, and professional services. Healthcare and educational services are the largest employers, accounting for nearly 26.0 percent of the workforce, while the retail trade industry employs 13.6 percent. Census tract 106 follows a similar trend to Cascade County, with 22.2 percent of the workforce employed in healthcare and educational services. However, agriculture stands out as the second-largest industry in the tract, employing 16.2 percent of the workforce. These sectors contribute to a balanced and resilient local economy. Cascade County also benefits from a strong tourism sector, supported by nearby parks, national forests, and local attractions such as Giant Springs State Park, Lewis & Clark Heritage Greenway State Park, and River's Edge Trail. In 2023, nonresident visitors spent an estimated $276 million in the county, placing it among the top five counties in the state for tourism spending.[6] This tourism influx further bolsters the region's economic stability and growth potential. **Table 6** presents the 2019 through 2023 and 2014 through 2018 employment estimates by industry for the region, state, and country.

Table 6: Employment by Industry

Industry	Census Tract 106		Cascade County		State of Montana		United States	
	2019-2023	2014-2018	2019-2023	2014-2018	2019-2023	2014-2018	2019-2023	2014-2018
Agriculture, forestry, fishing, hunting, and mining	16.2%	14.8%	3.7%	3.3%	5.5%	6.8%	1.6%	1.8%
Construction	9.0%	6.8%	8.0%	7.0%	9.4%	8.2%	6.9%	6.5%
Manufacturing	3.3%	3.8%	5.2%	3.8%	5.0%	4.7%	9.9%	10.2%
Wholesale trade	3.9%	2.3%	3.0%	2.7%	2.0%	2.3%	2.0%	2.6%
Retail trade	12.1%	9.8%	13.6%	12.7%	10.8%	11.7%	10.6%	11.3%
Transportation, warehousing, and utilities	2.6%	6.8%	4.7%	5.8%	5.3%	5.1%	6.0%	5.2%
Information	0.2%	2.3%	0.7%	1.8%	1.3%	1.7%	1.9%	2.1%
Finance, insurance, real estate, rental and leasing	3.0%	3.7%	5.9%	6.7%	6.3%	5.5%	6.6%	6.6%
Professional, scientific, management, and administrative	9.7%	3.9%	7.5%	6.6%	9.8%	8.4%	12.8%	11.4%
Educational services, health care and social assistance	22.2%	23.0%	26.4%	25.1%	23.4%	23.4%	23.5%	23.1%
Arts, entertainment, recreation, and accommodation	4.6%	8.3%	10.0%	11.1%	10.3%	11.2%	8.8%	9.7%
Other services, except public administration	3.5%	5.9%	5.8%	5.6%	5.4%	5.0%	4.8%	4.9%
Public administration	9.7%	8.5%	5.6%	7.9%	5.6%	6.0%	4.6%	4.6%

Source: US Census Bureau. 20 2019-2023. ACS 5-Year Estimates.

2.2.2 Employment Status and Income Measures

Table 7 presents data on employment status and income levels for census tract 106, Cascade County, the State of Montana, and the United States for the 2014 through 2018 and 2019 through 2023 periods. In 2023, census tract 106 reported a median household income of $77,790, which is higher than both the county median of $66,203 and the state median of $69,922. The mean household income in census tract 106 was $107,051, above both the county average of $85,695 and the state average of $94,544. From the five-year period ending in 2018 through the one ending in 2023, Census Tract 106 experienced a greater percentage increase in both median and mean household income than the county, state, and nation. In 2023, the unemployment rate in census tract 106 was 2.9 percent, which is slightly lower than the county rate of 3.0 percent and much lower than the state and national averages of 3.8 and 5.2 percent, respectively. The poverty rate in census tract 106 was 7.6 percent, well below the state rate of 12.0 percent and slightly lower than the national rate of 12.4 percent. Cascade County was the only area considered that did not see a decrease in the poverty rate between the two five-year periods.

Table 7: Employment Status and Income Statistics

Characteristics of Population	Census Tract 106		Cascade County		State of Montana		United States	
	2019-2023	2014-2018	2019-2023	2014-2018	2019-2023	2014-2018	2019-2023	2014-2018
Civilian Labor Force (16 years and older)	1,877	1,664	39,865	38,479	560,181	529,682	168,567,852	162,248,196
Employed %	97.1%	97.8%	97.0%	95.5%	96.2%	95.9%	94.8%	94.1%
Unemployed %	2.9%	2.2%	3.0%	4.1%	3.8%	4.2%	5.2%	5.9%
Median Household Income	$77,790	$55,946	$66,203	$48,160	$69,922	$52,559	$78,538	$60,293
Mean Household Income	$107,051	$70,332	$85,695	$67,396	$94,544	$70,959	$110,491	$84,938
Per Capita Income	$44,072	$29,207	$36,562	$29,212	$39,842	$29,765	$43,289	$32,621
Poverty Rate	7.6%	9.1%	13.2%	12.8%	12.0%	13.7%	12.4%	14.1%

Source: US Census Bureau. 2014-2018 and 2019-2023. ACS 5-Year Estimates.
Note: Civilian labor force is defined as workers 16 years and over not in the Armed Forces. Unemployed percentage calculated based on total civilian labor force.

3.0 PHYSICAL FEATURES AND CHARACTERISTICS

US 87 is a key north-south transportation route in Central Montana, vital to the local, state, and national transportation networks. It begins in New Mexico and ends in Montana near the Canadian border. Within the subarea, the corridor connects the City of Great Falls to several communities in Central Montana, including Stanford and Lewistown, making it an essential route for both passenger and freight traffic.

The roadway follows Otter Creek, which winds along both sides of the road, as well as a railroad operated by BNSF Railway, located on the east side of the road, throughout much of the subarea corridor. The subarea encompasses a variety of land uses, with much of the surrounding land devoted to agricultural production, while some areas remain undeveloped or are under conservation easements, contributing to the region's environmental and ecological significance.

The US 87 corridor is heavily used by freight and commercial vehicle traffic, with approximately 570 trucks traveling US 87 within the subarea daily, representing a large portion of the traffic volume in the area. This heavy traffic is facilitated by a weigh station located at Armington Junction, at the north end of the subarea. The region's freight operations are further supported by the nearby BNSF Railway, which runs parallel to the highway.

There are no sidewalks or trails along the subarea corridor, and the two- to four-foot road shoulders make biking or walking along the highway uncommon. As a result, there is no recorded pedestrian or bicycle traffic along US 87 in the subarea. Despite this, the corridor serves as a critical route for local businesses and residences, highlighting the importance of the highway to the regional economy, providing access to essential services, agricultural lands, and commercial enterprises.

3.1 Land Use, Land Ownership, and Right-of-Way

The land in the subarea is primarily owned by private landowners (98 percent), with the remaining two percent held by the DOD, MDT, and the state. Human land use including agriculture, roads, and railroads accounts for approximately 28 percent of the subarea, while the rest is categorized as undeveloped land. While a few residences are accessed along the corridor, much of the land adjacent to the highway is in agricultural production or remains undeveloped. Additionally, a conservation easement held by the Montana Land Reliance is located south of Armington, extending from the northwest corner of the Armington junction intersection south along US 89.[7]

Otter Creek runs along both sides of the corridor, with the railroad on the east side. As a result, right-of-way widths vary throughout the corridor. On the west side, the typical right-of-way width is about 80 feet, with a few exceptions. There are four areas where the right-of-way widens, reaching a maximum width of 270 feet. However, between RP 4.0 and RP 5.0, the width briefly narrows to 70 feet, which is the minimum width on the west side. On the east side, the railroad and road rights-of-way are adjacent to one another. The road's right-of-way width generally ranges from 50 to 80 feet, with most sections measuring 60 feet. However, in some areas, the right-of-way meets the road’s edge, leaving no room for improvements without easements or right-of-way acquisition. A map of existing managed lands is shown in **Figure 2**.

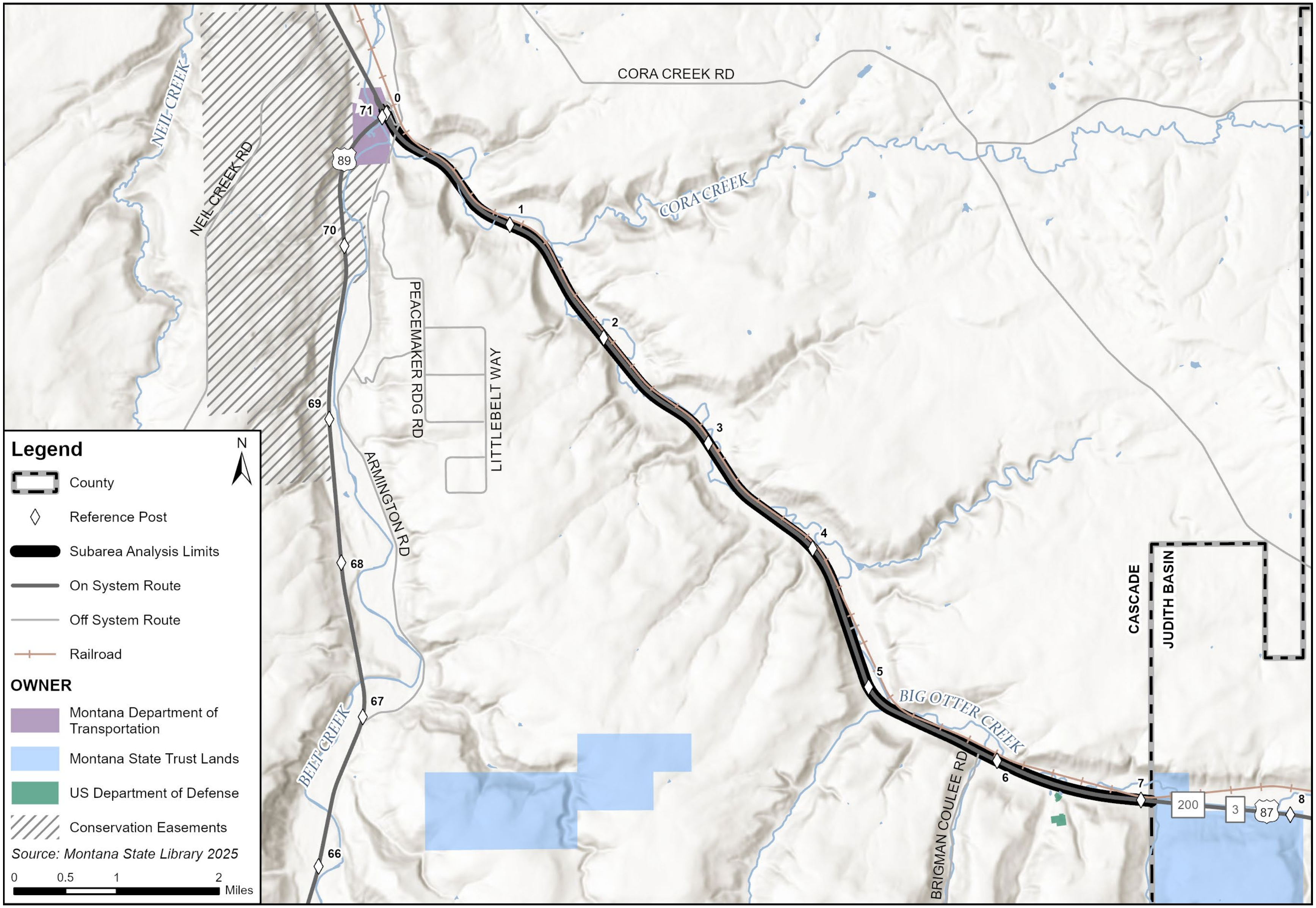

Figure 2: Managed Lands

3.2 Roadway Surfacing

Based on roadway surfacing information provided by MDT, the majority of the subarea corridor has a consistent width of 30 feet, with the road paved along its entire length. The width includes one travel lane in each direction and a two- to four-foot shoulder according to MDT's *Bicycling the Big Sky* map.[8] A small section from RP 0.0 to 0.3 has a width of 66 feet, including a concrete median and curb and gutter (RP 0.0 to 0.2) or a two-way left-turn lane (TWLTL) with 12-foot shoulders (RP 0.2 to 0.3).

Pavement condition indices are measured and tracked annually in the corridor. MDT's Pavement Management System (PvMS) is used to analyze the collected data to determine the relative performance of the pavement. Items of primary interest include the presence and degree of cracking and rutting. Several pavement condition indices are monitored through the PvMS. The performance measures and corresponding indices use a numerical value of 100 (assigned to a new pavement with no flaws) through 0 (representing highly degraded pavement).

- **Ride Index (IRI):** Determined by using an internationally applied roughness index in inches per mile.
- **Rut Index (RI):** Rut measurements are taken approximately every foot and averaged into one-tenth mile reported depths.
- **Alligator Crack Index (ACI):** Measured by combining all load associated cracking.
- **Miscellaneous Cracking Index (MCI):** Calculated by combining all non-load associate cracking.
- **Overall Performance Index (OPI):** Determined by combining and placing various weighting factors on the IRI, RI, ACI, and MCI figures. The OPI is calculated to provide a single index describing the current general health of a particular route or system.

In 2022, pavement conditions were assessed in 0.1-mile segments on both sides of the road. These values were then averaged into one-mile segments, with the results summarized in **Table 8**. The maximum and minimum values for each segment are also provided to highlight the range of pavement performance throughout the subarea. According to the *2024 Pavement Performance and Condition Report*,[9] the OPI ranges from 0 to 100, with values of 63 and above indicating good condition, values between 45 and 62 considered fair, and values below 45 indicating poor condition. The 2022 OPI data indicates that, on average, the pavement was in fair condition across most of the corridor, however, a few short segments in the first and last mile were in good condition, as shown in **Figure 3**.

Following the 2024 completion of the *Armington Junction - East* project, which included minor pavement preservation work between RP 0.4 and 7.2, the corridor was reevaluated. Data from 2024 showed slightly improved pavement conditions, as reflected in **Table 8**. Despite this improvement, the 2024 OPI rating still classifies the overall pavement condition as fair, largely due to the aging roadbed.

Table 8: Pavement Condition Indices

Begin RP	End RP	ACI			MCI			IRI			RI			OPI		
		Average	*Minimum*	*Maximum*	*Average*	*Minimum*	*Maximum*	*Average*	*Minimum*	*Maximum*	*Average*	*Minimum*	*Maximum*	*Average*	*Minimum*	*Maximum*
2022 Pavement Data																
0.0	**1.0**	96.7 Good	88.9 Good	100.0 Good	87.9 Good	74.6 Fair	97.9 Good	66.7 Fair	44.8 Poor	81.1 Good	57.8 Fair	41.8 Fair	81.3 Good	53.8 Fair	42.6 Poor	77.1 Good
1.0	**2.0**	96.6 Good	86.7 Good	99.4 Good	79.2 Fair	64.3 Fair	92.7 Good	66.1 Fair	48.5 Poor	78.1 Fair	54.7 Fair	48.1 Fair	63.7 Good	47.9 Fair	38.8 Poor	53.5 Fair
2.0	**3.0**	97.0 Good	89.7 Good	99.8 Good	78.9 Fair	64.3 Fair	94.5 Good	61.9 Fair	45.1 Poor	78.7 Fair	51.1 Fair	45.7 Fair	59.7 Fair	45.3 Fair	37.9 Poor	52.3 Fair
3.0	**4.0**	97.5 Good	93.8 Good	99.8 Good	80.6 Good	63.9 Fair	93.3 Good	66.2 Fair	48.0 Poor	77.6 Fair	52.4 Fair	43.0 Fair	65.7 Good	48.6 Fair	42.9 Poor	52.7 Fair
4.0	**5.0**	96.1 Good	79.3 Fair	99.4 Good	81.2 Good	66.4 Fair	90.6 Good	68.3 Fair	53.6 Poor	74.7 Fair	49.8 Fair	44.2 Fair	55.0 Fair	48.2 Fair	40.5 Poor	54.2 Fair
5.0	**6.0**	96.5 Good	85.7 Good	99.7 Good	84.2 Good	72.1 Fair	91.9 Good	70.3 Fair	57.1 Poor	80.8 Good	53.5 Fair	48.4 Fair	61.7 Good	51.4 Fair	44.3 Poor	56.7 Fair
6.0	**7.1**	98.2 Good	94.2 Good	99.7 Good	86.9 Good	76.0 Fair	97.1 Good	70.5 Fair	55.7 Poor	84.0 Good	54.5 Fair	48.1 Fair	80.0 Good	54.1 Fair	46.3 Fair	77.6 Good
2024 Pavement Data																
0.0	**7.1**	100 Good			90.1 Good			72.2 Fair			56.9 Fair			57.1 Fair		

Source: MDT. 2024, 2022.

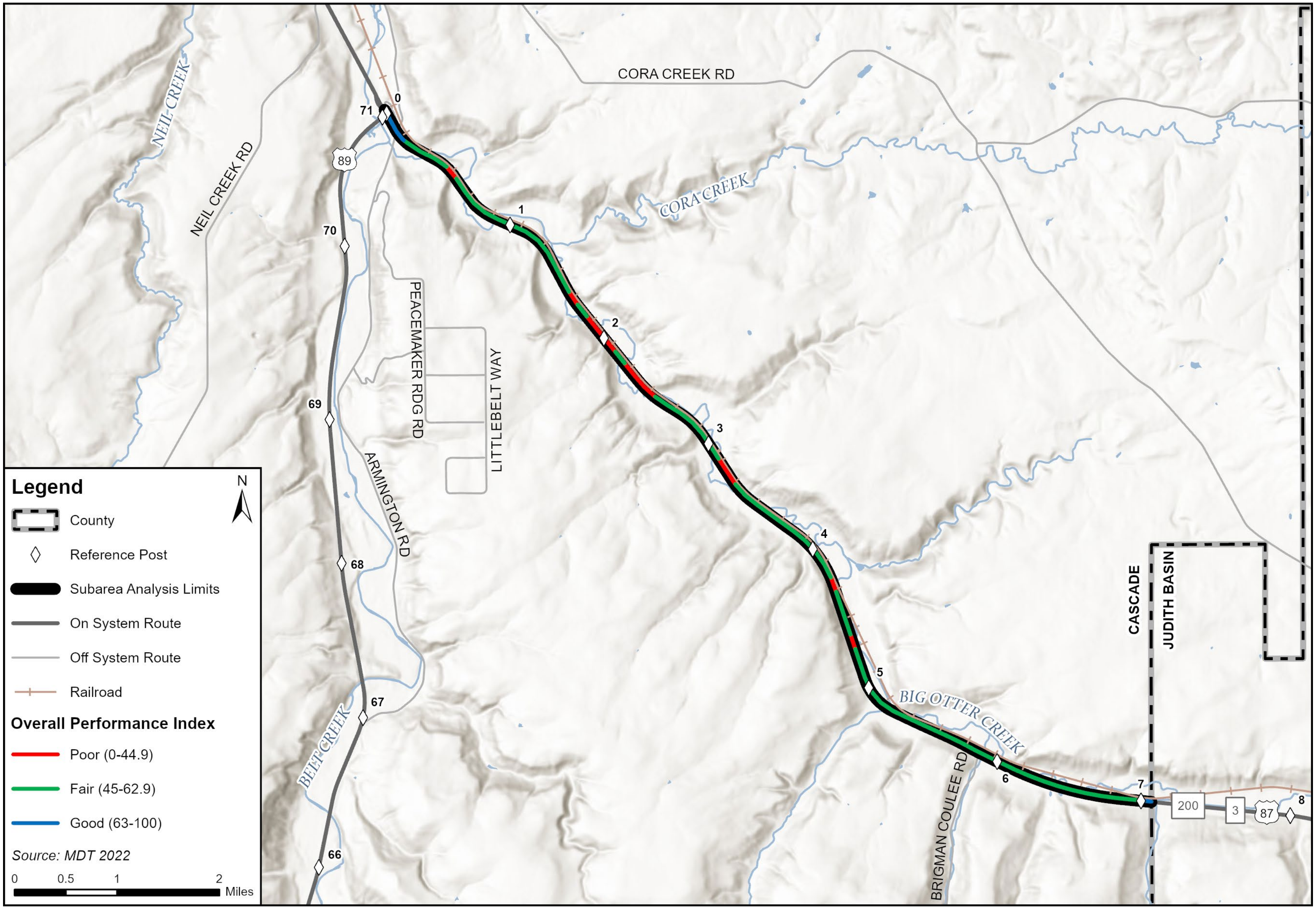

Figure 3: Pavement Condition

3.3 Access Points and Turnouts

Numerous public and private access points occur along the subarea corridor. Access points were identified through a review of available GIS data and aerial imagery. Based on this review, 49 access points were identified along the corridor. Of the 49 total access points, four were considered public roadways, 13 were private approaches, 25 were farm field approaches, and seven were turnouts. Accesses were categorized according to their most typical use, as determined from aerial imagery.

The angle of an approach refers to the angle at which the approaching road intersects the major road. Desirably, roadways should intersect at or as close to 90° as practical. Intersection skews greater than 30° from perpendicular are typically undesirable, as the driver's line of sight becomes restricted. Accordingly, the approach angle is recommended to be between 60° and 120°. A total of seven skewed access points were identified within the subarea, none of which are public approaches.

Table 9 provides a summary of access points grouped in incremental segments along the subarea corridor. The table shows the number and density of approaches for the various roadway segments. The density of approaches per mile is also shown in **Figure 4**. There are no existing access control plans in place along the segment of US 87 within the subarea.

Table 9: Access Points Along Subarea Corridor

Segment	Begin RP	End RP	Length (mi)	Access Points				Density (per mi)	Skewed (<60°)
				Public	Private	Farm	Turnout		
RP 0.0 to 1.0	0.0	1.0	1.1	4	4	3	2	12	2
RP 1.0 to 2.0	1.0	2.0	1.0	0	0	3	0	3	0
RP 2.0 to 3.0	2.0	3.0	1.0	0	1	5	2	8	2
RP 3.0 to 4.0	3.0	4.0	1.0	0	2	5	1	8	2
RP 4.0 to 5.0	4.0	5.0	1.0	0	2	0	2	4	0
RP 5.0 to 6.0	5.0	6.0	1.0	0	2	4	0	6	1
RP 6.0 to 7.1	6.0	7.1	1.1	0	2	5	0	6	0
Total			**7.2**	**4**	**13**	**25**	**7**	**7**	**7**

Developed via review of available aerial and Google Streetview imagery in 2025.

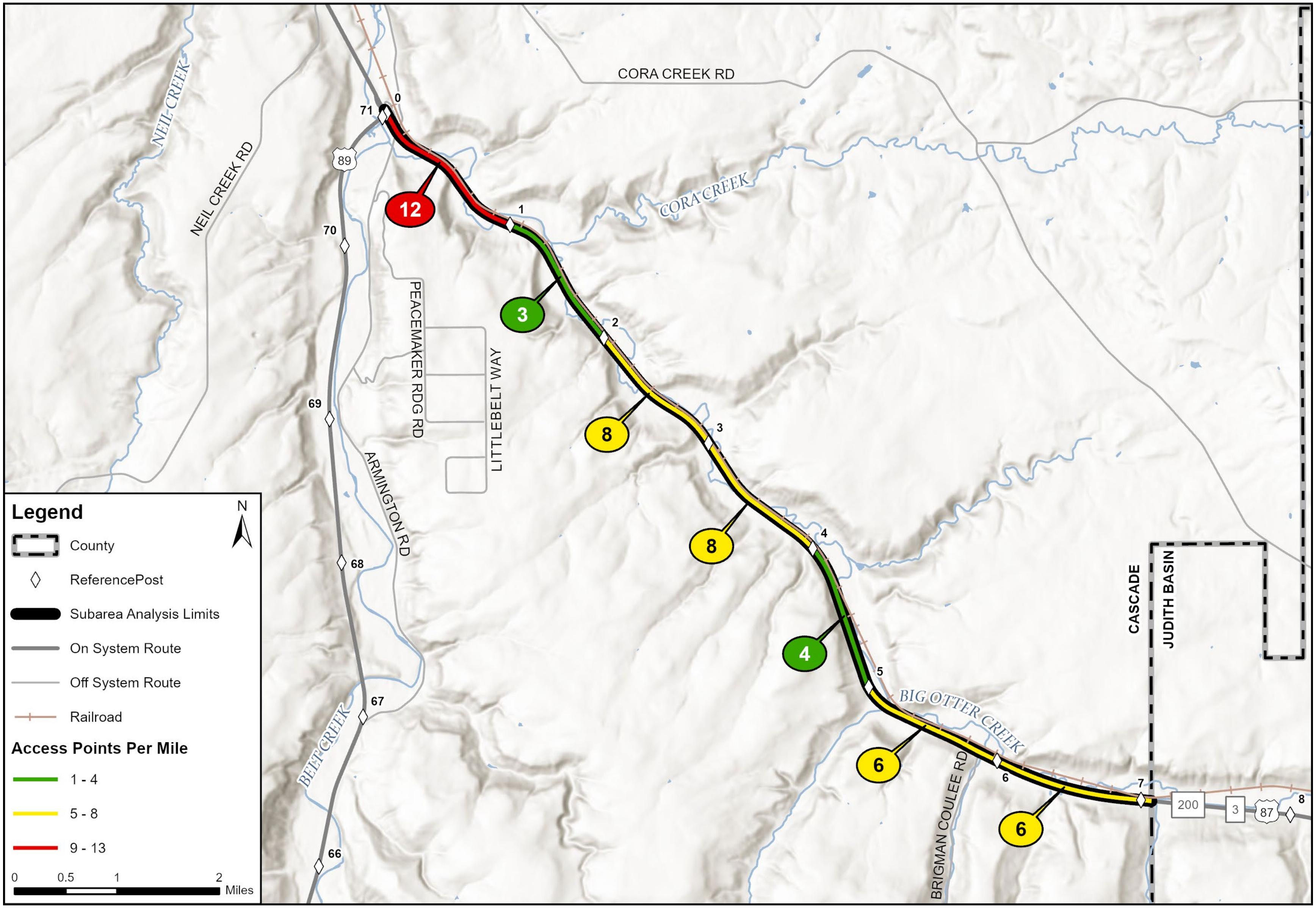

Figure 4: Access Point Density

3.4 Posted Speeds

The subarea corridor has varying speed limits and intermittent speed zones. Per MDT speed limit guidance, most of the roadway is signed as a standard two-lane highway with a 70 mile per hour (mph) daytime limit for passenger vehicles and 65 mph limit for heavy trucks and at nighttime.[10] A speed zone exists from approximately RP 0.0 to 0.3 as vehicles approach and exit the roundabout at the Armington Junction Rest Area and Weigh Station.

While speeds limits are typically statutory, based on guidance in Montana Code Annotated (MCA) 61-8-303,[11] speed limits can be modified to better fit the context of the roadway based on the results of a speed study. This involves data collection at specific locations to determine the 85th percentile speed, or the speed at or below which 85 percent of drivers travel under ideal conditions. This speed is typically used as a starting point for setting a rational speed limit and is considered the maximum safe speed for that area. A speed study was recently requested to evaluate highway speed limits in relation to the recently constructed Armington Junction roundabout. The speed study extends from RP 0.0 to 4.0 within the subarea. The existing posted speed limits and MDT speed studies are shown in **Figure 5**.

3.5 Passing Zones

Passing opportunities are provided along the corridor in areas where roadway geometrics allow. Passing areas are designated by broken yellow center pavement markings. No-passing zones are designated in areas with insufficient passing sight distance or other special conditions according to the *Manual on Uniform Traffic Control Devices.*[12] A total of 10 passing zones, five northbound and five southbound, exist along the corridor. The following information summarizes the guidelines for no-passing zones as described in the MDT *Road Design Manual.*[13]

- For determining a no-passing zone, the distance along a driver's line of sight is measured from a 3.5-foot height of eye to a 3.5-foot height of object.
- For two-lane rural highways of level terrain on the National Highway System (NHS), the no-passing zone design speed will be 70 mph.
- The minimum passing sight distance required for a 70 mph no-passing zone design speed is 1,200 feet.
- The minimum length for a no-passing zone is 500 feet.
- If the length between successive no-passing zones in the same direction of travel is less than 1,000 feet, then the gap between the no-passing zones should be closed.
- A no-passing zone should be marked in advance of intersections at a minimum distance of 500 feet.

There are no passing lanes present within the subarea corridor. **Figure 6** shows the existing passing zones, along with their length, as documented through aerial imagery.

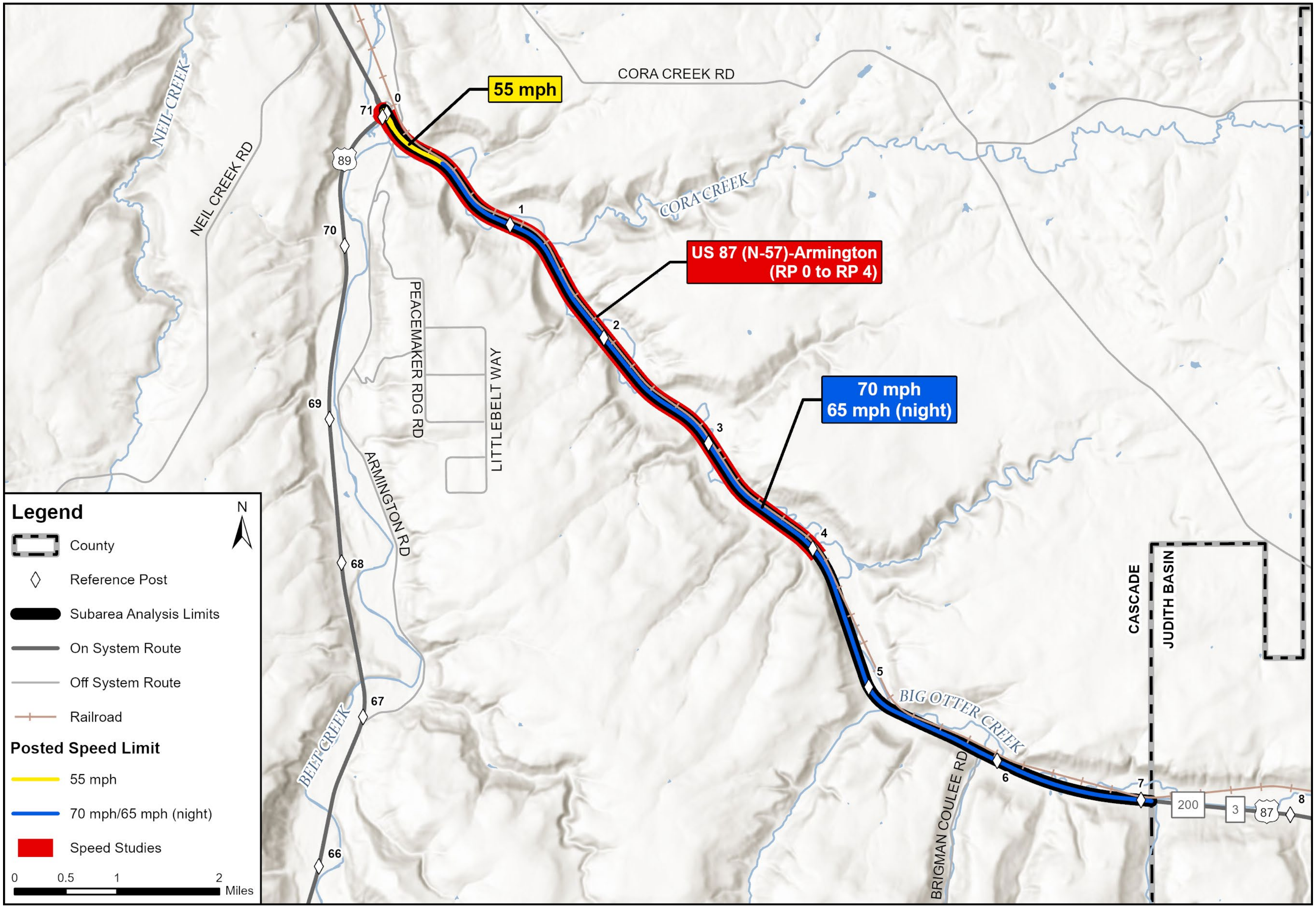

Figure 5: Posted Speed Limits

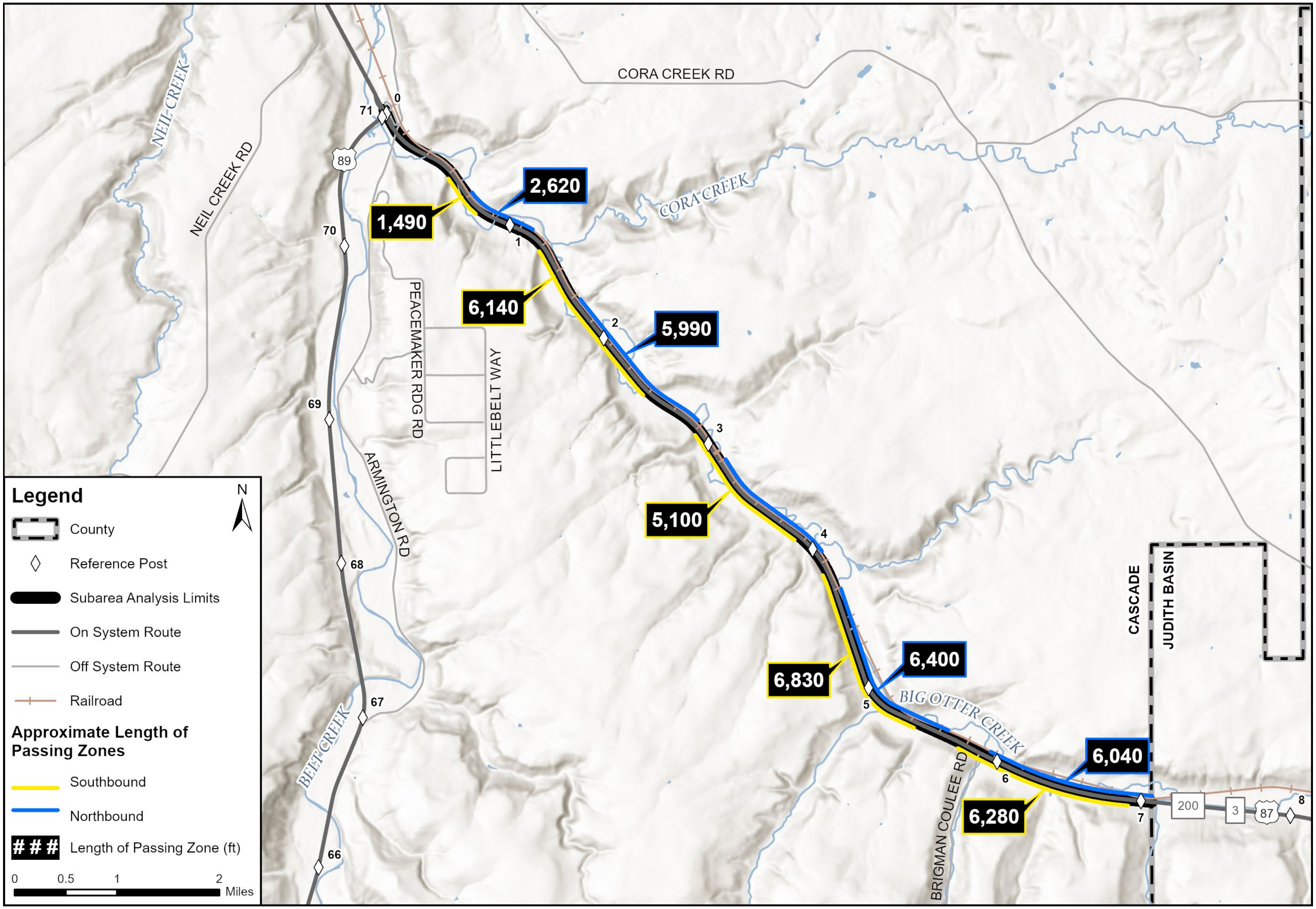

Figure 6: Passing Zones

3.6 Maintenance and Operations

MDT is responsible for the maintenance of US 87 throughout the entire subarea, including repairs and preventative maintenance of the roadway as well as maintenance of signs and structures within the highway right-of-way. The entire corridor is within the Great Falls Maintenance Division and is part of the Belt Maintenance Section. The Belt Section House is located at the intersection of US 87 and US 89 (RP 0.0) and includes one sand/salt stockpile.

Winter Maintenance

Winter snowplowing and sanding are the responsibility of MDT maintenance personnel. Within the subarea, US 87 is considered a Level II winter maintenance area according to the MDT *Maintenance Operations and Procedures Manual.*[14] The Level II category applies to MDT-maintained roadways with ADT of 1,000 to 3,000 vehicles per day (vpd). Level II routes are eligible to receive up to 17 hours-per-day of coverage during a winter storm event, typically from 5:00 a.m. to 10:00 p.m. Implementation of coverage is at the discretion of MDT's Great Falls Area Maintenance Chief. The primary objective is to keep one lane in each direction open to traffic. Snow-packed and/or icy surfaces are acceptable, but they may be treated with abrasives or abrasive/chemical combination. Plowing/removal of any snowpack or icy surface, widening of the traveled way, and clearing of shoulders should be accomplished only during regularly scheduled work hours. Anti-icing strategies and techniques will not be implemented unless documented to be cost-effective.

During field review, MDT Maintenance personnel noted a need for more snow storage. The concern was mainly on the west side of the corridor where wind causes snow drifts throughout the winter.

Heavy Vehicle Operations

A single scale site is located at RP 0.0 next to the Armington Junction Rest Area.

Emergency Services

Cascade County Emergency Management Services is the umbrella organization for operations relating to emergency management, incident management, hazardous materials, fire service, and 9-1-1 calls. They work closely with Montana Disaster and Emergency Services as well as the county rural emergency medical services, rural volunteer fire districts, and the Community Emergency Response Team in the surrounding towns.

The subarea is served by the Belt Rural Fire District.[15] The Belt City Fire Department is also located nearby.

US 87 is patrolled by the Cascade County Sheriff's Offices in conjunction with Montana Highway Patrol (MHP).

Medical services for emergency situations are primarily served by Benefis Health System in Great Falls, a Level II Trauma Hospital, or the Great Falls Hospital also located in Great Falls. Benefis Hospital has an on-site helipad for air ambulance transport.

Mutual Aid Agreements

The *Agreement for Mutual Aid in Fire Protection with Cascade County Rural Fire Services and Great Falls Fire Rescue*[16] allows the 16 rural fire departments in Cascade County and the Great Falls Fire Rescue to respond within each other's districts without prior approval from the elected body.

Under the *Intrastate Mutual Aid System* (MCA 10-3-901), member jurisdictions may request assistance from other member jurisdictions to prevent, mitigate, respond to or recover from an emergency or disaster, or in concert with drills or exercises. Any resource (personnel, assets and equipment) of a member jurisdiction may be made available to another member jurisdiction. All jurisdictions were automatically enrolled in the program when the agreement was codified in 2009 and must formally withdraw from the program if they do not wish to participate.

3.7 Geotechnical Conditions

US 87 primarily traverses hilly terrain, with some areas of mountainous terrain, composed mainly of alluvial deposits, Morrison Formations, and Kootenai Formations. The alluvial deposits, which are the result of erosion and sediment transport by streams, consist of fine silt, sand, clay, and gravel deposited at various points.[17] These deposits form the foundation for much of the surrounding landscape. The Morrison Formation is primarily composed of sandstone and brightly colored sandy shale, with occasional layers of impure limestone. These sedimentary rock layers often exhibit striking hues of red, yellow, and brown. The Kootenai Formation consists of alternating layers of sandstone and shale, with sandstone predominating, giving the formation a distinctive layered appearance.

The soils deposited between bedrock outcrops are predominately silt, sand, gravel, and clay. The silty materials are difficult to vegetate, especially if they are present in slopes steeper than 2:1 (horizontal to vertical ratio). The till materials are prone to erosion when steeper than 2:1, which also hinders revegetation. Based on visual field observations, steep slopes generally occur at RP 0.6, 1.3, 2.0, 2.9, 3.7, 4.8, and 5.9.

MDT has identified no rock slopes along this corridor that are cataloged in MDT's *Rockfall Asset Management Program*.[18]

3.8 Structures and Hydraulic Conditions

MDT's Bridge Program emphasizes asset management and preservation. This emphasis promotes a "right treatment at the right time" philosophy in prioritizing and selecting projects on MDT's bridge system. MDT has defined bridge program objectives and performance measures to assist with this process. The objectives and measures are intended to identify the right treatments for Montana's bridges, and promote cost-effective bridge preservation, appropriate safety-related work, and economic growth.

Bridge conditions are determined using the National Bridge Inventory (NBI) General Condition Ratings (GCR). The GCRs are used to describe the existing bridge as compared to its as-built condition. The material used, as well as the physical condition of the deck, superstructure, and substructure of the bridge are considered in the rating. GCRs are given a numerical rating ranging from zero (failed condition) to nine (excellent condition) as described in the *FHWA Coding Guide*.[19] Bridges are considered structurally deficient if the superstructure or substructure elements are rated less than five on the NBI scale.

Nine bridges are located within the subarea. **Figure 7** shows the bridges' locations and **Table 10** details their physical characteristics, condition ratings, and design loads. All of the bridges have a superstructure rating of eight and a substructure rating of seven, meaning none are considered structurally deficient. However, one bridge has a deck rating of six, associated with a satisfactory condition, and three bridges have a deck rating of four, indicating decks in poor condition. All of the bridges in the subarea were included in the *Armington Junction - East* project, which involved deck rehabilitation work in late 2023 and early 2024. The most recent inspections, conducted in June 2024, reflect the condition of the bridges following the rehabilitation work.

Table 10: Bridge Data

Bridge ID	Location	Feature	Type	Year Built	Length (ft)	Health Index	Sufficiency Rating	Deck Rating	Superstructure Rating	Substructure Rating	Channel Rating	Design Load
05946	RP 0.4	Otter Creek	Prestressed Concrete	1959	124.0	98.51	86.7	7 Good	8 Very Good	7 Good	7	HS 20
05947	RP 0.7	Otter Creek	Prestressed Concrete	1959	119.0	97.16	86.7	7 Good	8 Very Good	7 Good	7	HS 20
05948	RP 1.0	Otter Creek	Prestressed Concrete	1959	119.0	98.31	86.7	8 Very Good	8 Very Good	7 Good	7	HS 20
05949	RP 1.5	Otter Creek	Prestressed Concrete	1959	102.5	97.04	86.7	4 Poor	8 Very Good	7 Good	7	HS 20
05950	RP 1.9	Otter Creek	Prestressed Concrete	1959	102.5	99.03	86.7	7 Good	8 Very Good	7 Good	7	HS 20
05951	RP 2.2	Otter Creek	Prestressed Concrete	1959	92.5	98.71	81.6	6 Satisfactory	8 Very Good	7 Good	7	HS 20
05952	RP 2.6	Otter Creek	Prestressed Concrete	1959	93.0	99.01	85.7	7 Good	8 Very Good	7 Good	7	HS 20
05953	RP 3.1	Otter Creek	Prestressed Concrete	1959	103.0	95.41	85.7	4 Poor	8 Very Good	7 Good	7	HS 20
05954	RP 3.6	Otter Creek	Prestressed Concrete	1959	103.0	95.01	80.6	4 Poor	8 Very Good	7 Good	7	HS 20

Source: MDT. 2024. Structure Management System.

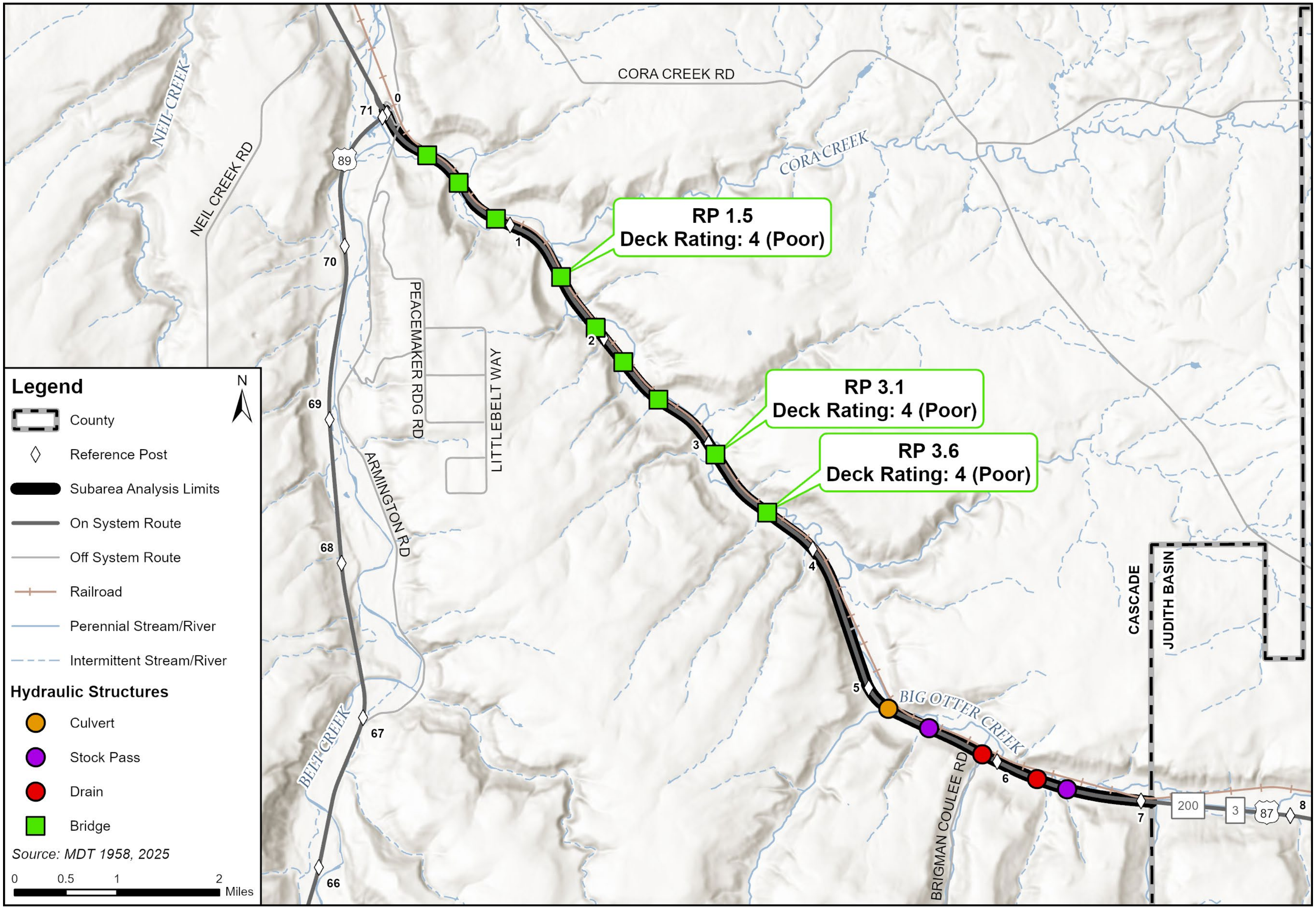

Figure 7: Major Hydraulic and Structural Features

Within the subarea, 34 drainage features were identified beneath US 87, based on the 1958 as-built drawings. Most of these features are small culverts or conduits, ranging in size from 15 to 42 inches, although their sizes may have changed since their initial installation in 1958. Of these, five are considered major features with sizes of 48 inches or larger, as detailed in **Table 11** and shown above in **Figure 7**.

Additionally, MDT has received multiple requests from nearby property owners for the installation and rehabilitation of stock passes beneath the highway. Notably, the landowner at the intersection of US 87 and Brigman Coulee Road has specifically inquired about the potential installation of a stock pass at this location.

Table 11: Major Hydraulic Structures

RP	Station	Size (inches or feet)	Type / Material	Year installed
5.2	**273+40**	48”	RCP	1958
5.4	**282+50**	6’-6” X 5’-10”	SPP Stock Pass	1958
5.9	**309+93**	72”	SPPC Drain	1958
6.3	**330+50**	72”	SPPC Drain	1958
6.5	**342+50**	6’-6” X 5’-10”	SPP Stock Pass	1958

Source: MDT. 1958.

Note: Reinforced Concrete Pipe (RCP), Structural Plate Pipe (SPP).

3.9 Utilities

Multiple utilities are present within the subarea corridor providing electrical, gas, communications, sewer, and water services. Electrical services are supplied by several private providers including Energy West and NorthWestern Energy. Electrical connections are primarily provided through overhead power lines paralleling the highway with occasional crossings over or under the roadway. Gas services may be present in the subarea via underground gas lines. Communications services, including telephone, internet, and cable, are provided by CenturyLink. Most of these utilities are underground, though a few overhead telephone lines are also present within the subarea corridor. Underground water and sewer lines primarily serve local water and sewer districts. The Armington Junction Rest Area is served by a well located approximately 475 feet south of the site.[20]

As part of the Sentinel project, existing utility corridors are being upgraded, and new utility corridors are anticipated. These corridors are designed to provide essential utilities to the main bases, missile alert facilities, launch facilities, and communication towers. Within the subarea corridor, a new utility corridor is proposed from RP 5.9 to 7.1.

Utility providers must obtain appropriate occupancy and/or encroachment permits prior to utility installation within MDT right-of-way. MDT’s online Utilities Permitting Administration System facilitates the permitting process and maintains a repository of utility information including applicant name, utility location and size, utility service type, permit type, and approval date. If projects are advanced following this subarea analysis, coordination with utility owners may be required to address potential impacts on utility infrastructure and associated mitigation.

3.10 Multimodal Transportation Facilities

Freight Facilities

Freight and heavy vehicle traffic operating on US 87 consists mainly of commercial truck traffic, construction vehicles, and smaller delivery trucks. US 87 is one of the main routes connecting Great Falls to cities and towns in Central Montana such as Lewistown and Stanford. Due to the high freight traffic through the area, there is a weigh station located at RP 0.0 next to the Armington Junction Rest Area.

Rail Facilities

A railroad owned by BNSF Railway runs along the east side of US 87 throughout the entire subarea. Although the road and railway share right-of-way, the railroad does not cross the road, meaning it does not directly impact vehicle traffic. This rail line is primarily used for transporting coal and grain, with the nearby Great Falls Rail Yard serving as a key hub for freight operations. The proximity of the rail line to US 87 does not cause major interference with road travel; however, it plays a key role in regional logistics and transportation dynamics.

The road and railroad rights-of-way are coincident along the east side of the corridor. The close proximity to the railroad is limiting, as acquiring easements from the railroad is often challenging, so improvements should attempt to minimize or avoid impacts to the railroad. While the right-of-way width typically ranges between 50 and 80 feet on the west side, there are segments where the right-of-way line aligns with the edge of the roadway.

Pedestrian and Bike Facilities

There are no sidewalks or trails within the subarea, and the shoulders on US 87 are generally two feet or less throughout most of the subarea, leaving minimal space for bicycles to safely ride outside the travel lane. Accordingly, there is no recorded pedestrian or bike traffic along US 87 within the subarea.

4.0 GEOMETRIC CONDITIONS

The segment of US 87 within the subarea was constructed on its current alignment in the late 1950s. Several improvement projects have taken place since then. Those projects consist of a variety of work including intersection realignment, resurfacing, widening, the addition of turn lanes, and other safety improvements. Existing roadway geometrics were evaluated and compared to current MDT baseline criteria. The analysis was conducted based on MDT as-built drawings, GIS data, and aerial imagery. The available as-built drawings for the base construction were used to establish preliminary horizontal and vertical alignments. Alignment data from the late 1950s was provided for the entire subarea. Newer as-built drawings for spot improvement projects were used to supplement the original plans to account for changes in roadway alignment. These included as-built drawings from a 2016 slope flattening project, covering RP 1.3 to 3.7, as well as the 2021 Belt N & S Phase 3 plans, which detail the addition of a roundabout at the beginning of the subarea corridor.

4.1 Design Criteria

The MDT *Baseline Criteria Practitioner's Guide*[21] specify quantitative design criteria to be used as uniform baseline design dimensions or values. Baseline criteria are intended to be used as a starting point. For any projects advanced from this corridor study, the MDT project team and engineer of record will consider the context of the facility and scope of the project to determine final criteria. The criteria for the subarea are based on the current MDT baseline design criteria for rural principal arterials, as presented in **Table 12**.

For this classification, design speeds may vary depending on terrain conditions. According to the definitions in the *Road Design Manual,*[22] the subarea corridor is mostly considered rolling terrain, with areas of mountainous and level terrain. For the topography and roadway classification of the corridor, the design speed ranges from 50 mph for mountainous terrain, 60 mph for rolling terrain, and 70 mph for level terrain. Posted speeds may differ from the design speed. The *Baseline Criteria Practitioner's Guide* provides critical roadway design criteria depending on design speed and roadway classification. Design speed and terrain type will ultimately be determined as necessary during the project development process for any improvement options forwarded from this subarea analysis.

4.2 Roadway Width

Within the subarea, US 87 typically consists of one 12-foot travel lane in each direction with two- to four-foot shoulders, resulting in a typical roadway width ranging from 28 to 32 feet. Outside of the typical corridor section, there are spot locations with medians, curbs, shoulders, and a center TWLTL. The MDT *Baseline Criteria Practitioner's Guide* recommends a travel lane width of 12 feet on rural principal arterial routes. The MDT *Route Segment Plan*[23] defines a minimum total roadway width of 40 feet for the subarea. While the corridor satisfies the 12-foot travel lane width, most of the corridor has shoulder widths less than eight feet, which does not satisfy the 40-foot minimum recommended roadway width. In general, two-foot shoulders exist throughout the subarea in areas without bridges or steep side slopes, where guardrails are installed instead.

Table 12: Baseline Criteria for Rural Principal Arterials

<table>
<tr><th colspan="3">Design Element</th><th colspan="3">Design Criteria</th></tr>
<tr><td rowspan="3">Design Control</td><td rowspan="3">Design Speed (minimum)</td><td>Level</td><td colspan="3">70 mph</td></tr>
<tr><td>Rolling</td><td colspan="3">60 mph</td></tr>
<tr><td>Mountainous</td><td colspan="3">50 mph</td></tr>
<tr><td rowspan="5">Roadway Elements</td><td colspan="2">Travel Lane Width</td><td colspan="3">12 ft</td></tr>
<tr><td colspan="2">Shoulder Width*</td><td colspan="3">8 ft</td></tr>
<tr><td rowspan="2">Cross Slope</td><td>Travel Lane</td><td colspan="3">2%</td></tr>
<tr><td>Shoulder</td><td colspan="3">2%</td></tr>
<tr><td colspan="2"></td><td colspan="3"></td></tr>
<tr><td rowspan="13">Roadside Elements</td><td rowspan="3">Ditch</td><td>Inslope</td><td colspan="3">6:1 (width 10 ft)</td></tr>
<tr><td>Width</td><td colspan="3">10 ft minimum</td></tr>
<tr><td>Slope</td><td colspan="3">20:1 towards backslope</td></tr>
<tr><td rowspan="4">Backslope Cut Depth</td><td>0-5 ft</td><td colspan="3">5:1</td></tr>
<tr><td>5-10 ft</td><td colspan="3">Level/Rolling: 4:1
Mountainous: 3:1</td></tr>
<tr><td>10-15 ft</td><td colspan="3">Level/Rolling: 3:1
Mountainous: 2:1</td></tr>
<tr><td>>15 ft</td><td colspan="3">Level/Rolling: 2:1
Mountainous: 1.5:1</td></tr>
<tr><td rowspan="4">Fill Slopes</td><td>Fill Height 0-10 ft</td><td colspan="3">6:1</td></tr>
<tr><td>Fill Height 10-20 ft</td><td colspan="3">4:1</td></tr>
<tr><td>Fill Height 20-30 ft</td><td colspan="3">3:1</td></tr>
<tr><td>Fill Height >30 ft</td><td colspan="3">2:1</td></tr>
<tr><td colspan="2">Median Width</td><td colspan="3">See Road Design Manual Section 5.3</td></tr>
<tr><td colspan="2">Clear Zone</td><td colspan="3">See Road Design Manual Section 9.2</td></tr>
<tr><td rowspan="12">Alignment Elements</td><td colspan="2">DESIGN SPEED</td><td>70 mph</td><td>60 mph</td><td>50 mph</td></tr>
<tr><td colspan="2">Stopping Sight Distance (Level Terrain) – See RDM Section 2.8</td><td>730 ft</td><td>570 ft</td><td>425 ft</td></tr>
<tr><td colspan="2">Passing Sight Distance</td><td>1,200 ft</td><td>1,000 ft</td><td>800 ft</td></tr>
<tr><td colspan="2">Minimum Radius (e=8%)</td><td>1,810 ft</td><td>1,200 ft</td><td>760 ft</td></tr>
<tr><td colspan="2">Spiral Curve Section</td><td colspan="3">$e \geq 7\%$</td></tr>
<tr><td colspan="2">Superelevation Rate</td><td colspan="3">$e_{max} = 8.0\%$</td></tr>
<tr><td rowspan="2">Vertical Curve Length</td><td>Crest</td><td colspan="3" rowspan="2">See Chapter 4, Section 4.4 of the MDT Road Design Manual</td></tr>
<tr><td>Sag</td></tr>
<tr><td rowspan="3">Maximum Grade</td><td>Level</td><td colspan="3">3%</td></tr>
<tr><td>Rolling</td><td colspan="3">4%</td></tr>
<tr><td>Mountainous</td><td colspan="3">7%</td></tr>
<tr><td colspan="2">Minimum Vertical Clearance</td><td colspan="3">17 ft</td></tr>
</table>

Source: MDT. March 2021.Baseline Criteria Practitioner's Guide. ftp.mdt.mt.gov/other/webdata/external/cadd/RDM/STANDARDS/BASELINE-CRITERIA-PRACTITIONERS-GUIDE.pdf.
**As determined from MDT's Route Segment Plan: mdt.mt.gov/other/webdata/external/cadd/RDM/SAMPLE-PLANS/ROUTE-SEGMENT-PLAN.PDF.*

4.3 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 a corridor. MDT's baseline criteria for horizontal curves are defined in terms of curve radius, which varies based on design speed. For a 70 mph design speed, the minimum recommended radius is 1,810 feet with a minimum stopping sight distance (SSD) of 730 feet. For a 50 mph design speed, the minimum recommended radius is 760 feet with a minimum SSD of 425 feet.

Appendix A provides a list of horizontal curves within the subarea determined through a review of available as-builts. A determination of whether the curve meets baseline criteria was decided based on the elements discussed previously. The controlling design criteria for the horizontal curves are radius and SSD. For a horizontal curve, SSD is evaluated based on the ability to see through the inside of the corner. Minimum sight obstruction distances were calculated based on MDT design criteria. The minimum sight obstruction distance is measured from the center of the inside travel lane and defines the area that should be clear of obstructions to allow for the recommended SSD.

Table 13 summarizes the horizontal curves and the design speed that each of the curves meets. There are 15 existing horizontal curves along the subarea corridor. Only two curves do not meet the baseline criteria for horizontal curvature based on a 70 mph design speed for level terrain. Both of those curves are associated with the roundabout which has a lower design speed than a typical rural principal arterial, making the curves acceptable for their intended function. **Figure 8** shows the locations of curves with design speeds less than 70 mph.

Table 13: Horizontal Alignment Summary

	Design Speed Met (mph)	Number of Curves	Percent of Curves
Level	80	8	53.3%
	70	5	33.3%
	Total ≥ 70	**13**	**86.7%**
Rolling	**Total ≥ 60**	**13**	**86.7%**
Mountainous*	55	1	6.7%
	Total ≥ 50	**14**	**93.3%**
Do Not Meet Baseline Criteria*	25	1	6.7%
	Total < 50	**1**	**6.7%**

Source: MDT. 1958-2021. As-Builts.
**These curves are associated with the roundabout and are acceptable for their intended function.*
Note: Data is based on available as-builts.

4.4 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 a 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.

Appendix A lists the locations and controlling design features for the vertical curves within the subarea. According to the MDT *Baseline Criteria Practitioner's Guide*, the maximum allowable grade for a 70 mph design speed is three percent for level terrain, four percent for rolling terrain, and seven percent for mountainous terrain.

Minimum lengths of crest or sag curves are commonly defined by the K-value, which represents the horizontal distance needed for a vertical curve to produce a one percent change in gradient. Minimum K-values relate lengths of vertical curves to the required sight distance on crest curves and to headlight beam distance on sag vertical curves. Minimum K-values are provided in the MDT *Road Design Manual* and vary based on design speed, and roadway grade. For a 70 mph design speed with a level grade, minimum K-values of 247 and 181 are recommended for crest and sag vertical curves, respectively. For a 60 mph design speed and six percent maximum downgrade (rolling terrain), minimum K-values of 189 and 155 are recommended for crest and sag vertical curves, respectively.

Table 14 summarizes the 18 vertical curves in the subarea and the design speed that each of the curves meets. About 17 percent of the vertical curves (three) do not meet baseline criteria for a 70 mph design speed on level terrain. Of those curves, two meet baseline criteria for rolling terrain (60 mph design speed). One curve does not meet baseline criteria for design speeds associated with a principal arterial route. **Figure 8** shows the locations of the curves with design speeds lower than 70 mph.

Table 14: Vertical Alignment Summary

	Design Speed Met (mph)	Number of Curves	Percent of Curves
Level	80	14	77.8%
	75	1	5.8%
	Total ≥ 70	**15**	**83.3%**
Rolling	65	2	11.1%
	Total ≥ 60	**17**	**94.4%**
Mountainous	**Total ≥ 50**	**17**	**94.4%**
Do Not Meet Baseline Criteria	45	1	5.8%
	Total < 50	**1**	**5.8%**

Source: MDT. 1958. As-Builts.
Note: Data is based on available as-builts.

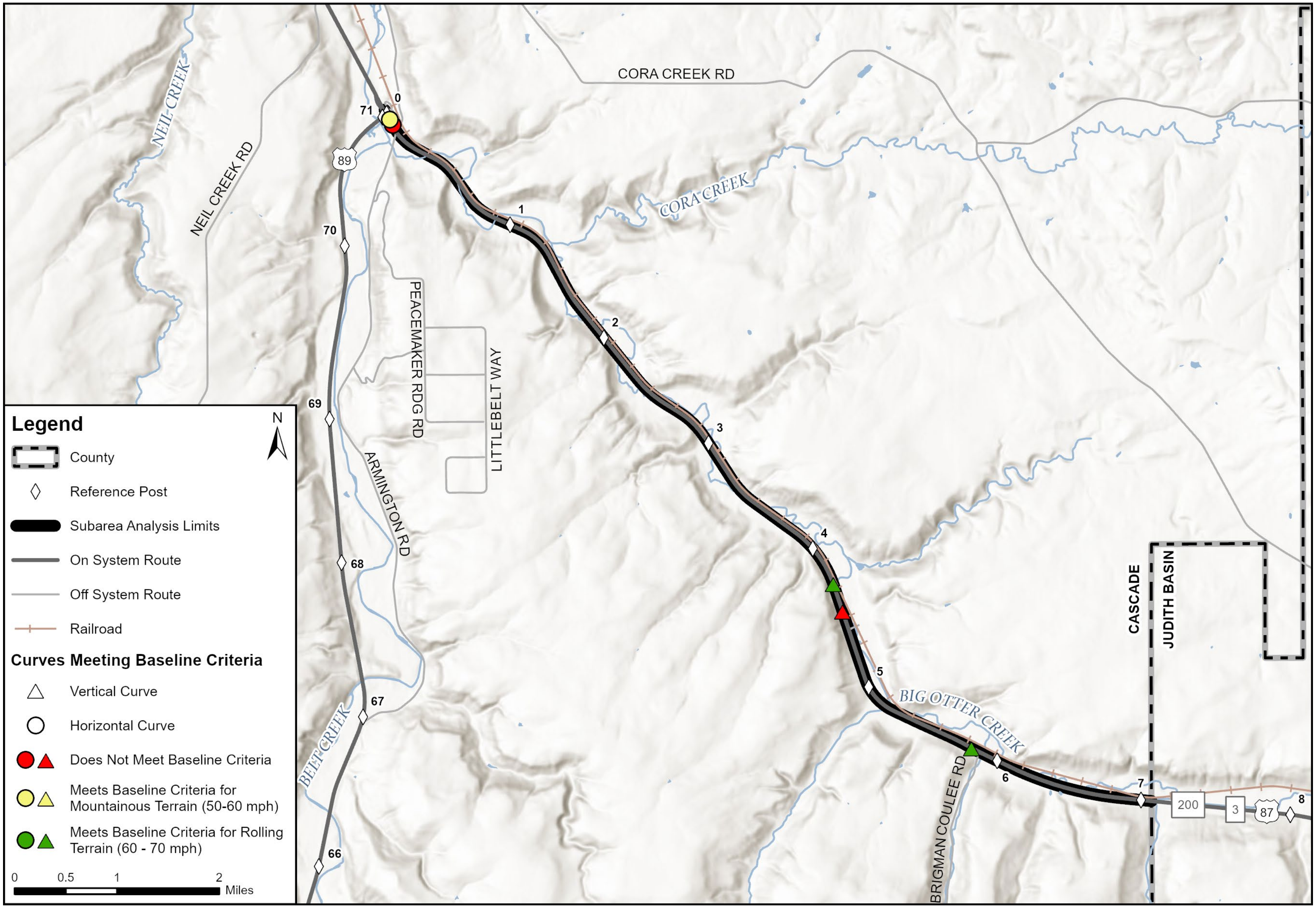

Figure 8: Existing Geometric Conditions

4.5 Sight Distance and Clear Zone

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, SSD, 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.

The roadside clear zone, starting at the edge of the traveled way, is the total roadside border area available for safe use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a non-recoverable slope, and/or a recovery area. The desired clear zone width for the subarea ranges from 18 to 46 feet depending on traffic volumes, speeds, and roadside geometry. Clear zones are evaluated individually based on the roadside cross section. It is generally desirable to attain adequate clear zones by removing or shielding obstacles if costs are reasonable.

Portions of the US 87 corridor are narrow with limited room for road expansion. The proximity of rock outcroppings, railroad tracks, Otter Creek, and steep side slopes in certain locations may limit sight distances and restrict the ability to provide recommended clear zone widths as outlined by MDT baseline criteria. In some locations, guardrails have been installed along the roadside to shield drivers from obstacles and in areas with steep side slopes.

In certain locations within the subarea, it may be impractical to protect or remove certain obstacles within the clear zone. As improvement options develop, roadside clear zones should be designated, to a practical extent, to meet current MDT baseline criteria. This may include slope flattening, clearing trees along the roadside, and/or widening shoulders.

5.0 TRAFFIC CONDITIONS

An evaluation of traffic operations for the subarea was completed using available data provided by MDT in addition to supplemental field-collected data. Turning-movement counts were conducted at three intersections within the subarea over a 24-hour period in February 2025. Mainline traffic volume data for existing and historic conditions was available at multiple locations within the subarea. The following sections provide details about the existing and projected traffic characteristics for the subarea. Detailed data is available in **Appendix B**.

5.1 Average Traffic Volumes

Traffic volumes along US 87 are typically collected annually as part of MDT's traffic data collection program. One data collection site is located within the subarea, while three others are nearby on US 87. Among these four sites, one is both a continuous count site and a weigh-in-motion site. Another weigh-in-motion site is located south of the roundabout at Armington Junction, though this site was excluded from the analysis because it only captures northbound traffic. The data from short-term count sites, typically completed annually, is used to determine an annual average daily traffic (AADT) volume. **Figure 9** plots the AADTs for the count sites along the corridor over the past 20 years.

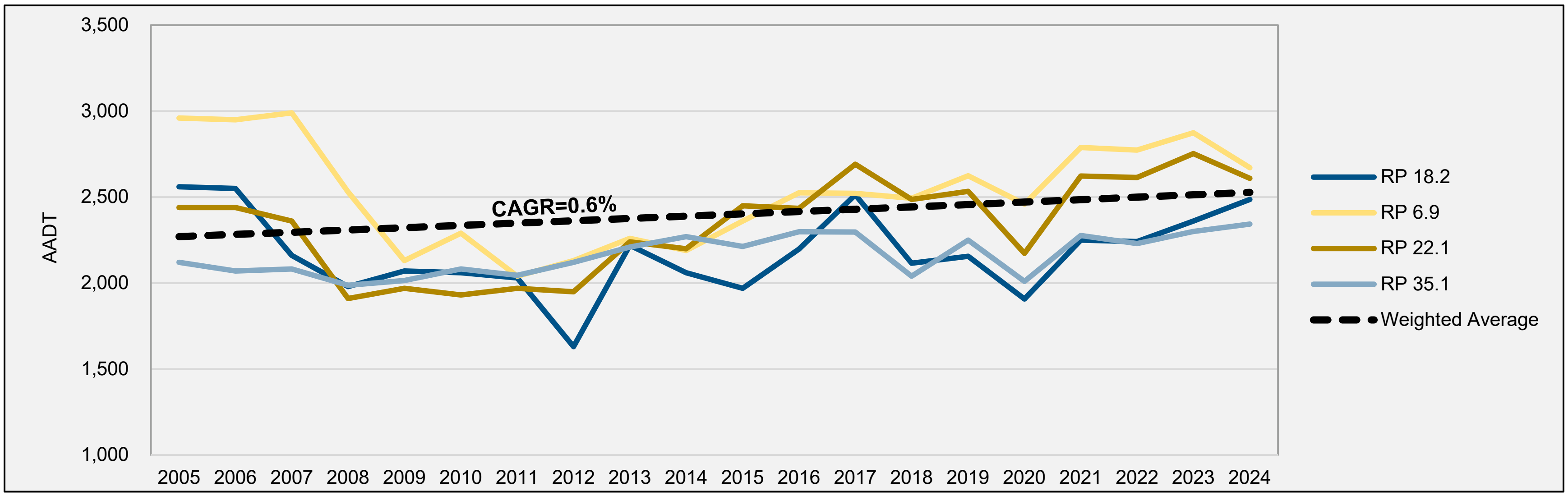

Figure 9: Historic Traffic Volumes

As shown in the figure, traffic volumes are generally highest at the count site in the subarea (RP 6.9). Existing volumes on US 87 in and near the subarea range from a low of just over 2,300 vpd at RP 35.1, to a high of nearly 2,700 at RP 6.9. When averaged together, traffic volumes have increased at an annual rate of 0.6 percent per year since 2005. More detailed data on growth rates is shown in **Table 15**.

Table 15: Historic Traffic Growth

Site ID	Location	RP	2005 AADT	2024 AADT	Annual Growth			
					20-Year (2005 – 2024)	15-Year (2010 – 2024)	10-Year (2015 – 2024)	5-Year (2020 – 2024)
07-2-024	Judith Basin Co line	6.9	2,960	2,671	0.2%	2.1%	1.7%	2.0%
23-1-001	3.5 mi W of S 551 in Geyser	18.2	2,560	2,487	0.2%	1.4%	1.3%	6.0%
23-1-002	0.5 mi E of S 551 in Geyser	22.1	2,440	2,609	1.2%	2.3%	0.8%	4.2%
W-114	1.5 Mi. W of Stanford	35.1	2,120	2,343	0.6%	0.5%	0.4%	3.2%
Weighted Average US 87 Traffic Growth					**0.6%**	**1.6%**	**1.1%**	**3.8%**

Source: MDT. 2024. Traffic Count Database System. https://mdt.public.ms2soft.com/tcds/tsearch.asp?loc=Mdt&mod=. Calculations by RPA. 2025.

At all traffic count sites, traffic volumes decreased in 2006 and 2007, with growth starting again in 2011 and 2012. Since 2012, traffic volumes have steadily increased, with a notable spike in 2017 and dip in 2020. When all count sites are averaged, the 20-year CAGR is calculated at 0.6 percent. Shorter timeframe growth rates are higher, with the five-year CAGR being 3.8 percent.

Factoring in the various historic growth rates for the subarea corridor, it was determined that a growth rate of two percent per year would be appropriate to evaluate future year conditions. Growth was applied to existing traffic volumes to evaluate projected year (2045) conditions.

5.2 Heavy Vehicle Volumes

An evaluation of the heavy vehicle traffic within the subarea was conducted using information available from the MDT count sites along US 87. Heavy vehicle data for 2024 was unavailable at all sites, so 2023 data was used to assess heavy vehicle traffic. One of the count sites is a continuous count site as well as a weigh-in-motion site.

The percentage of heavy vehicles within the traffic stream varies from 20 to 25 percent. Generally, the counts indicate about 550 to 570 heavy vehicles per day within the subarea. **Table 16** shows the percentage of heavy vehicles on US 87 as reported in 2023 by MDT.

Table 16: Commercial Truck Traffic

Site ID	Location	RP	2023 AADT	Heavy Vehicle Percentage
07-2-024	Judith Basin Co line	6.9	2,874	20%
23-1-001	3.5 mi W of S 551 in Geyser	18.2	2,361	24%
23-1-002	0.5 mi E of S 551 in Geyser	22.1	2,753	21%
W-114	1.5 Mi. W of Stanford	35.1	2,300	25%

Source: MDT. 2024. Traffic Count Database System. https://mdt.public.ms2soft.com/tcds/tsearch.asp?loc=Mdt&mod=. Calculations by RPA. 2025.

5.3 Intersection Operations

To supplement the existing AADT counts, intersection turning movement counts (TMCs) were performed at three intersections within the subarea. Vehicle turning movement data was collected at each intersection over a 24-hour period on Tuesday and Wednesday, February 25th and 26th, 2025. A seasonal adjustment factor was applied to the TMC data.[24] Since the peak hours of the TMCs occurred on Wednesday February 26th, the Wednesday in February adjustment factor of 1.579 for a rural primary arterial in Financial District 3 was applied to all traffic counts.

Although US 87 is oriented at a roughly 45-degree angle to cardinal directions through the subarea, the signed directions of US 87, northbound and southbound, were used as the basis for direction for the intersection analysis.

The operational conditions of the intersections are characterized by the level of service (LOS). LOS is based on an alphabetic scale which represents the full range of operating conditions. This scale is defined based on the vehicle delay experienced at the intersection. The scale ranges from A, which indicates little, if any, vehicle delay, to F, which indicates substantial delay and traffic congestion.

An analysis was performed on each of the three intersections for two peak periods, a.m. and p.m. Two of the three intersections are stop-controlled in the minor direction. The LOS for stop-controlled intersections is determined based on the movement that has the highest amount of delay. The third intersection is a roundabout. The LOS for a roundabout is determined based on the average delay incurred on all legs. **Table 17** and **Figure 10** present the analysis results for the existing 2025 traffic volumes. Further detailed operational analysis results are located in **Appendix C**.

Table 17: Existing Conditions (2025) Intersection Operations

ID	Intersection	Northbound		Southbound		Eastbound		Westbound		Intersection Total		
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Worst Mvmt	Delay (s)	LOS
2025 A.M. Peak Hour												
1	US 89 (roundabout)	4.5	A	5.2	A	3.9	A	5.7	A	-	5.0	A
2	Armington Rd	0.0	A	0.2	A	11.2	B	10.2	B	WB THRU	11.4	B
3	Brigman Coulee Rd	0.1	A	0.0	A	0.0	A	-	-	NB LT	7.5	A
2025 P.M. Peak Hour												
1	US 89 (roundabout)	5.1	A	5.4	A	4.3	A	4.5	A	-	5.0	A
2	Armington Rd	0.0	A	0.3	A	11.5	B	11.6	B	WB LT	12.0	B
3	Brigman Coulee Rd	0.2	A	0.0	A	0.0	A	-	-	NB LT	8.2	A

Each of the three intersections is shown to operate at LOS B or better during both peak periods. Pedestrian and biking activity was not recorded at any of the intersections. At the US 89 intersection, a large percentage of heavy truck traffic was recorded making movements to and from the westbound leg due to the presence of the Motor Carrier Services scale site. The heavy truck movements do not appear to be negatively impacting the operations of the roundabout.

Table 18 and **Figure 11** present the analysis results for the future 2045 traffic volumes. All of the 2025 traffic volumes were increased using the annual growth rate of two percent discussed previously. All intersection control remained the same as under the existing 2025 conditions. Detailed projected operational analysis results are located in **Appendix D**.

Table 18: Projected Conditions (2045) Intersection Operations

ID	Intersection	Northbound		Southbound		Eastbound		Westbound		Intersection Total		
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Worst Mvmt	Delay (s)	LOS
2025 A.M. Peak Hour												
1	**US 89 (roundabout)**	5.0	A	5.9	A	4.1	A	6.2	A	-	5.6	A
2	**Armington Rd**	0.0	A	0.2	A	12.0	B	10.4	B	WB THRU	12.1	B
3	**Brigman Coulee Rd**	0.8	A	0.0	A	0.0	A	-	-	NB LT	7.6	A
2025 P.M. Peak Hour												
1	**US 89 (roundabout)**	6.4	A	6.8	A	5.5	A	5.4	A	-	6.4	A
2	**Armington Rd**	0.0	A	0.3	A	13.7	B	14.2	B	WB LT	15.1	C
3	**Brigman Coulee Rd**	0.2	A	0.0	A	0.0	A	-	-	NB LT	8.5	A

The operations at each of the three intersections remained largely the same as under the existing 2025 conditions. Minor increases in delay were noted at each intersection. The LOS for the Armington Road intersection decreased to LOS C during the p.m. peak hour. The westbound left-turn movement was the worst-performing movement, while all other movements were found to be operating at LOS B or better.

5.4 Highway Operations

Corridor segment LOS was determined utilizing the *Highway Capacity Software 2024* (HCS). HCS follows the *Highway Capacity Manual (HCM) 7th Edition*[25] methodology. The HCM methodology has been updated for the seventh edition of the HCM which calculates following density (following vehicles per mile per lane) as the performance metric for two-lane facilities. This method takes passing zones and lanes into account, as well as speed limit, directional and opposing traffic volumes, heavy truck percentages, roadway geometry (both vertical and horizontal), lane and shoulder widths, and access point density.

For the corridor analysis, the highway was broken into northbound and southbound segments based on changes to the passing zones. Each of the segments were further broken into subsegments based on the horizontal alignment. For this analysis, the following assumptions were made:

- All grades were assumed to be negative two percent (level terrain) in the northbound direction and positive two percent in the southbound direction.
- All travel lanes were assumed to be 12.0 feet wide.
- The paved shoulders were assumed to be four feet wide.
- The speed limit was set to the truck speed limit of 65 mph.
- Traffic volumes were determined based on the TMC data collected in February 2025.
- Heavy vehicle percentages were based on the TMC data collected in February 2025.
- Only the p.m. peak hour was analyzed as it has the highest traffic volumes.
- The average peak hour factor from the TMCs was 0.92 and was used for all segments.
- Access points were counted from aerial images. Residential driveways and minor access points that are unlikely to generate more than 20 vehicles per day were omitted, per HCM guidance.
- All horizontal curves were included with an assumed super elevation of eight percent.

The results of the existing conditions analysis are presented in **Table 19** and **Figure 10**. For a rural principal arterial on the Non-Interstate NHS system, MDT targets a LOS of B for level/rolling terrain.[26]

Table 19: Existing (2025) Corridor LOS

Segment Type		Length (ft)*	Average Speed (mph)	Percent Followers	Following Density (followers/mi/ln)	LOS
Northbound						
1	Passing Constrained	2,439	69.5	34.7	1.3	A
2	Passing Zone	2,618	69.9	32.3	1.2	A
3	Passing Constrained	2,851	69.5	34.3	1.3	A
4	Passing Zone	5,998	69.9	31.1	1.2	A
5	Passing Constrained	1,616	69.5	35.6	1.3	A
6	Passing Zone	4,718	69.9	31.2	1.2	A
7	Passing Constrained	1,461	69.5	36.1	1.3	A
8	Passing Zone	6,831	69.9	31.2	1.2	A
9	Passing Constrained	1,649	69.5	35.8	1.3	A
10	Passing Zone	5,833	69.9	31.1	1.2	A
Southbound						
1	Passing Constrained	659	69.2	40.6	1.8	A
2	Passing Zone	6,269	69.6	34.9	1.6	A
3	Passing Constrained	1,682	69.2	39.9	1.8	A
4	Passing Zone	6,409	69.6	34.9	1.6	A
5	Passing Constrained	1,692	69.2	39.9	1.8	A
6	Passing Zone	5,091	69.6	35.0	1.6	A
7	Passing Constrained	2,340	69.2	39.0	1.8	A
8	Passing Zone	6,071	69.6	34.9	1.6	A
9	Passing Constrained	2,718	69.2	38.6	1.7	A
10	Passing Zone	2,732	69.7	36.1	1.6	A
11	Passing Constrained	346	69.2	40.6	1.8	A

**Developed via review of available aerial and Google Streetview imagery in 2025.*
Source: MDT. 2024. Traffic Count Database System. https://mdt.public.ms2soft.com/tcds/tsearch.asp?loc=Mdt&mod=. Calculations by RPA. 2025.

The following density was generally consistent throughout the subarea regardless of the availability of a passing zone. The LOS remained at LOS A for all segments both northbound and southbound. The calculated vehicle speeds in the northbound direction were slightly higher than the southbound direction due to lower northbound volumes.

Table 20: Projected (2045) Corridor LOS

Segment Type		Length (ft)	Average Speed (mph)	Percent Followers	Following Density (followers/mi/ln)	LOS
Northbound						
1	Passing Constrained	2,439	68.9	44.6	2.5	B
2	Passing Zone	2,618	69.2	43.1	2.4	B
3	Passing Constrained	2,851	68.9	44.2	2.5	B
4	Passing Zone	5,998	69.2	41.7	2.4	B
5	Passing Constrained	1,616	68.9	45.8	2.6	B
6	Passing Zone	4,718	69.2	41.9	2.4	B
7	Passing Constrained	1,461	68.9	46.1	2.6	B
8	Passing Zone	6,831	69.1	41.8	2.4	B
9	Passing Constrained	1,649	68.9	45.7	2.6	B
10	Passing Zone	5,833	69.2	41.7	2.4	B
Southbound						
1	Passing Constrained	659	68.6	51.2	3.5	B
2	Passing Zone	6,269	68.9	46.4	3.2	B
3	Passing Constrained	1,682	68.6	50.5	3.5	B
4	Passing Zone	6,409	68.9	46.4	3.2	B
5	Passing Constrained	1,692	68.6	90.5	3.5	B
6	Passing Zone	5,091	68.9	46.5	3.2	B
7	Passing Constrained	2,340	68.6	49.6	3.4	B
8	Passing Zone	6,071	68.9	46.4	3.2	B
9	Passing Constrained	2,718	68.6	49.2	3.4	B
10	Passing Zone	2,732	68.9	47.7	3.3	B
11	Passing Constrained	346	68.6	51.2	3.5	B

**Developed via review of available aerial and Google Streetview imagery in 2025.*
Source: MDT. 2024. Traffic Count Database System. https://mdt.public.ms2soft.com/tcds/tsearch.asp?loc=Mdt&mod=. Calculations by RPA. 2025.

The projected 2045 corridor LOS decreased to LOS B as presented in **Table 20** and **Figure 11**. The percent followers and following density increased in both directions at all locations. In the northbound direction, the following density increased by about 1.2 followers per mile per lane. In the southbound direction, the following density increased by about 1.6 followers per mile per lane. The calculated LOS for the corridor remained within acceptable values per MDT guidance.

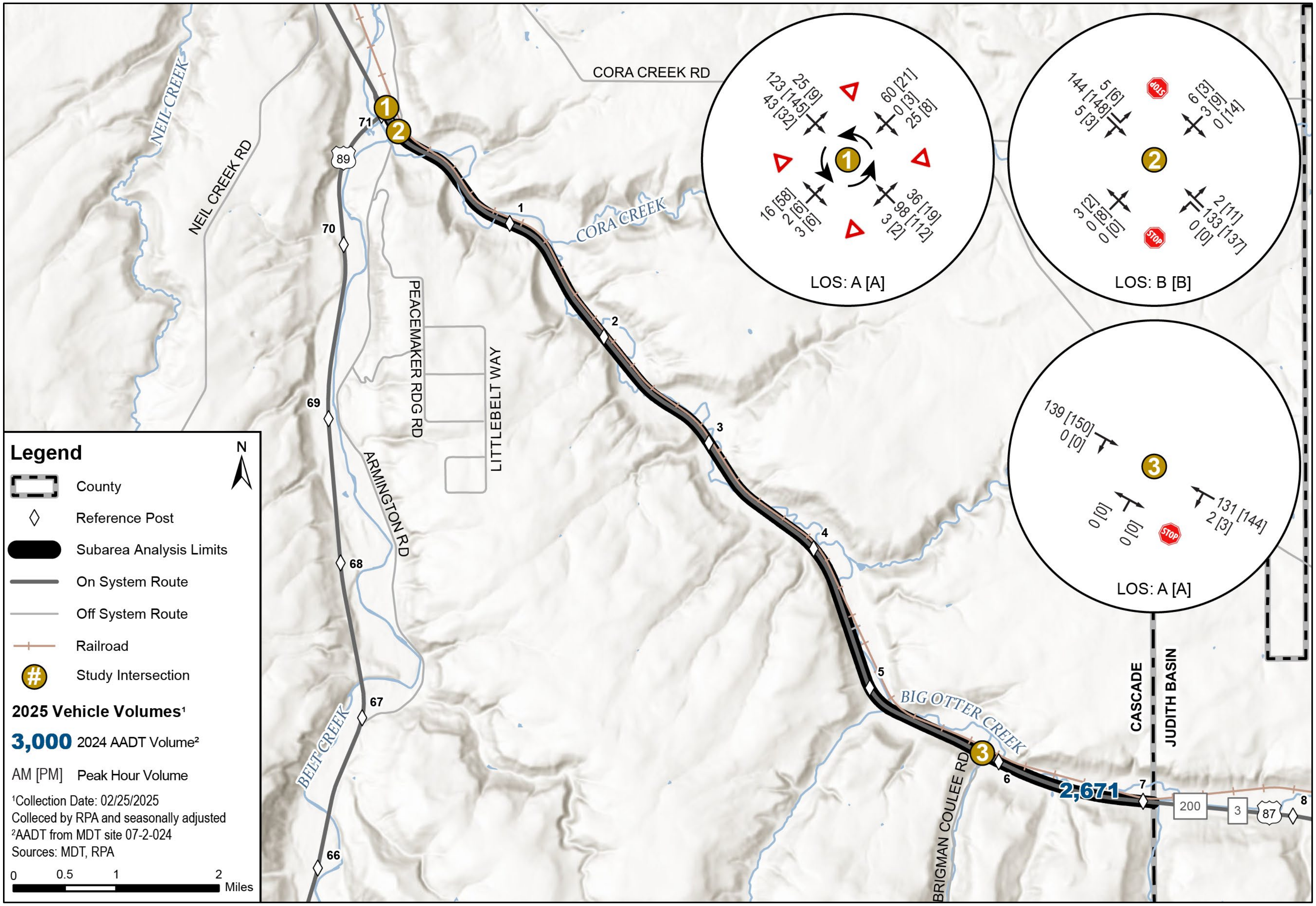

Figure 10: Existing Conditions Traffic Operations (2025)

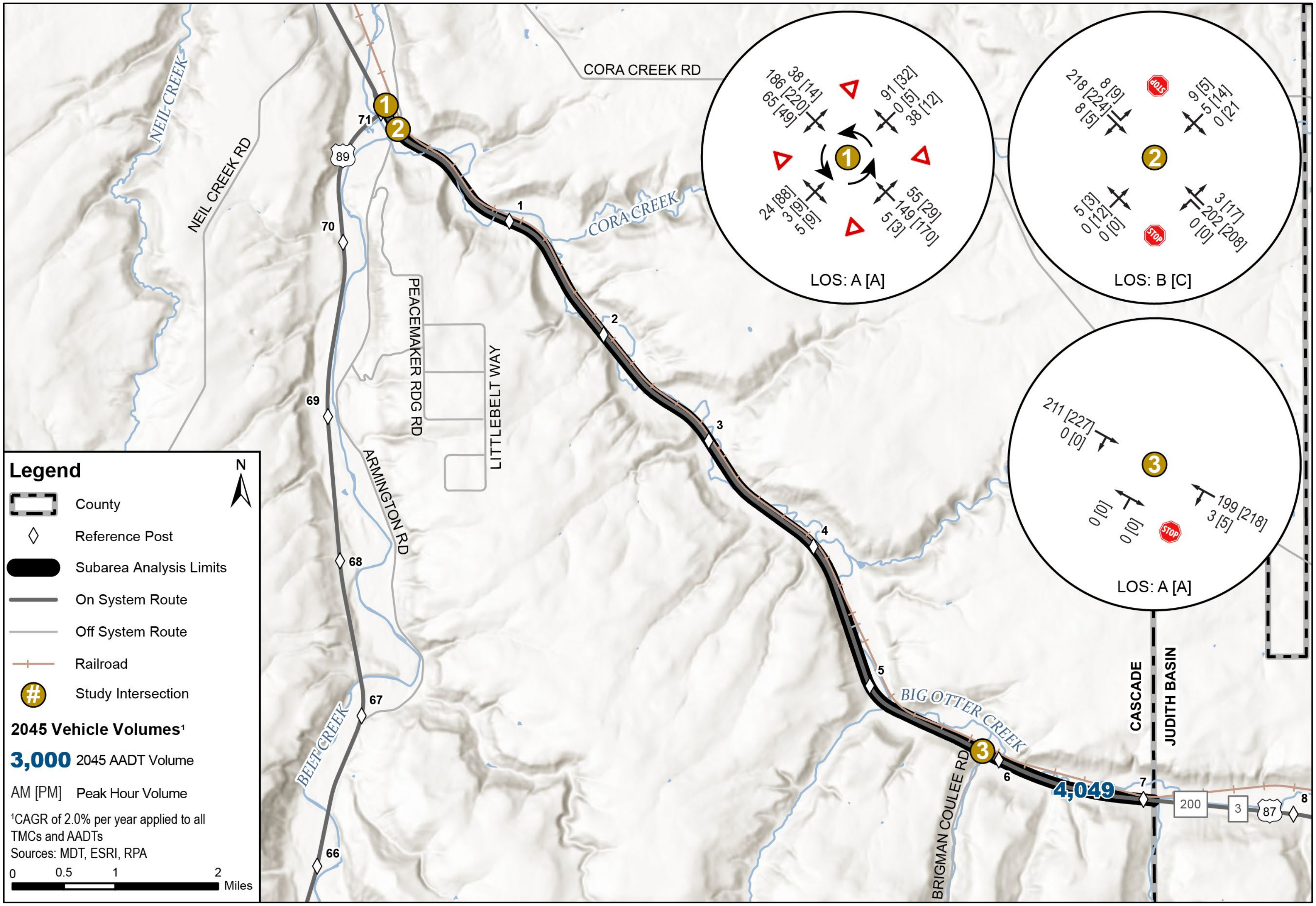

Figure 11: Projected Conditions Traffic Operations (2045)

6.0 SAFETY CONDITIONS

The MDT Traffic and Safety Bureau provided crash data for the subarea for the five-year period from January 1, 2019, through December 31, 2023, and is summarized in **Sections 6.2** through **6.10**.[i] This information includes data from crash reports submitted to MHP from their patrol officers and by local county law enforcement. While vehicle and crash characteristics were provided, person-level data was not provided. The crash reports are a summation of information from the scene of the crash provided by the responding officer. Some of the information contained in the crash reports may be subjective. Any crash records from other law enforcement agencies that were not reported to or by MHP were not contained in the database and are not included in this analysis.

6.1 Data Limitations

Although crash data can help identify trends in behavioral and circumstantial contributors to crashes within the subarea, limitations include unreported and inconsistent data. Many crash records include blank fields, and occasionally a report will list “unknown” rather than a blank field. Similarly, many crashes, especially those where individuals and vehicles are unharmed, may not be reported to the police. Underreporting can limit the ability to properly and effectively manage road safety, since the analyses in this report are based only on reported crash data. Another limitation may be inconsistencies with reporting. Although protocol has been established and training for filling out crash reports is provided to law enforcement, there may still be inconsistencies or errors in the reporting. The data analysis in the following sections is based solely on the information contained in the crash records. These records are evaluated as reported, with no attempts made to correct errors or fill in missing information.

6.2 Crash Location

The crash locations were plotted using latitude and longitude assigned to each record. According to the records, a total of 76 crashes were reported within the subarea during the five-year analysis period. The crash records were reviewed to identify trends, contributing factors, and characteristics as discussed in the following sections. The density of crashes along the subarea corridor is shown in **Figure 12.** Crash density was the highest in the first quarter mile of the subarea, where 12 crashes were recorded. The majority of these crashes occurred prior to the completion of the Belt – N & S – Phase 3 project in the summer of 2023, which included the construction of a roundabout at the intersection of US 87 and US 89. Other areas with high crash concentrations include the segment between RP 1.0 and RP 2.2, which experienced 19 crashes, and the segment between RP 5.0 and RP 7.0, which saw 27 crashes.

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[i] *Pursuant to 23 U.S.C. § 407, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway-highway crossings, pursuant to sections 130, 144, and 148 of Title 23, U.S.C., or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data. This publication is not intended to waive any of the State of Montana’s rights or privileges under 23 U.S.C. § 407.*

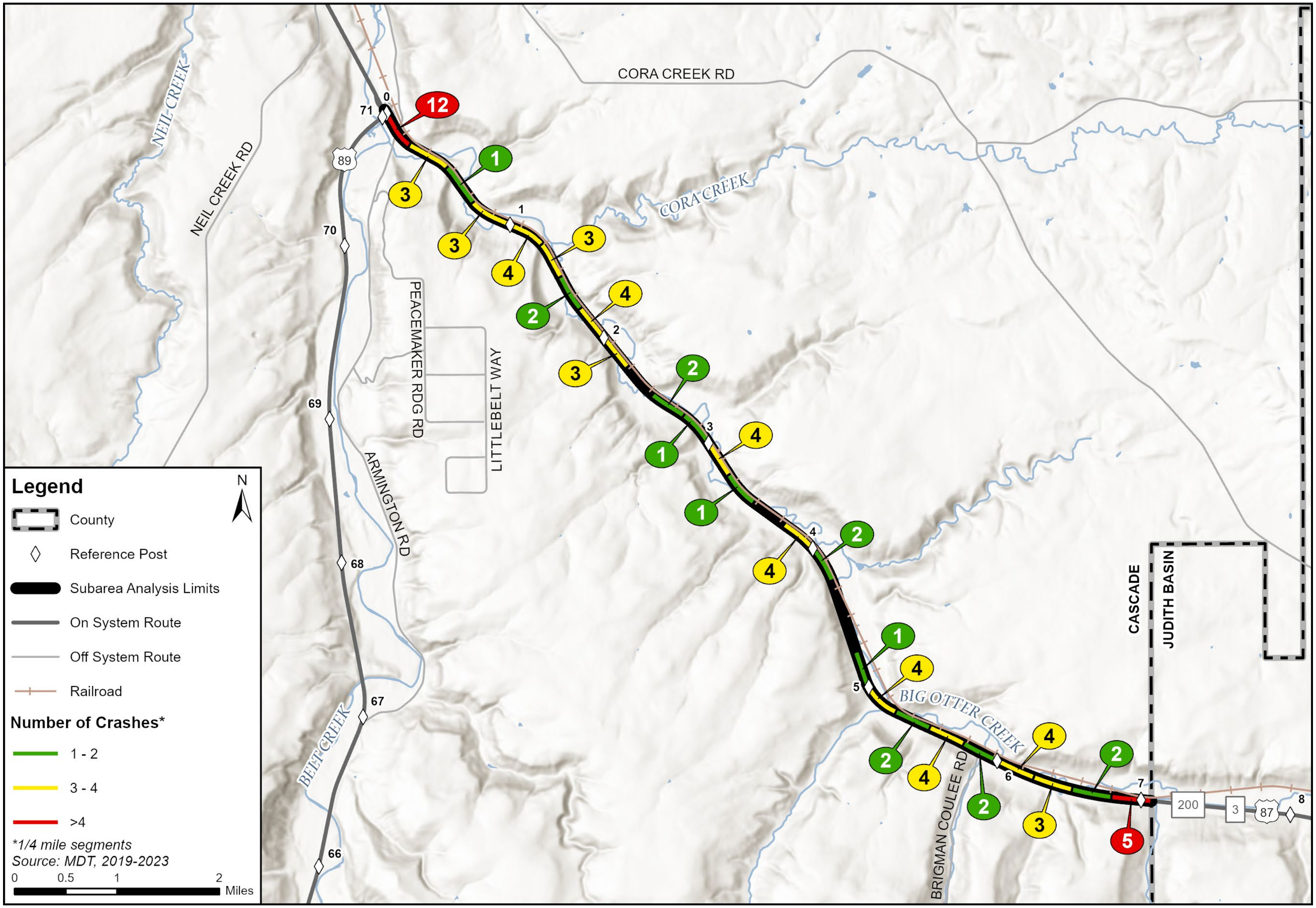

Figure 12: Crash Density

6.3 Crash Severity

Crashes can be categorized by the severity of injuries reported. The most severe injury defines the severity of the crash. For example, if a crash results in a fatality and a minor injury, the crash would be defined as a fatal crash. Crash severity includes, from least severe to most, property damage only (PDO), possible injury, suspected minor injury, suspected serious injury, and fatal injury. Severe crashes include those resulting in a fatality or suspected serious injury.

The distribution of reported crash severity is presented in **Figure 13**. There were no severe crashes over the five-year period. There were 13 suspected minor injury crashes (17.1 percent) and two possible injury crashes (2.6 percent). One crash had unknown severity. The remaining 60 crashes (78.9 percent) resulted in PDO.

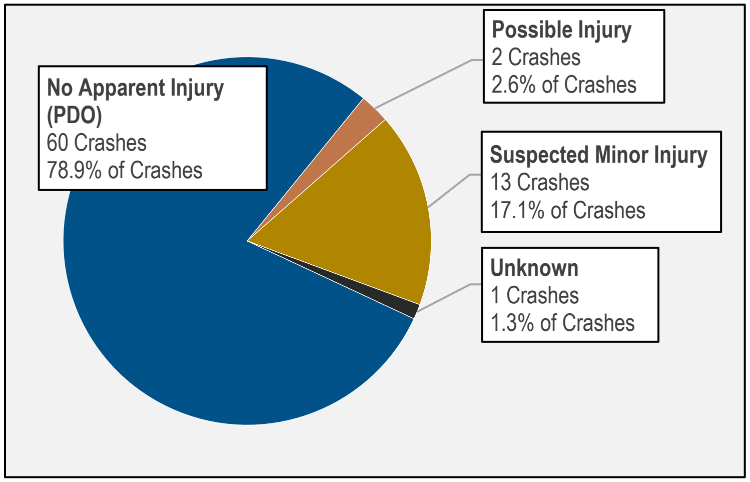

Figure 13: Crash Severity

6.4 Crash Type

Crash types were grouped into two categories: single- and multiple-vehicle crashes. Single-vehicle crashes are those that involve only one vehicle. Single-vehicle crashes accounted for 75 percent (57 crashes) of all reported crashes. Of the single-vehicle crashes, wild animal crashes were the most common type (24 crashes), followed by fixed object (17 crashes) and rollover crashes (nine crashes).

Multiple-vehicle crashes involve two or more vehicles. Multiple-vehicle crashes accounted for 25 percent (19 crashes) of all crashes. The most common multiple-vehicle crash types were sideswipe crashes (eight crashes) followed by right-angle (four crashes) and rear-end crashes (three crashes). **Figure 14** presents the distribution of crash types within the subarea.

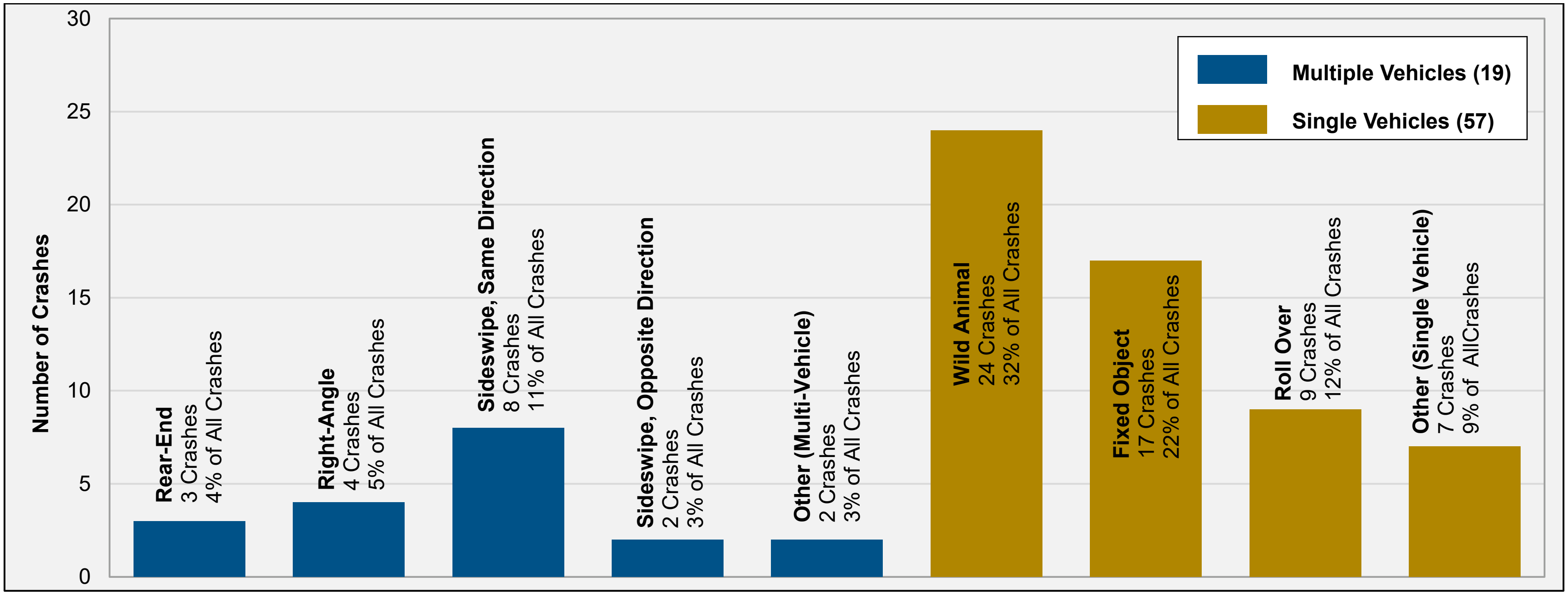

Figure 14: Crash Type

Crash types tend to be associated with their relation to a junction (i.e. intersection or driveway). For example, multiple-vehicle crashes are more common in locations near junctions. As such, analysis of relation to junction information can help to identify systemic issues within the subarea. Of the 76 total reported crashes, 84 percent (64 crashes) of crashes were non-junction related. The remaining 16 percent (12 crashes) of crashes were, in some way, related to a junction (intersection, driveway, or other access point). Of these, two-thirds occurred at the intersection of US 87 and US 89, prior to the completion of the roundabout in November 2023.

6.5 Crash Period

Each crash record includes the date and time when the crash occurred. This information can be used to determine seasonal and other time-dependent trends. Time of day data was analyzed to determine if any specific trends were present. The data was plotted based on the hour the crash occurred and whether the crash occurred on weekdays, weekends, and all days combined. For weekday crashes (67 percent of all crashes), two sets of peaks are apparent. The first set of peaks was more prolonged and occurred during the morning commuting hours from 5:00 to 9:00 a.m., which accounted for 37 percent of weekday crashes. The second pair of peaks was more concentrated, occurring from 5:00 to 7:00 p.m., with the highest peak at 7:00 p.m., coinciding with evening commuting hours. This period accounts for about 28 percent of crashes. For weekend crashes, which account for 33 percent of all crashes, peak periods were less distinct due to the absence of regular commute patterns, with crashes more evenly distributed throughout the day. However, there were slight increases in crashes at 2:00 p.m. and 5:00 p.m., each accounting for three crashes. **Figure 15** presents the distribution of crashes with respect to time of day that crashes occurred.

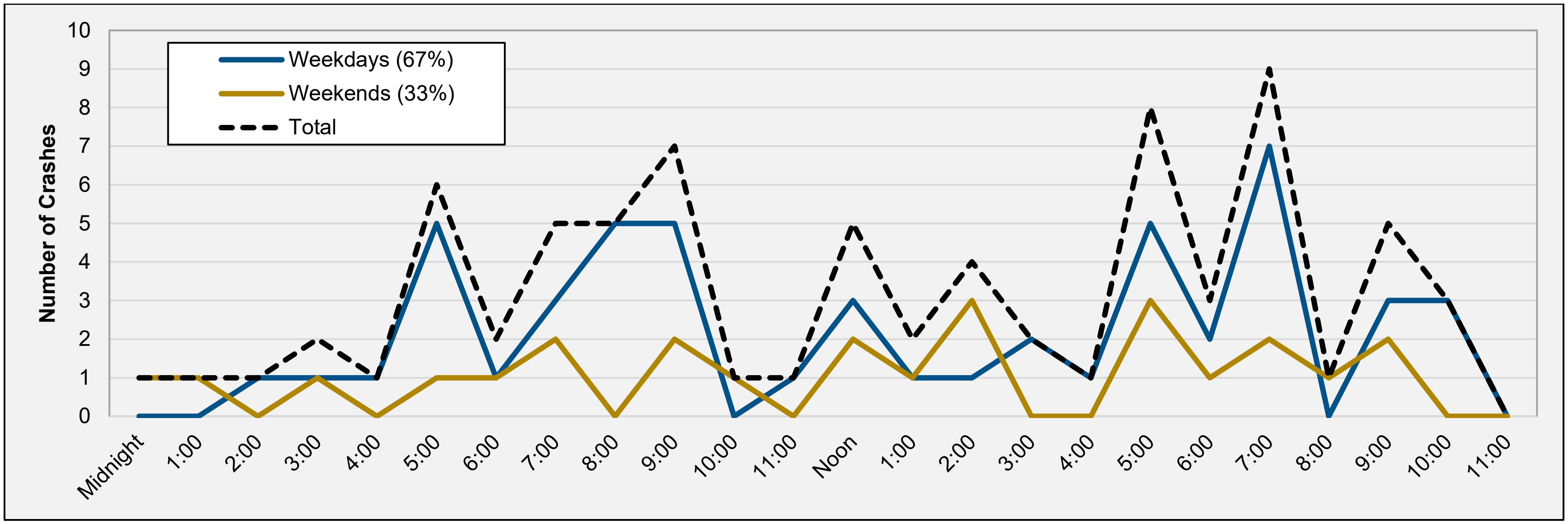

Figure 15: Crash Occurrence by Time of Day

The frequency of crashes occurring during each month and on a given day are plotted in **Figure 16**. The greatest number of crashes occurred on Thursdays (23.7 percent), while the fewest crashes occurred on Tuesdays (5.3 percent). In general, crashes were most frequent during the winter months (December through February), accounting for about 35.5 percent of all crashes, and lowest in the spring months (March through May) at 15.8 percent. Consistent with the seasonal trend, December saw the greatest number of crashes, accounting for 15.8 percent.

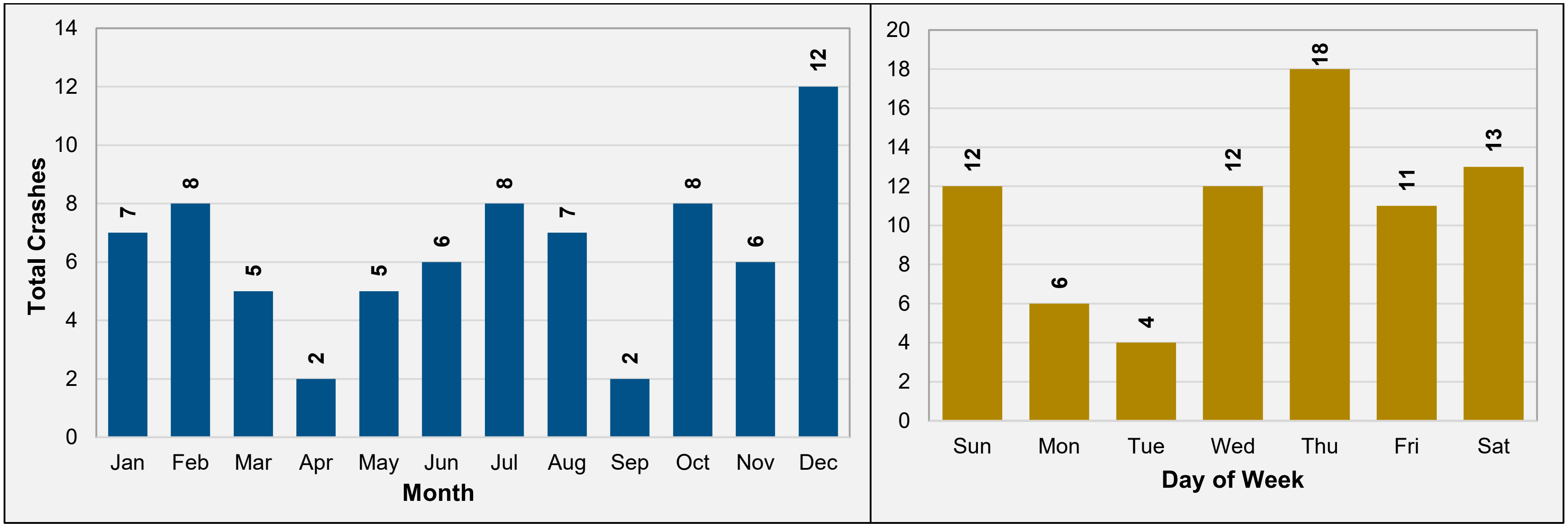

Figure 16: Crash Occurrence by Month and Day of the Week

Figure 17 shows the frequency of crashes occurring per year. As shown, the number of crashes per year has generally decreased since 2019, with a large drop in 2020, which accounted for only 10.5 percent of the crashes during the analysis period. The highest number of crashes occurred in 2019, making up 27.6 percent. From 2021 through 2023, the number of crashes remained relatively consistent, with each year accounting for approximately 18 to 22 percent of the total.

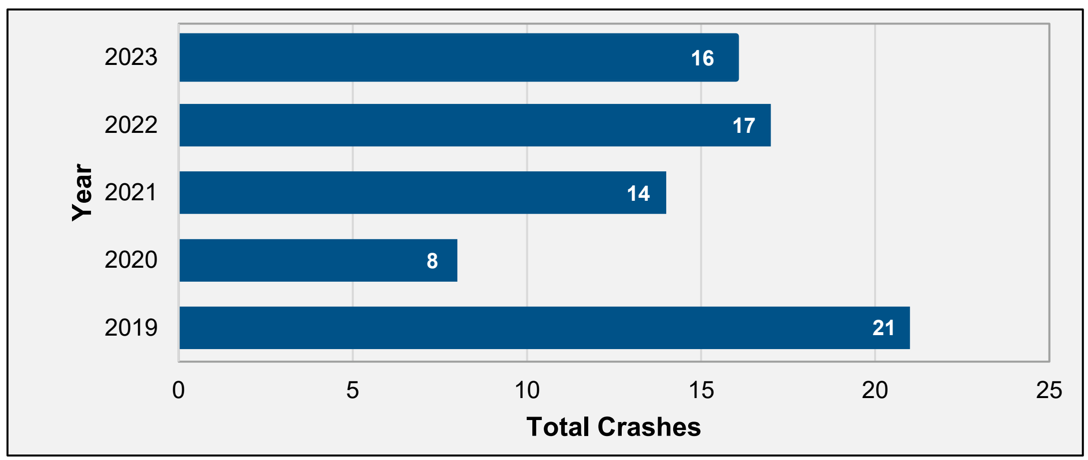

Figure 17: Crashes per Year

6.6 Environmental Factors

Crash data was reviewed to determine if any trends exist in relation to environmental factors such as weather, roadway surface, and lighting conditions. The weather condition was reported as clear or cloudy in 82 percent of all crashes. Adverse weather conditions, including snow and rain, were reported in approximately 18 percent of crashes. **Figure 18** presents the distribution of crashes based on weather conditions. The "other" category includes fog, smog, or smoke; severe crosswinds; and blowing snow.

The reported road surface condition for crashes within the subarea is also presented in **Figure 18**. Approximately 63 percent of all crashes were reported as having occurred on dry roads, while 34 percent of crashes were reported as having occurred on wet, snowy, or icy/frost-covered roads. The "other" category includes oil and slush.

About 54 percent of all crashes were reported as having occurred under daylight conditions. An additional 37 percent of crashes were reported as occurring in the dark, about 93 percent of those occurred where street lighting was not present. The distribution of crashes occurring under the different lighting conditions is presented in **Figure 18**. The "other" category includes dusk and dawn.

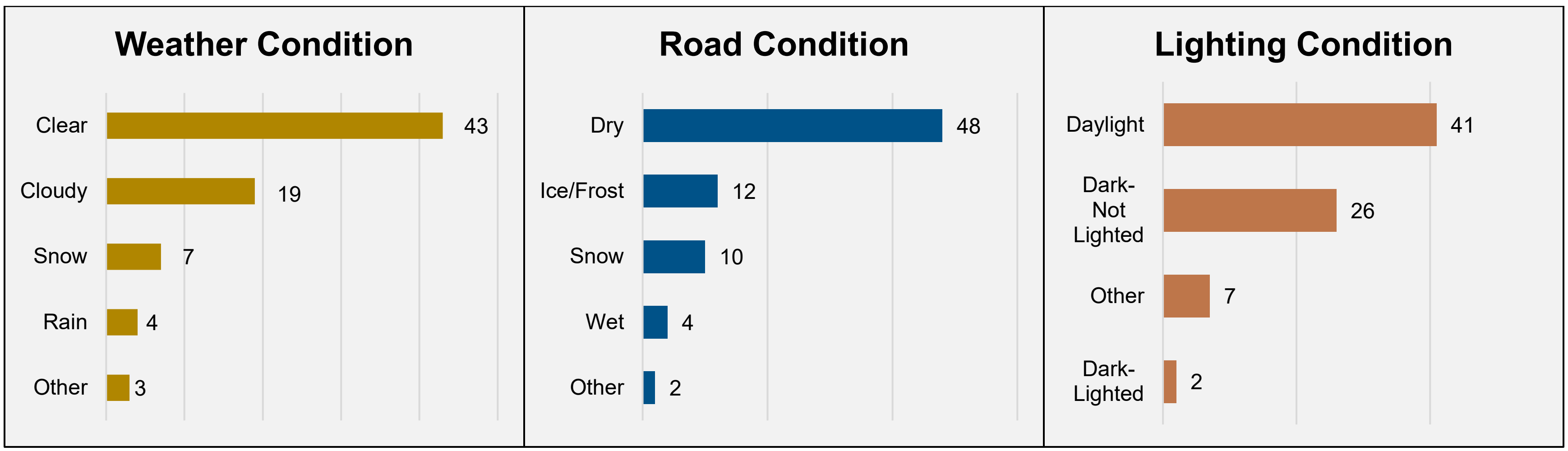

Figure 18: Crash Environmental Factors

6.7 Other Factors

Although data about the driver and people involved was not provided for the subarea, other factors can be identified from the crash and vehicle data. These include non-motorist involvement, proximity to work zones, impaired driving, and vehicle maneuver actions. No pedestrians or cyclists were involved in any crashes within the subarea over the five-year data period. Only two crashes were reported as work zone-related, though this may have been underreported, as other crashes occurred in areas during known construction periods.

Impaired driving is defined as operating a vehicle while under the influence of drugs or alcohol.[27] In Montana, driving under the influence is when the driver's blood alcohol concentration is 0.08 or higher. Impairment of marijuana in Montana is defined as exceeding a five nanogram per milliliter threshold for tetrahydrocannabinol (THC) in blood for anyone operating a motor vehicle. Of the 76 crashes, five involved impaired drivers.

The maneuver action of the vehicle at the time of the crash provides insight into how the crash occurred. Most vehicles were traveling straight ahead (57 percent) or negotiating a curve (23 percent) when the crash took place. Vehicles attempting to pass or overtake another vehicle at the time of the collision make up nine percent. Other maneuver actions involved in the crashes include changing lanes, slowing down, turning left or right, and stopped or parked vehicles.

6.8 Vehicle Details

Over the analysis period, 97 vehicles were involved in crashes within the subarea. Of these vehicles, 25 percent were passenger cars/vans, 37 percent were pickups, and 21 percent were sport utility vehicles. Large trucks were involved in about 13 percent of crashes while only one crash involved a motorcycle. Other vehicles involved in crashes included light trucks (two percent) and cargo vans (one percent). Commercial vehicles were involved in more than 25 percent of crashes.

6.9 Citations

Citation data was obtained from the MDT Traffic and Safety Bureau for the same five-year analysis period (2019 through 2023). This data includes citations issued primarily by MHP for violations reflecting state and federal traffic codes. **Figure 19** shows the locations of citations issued within the subarea. As shown in the figure, citations are issued sporadically throughout the corridor.

A total of 68 citations were issued, with the greatest number being related to speeding, careless/reckless driving, seatbelt violations, improper following/passing, and registration/insurance violations. The dataset indicates that 51 percent of the citations were issued as a result of a crash and about 19 percent were issued as a result of a crash causing injury. According to year, the most citations were issued in 2021 (23) with declining numbers of citations in 2023 (seven). Citations are higher in January (22 percent) and May (21 percent) compared to other months. Half of citations were issued from 3:00 p.m. to 9:00 p.m. and the lowest number of citations (one percent) were issued in the morning (7:00 a.m. to noon).

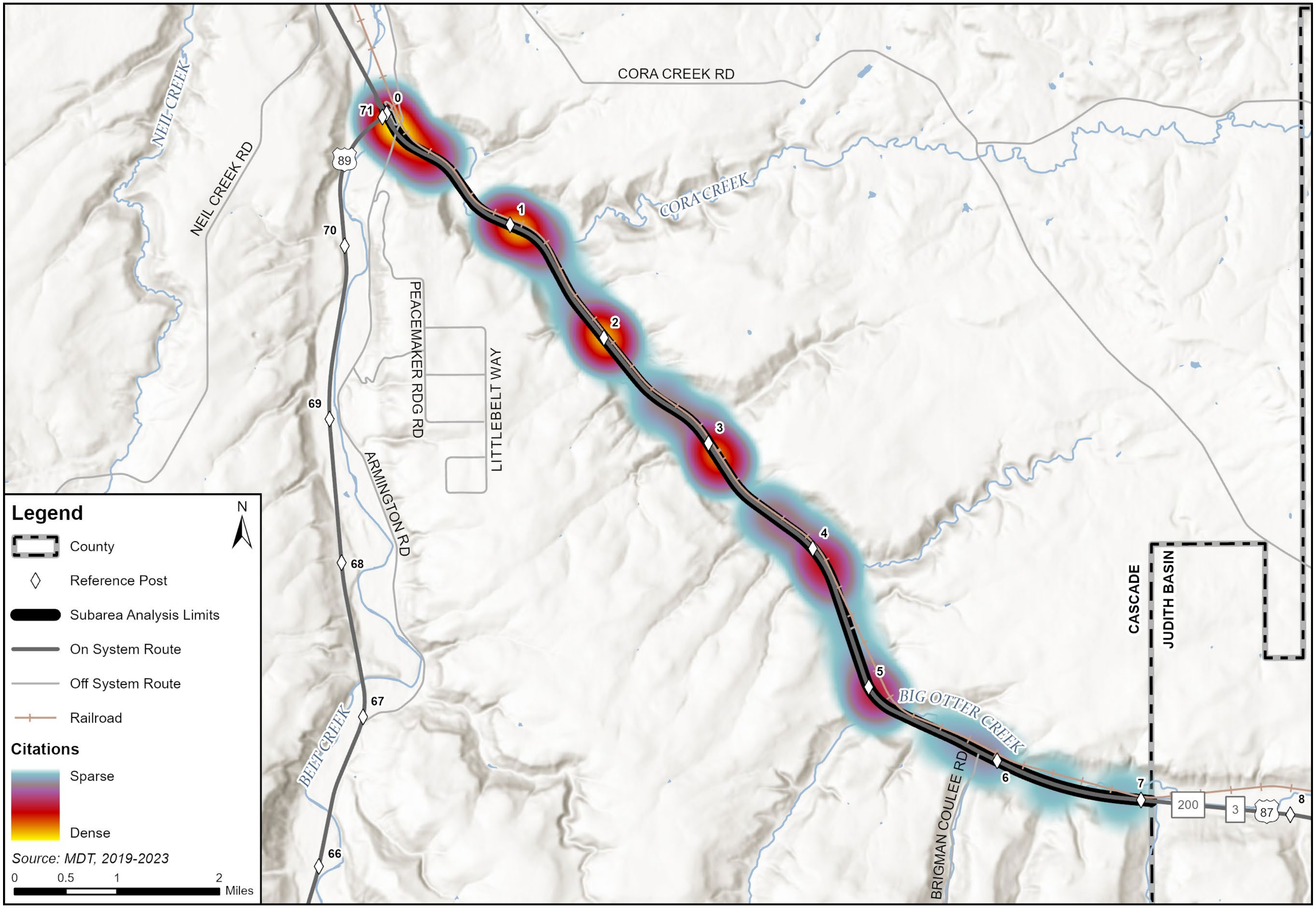

Figure 19: Location of Citations

6.10 Wildlife Conflicts

Animal Carcasses

Data from the MDT Maintenance Animal Incident Database from January 1, 2019, through December 31, 2023, indicates that a minimum of 25 animal carcasses were collected and documented along the subarea corridor. The database contains information on carcasses collected by MDT maintenance personnel on MDT-maintained routes only. However, not all carcass collection is reported consistently or on a regular schedule. This makes the information useful for pattern identification, but it is not statistically valid.

Figure 20 shows the number of carcasses collected by month and by year. As shown, animal mortality appears to be greater in fall and winter months (October through January), with the most carcasses collected in November. The number of carcasses collected increased in 2014, followed by a decline in subsequent years. Yearly differences could be attributable to differences in staffing availability, frequency of reporting/pick up, or any other number of outside factors and does not necessarily indicate an increase in wildlife activity or mortality.

Figure 21 shows the density of large mammal carcasses collected within the subarea, with a higher density of large mammal carcasses collected at RP 0.0, between RP 1.8 and 2.6, RP 4.0 and 4.6, and RP 5.9 and 7.0. Carcass locations do not necessarily correspond to a crash occurrence or crash location. All of the carcasses collected were deer, including five white-tailed deer and 20 mule deer**.** Future projects should use the latest data to assess carcass retrieval and animal mortality in the corridor.

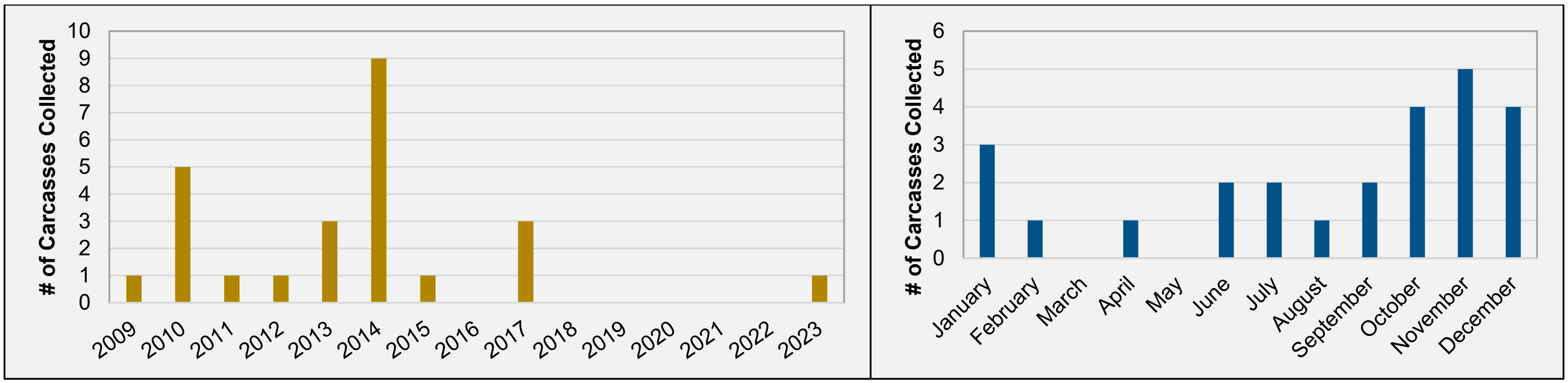

Figure 20: Seasonal and Yearly Distribution of Carcasses Collected

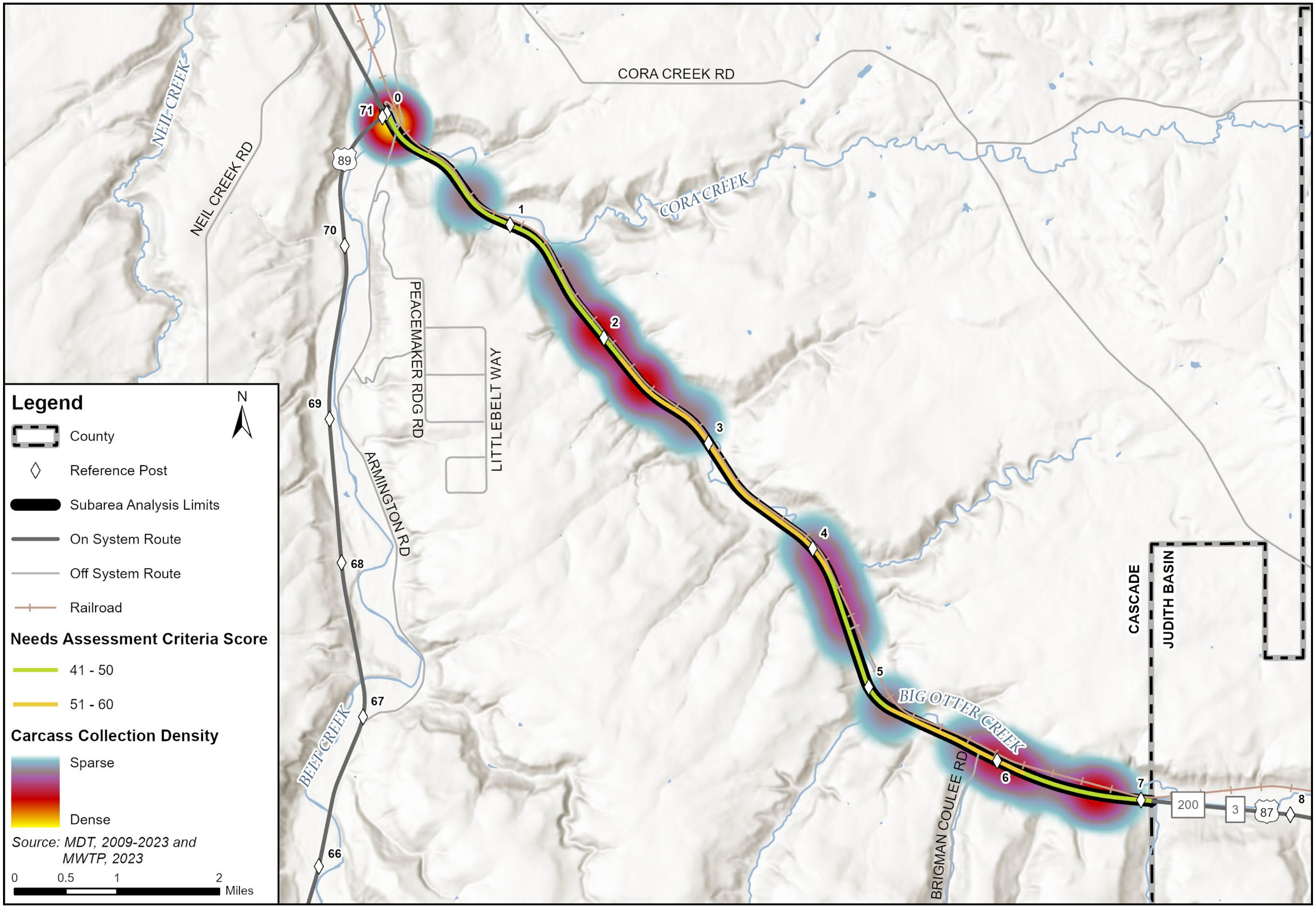

Figure 21: Carcasses Collected

Salvage Permits

In 2013, Montana passed a bill that allows the public to salvage deer, elk, moose, and antelope killed as a result of a motor vehicle collision. To possess salvaged wildlife, a salvage permit must be obtained from a law enforcement officer at the scene or online via the Montana Fish, Wildlife & Parks website. A person has 24 hours from the collision to apply for and obtain a salvage permit. No data was available on salvage permits within the subarea.

Wildlife Needs Assessment

The Montana Wildlife & Transportation Partnership (MWTP) Steering Committee developed a planning tool[28] as a statewide resource for evaluating highway segments of interest for wildlife accommodations, based on wildlife-vehicle conflicts and important areas for wildlife movement and conservation. A team of biologists, road ecologists, engineers, and GIS specialists from MDT, Montana Fish, Wildlife & Parks, and Montanans for Safe Wildlife Passage created the tool. Its purpose is to assist stakeholders and the interested public in working collaboratively to identify potential conservation efforts on and adjacent to transportation corridors throughout Montana.

The planning tool is structured around five Needs Assessment Criteria, scored on a 100-point scale using data from state, federal, and private sources. The five criteria are as follows:

1. Risk to human safety and property damage resulting from wildlife-vehicle conflict. (35 percent)
2. Important daily and seasonal habitats for big game and carnivores. (19 percent)
3. Important habitats for struggling or at-risk species. (12 percent)
4. Important habitats for a wide range of species. (13 percent)
5. Highway and adjacent linear infrastructure that may impede wildlife movement. (21 percent)

A review of the tool results indicates that the subarea corridor scored between 41 and 60, representing a moderate need for wildlife accommodations. The highest scoring portion of the corridor is between RP 5.2 and 6.2 with a score of 52.

The MWTP Steering Committee uses this planning tool to support a standardized approach for evaluating and selecting project proposals for the implementation of standalone wildlife accommodation projects. The statewide project selection process integrates the planning tool's output with additional evaluation criteria and considerations—such as community support, surrounding land use, and engineering feasibility—to prioritize projects that reduce wildlife-vehicle conflicts and improve safe wildlife passage across Montana highways.

7.0 AREAS OF CONCERN AND CONSIDERATION

This section provides a list and description of areas of concern and consideration within the subarea. These items were identified through review of as-built drawings, field review, public databases, and other resources. More discussion has been provided in the previous sections, and it is reiterated here as appropriate.

7.1 Demographics

- While local demographic data may not reflect the primary users of the US 87 corridor, it can still offer insight into some user characteristics.
- From 1970 through 2020, Cascade County saw a CAGR of approximately 0.1 percent and 1.6 percent. In contrast, Montana and the nation grew at CAGRs of 0.87 and 1.00 percent, respectively, during the same 50-year period.
- From 1990 through 2020, Cascade County experienced substantial population growth, with a collective increase of over 8.0 percent, bringing the combined estimated population to almost 85,000 residents. Approximately 72.0 percent of this population resides in Great Falls.
- Census tract 106 has a higher percentage of White residents at 92.8 percent compared to the county at 84.7 percent and the state at 85.7 percent.
- The populations of Cascade County and census tract 106 are projected to decrease by 1.6 percent over the next 10 years, while the populations of the state and country are expected to grow by 4.9 and 3.8 percent, respectively.
- Census tract 106 residents have a higher percentage of population walking and biking to work at 10.0 percent than Cascade County (3.0 percent) and the state (5.0 percent). Mean travel time to work was also longer in census tract 106 at 26.3 minutes compared to Cascade County at 16.6 minutes.
- The educational services, healthcare, and social assistance industries along with the agriculture, forestry, fishing, hunting, and mining industry play a very important economic role in the region.
- The median household income and income per capita are higher in census tract 106 compared to the state and Cascade County.
- The poverty rate in census tract 106 is 7.6 percent, almost half the rate for Cascade County (13.2 percent) and lower than the statewide average of 12.0 percent. The unemployment rate in the census tract is also lower than that of the county and state.

7.2 Transportation Conditions

Physical Features

- Right-of-way widths vary considerably within the subarea. For much of the corridor, widths are approximately 140 feet but are typically narrower where the creek and railroad are a constraint. The road also shares right-of-way with the railroad the entire length.
- Roadway pavement within most of the subarea is in poor condition with the exception of the first and last 0.1 miles, which are in fair condition.
- The subarea has varying access density with an average of seven access points per mile. No access management plans have been developed within the subarea.
- Most of the subarea is signed as a standard two-lane highway with a 70 mph daytime limit for passenger vehicles and a 65 mph limit at nighttime and for heavy trucks, with the exception of a newly established 55 mph zone between RP 0.0 and 0.3 where the roundabout was constructed. There is one speed study underway from RP 0.0 to 4.0.
- There are 10 passing zones within the subarea, five northbound and five southbound.
- MDT has identified no rock slopes within the subarea, although, during field review, seven locations with steep slopes were noted.
- There are nine bridges within the subarea, all of which cross Otter Creek. All of the bridges are rated as having very good superstructures and good substructures. However, one bridge has a satisfactory deck, and three bridges have decks rated as poor.
- Within the subarea, a total of 34 drainage features cross underneath the highway. Most are small culverts or conduits ranging in size from 15 to 42 inches. Of the total, five are considered major features sized 48 inches or larger.
- Utilities within the subarea include electrical, gas, communications, sewer, and water services.
- No sidewalks or trails are located within the subarea, and the shoulders are generally two feet or less, leaving minimal space for bicycles to safely ride outside the travel lane.
- A weigh station is located at RP 0.0 next to the Armington Junction Rest Area.
- A railroad owned by BNSF Railway runs along the east side of US 87 for the entire length of the subarea.

Geometric Conditions

- Within the subarea, US 87 is considered a rural principal arterial on the Non-Interstate NHS and was generally constructed on its current alignment in the late 1950s. Several improvement projects have taken place since then, including intersection realignment, resurfacing, widening, the addition of turn lanes, and other safety improvements.
- Most of the subarea has shoulders with a width of two feet or less which are narrower than the recommended width of eight feet.
- Approximately 13 percent of horizontal curves (two curves) do not meet baseline criteria for a 70 mph design speed on level terrain. Of those curves, one meets baseline criteria for rolling terrain (60 mph design speed) and one meets standards for mountainous terrain (50 mph design speed). The only curve identified as not meeting minimum design standards for a rural principal arterial route is associated with the roundabout.

- Nearly 17 percent of vertical curves (three) do not meet baseline criteria for a 70 mph design speed on level terrain. Of those curves, two meet baseline criteria for rolling terrain (60 mph). One curve does not meet baseline criteria for a rural principal arterial route.
- Parts of the subarea are narrow with little room for road expansion. The railroad and Otter Creek are constraints for expansion in some areas.

Traffic Conditions

- Traffic volumes are increasing throughout the subarea at an average annual rate of 0.6 percent per year.
- The percentage of heavy vehicle traffic increases traveling south.
- Existing intersection LOS is B or above for a.m. and p.m. peak hours at all three intersections. The intersections are projected to operate at LOS B or above in the future as well, except for the Armington Road intersection during the 2045 p.m. peak hour, which is projected to operate at LOS C.
- Under existing traffic conditions, the corridor was found to be operating at LOS A for its entire length. Projections indicate the corridor will operate at a LOS B under future 2045 conditions.

Safety[ii]

- A total of 76 crashes were reported during the five-year period from January 2019 through December 2023.
- Single-vehicle crashes accounted for 75 percent of all reported crashes. The most common crash types were wild animal (32 percent), fixed object (22 percent), and roll over (12 percent) crashes.
- Of the 76 total reported crashes, 84 percent (64) of crashes were non-junction related.
- Weekend crashes accounted for 33 percent of crashes.
- There were no severe crashes during the five-year period.
- Adverse weather conditions were reported in approximately 18 percent of crashes.
- Crashes were most frequent during the winter months (December through February), accounting for about 35.5 percent of all crashes.
- Adverse road conditions were reported in about 63 percent of crashes.
- About 37 percent of all crashes were reported as occurring in the dark, with 93 percent of those occurring where street lighting was not present.
- Within the subarea, approximately seven percent of crashes were determined to have involved an impaired driver.
- A total of 68 citations were issued within the subarea over the five-year analysis period, with the greatest number being related to speeding, careless/reckless driving, seatbelt violations, improper following/passing, and registration/insurance violations.

[ii] *Pursuant to 23 U.S.C. § 407, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway-highway crossings, pursuant to sections 130, 144, and 148 of Title 23, U.S.C., or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data. This publication is not intended to waive any of the State of Montana's rights or privileges under 23 U.S.C. § 407.*

- A minimum of 25 animal carcasses were collected and documented along the subarea corridor from 2019 through 2023, with a higher density of carcasses collected at RP 0.0, between RP 1.8 and 2.6, RP 4.0 and 4.6, and RP 5.9 and 7.0. The MWTP planning tool indicates the subarea corridor has a moderate need for wildlife accommodations.

7.3 Environmental Constraints

Environmental constraints are summarized based on information provided in the *Environmental Scan.*[29]

Physical Environment

- Some lands (two percent) adjacent to the US 87 corridor are publicly held by the Montana Department of Natural Resources and Conservation while the rest is privately owned.
- The subarea contains some soils classified as prime farmland if irrigated (3.0 percent), and farmland of local or statewide importance (18.0 percent) that may be subject to protections.
- The subarea is in a low seismic risk zone.
- US 87 generally follows Otter Creek, which is considered impaired.
- There are 82 wells within the subarea, one of which is a public water supply.
- Flood risk is high at the beginning of the subarea corridor near Armington Junction but is considered minimal for the majority of the corridor.
- A total of 105 wetlands have been mapped within the subarea totaling 31 acres.
- There is one state superfund site, two resolved petroleum tank release sites, and two abandoned mine sites within or near the corridor.
- Residences and Section 4(f)/Section 6(f) properties in the subarea are sensitive noise receptors, which could be affected by future roadway improvements.

Biological Resources

- Nearly 30 species of invasive and noxious weeds are present within the subarea.
- Lands surrounding the US 87 corridor provide prairie and riverine habitats for a variety of wildlife species including mammals, birds, and aquatic species.
- In addition to migratory birds and aquatic species, three species of concern have been documented in the subarea.

Social and Cultural Resources

- There are no federal, state, county, or city recreation sites within a quarter-mile of the subarea.
- The Kings Hill Scenic Byway begins at Armington Junction and stretches 71 miles south of the subarea corridor through the Little Belt Mountains to White Sulphur Springs.
- The Montana State Historic Preservation Office online database indicates no historic properties or districts in the subarea are currently listed on the National Register of Historic Places. However, there are six sites eligible for listing on the NRHP, two ineligible sites, five undetermined sites, and one unresolved site.

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Appendix A

As Built Geometrics Review

Central Montana Transportation Study

US 87 Armington Junction - Otter Creek Canyon Analysis

HORIZONTAL ALIGNMENT - AS BUILT REVIEW

Design Speed (mph):	70	60	50
SSD (ft):	730	570	425
Radius (ft):	1810	1200	760
Superelevation Rate:	8.00%	8.00%	8.00%

RADIUS (FT)	SPEED (V)
80	20
140	25
220	30
320	35
450	40
590	45
760	50
960	55
1200	60
1480	65
1810	70
2210	75
2670	80

ID	PLANS	STATION	RP	RADIUS (FT)	LENGTH (FT)	MIN SIGHT OBST. (FT)	DESIGN SPEED MET (MPH)	MEETS STANDARDS
D	2021, NH 60-2(60)71	49+94.78	0.06	1106	337	59.7	55	No
D	2021, NH 60-2(60)71	48+09.92	0.10	197	30	251.9	25	No
D	2021, NH 60-2(60)71	41+83.10	0.22	1985	1268	33.5	70	Yes
A	1958, F_235(26)_U1	21+28.00	0.55	1910	1078	34.8	70	Yes
A	1958, F_235(26)_U1	40+55.60	0.92	1325	2292	50.0	75	Yes
C	2016, HSIP 57-1(19)1	17+38.03	1.00	1910	1275	34.8	70	Yes
C	2016, HSIP 57-1(19)1	40+95.28	1.39	3820	710	17.4	80	Yes
C	2016, HSIP 57-1(19)1	83+75.15	2.20	3820	1310	17.4	80	Yes
C	2016, HSIP 57-1(19)1	102+41.35	2.56	2865	1279	23.2	80	Yes
C	2016, HSIP 57-1(19)1	131+62.86	3.11	2865	1056	23.2	80	Yes
A	1958, F_235(26)_U1	212+39.70	4.03	3820	2371	17.4	80	Yes
A	1958, F_235(26)_U1	268+26.30	5.09	1910	1544	34.8	70	Yes
B	1958, F_235(27)	286+33.30	5.43	22920	267	2.9	80	Yes
B	1958, F_235(27)	310+15.70	5.88	11460	622	5.8	80	Yes
B	1958, F_235(27)	341+11.10	6.47	11460	4043	5.8	80	Yes

VERTICAL ALIGNMENT

		50	60	70
DESIGN SPEED (MPH)		50	60	70
K-VALUE	CREST	84	151	247
	SAG	96	136	181
MAXIMUM GRADE	LEVEL	3%	3%	3%
	ROLLING	4%	4%	4%
	MOUNTAINOUS	7%	7%	7%

DESIGN SPEED (V)	CREST K	SAG K
15	3	10
20	7	17
25	12	26
30	19	37
35	29	50
40	44	64
45	61	79
50	84	96
55	114	115
60	151	136
65	193	157
70	247	181
75	312	206
80	384	231

ID	PLANS	STATION	RP	TYPE	LENGTH	GRADE BACK	GRADE AHEAD	K-VALUE	DESIGN SPEED MET (MPH)	MEETS STANDARDS
A	1958, F_235(26)_U1	38+2.53	0.22	sag	400	0.57%	2.01%	277.2	80	Yes
A	1958, F_235(26)_U1	19+14.69	0.88	crest	400	2.01%	0.94%	375.2	75	Yes
A	1958, F_235(26)_U1	50+41.67	1.00	sag	300	0.76%	1.76%	299.7	80	Yes
A	1958, F_235(26)_U1	61+61.04	1.18	crest	800	1.76%	-0.03%	446.7	80	Yes
A	1958, F_235(26)_U1	77+60.56	2.76	sag	300	-0.03%	0.66%	432.9	80	Yes
A	1958, F_235(26)_U1	180+39.57	3.43	crest	400	0.93%	0.54%	1025.6	80	Yes
A	1958, F_235(26)_U1	190+44.97	3.62	sag	400	0.54%	0.80%	1538.5	80	Yes
A	1958, F_235(26)_U1	200+53.37	3.81	sag	800	0.80%	3.29%	321.5	80	Yes
A	1958, F_235(26)_U1	217+55.97	4.13	crest	1600	3.29%	-4.00%	219.5	65	No
A	1958, F_235(26)_U1	227+77.90	4.32	sag	400	-4.00%	0.66%	85.9	45	No
A	1958, F_235(26)_U1	240+86.59	4.57	crest	400	0.66%	0.41%	1593.6	80	Yes
A	1958, F_235(26)_U1	264+96.15	5.03	sag	200	0.41%	0.93%	385.4	80	Yes
B	1958, F_235(27)	283+14.32	5.37	sag	800	0.92%	3.81%	276.8	80	Yes

B	1958, F_235(27)	298+71.47	5.67	crest	1200	3.81%	-1.72%	217.0	65	No
B	1958, F_235(27)	317+38.80	6.02	sag	800	-1.72%	1.25%	269.4	80	Yes
B	1958, F_235(27)	334+60.05	6.35	crest	400	1.25%	0.53%	555.6	80	Yes
B	1958, F_235(27)	350+68.53	6.65	sag	400	0.53%	1.11%	689.7	80	Yes
B	1958, F_235(27)	362+81.86	6.88	sag	400	1.11%	1.63%	769.2	80	Yes

Appendix B

Traffic Data Collection

Central Montana
Transportation Study

US 87 Armington Junction -
Otter Creek Canyon Analysis

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: Bringman Coulee Road
Site Code: 3
Start Date: 02/25/2025

Turning Movement Data

Start Time	US 87 Northbound Left	US 87 Northbound Thru	US 87 Northbound App. Total	US 87 Southbound Thru	US 87 Southbound Right	US 87 Southbound App. Total	Bingman Coulee Road Eastbound Left	Bingman Coulee Road Eastbound Right	Bingman Coulee Road Eastbound App. Total	Int. Total
6:00 PM	0	9	9	12	0	12	0	0	0	21
6:15 PM	0	9	9	13	0	13	0	0	0	22
6:30 PM	0	9	9	14	0	14	0	0	0	23
6:45 PM	0	6	6	4	0	4	0	0	0	10
Hourly Total	0	33	33	43	0	43	0	0	0	76
7:00 PM	0	11	11	17	0	17	0	1	1	29
7:15 PM	2	6	8	8	0	8	0	0	0	16
7:30 PM	0	4	4	10	0	10	0	0	0	14
7:45 PM	0	4	4	8	0	8	0	0	0	12
Hourly Total	2	25	27	43	0	43	0	1	1	71
8:00 PM	0	2	2	11	0	11	0	0	0	13
8:15 PM	0	7	7	8	0	8	0	0	0	15
8:30 PM	0	2	2	4	0	4	0	0	0	6
8:45 PM	0	2	2	8	0	8	0	0	0	10
Hourly Total	0	13	13	31	0	31	0	0	0	44
9:00 PM	0	9	9	4	0	4	0	0	0	13
9:15 PM	0	3	3	6	0	6	0	0	0	9
9:30 PM	0	7	7	5	0	5	0	0	0	12
9:45 PM	0	4	4	6	0	6	0	0	0	10
Hourly Total	0	23	23	21	0	21	0	0	0	44
10:00 PM	0	1	1	3	0	3	0	0	0	4
10:15 PM	0	2	2	2	0	2	0	0	0	4
10:30 PM	0	5	5	3	0	3	0	0	0	8
10:45 PM	0	7	7	5	0	5	0	0	0	12
Hourly Total	0	15	15	13	0	13	0	0	0	28
11:00 PM	0	4	4	3	0	3	0	0	0	7
11:15 PM	0	2	2	1	0	1	0	0	0	3
11:30 PM	0	3	3	5	0	5	0	0	0	8
11:45 PM	0	1	1	2	0	2	0	0	0	3
Hourly Total	0	10	10	11	0	11	0	0	0	21
12:00 AM	0	1	1	1	0	1	0	0	0	2
12:15 AM	0	4	4	2	0	2	0	1	1	7
12:30 AM	1	0	1	2	0	2	0	0	0	3
12:45 AM	0	2	2	1	0	1	0	0	0	3
Hourly Total	1	7	8	6	0	6	0	1	1	15
1:00 AM	0	2	2	3	0	3	0	0	0	5
1:15 AM	0	2	2	3	0	3	0	0	0	5
1:30 AM	0	0	0	1	0	1	0	0	0	1
1:45 AM	0	2	2	1	0	1	0	0	0	3
Hourly Total	0	6	6	8	0	8	0	0	0	14
2:00 AM	0	2	2	0	0	0	0	0	0	2
2:15 AM	0	0	0	1	0	1	0	0	0	1
2:30 AM	0	1	1	0	0	0	0	0	0	1
2:45 AM	0	2	2	2	0	2	0	0	0	4
Hourly Total	0	5	5	3	0	3	0	0	0	8
3:00 AM	0	1	1	0	0	0	0	0	0	1
3:15 AM	0	0	0	3	0	3	0	0	0	3
3:30 AM	0	3	3	1	0	1	0	0	0	4
3:45 AM	0	2	2	3	0	3	0	0	0	5
Hourly Total	0	6	6	7	0	7	0	0	0	13
4:00 AM	0	4	4	2	0	2	0	0	0	6
4:15 AM	0	3	3	1	0	1	0	0	0	4
4:30 AM	0	4	4	3	0	3	0	0	0	7
4:45 AM	0	7	7	3	0	3	0	0	0	10
Hourly Total	0	18	18	9	0	9	0	0	0	27
5:00 AM	0	0	0	2	0	2	0	0	0	2
5:15 AM	0	4	4	1	0	1	0	0	0	5
5:30 AM	0	6	6	4	0	4	0	0	0	10
5:45 AM	0	6	6	12	0	12	0	0	0	18
Hourly Total	0	16	16	19	0	19	0	0	0	35
6:00 AM	0	9	9	8	0	8	0	0	0	17

6:15 AM	0	8	8	11	0	11	0	0	0	19
6:30 AM	0	9	9	13	0	13	0	0	0	22
6:45 AM	0	3	3	11	0	11	0	0	0	14
Hourly Total	0	29	29	43	0	43	0	0	0	72
7:00 AM	0	12	12	16	0	16	0	0	0	28
7:15 AM	0	11	11	19	0	19	0	0	0	30
7:30 AM	0	9	9	11	0	11	0	0	0	20
7:45 AM	0	12	12	17	0	17	0	0	0	29
Hourly Total	0	44	44	63	0	63	0	0	0	107
8:00 AM	1	8	9	21	0	21	0	1	1	31
8:15 AM	0	9	9	14	0	14	0	0	0	23
8:30 AM	0	2	2	18	0	18	0	0	0	20
8:45 AM	0	19	19	20	0	20	0	0	0	39
Hourly Total	1	38	39	73	0	73	0	1	1	113
9:00 AM	0	20	20	30	0	30	0	0	0	50
9:15 AM	0	21	21	8	0	8	0	0	0	29
9:30 AM	0	17	17	20	1	21	0	0	0	38
9:45 AM	1	21	22	27	0	27	0	0	0	49
Hourly Total	1	79	80	85	1	86	0	0	0	166
10:00 AM	0	19	19	28	0	28	0	0	0	47
10:15 AM	0	16	16	19	0	19	0	0	0	35
10:30 AM	0	27	27	14	0	14	0	0	0	41
10:45 AM	0	12	12	23	1	24	0	1	1	37
Hourly Total	0	74	74	84	1	85	0	1	1	160
11:00 AM	0	15	15	26	0	26	0	0	0	41
11:15 AM	0	15	15	20	1	21	0	2	2	38
11:30 AM	0	24	24	14	0	14	0	2	2	40
11:45 AM	0	27	27	10	0	10	0	0	0	37
Hourly Total	0	81	81	70	1	71	0	4	4	156
12:00 PM	0	21	21	12	0	12	0	0	0	33
12:15 PM	0	20	20	17	0	17	0	0	0	37
12:30 PM	0	23	23	17	0	17	0	0	0	40
12:45 PM	1	25	26	20	0	20	1	0	1	47
Hourly Total	1	89	90	66	0	66	1	0	1	157
1:00 PM	0	30	30	20	0	20	0	0	0	50
1:15 PM	0	7	7	15	0	15	0	0	0	22
1:30 PM	1	21	22	19	0	19	0	0	0	41
1:45 PM	1	19	20	21	0	21	0	0	0	41
Hourly Total	2	77	79	75	0	75	0	0	0	154
2:00 PM	0	26	26	16	0	16	0	0	0	42
2:15 PM	0	18	18	16	0	16	0	0	0	34
2:30 PM	0	20	20	15	0	15	1	0	1	36
2:45 PM	0	23	23	22	0	22	0	1	1	46
Hourly Total	0	87	87	69	0	69	1	1	2	158
3:00 PM	1	18	19	23	0	23	0	1	1	43
3:15 PM	0	25	25	21	0	21	0	0	0	46
3:30 PM	1	18	19	23	0	23	0	0	0	42
3:45 PM	0	24	24	28	0	28	0	0	0	52
Hourly Total	2	85	87	95	0	95	0	1	1	183
4:00 PM	1	24	25	23	0	23	0	0	0	48
4:15 PM	0	11	11	22	0	22	0	1	1	34
4:30 PM	0	10	10	21	0	21	0	0	0	31
4:45 PM	0	15	15	17	0	17	0	0	0	32
Hourly Total	1	60	61	83	0	83	0	1	1	145
5:00 PM	0	19	19	13	0	13	0	0	0	32
5:15 PM	1	12	13	20	0	20	0	0	0	33
5:30 PM	0	16	16	14	0	14	0	0	0	30
5:45 PM	0	19	19	15	0	15	0	0	0	34
Hourly Total	1	66	67	62	0	62	0	0	0	129
Grand Total	12	986	998	1082	3	1085	2	11	13	2096
Approach %	1.2	98.8	-	99.7	0.3	-	15.4	84.6	-	-
Total %	0.6	47.0	47.6	51.6	0.1	51.8	0.1	0.5	0.6	-
Lights	9	705	714	704	3	707	2	10	12	1433
% Lights	75.0	71.5	71.5	65.1	100.0	65.2	100.0	90.9	92.3	68.4
Mediums	1	48	49	46	0	46	0	1	1	96
% Mediums	8.3	4.9	4.9	4.3	0.0	4.2	0.0	9.1	7.7	4.6
Articulated Trucks	2	233	235	332	0	332	0	0	0	567
% Articulated Trucks	16.7	23.6	23.5	30.7	0.0	30.6	0.0	0.0	0.0	27.1

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: Bringman Coulee Road
Site Code: 3
Start Date: 02/25/2025
Page No: 3

US 87 [N]

Out	In	Total
707	707	1414
48	46	94
233	332	565
988	**1085**	**2073**

R	T
3	704
0	46
0	332
3	**1082**

Bingman Coulee Road [W]

Out	In	Total
12	12	24
1	1	2
2	0	2
15	**13**	**28**

R	L
10	2
1	0
0	0
11	**2**

02/25/2025 6:00 PM
Ending At
02/26/2025 6:00 PM

Lights
Mediums
Articulated Trucks

Fake Approach [E]

Out	In	Total
0	0	0
0	0	0
0	0	0
0	**0**	**0**

L	T
9	705
1	48
2	233
12	**986**

Out	In	Total
714	714	1428
47	49	96
332	235	567
1093	**998**	**2091**

US 87 [S]

Turning Movement Data Plot

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Turning Movement Peak Hour Data (6:15 PM)

Start Time	US 87 Northbound Left	US 87 Northbound Thru	US 87 Northbound App. Total	US 87 Southbound Thru	US 87 Southbound Right	US 87 Southbound App. Total	Bingman Coulee Road Eastbound Left	Bingman Coulee Road Eastbound Right	Bingman Coulee Road Eastbound App. Total	Int. Total
6:15 PM	0	9	9	13	0	13	0	0	0	22
6:30 PM	0	9	9	14	0	14	0	0	0	23
6:45 PM	0	6	6	4	0	4	0	0	0	10
7:00 PM	0	11	11	17	0	17	0	1	1	29
Total	0	35	35	48	0	48	0	1	1	84
Approach %	0.0	100.0	-	100.0	0.0	-	0.0	100.0	-	-
Total %	0.0	41.7	41.7	57.1	0.0	57.1	0.0	1.2	1.2	-
PHF	0.000	0.795	0.795	0.706	0.000	0.706	0.000	0.250	0.250	0.724
Lights	0	25	25	19	0	19	0	1	1	45
% Lights	-	71.4	71.4	39.6	-	39.6	-	100.0	100.0	53.6
Mediums	0	3	3	2	0	2	0	0	0	5
% Mediums	-	8.6	8.6	4.2	-	4.2	-	0.0	0.0	6.0
Articulated Trucks	0	7	7	27	0	27	0	0	0	34
% Articulated Trucks	-	20.0	20.0	56.3	-	56.3	-	0.0	0.0	40.5

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: Bringman Coulee Road
Site Code: 3
Start Date: 02/25/2025
Page No: 5

US 87 [N]

Out	In	Total
25	19	44
3	2	5
7	27	34
35	**48**	**83**

R	T
0	19
0	2
0	27
0	**48**

Bingman Coulee Road [W]

Out	In	Total
0	1	1
0	0	0
0	0	0
0	**1**	**1**

L	R
0	1
0	0
0	0
0	**1**

Peak Hour Data

02/25/2025 6:15 PM
Ending At
02/25/2025 7:15 PM

Lights
Mediums
Articulated Trucks

Fake Approach [E]

Out	In	Total
0	0	0
0	0	0
0	0	0
0	**0**	**0**

L	T
0	25
0	3
0	7
0	**35**

US 87 [S]

Out	In	Total
20	25	45
2	3	5
27	7	34
49	**35**	**84**

Turning Movement Peak Hour Data Plot (6:15 PM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Turning Movement Peak Hour Data (9:45 AM)

Start Time	US 87 Northbound			US 87 Southbound			Bingman Coulee Road Eastbound			
	Left	Thru	App. Total	Thru	Right	App. Total	Left	Right	App. Total	Int. Total
9:45 AM	1	21	22	27	0	27	0	0	0	49
10:00 AM	0	19	19	28	0	28	0	0	0	47
10:15 AM	0	16	16	19	0	19	0	0	0	35
10:30 AM	0	27	27	14	0	14	0	0	0	41
Total	1	83	84	88	0	88	0	0	0	172
Approach %	1.2	98.8	-	100.0	0.0	-	0.0	0.0	-	-
Total %	0.6	48.3	48.8	51.2	0.0	51.2	0.0	0.0	0.0	-
PHF	0.250	0.769	0.778	0.786	0.000	0.786	0.000	0.000	0.000	0.878
Lights	1	61	62	65	0	65	0	0	0	127
% Lights	100.0	73.5	73.8	73.9	-	73.9	-	-	-	73.8
Mediums	0	4	4	1	0	1	0	0	0	5
% Mediums	0.0	4.8	4.8	1.1	-	1.1	-	-	-	2.9
Articulated Trucks	0	18	18	22	0	22	0	0	0	40
% Articulated Trucks	0.0	21.7	21.4	25.0	-	25.0	-	-	-	23.3

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
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Peak Hour Data

02/26/2025 9:45 AM
Ending At
02/26/2025 10:45 AM

Lights
Mediums
Articulated Trucks

US 87 [N]

Out	In	Total
61	65	126
4	1	5
18	22	40
83	**88**	**171**

R	T
0	65
0	1
0	22
0	**88**

Bingman Coulee Road [W]

Out	In	Total
1	0	1
0	0	0
0	0	0
1	**0**	**1**

L	R
0	0
0	0
0	0
0	**0**

Fake Approach [E]

Out	In	Total
0	0	0
0	0	0
0	0	0
0	**0**	**0**

L	T
1	61
0	4
0	18
1	**83**

US 87 [S]

Out	In	Total
65	62	127
1	4	5
22	18	40
88	**84**	**172**

Turning Movement Peak Hour Data Plot (9:45 AM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Turning Movement Peak Hour Data (3:15 PM)

Start Time	US 87 Northbound			US 87 Southbound			Bingman Coulee Road Eastbound			
	Left	Thru	App. Total	Thru	Right	App. Total	Left	Right	App. Total	Int. Total
3:15 PM	0	25	25	21	0	21	0	0	0	46
3:30 PM	1	18	19	23	0	23	0	0	0	42
3:45 PM	0	24	24	28	0	28	0	0	0	52
4:00 PM	1	24	25	23	0	23	0	0	0	48
Total	2	91	93	95	0	95	0	0	0	188
Approach %	2.2	97.8	-	100.0	0.0	-	0.0	0.0	-	-
Total %	1.1	48.4	49.5	50.5	0.0	50.5	0.0	0.0	0.0	-
PHF	0.500	0.910	0.930	0.848	0.000	0.848	0.000	0.000	0.000	0.904
Lights	1	68	69	67	0	67	0	0	0	136
% Lights	50.0	74.7	74.2	70.5	-	70.5	-	-	-	72.3
Mediums	0	5	5	5	0	5	0	0	0	10
% Mediums	0.0	5.5	5.4	5.3	-	5.3	-	-	-	5.3
Articulated Trucks	1	18	19	23	0	23	0	0	0	42
% Articulated Trucks	50.0	19.8	20.4	24.2	-	24.2	-	-	-	22.3

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: Bringman Coulee Road
Site Code: 3
Start Date: 02/25/2025

Peak Hour Data

02/26/2025 3:15 PM
Ending At
02/26/2025 4:15 PM

Lights
Mediums
Articulated Trucks

US 87 [N]

Out	In	Total
68	67	135
5	5	10
18	23	41
91	**95**	**186**

R	T
0	67
0	5
0	23
0	**95**

Bingman Coulee Road [W]

Out	In	Total
1	0	1
0	0	0
1	0	1
2	**0**	**2**

L	R
0	0
0	0
0	0
0	**0**

Fake Approach [E]

Out	In	Total
0	0	0
0	0	0
0	0	0
0	**0**	**0**

L	T
1	68
0	5
1	18
2	**91**

US 87 [S]

Out	In	Total
67	69	136
5	5	10
23	19	42
95	**93**	**188**

Turning Movement Peak Hour Data Plot (3:15 PM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 87 & US 89
Site Code:
Start Date: 02/25/2025

Turning Movement Data

Start Time	US 87 Northbound				US 87 Southbound				US 89 Eastbound				Rest Area/Scale Westbound				
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
6:00 PM	0	11	0	11	2	10	5	17	2	0	0	2	3	0	1	4	34
6:15 PM	0	7	1	8	6	10	4	20	1	1	1	3	4	0	2	6	37
6:30 PM	0	10	1	11	0	6	3	9	0	0	0	0	2	0	1	3	23
6:45 PM	1	6	1	8	2	7	1	10	1	1	0	2	0	0	1	1	21
Hourly Total	1	34	3	38	10	33	13	56	4	2	1	7	9	0	5	14	115
7:00 PM	0	9	3	12	0	15	2	17	0	0	0	0	2	0	1	3	32
7:15 PM	0	3	0	3	0	9	0	9	0	0	0	0	0	0	2	2	14
7:30 PM	1	4	1	6	0	9	10	19	1	0	2	3	0	0	1	1	29
7:45 PM	1	4	0	5	2	9	3	14	0	0	0	0	0	0	0	0	19
Hourly Total	2	20	4	26	2	42	15	59	1	0	2	3	2	0	4	6	94
8:00 PM	0	6	0	6	0	9	1	10	0	0	0	0	1	0	0	1	17
8:15 PM	0	3	1	4	0	7	0	7	1	0	0	1	0	0	1	1	13
8:30 PM	0	4	0	4	3	6	3	12	1	0	0	1	0	0	0	0	17
8:45 PM	0	0	0	0	0	6	1	7	1	0	0	1	2	0	0	2	10
Hourly Total	0	13	1	14	3	28	5	36	3	0	0	3	3	0	1	4	57
9:00 PM	0	7	1	8	1	4	0	5	0	0	0	0	1	0	2	3	16
9:15 PM	0	3	2	5	0	2	2	4	2	0	1	3	1	0	2	3	15
9:30 PM	0	1	0	1	0	8	0	8	0	0	0	0	0	0	0	0	9
9:45 PM	0	8	1	9	0	6	0	6	0	0	0	0	0	0	0	0	15
Hourly Total	0	19	4	23	1	20	2	23	2	0	1	3	2	0	4	6	55
10:00 PM	0	0	1	1	0	5	0	5	0	0	0	0	0	0	0	0	6
10:15 PM	0	2	0	2	1	3	2	6	0	0	0	0	1	0	2	3	11
10:30 PM	0	3	0	3	0	0	1	1	0	0	0	0	0	0	0	0	4
10:45 PM	0	7	0	7	0	6	0	6	0	0	0	0	0	0	0	0	13
Hourly Total	0	12	1	13	1	14	3	18	0	0	0	0	1	0	2	3	34
11:00 PM	0	5	1	6	0	4	0	4	0	0	0	0	0	0	0	0	10
11:15 PM	0	1	1	2	1	3	0	4	0	0	0	0	0	0	0	0	6
11:30 PM	0	4	0	4	0	2	0	2	0	0	0	0	0	0	0	0	6
11:45 PM	0	1	0	1	0	2	0	2	0	0	0	0	0	0	0	0	3
Hourly Total	0	11	2	13	1	11	0	12	0	0	0	0	0	0	0	0	25
12:00 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
12:15 AM	0	4	1	5	0	3	0	3	0	0	0	0	0	0	1	1	9
12:30 AM	0	0	0	0	0	1	1	2	1	0	0	1	0	0	0	0	3
12:45 AM	0	2	0	2	0	1	2	3	0	0	0	0	0	0	0	0	5
Hourly Total	0	6	1	7	0	6	3	9	1	0	0	1	0	0	1	1	18
1:00 AM	0	2	0	2	0	4	0	4	0	0	0	0	0	0	0	0	6
1:15 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
1:30 AM	0	1	0	1	0	2	0	2	0	0	0	0	0	0	1	1	4
1:45 AM	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
Hourly Total	1	5	0	6	0	6	0	6	0	0	0	0	0	0	1	1	13
2:00 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
2:15 AM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
2:30 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1
2:45 AM	0	2	0	2	0	2	0	2	0	0	0	0	0	0	0	0	4
Hourly Total	0	4	0	4	0	3	0	3	1	0	0	1	0	0	0	0	8
3:00 AM	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
3:15 AM	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0	4
3:30 AM	0	2	0	2	0	1	0	1	0	0	0	0	0	0	0	0	3
3:45 AM	0	2	0	2	0	3	0	3	1	0	0	1	0	0	0	0	6
Hourly Total	0	6	0	6	0	8	0	8	1	0	0	1	0	0	0	0	15
4:00 AM	0	2	1	3	0	2	2	4	0	0	1	1	0	0	0	0	8
4:15 AM	0	3	1	4	0	1	1	2	2	0	0	2	0	0	2	2	10
4:30 AM	0	4	0	4	0	3	0	3	0	0	0	0	0	0	0	0	7
4:45 AM	1	3	1	5	0	2	0	2	1	0	0	1	0	0	0	0	8
Hourly Total	1	12	3	16	0	8	3	11	3	0	1	4	0	0	2	2	33
5:00 AM	0	2	1	3	0	1	0	1	2	0	0	2	0	0	2	2	8
5:15 AM	0	2	0	2	0	3	0	3	2	0	0	2	0	0	0	0	7
5:30 AM	0	5	1	6	2	4	0	6	1	0	0	1	2	0	1	3	16
5:45 AM	3	4	1	8	6	9	2	17	1	0	0	1	6	0	1	7	33
Hourly Total	3	13	3	19	8	17	2	27	6	0	0	6	8	0	4	12	64

6:00 AM	0	4	2	6	1	9	1	11	6	0	0	6	2	0	3	5	28
6:15 AM	0	8	1	9	4	12	1	17	7	0	0	7	2	1	1	4	37
6:30 AM	0	7	1	8	0	10	0	10	3	0	0	3	0	0	1	1	22
6:45 AM	0	8	2	10	3	12	5	20	7	0	0	7	1	0	2	3	40
Hourly Total	0	27	6	33	8	43	7	58	23	0	0	23	5	1	7	13	127
7:00 AM	0	5	0	5	5	12	3	20	5	1	0	6	5	0	1	6	37
7:15 AM	0	11	1	12	2	13	6	21	21	2	1	24	4	0	0	4	61
7:30 AM	0	10	4	14	7	9	6	22	9	0	0	9	5	0	4	9	54
7:45 AM	0	9	1	10	9	15	9	33	4	0	0	4	3	1	3	7	54
Hourly Total	0	35	6	41	23	49	24	96	39	3	1	43	17	1	8	26	206
8:00 AM	0	8	4	12	7	11	3	21	5	0	0	5	7	2	5	14	52
8:15 AM	1	6	1	8	1	11	17	29	5	0	1	6	2	0	5	7	50
8:30 AM	2	6	1	9	7	16	16	39	4	2	0	6	4	2	3	9	63
8:45 AM	0	5	4	9	7	11	14	32	0	0	1	1	7	0	5	12	54
Hourly Total	3	25	10	38	22	49	50	121	14	2	2	18	20	4	18	42	219
9:00 AM	1	17	5	23	1	22	9	32	3	0	1	4	4	0	8	12	71
9:15 AM	1	14	6	21	3	15	6	24	1	0	0	1	1	0	5	6	52
9:30 AM	0	14	5	19	8	13	9	30	4	0	1	5	7	0	10	17	71
9:45 AM	0	17	7	24	4	28	3	35	2	1	0	3	4	0	15	19	81
Hourly Total	2	62	23	87	16	78	27	121	10	1	2	13	16	0	38	54	275
10:00 AM	0	9	4	13	5	13	9	27	2	1	0	3	6	1	7	14	57
10:15 AM	0	17	2	19	4	17	3	24	6	0	0	6	2	0	2	4	53
10:30 AM	0	17	5	22	6	15	5	26	5	0	0	5	4	1	3	8	61
10:45 AM	0	10	9	19	5	17	2	24	3	1	2	6	3	0	8	11	60
Hourly Total	0	53	20	73	20	62	19	101	16	2	2	20	15	2	20	37	231
11:00 AM	0	4	4	8	2	21	0	23	7	0	0	7	5	0	10	15	53
11:15 AM	0	18	2	20	4	16	5	25	0	0	1	1	3	0	6	9	55
11:30 AM	1	15	6	22	5	8	4	17	3	2	0	5	3	1	8	12	56
11:45 AM	0	19	1	20	1	12	3	16	4	0	0	4	0	0	7	7	47
Hourly Total	1	56	13	70	12	57	12	81	14	2	1	17	11	1	31	43	211
12:00 PM	0	22	3	25	4	14	6	24	4	0	0	4	2	1	3	6	59
12:15 PM	0	23	2	25	3	14	6	23	3	1	0	4	1	1	1	3	55
12:30 PM	0	21	1	22	1	17	3	21	5	0	0	5	1	1	2	4	52
12:45 PM	1	20	2	23	1	23	6	30	2	1	1	4	1	0	1	2	59
Hourly Total	1	86	8	95	9	68	21	98	14	2	1	17	5	3	7	15	225
1:00 PM	0	30	6	36	0	16	5	21	2	7	0	9	0	0	5	5	71
1:15 PM	0	4	1	5	1	17	6	24	11	1	1	13	0	0	4	4	46
1:30 PM	2	16	0	18	2	20	2	24	4	0	0	4	1	0	2	3	49
1:45 PM	0	15	6	21	0	19	6	25	3	0	0	3	1	0	4	5	54
Hourly Total	2	65	13	80	3	72	19	94	20	8	1	29	2	0	15	17	220
2:00 PM	0	21	3	24	1	11	6	18	2	1	2	5	1	0	7	8	55
2:15 PM	1	19	2	22	2	14	3	19	7	0	1	8	0	1	4	5	54
2:30 PM	0	15	3	18	0	18	5	23	12	1	1	14	0	0	2	2	57
2:45 PM	0	22	3	25	3	22	2	27	8	0	0	8	0	0	4	4	64
Hourly Total	1	77	11	89	6	65	16	87	29	2	4	35	1	1	17	19	230
3:00 PM	0	12	2	14	0	18	7	25	9	0	1	10	2	0	3	5	54
3:15 PM	2	25	1	28	2	18	3	23	8	0	0	8	2	1	3	6	65
3:30 PM	0	17	5	22	1	24	5	30	10	0	0	10	0	0	0	0	62
3:45 PM	0	15	1	16	1	24	2	27	11	1	1	13	2	0	7	9	65
Hourly Total	2	69	9	80	4	84	17	105	38	1	2	41	6	1	13	20	246
4:00 PM	0	20	4	24	2	25	3	30	4	2	2	8	2	1	2	5	67
4:15 PM	1	19	2	22	2	19	10	31	12	1	1	14	1	1	4	6	73
4:30 PM	2	8	0	10	2	16	9	27	13	1	1	15	2	0	3	5	57
4:45 PM	2	12	1	15	0	9	9	18	4	1	0	5	1	0	3	4	42
Hourly Total	5	59	7	71	6	69	31	106	33	5	4	42	6	2	12	20	239
5:00 PM	2	18	1	21	0	16	10	26	7	0	0	7	0	2	3	5	59
5:15 PM	0	13	1	14	0	20	7	27	6	2	0	8	0	0	7	7	56
5:30 PM	4	11	2	17	1	19	6	26	6	2	0	8	2	0	3	5	56
5:45 PM	0	16	1	17	0	8	7	15	8	0	0	8	0	0	3	3	43
Hourly Total	6	58	5	69	1	63	30	94	27	4	0	31	2	2	16	20	214
Grand Total	31	827	153	1011	156	955	319	1430	299	34	25	358	131	18	226	375	3174
Approach %	3.1	81.8	15.1	-	10.9	66.8	22.3	-	83.5	9.5	7.0	-	34.9	4.8	60.3	-	-
Total %	1.0	26.1	4.8	31.9	4.9	30.1	10.1	45.1	9.4	1.1	0.8	11.3	4.1	0.6	7.1	11.8	-
Lights	29	626	81	736	60	677	306	1043	291	26	24	341	38	15	149	202	2322
% Lights	93.5	75.7	52.9	72.8	38.5	70.9	95.9	72.9	97.3	76.5	96.0	95.3	29.0	83.3	65.9	53.9	73.2
Mediums	1	27	7	35	10	36	6	52	6	2	1	9	10	1	9	20	116
% Mediums	3.2	3.3	4.6	3.5	6.4	3.8	1.9	3.6	2.0	5.9	4.0	2.5	7.6	5.6	4.0	5.3	3.7
Articulated Trucks	1	174	65	240	86	242	7	335	2	6	0	8	83	2	68	153	736
% Articulated Trucks	3.2	21.0	42.5	23.7	55.1	25.3	2.2	23.4	0.7	17.6	0.0	2.2	63.4	11.1	30.1	40.8	23.2

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 87 & US 89
Site Code:
Start Date: 02/25/2025

US 87 [N]

Out	In	Total
1066	1043	2109
42	52	94
244	335	579
1352	**1430**	**2782**

R	T	L
306	677	60
6	36	10
7	242	86
319	**955**	**156**

US 89 [W]

Out	In	Total
350	341	691
8	9	17
10	8	18
368	**358**	**726**

L	T	R
291	26	24
6	2	1
2	6	0
299	**34**	**25**

02/25/2025 6:00 PM
Ending At
02/26/2025 6:00 PM

Lights
Mediums
Articulated Trucks

Rest Area/Scale [E]

Out	In	Total
167	202	369
19	20	39
157	153	310
343	**375**	**718**

R	T	L
149	15	38
9	1	10
68	2	83
226	**18**	**131**

US 87 [S]

L	T	R
29	626	81
1	27	7
1	174	65
31	**827**	**153**

Out	In	Total
739	736	1475
47	35	82
325	240	565
1111	**1011**	**2122**

Turning Movement Data Plot

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Turning Movement Peak Hour Data (6:00 PM)

Start Time	US 87 Northbound Left	US 87 Northbound Thru	US 87 Northbound Right	US 87 Northbound App. Total	US 87 Southbound Left	US 87 Southbound Thru	US 87 Southbound Right	US 87 Southbound App. Total	US 89 Eastbound Left	US 89 Eastbound Thru	US 89 Eastbound Right	US 89 Eastbound App. Total	Rest Area/Scale Westbound Left	Rest Area/Scale Westbound Thru	Rest Area/Scale Westbound Right	Rest Area/Scale Westbound App. Total	Int. Total
6:00 PM	0	11	0	11	2	10	5	17	2	0	0	2	3	0	1	4	34
6:15 PM	0	7	1	8	6	10	4	20	1	1	1	3	4	0	2	6	37
6:30 PM	0	10	1	11	0	6	3	9	0	0	0	0	2	0	1	3	23
6:45 PM	1	6	1	8	2	7	1	10	1	1	0	2	0	0	1	1	21
Total	1	34	3	38	10	33	13	56	4	2	1	7	9	0	5	14	115
Approach %	2.6	89.5	7.9	-	17.9	58.9	23.2	-	57.1	28.6	14.3	-	64.3	0.0	35.7	-	-
Total %	0.9	29.6	2.6	33.0	8.7	28.7	11.3	48.7	3.5	1.7	0.9	6.1	7.8	0.0	4.3	12.2	-
PHF	0.250	0.773	0.750	0.864	0.417	0.825	0.650	0.700	0.500	0.500	0.250	0.583	0.563	0.000	0.625	0.583	0.777
Lights	1	28	1	30	1	16	13	30	4	1	1	6	0	0	2	2	68
% Lights	100.0	82.4	33.3	78.9	10.0	48.5	100.0	53.6	100.0	50.0	100.0	85.7	0.0	-	40.0	14.3	59.1
Mediums	0	1	0	1	1	0	0	1	0	0	0	0	1	0	0	1	3
% Mediums	0.0	2.9	0.0	2.6	10.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	11.1	-	0.0	7.1	2.6
Articulated Trucks	0	5	2	7	8	17	0	25	0	1	0	1	8	0	3	11	44
% Articulated Trucks	0.0	14.7	66.7	18.4	80.0	51.5	0.0	44.6	0.0	50.0	0.0	14.3	88.9	-	60.0	78.6	38.3

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Peak Hour Data

02/25/2025 6:00 PM
Ending At
02/25/2025 7:00 PM

Lights
Mediums
Articulated Trucks

US 87 [N]

Out	In	Total
34	30	64
1	1	2
8	25	33
43	**56**	**99**

R	T	L
13	16	1
0	0	1
0	17	8
13	**33**	**10**

US 89 [W]

Out	In	Total
14	6	20
0	0	0
0	1	1
14	**7**	**21**

L	T	R
4	1	1
0	0	0
0	1	0
4	**2**	**1**

Rest Area/Scale [E]

Out	In	Total
3	2	5
1	1	2
11	11	22
15	**14**	**29**

R	T	L
2	0	0
0	0	1
3	0	8
5	**0**	**9**

US 87 [S]

L	T	R
1	28	1
0	1	0
0	5	2
1	**34**	**3**

Out	In	Total
17	30	47
1	1	2
25	7	32
43	**38**	**81**

Turning Movement Peak Hour Data Plot (6:00 PM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Turning Movement Peak Hour Data (9:00 AM)

Start Time	US 87 Northbound				US 87 Southbound				US 89 Eastbound				Rest Area/Scale Westbound				
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
9:00 AM	1	17	5	23	1	22	9	32	3	0	1	4	4	0	8	12	71
9:15 AM	1	14	6	21	3	15	6	24	1	0	0	1	1	0	5	6	52
9:30 AM	0	14	5	19	8	13	9	30	4	0	1	5	7	0	10	17	71
9:45 AM	0	17	7	24	4	28	3	35	2	1	0	3	4	0	15	19	81
Total	2	62	23	87	16	78	27	121	10	1	2	13	16	0	38	54	275
Approach %	2.3	71.3	26.4	-	13.2	64.5	22.3	-	76.9	7.7	15.4	-	29.6	0.0	70.4	-	-
Total %	0.7	22.5	8.4	31.6	5.8	28.4	9.8	44.0	3.6	0.4	0.7	4.7	5.8	0.0	13.8	19.6	-
PHF	0.500	0.912	0.821	0.906	0.500	0.696	0.750	0.864	0.625	0.250	0.500	0.650	0.571	0.000	0.633	0.711	0.849
Lights	2	58	11	71	2	68	23	93	10	0	2	12	0	0	26	26	202
% Lights	100.0	93.5	47.8	81.6	12.5	87.2	85.2	76.9	100.0	0.0	100.0	92.3	0.0	-	68.4	48.1	73.5
Mediums	0	0	0	0	1	2	1	4	0	1	0	1	0	0	0	0	5
% Mediums	0.0	0.0	0.0	0.0	6.3	2.6	3.7	3.3	0.0	100.0	0.0	7.7	0.0	-	0.0	0.0	1.8
Articulated Trucks	0	4	12	16	13	8	3	24	0	0	0	0	16	0	12	28	68
% Articulated Trucks	0.0	6.5	52.2	18.4	81.3	10.3	11.1	19.8	0.0	0.0	0.0	0.0	100.0	-	31.6	51.9	24.7

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
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Count Name: US 87 & US 89
Site Code:
Start Date: 02/25/2025
Page No: 7

Peak Hour Data

02/26/2025 9:00 AM
Ending At
02/26/2025 10:00 AM

Lights
Mediums
Articulated Trucks

US 87 [N]

Out	In	Total
94	93	187
0	4	4
16	24	40
110	**121**	**231**

R	T	L
23	68	2
1	2	1
3	8	13
27	**78**	**16**

US 89 [W]

Out	In	Total
25	12	37
1	1	2
3	0	3
29	**13**	**42**

R	T	L
2	0	10
0	1	0
0	0	0
2	**1**	**10**

Rest Area/Scale [E]

Out	In	Total
13	26	39
2	0	2
25	28	53
40	**54**	**94**

R	T	L
26	0	0
0	0	0
12	0	16
38	**0**	**16**

US 87 [S]

L	T	R
2	58	11
0	0	0
0	4	12
2	**62**	**23**

Out	In	Total
70	71	141
2	0	2
24	16	40
96	**87**	**183**

Turning Movement Peak Hour Data Plot (9:00 AM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 87 & US 89
Site Code:
Start Date: 02/25/2025

Turning Movement Peak Hour Data (3:30 PM)

Start Time	US 87 Northbound				US 87 Southbound				US 89 Eastbound				Rest Area/Scale Westbound				
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
3:30 PM	0	17	5	22	1	24	5	30	10	0	0	10	0	0	0	0	62
3:45 PM	0	15	1	16	1	24	2	27	11	1	1	13	2	0	7	9	65
4:00 PM	0	20	4	24	2	25	3	30	4	2	2	8	2	1	2	5	67
4:15 PM	1	19	2	22	2	19	10	31	12	1	1	14	1	1	4	6	73
Total	1	71	12	84	6	92	20	118	37	4	4	45	5	2	13	20	267
Approach %	1.2	84.5	14.3	-	5.1	78.0	16.9	-	82.2	8.9	8.9	-	25.0	10.0	65.0	-	-
Total %	0.4	26.6	4.5	31.5	2.2	34.5	7.5	44.2	13.9	1.5	1.5	16.9	1.9	0.7	4.9	7.5	-
PHF	0.250	0.888	0.600	0.875	0.750	0.920	0.500	0.952	0.771	0.500	0.500	0.804	0.625	0.500	0.464	0.556	0.914
Lights	0	56	9	65	4	66	18	88	36	4	4	44	4	2	10	16	213
% Lights	0.0	78.9	75.0	77.4	66.7	71.7	90.0	74.6	97.3	100.0	100.0	97.8	80.0	100.0	76.9	80.0	79.8
Mediums	0	3	1	4	0	6	1	7	1	0	0	1	0	0	0	0	12
% Mediums	0.0	4.2	8.3	4.8	0.0	6.5	5.0	5.9	2.7	0.0	0.0	2.2	0.0	0.0	0.0	0.0	4.5
Articulated Trucks	1	12	2	15	2	20	1	23	0	0	0	0	1	0	3	4	42
% Articulated Trucks	100.0	16.9	16.7	17.9	33.3	21.7	5.0	19.5	0.0	0.0	0.0	0.0	20.0	0.0	23.1	20.0	15.7

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 87 & US 89
Site Code:
Start Date: 02/25/2025

Peak Hour Data

02/26/2025 3:30 PM
Ending At
02/26/2025 4:30 PM

Lights
Mediums
Articulated Trucks

US 87 [N]

Out	In	Total
102	88	190
4	7	11
15	23	38
121	**118**	**239**

R	T	L
18	66	4
1	6	0
1	20	2
20	**92**	**6**

US 89 [W]

Out	In	Total
20	44	64
1	1	2
2	0	2
23	**45**	**68**

L	T	R
36	4	4
1	0	0
0	0	0
37	**4**	**4**

Rest Area/Scale [E]

Out	In	Total
17	16	33
1	0	1
4	4	8
22	**20**	**42**

R	T	L
10	2	4
0	0	0
3	0	1
13	**2**	**5**

US 87 [S]

L	T	R
0	56	9
0	3	1
1	12	2
1	**71**	**12**

Out	In	Total
74	65	139
6	4	10
21	15	36
101	**84**	**185**

Turning Movement Peak Hour Data Plot (3:30 PM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: Armington Road
Site Code: 2
Start Date: 02/25/2025

Turning Movement Data

Start Time	US 87 Northbound				US 87 Southbound				Armington Road Eastbound				Armington Road Westbound				
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
6:00 PM	0	11	0	11	0	13	0	13	0	0	0	0	1	0	0	1	25
6:15 PM	0	7	0	7	1	13	0	14	0	0	0	0	2	0	0	2	23
6:30 PM	1	12	1	14	0	9	0	9	0	0	0	0	1	0	0	1	24
6:45 PM	0	7	0	7	0	7	0	7	0	0	1	1	0	1	1	2	17
Hourly Total	1	37	1	39	1	42	0	43	0	0	1	1	4	1	1	6	89
7:00 PM	0	12	0	12	1	14	0	15	0	0	0	0	0	0	0	0	27
7:15 PM	0	3	3	6	0	9	0	9	0	0	0	0	0	0	1	1	16
7:30 PM	0	3	0	3	1	9	0	10	0	0	0	0	1	0	1	2	15
7:45 PM	0	4	0	4	0	8	1	9	0	0	0	0	2	0	1	3	16
Hourly Total	0	22	3	25	2	40	1	43	0	0	0	0	3	0	3	6	74
8:00 PM	0	5	1	6	0	10	1	11	1	0	0	1	0	0	0	0	18
8:15 PM	0	5	0	5	0	7	0	7	0	1	0	1	0	0	0	0	13
8:30 PM	0	3	1	4	0	5	1	6	0	0	0	0	0	0	0	0	10
8:45 PM	0	0	0	0	0	8	0	8	0	0	0	0	0	0	0	0	8
Hourly Total	0	13	2	15	0	30	2	32	1	1	0	2	0	0	0	0	49
9:00 PM	0	9	0	9	0	5	0	5	0	0	0	0	0	0	0	0	14
9:15 PM	0	4	0	4	0	4	0	4	0	0	0	0	0	0	0	0	8
9:30 PM	0	1	1	2	0	5	2	7	0	0	0	0	0	0	0	0	9
9:45 PM	0	9	0	9	0	7	0	7	0	0	0	0	0	0	0	0	16
Hourly Total	0	23	1	24	0	21	2	23	0	0	0	0	0	0	0	0	47
10:00 PM	0	1	0	1	0	4	0	4	0	0	0	0	0	0	0	0	5
10:15 PM	0	2	0	2	0	3	0	3	0	0	0	0	0	0	0	0	5
10:30 PM	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
10:45 PM	0	7	0	7	0	6	0	6	0	0	0	0	0	0	0	0	13
Hourly Total	0	13	0	13	0	13	0	13	0	0	0	0	0	0	0	0	26
11:00 PM	0	6	0	6	0	4	0	4	0	0	0	0	0	0	0	0	10
11:15 PM	0	2	0	2	0	0	1	1	0	0	1	1	0	0	0	0	4
11:30 PM	0	4	0	4	0	4	0	4	0	0	0	0	0	0	0	0	8
11:45 PM	0	1	0	1	0	2	0	2	0	0	0	0	0	0	0	0	3
Hourly Total	0	13	0	13	0	10	1	11	0	0	1	1	0	0	0	0	25
12:00 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
12:15 AM	0	4	0	4	0	3	0	3	0	0	0	0	0	0	0	0	7
12:30 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
12:45 AM	0	2	0	2	0	1	0	1	0	0	0	0	0	0	0	0	3
Hourly Total	0	6	0	6	0	6	0	6	0	0	0	0	0	0	0	0	12
1:00 AM	0	2	0	2	0	5	0	5	0	0	1	1	0	0	0	0	8
1:15 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
1:30 AM	0	1	0	1	0	2	0	2	0	0	0	0	0	0	0	0	3
1:45 AM	0	2	0	2	0	0	0	0	0	0	0	0	0	0	1	1	3
Hourly Total	0	6	0	6	0	7	0	7	0	0	1	1	0	0	1	1	15
2:00 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
2:15 AM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
2:30 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
2:45 AM	0	1	0	1	0	2	0	2	0	0	0	0	0	0	0	0	3
Hourly Total	0	4	0	4	0	3	0	3	0	0	0	0	0	0	0	0	7
3:00 AM	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
3:15 AM	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0	4
3:30 AM	0	2	0	2	0	1	0	1	0	0	0	0	0	0	0	0	3
3:45 AM	0	2	0	2	0	2	0	2	0	0	0	0	0	0	0	0	4
Hourly Total	0	6	0	6	0	7	0	7	0	0	0	0	0	0	0	0	13
4:00 AM	0	3	0	3	0	3	0	3	0	0	0	0	0	0	0	0	6
4:15 AM	0	4	0	4	0	1	0	1	0	0	0	0	0	0	0	0	5
4:30 AM	0	4	0	4	0	3	0	3	0	0	0	0	0	0	0	0	7
4:45 AM	0	6	0	6	0	2	0	2	0	0	0	0	0	0	0	0	8
Hourly Total	0	17	0	17	0	9	0	9	0	0	0	0	0	0	0	0	26
5:00 AM	0	2	0	2	0	1	0	1	0	0	0	0	1	0	0	1	4
5:15 AM	0	2	0	2	0	3	0	3	0	0	0	0	1	0	0	1	6
5:30 AM	0	5	1	6	1	5	0	6	0	0	0	0	0	0	0	0	12
5:45 AM	0	5	0	5	0	12	0	12	0	0	0	0	0	0	3	3	20
Hourly Total	0	14	1	15	1	21	0	22	0	0	0	0	2	0	3	5	42

6:00 AM	0	6	0	6	0	8	0	8	0	0	0	0	0	0	0	0	14
6:15 AM	0	10	0	10	0	15	0	15	0	0	0	0	1	0	0	1	26
6:30 AM	1	7	0	8	0	12	0	12	0	0	0	0	0	0	0	0	20
6:45 AM	0	8	0	8	2	12	0	14	1	0	0	1	0	0	1	1	24
Hourly Total	1	31	0	32	2	47	0	49	1	0	0	1	1	0	1	2	84
7:00 AM	0	4	0	4	0	16	1	17	1	0	0	1	1	0	0	1	23
7:15 AM	0	10	4	14	1	16	0	17	1	1	0	2	0	0	1	1	34
7:30 AM	0	13	1	14	0	13	1	14	0	0	0	0	0	1	1	2	30
7:45 AM	0	10	1	11	0	17	1	18	0	1	0	1	3	1	0	4	34
Hourly Total	0	37	6	43	1	62	3	66	2	2	0	4	4	2	2	8	121
8:00 AM	0	11	0	11	0	20	0	20	0	0	0	0	1	0	0	1	32
8:15 AM	0	8	0	8	2	14	0	16	0	0	0	0	1	0	1	2	26
8:30 AM	0	6	0	6	0	20	0	20	0	0	1	1	1	0	2	3	30
8:45 AM	0	10	0	10	1	18	0	19	0	0	0	0	0	1	0	1	30
Hourly Total	0	35	0	35	3	72	0	75	0	0	1	1	3	1	3	7	118
9:00 AM	0	21	0	21	1	25	0	26	0	0	0	0	0	0	3	3	50
9:15 AM	0	23	1	24	0	16	1	17	0	0	0	0	0	0	1	1	42
9:30 AM	0	16	0	16	2	20	0	22	1	0	0	1	0	1	0	1	40
9:45 AM	0	24	0	24	0	30	2	32	1	0	0	1	0	1	0	1	58
Hourly Total	0	84	1	85	3	91	3	97	2	0	0	2	0	2	4	6	190
10:00 AM	0	14	1	15	0	20	0	20	1	0	0	1	0	0	0	0	36
10:15 AM	0	16	0	16	1	17	0	18	0	0	0	0	1	0	0	1	35
10:30 AM	0	20	0	20	0	19	0	19	0	1	0	1	1	0	0	1	41
10:45 AM	0	21	1	22	2	18	0	20	0	0	1	1	1	1	0	2	45
Hourly Total	0	71	2	73	3	74	0	77	1	1	1	3	3	1	0	4	157
11:00 AM	0	9	0	9	0	29	0	29	0	0	0	0	0	0	0	0	38
11:15 AM	1	19	1	21	1	17	0	18	0	0	0	0	0	0	0	0	39
11:30 AM	0	21	1	22	0	13	0	13	0	1	0	1	0	0	1	1	37
11:45 AM	0	19	0	19	0	11	0	11	0	0	0	0	0	1	0	1	31
Hourly Total	1	68	2	71	1	70	0	71	0	1	0	1	0	1	1	2	145
12:00 PM	0	25	0	25	0	15	0	15	0	1	0	1	0	0	0	0	41
12:15 PM	0	23	0	23	1	14	0	15	1	0	0	1	1	0	1	2	41
12:30 PM	0	20	2	22	0	15	0	15	0	0	0	0	3	0	0	3	40
12:45 PM	0	25	0	25	1	21	0	22	1	0	0	1	0	1	1	2	50
Hourly Total	0	93	2	95	2	65	0	67	2	1	0	3	4	1	2	7	172
1:00 PM	1	34	1	36	0	16	0	16	0	2	0	2	1	0	0	1	55
1:15 PM	0	5	0	5	1	16	1	18	0	0	0	0	1	0	0	1	24
1:30 PM	0	16	0	16	0	22	0	22	0	0	0	0	0	0	1	1	39
1:45 PM	0	19	1	20	0	19	1	20	1	0	0	1	0	1	0	1	42
Hourly Total	1	74	2	77	1	73	2	76	1	2	0	3	2	1	1	4	160
2:00 PM	0	23	0	23	2	11	0	13	1	0	0	1	0	2	0	2	39
2:15 PM	0	22	1	23	1	15	0	16	0	0	0	0	1	0	1	2	41
2:30 PM	0	19	1	20	1	15	0	16	0	0	0	0	0	0	0	0	36
2:45 PM	0	23	1	24	0	23	1	24	0	0	0	0	1	0	1	2	50
Hourly Total	0	87	3	90	4	64	1	69	1	0	0	1	2	2	2	6	166
3:00 PM	0	14	1	15	1	19	0	20	0	0	0	0	1	0	0	1	36
3:15 PM	0	28	2	30	0	18	1	19	0	2	0	2	3	2	1	6	57
3:30 PM	0	19	1	20	1	24	0	25	1	3	0	4	1	2	0	3	52
3:45 PM	0	18	2	20	1	23	1	25	0	0	0	0	4	2	0	6	51
Hourly Total	0	79	6	85	3	84	2	89	1	5	0	6	9	6	1	16	196
4:00 PM	0	22	2	24	2	29	0	31	0	0	0	0	1	0	1	2	57
4:15 PM	1	20	1	22	1	19	1	21	1	0	0	1	2	0	0	2	46
4:30 PM	0	7	1	8	0	19	0	19	1	1	0	2	1	0	3	4	33
4:45 PM	0	13	0	13	0	9	0	9	0	1	0	1	1	3	2	6	29
Hourly Total	1	62	4	67	3	76	1	80	2	2	0	4	5	3	6	14	165
5:00 PM	0	16	1	17	1	15	0	16	1	0	0	1	1	0	2	3	37
5:15 PM	0	12	0	12	1	18	0	19	1	0	0	1	0	0	0	0	32
5:30 PM	0	13	2	15	1	19	0	20	0	0	0	0	0	1	3	4	39
5:45 PM	1	16	1	18	0	8	1	9	1	0	1	2	2	0	0	2	31
Hourly Total	1	57	4	62	3	60	1	64	3	0	1	4	3	1	5	9	139
Grand Total	6	952	40	998	33	1047	19	1099	17	15	6	38	45	22	36	103	2238
Approach %	0.6	95.4	4.0	-	3.0	95.3	1.7	-	44.7	39.5	15.8	-	43.7	21.4	35.0	-	-
Total %	0.3	42.5	1.8	44.6	1.5	46.8	0.8	49.1	0.8	0.7	0.3	1.7	2.0	1.0	1.6	4.6	-
Lights	5	682	36	723	32	678	19	729	16	15	3	34	39	21	35	95	1581
% Lights	83.3	71.6	90.0	72.4	97.0	64.8	100.0	66.3	94.1	100.0	50.0	89.5	86.7	95.5	97.2	92.2	70.6
Mediums	1	37	4	42	1	35	0	36	1	0	1	2	6	0	0	6	86
% Mediums	16.7	3.9	10.0	4.2	3.0	3.3	0.0	3.3	5.9	0.0	16.7	5.3	13.3	0.0	0.0	5.8	3.8
Articulated Trucks	0	233	0	233	0	334	0	334	0	0	2	2	0	1	1	2	571
% Articulated Trucks	0.0	24.5	0.0	23.3	0.0	31.9	0.0	30.4	0.0	0.0	33.3	5.3	0.0	4.5	2.8	1.9	25.5

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

02/25/2025 6:00 PM
Ending At
02/26/2025 6:00 PM

Lights
Mediums
Articulated Trucks

US 87 [N]

Out	In	Total
733	729	1462
38	36	74
234	334	568
1005	**1099**	**2104**

R	T	L
19	678	32
0	35	1
0	334	0
19	**1047**	**33**

Armington Road [W]

	Out	In	Total
	45	34	79
	1	2	3
	1	2	3
	47	**38**	**85**

L	T	R
16	15	3
1	0	1
0	0	2
17	**15**	**6**

Armington Road [E]

Out	In	Total
83	95	178
5	6	11
0	2	2
88	**103**	**191**

R	T	L
35	21	39
0	0	6
1	1	0
36	**22**	**45**

L	T	R
5	682	36
1	37	4
0	233	0
6	**952**	**40**

Out	In	Total
720	723	1443
42	42	84
336	233	569
1098	**998**	**2096**

US 87 [S]

Turning Movement Data Plot

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: Armington Road
Site Code: 2
Start Date: 02/25/2025

Turning Movement Peak Hour Data (6:15 PM)

Start Time	US 87 Northbound				US 87 Southbound				Armington Road Eastbound				Armington Road Westbound				
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
6:15 PM	0	7	0	7	1	13	0	14	0	0	0	0	2	0	0	2	23
6:30 PM	1	12	1	14	0	9	0	9	0	0	0	0	1	0	0	1	24
6:45 PM	0	7	0	7	0	7	0	7	0	0	1	1	0	1	1	2	17
7:00 PM	0	12	0	12	1	14	0	15	0	0	0	0	0	0	0	0	27
Total	1	38	1	40	2	43	0	45	0	0	1	1	3	1	1	5	91
Approach %	2.5	95.0	2.5	-	4.4	95.6	0.0	-	0.0	0.0	100.0	-	60.0	20.0	20.0	-	-
Total %	1.1	41.8	1.1	44.0	2.2	47.3	0.0	49.5	0.0	0.0	1.1	1.1	3.3	1.1	1.1	5.5	-
PHF	0.250	0.792	0.250	0.714	0.500	0.768	0.000	0.750	0.000	0.000	0.250	0.250	0.375	0.250	0.250	0.625	0.843
Lights	1	24	1	26	2	18	0	20	0	0	1	1	3	1	1	5	52
% Lights	100.0	63.2	100.0	65.0	100.0	41.9	-	44.4	-	-	100.0	100.0	100.0	100.0	100.0	100.0	57.1
Mediums	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
% Mediums	0.0	5.3	0.0	5.0	0.0	0.0	-	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0	2.2
Articulated Trucks	0	12	0	12	0	25	0	25	0	0	0	0	0	0	0	0	37
% Articulated Trucks	0.0	31.6	0.0	30.0	0.0	58.1	-	55.6	-	-	0.0	0.0	0.0	0.0	0.0	0.0	40.7

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Peak Hour Data

02/25/2025 6:15 PM
Ending At
02/25/2025 7:15 PM

Lights
Mediums
Articulated Trucks

US 87 [N]

Out	In	Total
25	20	45
2	0	2
12	25	37
39	**45**	**84**

R	T	L
0	18	2
0	0	0
0	25	0
0	**43**	**2**

Armington Road [W]

Out	In	Total
2	1	3
0	0	0
0	0	0
2	**1**	**3**

L	T	R
0	0	1
0	0	0
0	0	0
0	**0**	**1**

Armington Road [E]

Out	In	Total
3	5	8
0	0	0
0	0	0
3	**5**	**8**

R	T	L
1	1	3
0	0	0
0	0	0
1	**1**	**3**

US 87 [S]

L	T	R
1	24	1
0	2	0
0	12	0
1	**38**	**1**

Out	In	Total
22	26	48
0	2	2
25	12	37
47	**40**	**87**

Turning Movement Peak Hour Data Plot (6:15 PM)

Robert Peccia & Associates
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Turning Movement Peak Hour Data (9:00 AM)

Start Time	US 87 Northbound				US 87 Southbound				Armington Road Eastbound				Armington Road Westbound				
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
9:00 AM	0	21	0	21	1	25	0	26	0	0	0	0	0	0	3	3	50
9:15 AM	0	23	1	24	0	16	1	17	0	0	0	0	0	0	1	1	42
9:30 AM	0	16	0	16	2	20	0	22	1	0	0	1	0	1	0	1	40
9:45 AM	0	24	0	24	0	30	2	32	1	0	0	1	0	1	0	1	58
Total	0	84	1	85	3	91	3	97	2	0	0	2	0	2	4	6	190
Approach %	0.0	98.8	1.2	-	3.1	93.8	3.1	-	100.0	0.0	0.0	-	0.0	33.3	66.7	-	-
Total %	0.0	44.2	0.5	44.7	1.6	47.9	1.6	51.1	1.1	0.0	0.0	1.1	0.0	1.1	2.1	3.2	-
PHF	0.000	0.875	0.250	0.885	0.375	0.758	0.375	0.758	0.500	0.000	0.000	0.500	0.000	0.500	0.333	0.500	0.819
Lights	0	69	1	70	3	66	3	72	2	0	0	2	0	2	3	5	149
% Lights	-	82.1	100.0	82.4	100.0	72.5	100.0	74.2	100.0	-	-	100.0	-	100.0	75.0	83.3	78.4
Mediums	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
% Mediums	-	0.0	0.0	0.0	0.0	1.1	0.0	1.0	0.0	-	-	0.0	-	0.0	0.0	0.0	0.5
Articulated Trucks	0	15	0	15	0	24	0	24	0	0	0	0	0	0	1	1	40
% Articulated Trucks	-	17.9	0.0	17.6	0.0	26.4	0.0	24.7	0.0	-	-	0.0	-	0.0	25.0	16.7	21.1

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Peak Hour Data

02/26/2025 9:00 AM
Ending At
02/26/2025 10:00 AM

Lights
Mediums
Articulated Trucks

US 87 [N]

Out	In	Total
74	72	146
0	1	1
16	24	40
90	**97**	**187**

R	T	L
3	66	3
0	1	0
0	24	0
3	**91**	**3**

Armington Road [W]

Out	In	Total
5	2	7
0	0	0
0	0	0
5	**2**	**7**

L	T	R
2	0	0
0	0	0
0	0	0
2	**0**	**0**

Armington Road [E]

Out	In	Total
4	5	9
0	0	0
0	1	1
4	**6**	**10**

R	T	L
3	2	0
0	0	0
1	0	0
4	**2**	**0**

L	T	R
0	69	1
0	0	0
0	15	0
0	**84**	**1**

Out	In	Total
66	70	136
1	0	1
24	15	39
91	**85**	**176**

US 87 [S]

Turning Movement Peak Hour Data Plot (9:00 AM)

Robert Peccia & Associates
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Count Name: Armington Road
Site Code: 2
Start Date: 02/25/2025

Turning Movement Peak Hour Data (3:15 PM)

Start Time	US 87 Northbound				US 87 Southbound				Armington Road Eastbound				Armington Road Westbound				
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
3:15 PM	0	28	2	30	0	18	1	19	0	2	0	2	3	2	1	6	57
3:30 PM	0	19	1	20	1	24	0	25	1	3	0	4	1	2	0	3	52
3:45 PM	0	18	2	20	1	23	1	25	0	0	0	0	4	2	0	6	51
4:00 PM	0	22	2	24	2	29	0	31	0	0	0	0	1	0	1	2	57
Total	0	87	7	94	4	94	2	100	1	5	0	6	9	6	2	17	217
Approach %	0.0	92.6	7.4	-	4.0	94.0	2.0	-	16.7	83.3	0.0	-	52.9	35.3	11.8	-	-
Total %	0.0	40.1	3.2	43.3	1.8	43.3	0.9	46.1	0.5	2.3	0.0	2.8	4.1	2.8	0.9	7.8	-
PHF	0.000	0.777	0.875	0.783	0.500	0.810	0.500	0.806	0.250	0.417	0.000	0.375	0.563	0.750	0.500	0.708	0.952
Lights	0	66	5	71	4	67	2	73	1	5	0	6	7	6	2	15	165
% Lights	-	75.9	71.4	75.5	100.0	71.3	100.0	73.0	100.0	100.0	-	100.0	77.8	100.0	100.0	88.2	76.0
Mediums	0	4	2	6	0	3	0	3	0	0	0	0	2	0	0	2	11
% Mediums	-	4.6	28.6	6.4	0.0	3.2	0.0	3.0	0.0	0.0	-	0.0	22.2	0.0	0.0	11.8	5.1
Articulated Trucks	0	17	0	17	0	24	0	24	0	0	0	0	0	0	0	0	41
% Articulated Trucks	-	19.5	0.0	18.1	0.0	25.5	0.0	24.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	18.9

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Peak Hour Data

02/26/2025 3:15 PM
Ending At
02/26/2025 4:15 PM

Lights
Mediums
Articulated Trucks

US 87 [N]

Out	In	Total
69	73	142
4	3	7
17	24	41
90	**100**	**190**

R	T	L
2	67	4
0	3	0
0	24	0
2	**94**	**4**

Armington Road [W]

Out	In	Total
8	6	14
0	0	0
0	0	0
8	**6**	**14**

L	T	R
1	5	0
0	0	0
0	0	0
1	**5**	**0**

Armington Road [E]

Out	In	Total
14	15	29
2	2	4
0	0	0
16	**17**	**33**

R	T	L
2	6	7
0	0	2
0	0	0
2	**6**	**9**

US 87 [S]

L	T	R
0	66	5
0	4	2
0	17	0
0	**87**	**7**

Out	In	Total
74	71	145
5	6	11
24	17	41
103	**94**	**197**

Turning Movement Peak Hour Data Plot (3:15 PM)

Appendix C

Existing Conditions Operations Analysis

Central Montana
Transportation Study

US 87 Armington Junction -
Otter Creek Canyon Analysis

Central MT - Armington Junction

Vistro File: F:\...\Armington Intersection LOS.vistro

Scenario 1 2025 AM Peak

Report File: F:\...\2025 AM Peak.pdf

3/19/2025

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Hwy 87 & Hwy 89	Roundabout	HCM 7th Edition	WB Right		5.0	A
2	Hwy 87 & Armington Road	Two-way stop	HCM 7th Edition	WB Thru	0.007	11.4	B
3	Hwy 89 & Bingman Coulee Road	Two-way stop	HCM 7th Edition	NB Left	0.001	7.5	A

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Hwy 87 & Hwy 89

Control Type:	Roundabout	Delay (sec / veh):	5.0
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	Hwy 87			Hwy 87			Hwy89			Rest Area/Scale		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Hwy 87			Hwy 87			Hwy89			Rest Area/Scale		
Base Volume Input [veh/h]	2	62	23	16	78	27	10	1	2	16	0	38
Base Volume Adjustment Factor	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790
Heavy Vehicles Percentage [%]	0.00	6.50	52.20	87.60	12.90	14.80	0.00	100.00	0.00	100.00	0.00	31.60
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	3	98	36	25	123	43	16	2	3	25	0	60
Peak Hour Factor	0.8490	0.8490	0.8490	0.8490	0.8490	0.8490	0.8490	0.8490	0.8490	0.8490	0.8490	0.8490
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	29	11	7	36	13	5	1	1	7	0	18
Total Analysis Volume [veh/h]	4	115	42	29	145	51	19	2	4	29	0	71
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	77			62			276			145		
Exiting Flow Rate [veh/h]	226			235			63			122		
Demand Flow Rate [veh/h]	3	98	36	25	123	43	16	2	3	25	0	60
Adjusted Demand Flow Rate [veh/h]	4	115	42	29	145	51	19	2	4	29	0	71

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00
A (intercept)	1380.00	1380.00	1380.00	1380.00
B (coefficient)	0.00102	0.00102	0.00102	0.00102
HV Adjustment Factor	0.87	0.84	0.95	0.68
Entry Flow Rate [veh/h]	186	270	27	147
Capacity of Entry and Bypass Lanes [veh/h]	1276	1296	1042	1190
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1105	1084	992	814
X, volume / capacity	0.15	0.21	0.03	0.12

Movement, Approach, & Intersection Results

Lane LOS	A	A	A	A
95th-Percentile Queue Length [veh]	0.51	0.78	0.08	0.42
95th-Percentile Queue Length [ft]	12.74	19.52	1.94	10.47
Approach Delay [s/veh]	4.54	5.23	3.85	5.66
Approach LOS	A	A	A	A
Intersection Delay [s/veh]	5.03			
Intersection LOS	A			

Intersection Level Of Service Report
Intersection 2: Hwy 87 & Armington Road

Control Type:	Two-way stop	Delay (sec / veh):	11.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.007

Intersection Setup

Name	Hwy 87			Hwy 87			Armington Road			Armington Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Hwy 87			Hwy 87			Armington Road			Armington Road		
Base Volume Input [veh/h]	0	84	1	3	91	3	2	0	0	0	2	4
Base Volume Adjustment Factor	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790
Heavy Vehicles Percentage [%]	0.00	17.90	0.00	0.00	27.50	0.00	0.00	0.00	0.00	0.00	0.00	25.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	133	2	5	144	5	3	0	0	0	3	6
Peak Hour Factor	0.8190	0.8190	0.8190	0.8190	0.8190	0.8190	0.8190	0.8190	0.8190	0.8190	0.8190	0.8190
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	41	1	2	44	2	1	0	0	0	1	2
Total Analysis Volume [veh/h]	0	162	2	6	176	6	4	0	0	0	4	7
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01
d_M, Delay for Movement [s/veh]	7.56	0.00	0.00	7.53	0.00	0.00	11.16	11.34	9.18	11.06	11.40	9.44
Movement LOS	A	A	A	A	A	A	B	B	A	B	B	A
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.02	0.02	0.05	0.05	0.05
95th-Percentile Queue Length [ft/ln]	0.00	0.00	0.00	0.32	0.00	0.00	0.51	0.51	0.51	1.18	1.18	1.18
d_A, Approach Delay [s/veh]	0.00			0.24			11.16			10.15		
Approach LOS	A			A			B			B		
d_I, Intersection Delay [s/veh]	0.55											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 3: Hwy 89 & Bingman Coulee Road

Control Type:	Two-way stop	Delay (sec / veh):	7.5
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.001

Intersection Setup

Name	Hwy 89		Hwy 89		Bingman Coulee Road	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	70.00		70.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Hwy 89		Hwy 89		Bingman Coulee Road	
Base Volume Input [veh/h]	1	83	88	0	0	0
Base Volume Adjustment Factor	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790
Heavy Vehicles Percentage [%]	0.00	26.50	26.10	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	2	131	139	0	0	0
Peak Hour Factor	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	37	40	0	0	0
Total Analysis Volume [veh/h]	2	149	158	0	0	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	7.51	0.00	0.00	0.00	10.26	9.03
Movement LOS	A	A	A	A	B	A
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	0.08	0.08	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	0.10		0.00		9.65	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.05					
Intersection LOS	A					

Central MT - Armington Junction

Vistro File: F:\...\Armington Intersection LOS.vistro

Report File: F:\...\2025 PM Peak.pdf

Scenario 2 2025 PM Peak

3/19/2025

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Hwy 87 & Hwy 89	Roundabout	HCM 7th Edition	SB Thru		5.0	A
2	Hwy 87 & Armington Road	Two-way stop	HCM 7th Edition	WB Left	0.031	12.0	B
3	Hwy 89 & Bingman Coulee Road	Two-way stop	HCM 7th Edition	NB Left	0.004	8.2	A

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Hwy 87 & Hwy 89

Control Type:	Roundabout	Delay (sec / veh):	5.0
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	Hwy 87			Hwy 87			Hwy89			Rest Area/Scale		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Hwy 87			Hwy 87			Hwy89			Rest Area/Scale		
Base Volume Input [veh/h]	1	71	12	6	92	20	37	4	4	5	2	13
Base Volume Adjustment Factor	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790
Heavy Vehicles Percentage [%]	100.00	21.10	25.00	33.30	28.20	10.00	2.70	0.00	0.00	20.00	0.00	23.10
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	2	112	19	9	145	32	58	6	6	8	3	21
Peak Hour Factor	0.7770	0.7770	0.7770	0.7770	0.7770	0.7770	0.7770	0.7770	0.7770	0.7770	0.7770	0.7770
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	36	6	3	47	10	19	2	2	3	1	7
Total Analysis Volume [veh/h]	3	144	24	12	187	41	75	8	8	10	4	27
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	101			22			268			257		
Exiting Flow Rate [veh/h]	260			285			55			54		
Demand Flow Rate [veh/h]	2	112	19	9	145	32	58	6	6	8	3	21
Adjusted Demand Flow Rate [veh/h]	3	144	24	12	187	41	75	8	8	10	4	27

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00
A (intercept)	1380.00	1380.00	1380.00	1380.00
B (coefficient)	0.00102	0.00102	0.00102	0.00102
HV Adjustment Factor	0.82	0.80	0.98	0.84
Entry Flow Rate [veh/h]	210	300	94	50
Capacity of Entry and Bypass Lanes [veh/h]	1245	1350	1051	1062
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1018	1081	1028	887
X, volume / capacity	0.17	0.22	0.09	0.05

Movement, Approach, & Intersection Results

Lane LOS	A	A	A	A
95th-Percentile Queue Length [veh]	0.60	0.85	0.29	0.15
95th-Percentile Queue Length [ft]	15.07	21.24	7.27	3.63
Approach Delay [s/veh]	5.09	5.39	4.29	4.49
Approach LOS	A	A	A	A
Intersection Delay [s/veh]	5.04			
Intersection LOS	A			

Intersection Level Of Service Report
Intersection 2: Hwy 87 & Armington Road

Control Type:	Two-way stop	Delay (sec / veh):	12.0
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.031

Intersection Setup

Name	Hwy 87			Hwy 87			Armington Road			Armington Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Hwy 87			Hwy 87			Armington Road			Armington Road		
Base Volume Input [veh/h]	0	87	7	4	94	2	1	5	0	9	6	2
Base Volume Adjustment Factor	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790
Heavy Vehicles Percentage [%]	0.00	25.10	28.60	0.00	28.70	0.00	0.00	0.00	0.00	22.20	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	137	11	6	148	3	2	8	0	14	9	3
Peak Hour Factor	0.8430	0.8430	0.8430	0.8430	0.8430	0.8430	0.8430	0.8430	0.8430	0.8430	0.8430	0.8430
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	41	3	2	44	1	1	2	0	4	3	1
Total Analysis Volume [veh/h]	0	163	13	7	176	4	2	9	0	17	11	4
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.03	0.02	0.00
d_M, Delay for Movement [s/veh]	7.56	0.00	0.00	7.56	0.00	0.00	11.40	11.54	9.26	11.99	11.74	9.46
Movement LOS	A	A	A	A	A	A	B	B	A	B	B	A
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.00	0.01	0.00	0.00	0.06	0.06	0.06	0.18	0.18	0.18
95th-Percentile Queue Length [ft/ln]	0.00	0.00	0.00	0.37	0.00	0.00	1.49	1.49	1.49	4.38	4.38	4.38
d_A, Approach Delay [s/veh]	0.00			0.28			11.51			11.59		
Approach LOS	A			A			B			B		
d_I, Intersection Delay [s/veh]	1.36											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 3: Hwy 89 & Bingman Coulee Road

Control Type:	Two-way stop	Delay (sec / veh):	8.2
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.004

Intersection Setup

Name	Hwy 89		Hwy 89		Bingman Coulee Road	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	70.00		70.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Hwy 89		Hwy 89		Bingman Coulee Road	
Base Volume Input [veh/h]	2	91	95	0	0	0
Base Volume Adjustment Factor	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790
Heavy Vehicles Percentage [%]	50.00	16.30	19.50	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	3	144	150	0	0	0
Peak Hour Factor	0.7240	0.7240	0.7240	0.7240	0.7240	0.7240
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	50	52	0	0	0
Total Analysis Volume [veh/h]	4	199	207	0	0	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	8.21	0.00	0.00	0.00	11.04	9.29
Movement LOS	A	A	A	A	B	A
95th-Percentile Queue Length [veh/ln]	0.01	0.01	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	0.17	0.17	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	0.16		0.00		10.17	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	0.08					
Intersection LOS	A					

Appendix D

Projected Conditions Operations Analysis

Central Montana Transportation Study

US 87 Armington Junction - Otter Creek Canyon Analysis

Central MT - Armington Junction

Vistro File: F:\...\Armington Intersection LOS.vistro Scenario 4 2045 PM Peak

Report File: F:\...\2045 PM Peak.pdf 3/19/2025

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Hwy 87 & Hwy 89	Roundabout	HCM 7th Edition	SB Thru		6.4	A
2	Hwy 87 & Armington Road	Two-way stop	HCM 7th Edition	WB Left	0.063	15.1	C
3	Hwy 89 & Bingman Coulee Road	Two-way stop	HCM 7th Edition	NB Left	0.007	8.5	A

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Hwy 87 & Hwy 89

Control Type:	Roundabout	Delay (sec / veh):	6.4
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	Hwy 87			Hwy 87			Hwy89			Rest Area/Scale		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Hwy 87			Hwy 87			Hwy89			Rest Area/Scale		
Base Volume Input [veh/h]	1	71	12	6	92	20	37	4	4	5	2	13
Base Volume Adjustment Factor	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790
Heavy Vehicles Percentage [%]	100.00	21.10	25.00	33.30	28.20	10.00	2.70	0.00	0.00	20.00	0.00	23.10
Proportion of CAVs [%]	0.00											
Growth Factor	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	3	170	29	14	220	49	88	9	9	12	5	32
Peak Hour Factor	0.7770	0.7770	0.7770	0.7770	0.7770	0.7770	0.7770	0.7770	0.7770	0.7770	0.7770	0.7770
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	55	9	5	71	16	28	3	3	4	2	10
Total Analysis Volume [veh/h]	4	219	37	18	283	63	113	12	12	15	6	41
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	152			32			405			389		
Exiting Flow Rate [veh/h]	393			432			83			82		
Demand Flow Rate [veh/h]	3	170	29	14	220	49	88	9	9	12	5	32
Adjusted Demand Flow Rate [veh/h]	4	219	37	18	283	63	113	12	12	15	6	41

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00
A (intercept)	1380.00	1380.00	1380.00	1380.00
B (coefficient)	0.00102	0.00102	0.00102	0.00102
HV Adjustment Factor	0.82	0.80	0.98	0.84
Entry Flow Rate [veh/h]	319	455	141	75
Capacity of Entry and Bypass Lanes [veh/h]	1182	1336	914	928
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	966	1070	894	777
X, volume / capacity	0.27	0.34	0.15	0.08

Movement, Approach, & Intersection Results

Lane LOS	A	A	A	A
95th-Percentile Queue Length [veh]	1.09	1.52	0.54	0.26
95th-Percentile Queue Length [ft]	27.29	38.03	13.51	6.49
Approach Delay [s/veh]	6.44	6.79	5.53	5.44
Approach LOS	A	A	A	A
Intersection Delay [s/veh]	6.37			
Intersection LOS	A			

Intersection Level Of Service Report
Intersection 2: Hwy 87 & Armington Road

Control Type:	Two-way stop	Delay (sec / veh):	15.1
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.063

Intersection Setup

Name	Hwy 87			Hwy 87			Armington Road			Armington Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Hwy 87			Hwy 87			Armington Road			Armington Road		
Base Volume Input [veh/h]	0	87	7	4	94	2	1	5	0	9	6	2
Base Volume Adjustment Factor	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790
Heavy Vehicles Percentage [%]	0.00	25.10	28.60	0.00	28.70	0.00	0.00	0.00	0.00	22.20	0.00	0.00
Growth Factor	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	208	17	9	224	5	3	12	0	21	14	5
Peak Hour Factor	0.8430	0.8430	0.8430	0.8430	0.8430	0.8430	0.8430	0.8430	0.8430	0.8430	0.8430	0.8430
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	62	5	3	66	1	1	4	0	6	4	1
Total Analysis Volume [veh/h]	0	247	20	11	266	6	4	14	0	25	17	6
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.03	0.00	0.06	0.04	0.01
d_M, Delay for Movement [s/veh]	7.76	0.00	0.00	7.77	0.00	0.00	13.96	13.59	10.01	15.08	14.16	10.58
Movement LOS	A	A	A	A	A	A	B	B	B	C	B	B
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.00	0.03	0.00	0.00	0.13	0.13	0.13	0.37	0.37	0.37
95th-Percentile Queue Length [ft/ln]	0.00	0.00	0.00	0.64	0.00	0.00	3.25	3.25	3.25	9.13	9.13	9.13
d_A, Approach Delay [s/veh]	0.00			0.30			13.67			14.19		
Approach LOS	A			A			B			B		
d_I, Intersection Delay [s/veh]	1.64											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 3: Hwy 89 & Bingman Coulee Road

Control Type:	Two-way stop	Delay (sec / veh):	8.5
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.007

Intersection Setup

Name	Hwy 89		Hwy 89		Bingman Coulee Road	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	70.00		70.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Hwy 89		Hwy 89		Bingman Coulee Road	
Base Volume Input [veh/h]	2	91	95	0	0	0
Base Volume Adjustment Factor	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790
Heavy Vehicles Percentage [%]	50.00	16.30	19.50	0.00	0.00	0.00
Growth Factor	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	218	227	0	0	0
Peak Hour Factor	0.7240	0.7240	0.7240	0.7240	0.7240	0.7240
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	75	78	0	0	0
Total Analysis Volume [veh/h]	7	301	314	0	0	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	8.54	0.00	0.00	0.00	13.08	9.92
Movement LOS	A	A	A	A	B	A
95th-Percentile Queue Length [veh/ln]	0.01	0.01	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	0.29	0.29	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	0.19		0.00		11.50	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	0.10					
Intersection LOS	A					

Central MT - Armington Junction

Vistro File: F:\...\Armington Intersection LOS.vistro Scenario 3 2045 AM Peak

Report File: F:\...\2045 AM Peak.pdf 3/19/2025

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Hwy 87 & Hwy 89	Roundabout	HCM 7th Edition	WB Right		6.3	A
2	Hwy 87 & Armington Road	Two-way stop	HCM 7th Edition	EB Left	0.014	13.4	B
3	Hwy 89 & Bingman Coulee Road	Two-way stop	HCM 7th Edition	NB Left	0.002	7.7	A

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Hwy 87 & Hwy 89

Control Type:	Roundabout	Delay (sec / veh):	6.3
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	Hwy 87			Hwy 87			Hwy89			Rest Area/Scale		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Hwy 87			Hwy 87			Hwy89			Rest Area/Scale		
Base Volume Input [veh/h]	2	62	23	16	78	27	10	1	2	16	0	38
Base Volume Adjustment Factor	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790
Heavy Vehicles Percentage [%]	0.00	6.50	52.20	87.60	12.90	14.80	0.00	100.00	0.00	100.00	0.00	31.60
Proportion of CAVs [%]	0.00											
Growth Factor	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	149	55	38	186	65	24	3	5	38	0	91
Peak Hour Factor	0.8490	0.8490	0.8490	0.8490	0.8490	0.8490	0.8490	0.8490	0.8490	0.8490	0.8490	0.8490
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	44	16	11	55	19	7	1	1	11	0	27
Total Analysis Volume [veh/h]	6	176	65	45	219	77	28	4	6	45	0	107
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	120			96			422			221		
Exiting Flow Rate [veh/h]	343			356			94			191		
Demand Flow Rate [veh/h]	5	149	55	38	186	65	24	3	5	38	0	91
Adjusted Demand Flow Rate [veh/h]	6	176	65	45	219	77	28	4	6	45	0	107

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00
A (intercept)	1380.00	1380.00	1380.00	1380.00
B (coefficient)	0.00102	0.00102	0.00102	0.00102
HV Adjustment Factor	0.87	0.84	0.95	0.68
Entry Flow Rate [veh/h]	286	408	40	223
Capacity of Entry and Bypass Lanes [veh/h]	1221	1252	898	1101
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1058	1047	856	753
X, volume / capacity	0.23	0.33	0.04	0.20

Movement, Approach, & Intersection Results

Lane LOS	A	A	A	A
95th-Percentile Queue Length [veh]	0.91	1.43	0.14	0.75
95th-Percentile Queue Length [ft]	22.66	35.69	3.48	18.80
Approach Delay [s/veh]	5.61	6.73	4.63	7.00
Approach LOS	A	A	A	A
Intersection Delay [s/veh]	6.32			
Intersection LOS	A			

Intersection Level Of Service Report
Intersection 2: Hwy 87 & Armington Road

Control Type:	Two-way stop	Delay (sec / veh):	13.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.014

Intersection Setup

Name	Hwy 87			Hwy 87			Armington Road			Armington Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Hwy 87			Hwy 87			Armington Road			Armington Road		
Base Volume Input [veh/h]	0	84	1	3	91	3	2	0	0	0	2	4
Base Volume Adjustment Factor	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790
Heavy Vehicles Percentage [%]	0.00	17.90	0.00	0.00	27.50	0.00	0.00	0.00	0.00	0.00	0.00	25.00
Growth Factor	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	202	3	8	218	8	5	0	0	0	5	9
Peak Hour Factor	0.8190	0.8190	0.8190	0.8190	0.8190	0.8190	0.8190	0.8190	0.8190	0.8190	0.8190	0.8190
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	62	1	2	67	2	2	0	0	0	2	3
Total Analysis Volume [veh/h]	0	247	4	10	266	10	6	0	0	0	6	11
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01
d_M, Delay for Movement [s/veh]	7.77	0.00	0.00	7.74	0.00	0.00	13.41	13.17	9.78	13.13	13.26	10.06
Movement LOS	A	A	A	A	A	A	B	B	A	B	B	B
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.00	0.02	0.00	0.00	0.04	0.04	0.04	0.09	0.09	0.09
95th-Percentile Queue Length [ft/ln]	0.00	0.00	0.00	0.57	0.00	0.00	1.05	1.05	1.05	2.19	2.19	2.19
d_A, Approach Delay [s/veh]	0.00			0.27			13.41			11.19		
Approach LOS	A			A			B			B		
d_I, Intersection Delay [s/veh]	0.62											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 3: Hwy 89 & Bingman Coulee Road

Control Type:	Two-way stop	Delay (sec / veh):	7.7
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.002

Intersection Setup

Name	Hwy 89		Hwy 89		Bingman Coulee Road	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	70.00		70.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Hwy 89		Hwy 89		Bingman Coulee Road	
Base Volume Input [veh/h]	1	83	88	0	0	0
Base Volume Adjustment Factor	1.5790	1.5790	1.5790	1.5790	1.5790	1.5790
Heavy Vehicles Percentage [%]	0.00	26.50	26.10	0.00	0.00	0.00
Growth Factor	1.5160	1.5160	1.5160	1.5160	1.5160	1.5160
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	3	199	211	0	0	0
Peak Hour Factor	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	57	60	0	0	0
Total Analysis Volume [veh/h]	3	227	240	0	0	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	7.69	0.00	0.00	0.00	11.52	9.48
Movement LOS	A	A	A	A	B	A
95th-Percentile Queue Length [veh/ln]	0.01	0.01	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	0.13	0.13	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	0.10		0.00		10.50	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	0.05					
Intersection LOS	A					