City of Laurel

Long Range Transportation Plan—2014

April 28, 2014

Prepared by:

Robert Peccia & Associates

825 Custer Ave | Helena, MT 59604

City of Laurel

Long Range Transportation Plan – 2014

April 28, 2014

Prepared for:

City of Laurel

City Planning | 115 W 1st Street | Laurel, MT 59044

In cooperation with:

Montana Department of Transportation

2701 Prospect Avenue | Helena, MT 59620

Prepared by:

Robert Peccia & Associates

825 Custer Avenue

Helena, MT 59604

406.447.5000

www.rpa-hln.com

ADDENDUM / ERRATA

This addendum is intended to address amendments made to the *City of Laurel Long Range Transportation Plan* prior to the public hearing and resolution for adoption by the Laurel City Council on May 6, 2014. The amendments were made in response to the public comments received in the letter on the following page.

The following short range projects are to be added to **Section 5.2.1** of the *City of Laurel Long Range Transportation Plan* (April 28, 2014):

SR-9: US 212 / Bernhardt Road Intersection

This intersection presently has stop control along Bernhardt Road. Future land use changes at the CHS facility are expected to change travel patterns in the area. Specifically, it is anticipated that truck traffic will be shifted to the intersection of Bernhardt Road and US 212. If traffic patterns change such that operational issues are realized, it is recommended that a traffic signal, or other traffic control device, be evaluated and installed when warrants are met.

Estimated Cost: $300,000

SR-10: US 212 Speed Study (Yellowstone River Bridge to I-90)

This section of US 212 has a posted speed limit of 45 mph. The roadway section consists of two travel lanes in each direction and a center TWLTL. There are multiple access points with stop control on the minor approach legs. The CHS facility is bisected by the highway which results in unique travel patterns and a mixture of commercial and large vehicle traffic. Local concern has been expressed regarding safety due to high vehicle speeds and vehicle mixtures. It is recommended that a speed study be conducted to evaluate the appropriate speed limit for this portion of the highway. Note that the Transportation Commission must approve special speed zones on the highway system (MCA 61-8-309).

Estimated Cost: $10,000

CHS

803 Hwy 212 South
Laurel, MT
59063

April 21, 2014

Jeff Key, Traffic & Transportation Manager
Robert Peccia & Associates
825 Custer Ave
Helena, MT 59604

Dear Mr. Key:

The CHS Laurel Refinery thanks RPA, City of Laurel, and MTDOT, for the opportunity to comment on the draft City of Laurel Transportation Plan. The Laurel Refinery falls within the footprint of the study area and its operation affects a number of items as outlined within the plan. CHS would like to suggest a meeting to discuss the plan and impacts. Agenda items would include:

- Mixed traffic concerns with Highway 212. Highway 212 bisects the refinery. Refinery operations can impact traffic on Hwy 212 with daily operations traffic, construction equipment, large contractor personal vehicle volume, and truck terminal traffic. Increasing traffic load, current highway speed, and changing refinery traffic patterns will all impact traffic on Highway 212. In addition there are emergency considerations we have had initial discussions with the State of Montana on.
- Bernhardt Road is listed as a restricted truck traffic road. This roadway is critical for refinery operation and it would be important to discuss the future for this roadway.
- Railroad Street is a key access roadway to the west side of the refinery. Changes to this roadway could impact our west side operations.
- The I-90 West Laurel Interchange may impact future refinery plans, employee/contractor access, oversized load transporting, especially during high traffic times such as bi-annual turnarounds.
- Future refinery operation/expansion.
- Improving emergency response access to the refinery.

We look forward to discussing these items with you, potentially on April 29th. Please contact me at (406)628-5256 at your convenience. Thank you for your consideration.

Sincerely,

Greg Brown
EHS Manager
CHS Laurel Refinery

Cc: Monica Plecker, Laurel Project Manager

TABLE OF CONTENTS

LIST OF FIGURES

List of Tables

ACKNOWLEDGMENTS

The successful completion of this project was made possible through cooperation and assistance of many individuals. The following people provided guidance and support throughout the course of this plan:

Laurel City Council

Emelie Eaton, Ward 1

Douglas Poehls, Ward 1

Bruce McGee, Ward 2

Richard Herr, Ward 2

Chuck Dickerson, Ward 3

Scot Stokes, Ward 3

Tom Nelson, Ward 4

Bill Mountsier, Ward 4

City of Laurel Staff

Monica Plecker, Laurel Project Manager

Heidi Jensen, Chief Administrative Officer

Kurt Markegard, Public Works Director

Kenneth Olson, Jr, Mayor (2013)

Mark Mace, Mayor (2014)

Montana Department of Transportation Staff

Stefan Streeter, Billings District Administrator

Carol Strizich, Statewide and Urban Planning Supervisor

Katie Potts, Transportation Planner

Tom Kahle, Travel Demand Modeler

Consultant Team

The Traffic and Transportation Division of the consulting firm of Robert Peccia and Associates was the prime consultant for this Plan. The following team-members were contributors to this Plan:

Jeff Key, PE, Traffic and Transportation Manager

Scott Randall, PE, PTOE, Project Manager

Dan Norderud, AICP, Senior Planner

Garrett Gurnett, EI, Engineering Technician

Kari Slyder, Production Manager

ACRONYMS

AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ACS	American Community Survey
ADA	Americans with Disabilities Act
BEA	Bureau of Economic Analysis
BNSF	Burlington Northern Santa Fe
CEIC	Census & Economic Information Center
CHS	Cenex Harvest States
CIL	Compact Interchange Lighting
CMAQ	Congestion Mitigation and Air Quality
DHV	Design Hourly Volume
FHWA	Federal Highway Administration
FLAP	Federal Lands Highway Program
FTA	Federal Transit Administration
GIS	Geographic Information Systems
HSIP	Highway Safety Improvement Program
HSSR	Highway State Special Revenue
IM	Interstate Maintenance
LOS	Level of Service
LRTP	Long Range Transportation Plan
MACI	Montana Air Congestion Initiative
MAP-21	Moving Ahead for Progress in the 21st Century Act
MCA	Montana Code Annotated
MDT	Montana Department of Transportation
MRFL	Montana Rail Freight Loan
MRL	Montana Rail Link
MSN	Major Street Network
MUTCD	Manual on Uniform Traffic Control Devices
NACTO	National Association of City Transportation Officials
NHPB	National Highway Performance Bridge
NHPP	National Highway Performance Program
NHS	National Highway System
PCPI	Per Capita Personal Income
PDO	Property Damage Only
PIL	Partial Interchange Lighting
REMI	Regional Economic Models, Inc.
RSID	Rural Special Improvement District
SID	Special Improvement District
SPUI	Single Point Urban Interchange
SR	Short Range
SRTS	Safe Routes to Schools
STIP	Statewide Transportation Improvement Program
STP	Surface Transportation Program
STPP	Surface Transportation Program Primary
STPS	Surface Transportation Program Secondary
STPU	Surface Transportation Program Urban
STPX	Surface Transportation Program Off-system
TA	Transportation Alternatives
TIF	Tax Increment Financing
TWLTL	Two-way, Left-turn Lane
UPP	Urban Pavement Preservation
v/c	Volume-to-Capacity Ratio
vpd	Vehicles per Day

1.0
Introduction and Background

This Long Range Transportation Plan (LRTP) was developed to provide a blueprint for guiding transportation infrastructure investments based on system needs and associated decision making principles. The LRTP is intended to offer guidance for the decision-makers in the Laurel area. It contains a multi-modal analysis of the transportation system in the greater Laurel area. This Plan includes an examination of existing and projected traffic operations, the road network, safety, alternative transportation modes, and land use. This document also identifies the needs and constraints of the various transportation systems and offers recommendations in the form of improvement projects and progressive programs aimed at relieving existing problems and/or meeting future demand.

The most recent Transportation Plan developed for the Laurel area was completed in 1978 by Cumin Associates. Much has changed in Laurel since 1978 which has necessitated the need for the development of this LRTP. It is the intent of this planning process to build upon existing planning efforts and known transportation evaluations, with the resulting document providing a comprehensive analysis of the existing transportation system, future growth, socio-economic considerations, and recommended improvements for the Laurel area transportation system.

1.1. STUDY AREA

Transportation plans generally begin by defining the study area. Sometimes the study area follows governmental boundaries such as city limits, but most often they include land outside existing city limits in which future growth is seen as likely to occur. The study area should include land where recent growth has occurred or is anticipated to occur in the foreseeable future. In addition, the study area should include areas that are subject to the goals and policies of the City of Laurel. With this in mind, the study area was developed to include the 2010 Laurel Urban Boundary, which incorporates the entire incorporated City of Laurel proper. Additional area was added to the west of Golf Course Road to include the Laurel Golf Club and areas where future development may occur. The study area boundary used for this LRTP is shown on **Figure 1.1**.

Note that lands outside of the formal study area still affect the transportation system within Laurel. The City of Billings, for example, has an impact on operations within Laurel due to its close proximity and commuter traffic patterns. To that end, land use changes outside of the study area are still accounted for and incorporated into the LRTP. Employment centers outside of the study area attract vehicle trips, necessitating the need for land use forecasting across jurisdictional areas. However, precise transportation system impacts and recommended improvements were not identified for facilities outside of the LRTP study area.

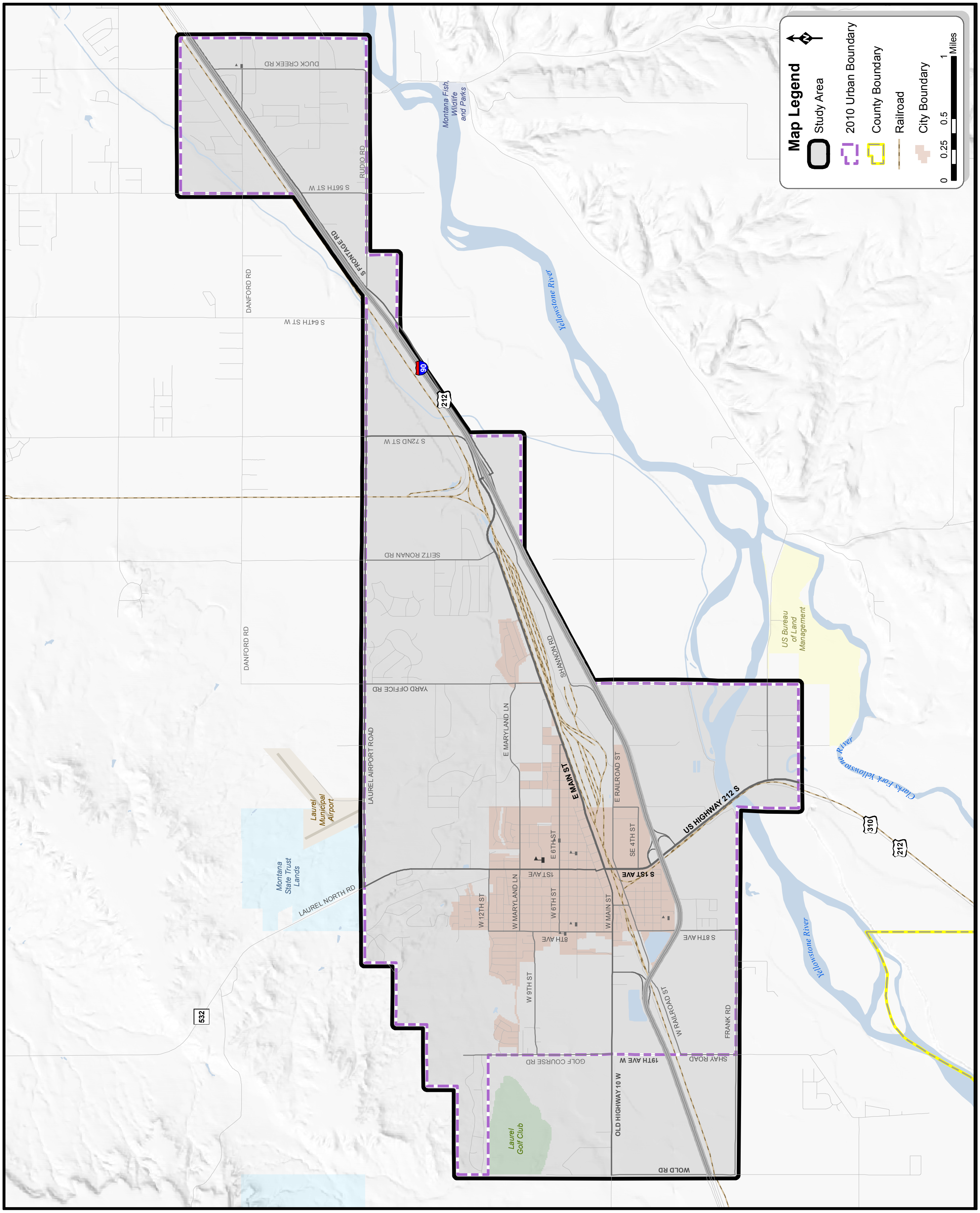


Figure 1.1: Study Area

1.2. OUTREACH AND PUBLIC INVOLVEMENT

Three formal public informational meetings were held at the Laurel Council Chambers during the LRTP planning process. The first meeting was an introductory meeting to discuss and identify the issues and visioning that should be addressed as part of the LRTP. This meeting focused on informing the public about the scope of the planning process, key dates during its development, and review of the study area boundary and draft goals and objectives for the transportation system.

The second public meeting was held to review the transportation system issues and areas of concern, and to assure that major transportation problems were identified and included in the analysis. A summary of the existing and proposed transportation system conditions was presented. A variety of key issues were identified. The issues generally fell within four categories: 1) the need to plan for future growth; 2) to relieve traffic congestion; 3) to improve traffic safety; and 4) to provide alternatives to the automobile. Specific problem intersections and roadway corridors were identified and presented at this meeting.

The third public meeting was held after the preliminary project recommendations were completed. This meeting gave the public the opportunity to review the preliminary project recommendations in their entirety, including a thorough review of recommended projects that not only offered mitigation measures to solve existing transportation issues, but also measures to accommodate future growth issues.

Newspaper articles were used during the planning process to help keep the public informed. News releases were also issued prior to public meetings to generate interest in the process and to encourage participation by the public. Concurrent with the public meetings, newsletters and flyers were distributed and brought in hard copy format to the meetings.

The results of the traffic studies and analyses conducted during the study process were made available to the public on the City of Laurel website. As sections of the report and graphic displays became available, they were posted on the website for public review and comment. This enabled the public to stay abreast of the developments occurring during the planning process. It also provided an opportunity for the public to submit comments during the planning process.

1.3. GOALS AND OBJECTIVES

The mission of the LRTP is to "**plan for a balanced, safe, cost-effective transportation system that ensures adequate mobility to all persons, accommodates planned growth, facilitates economic development, recognizes fiscal reality, and maintains an acceptable standard of livability and safety**". To accomplish this mission, a set of goals and objectives was developed for the LRTP. This section outlines the fundamental principles that guided the transportation planning and development process to achieve the stated mission.

The goals and objectives were developed with the community's vision for the future transportation system in mind. Review of current and developing transportation issues in the study area aided in formulation of these goals and objectives.

The goals stated within this section provide all-encompassing statements that are intended to direct the overall direction of the LRTP towards the community's vision. These goals do not specify how the actions would be accomplished. Objectives were identified as more specific statements of measures or procedures that provide steps to how a goal can be attained. Usually, there are several objectives associated with a goal.

Six goals were identified for the LRTP. The individual goals and objectives recognize the need for a balance between safety, mobility, accessibility, cost, and environmental impact.

Goal 1: Preserve and Maintain the Existing Transportation System

The transportation system in the Laurel area is aging while available funding is insufficient for necessary maintenance activities. There is often competition between funding for new projects and maintenance and operations of the existing system. The existing transportation system should be enhanced through preservation and maintenance in order to maximize efficiency and reduce the need for new infrastructure investment.

Objectives:

1.1. Maintain existing roadway systems to optimize their usefulness and minimize life-cycle costs.

1.2. Monitor the performance of key facilities and work with regional partners to identify critical deficiencies in the roadway network.

1.3. Use transportation project selection criteria to identify and prioritize maintenance activities and project development.

1.4. Relieve pressures on the existing transportation system through minor infrastructure improvements, maintenance and system preservation activities rather than expanding the current system.

1.5. Encourage reuse and/or redevelopment around existing transportation facilities.

Goal 2: Improve Mobility and Accessibility for People and Goods

The transportation system should be developed to allow mobility for all and provide appropriate access to employment, housing, services and recreation areas. An efficient transportation system allows people to move from place to place in as direct a route as possible while allowing them to reduce the amount of time spent in travel. Increased connectivity allows citizens to make route decisions and mode choices based on traffic and road conditions, or desired destinations.

Objectives:

2.1. Identify and implement critical and cost-effective new capacity and operations investments to improve transportation system throughput and reliability.

2.2. Develop and maintain transportation facilities and services that meet the special needs of the elderly, low-income families, residents with hearing, vision, cognitive, or ambulatory difficulties, and those without access to private automobiles.

2.3. Encourage projects, designs and initiatives that promote a shared, safe transportation system for all users.

Goal 3: Provide a Safe and Secure Transportation System

The transportation system should be enhanced to improve community safety and security by increasing efficiency and providing a system that is easily accessed by all users. Reducing crashes, improving emergency response times, and providing evacuation routes in the event of a natural disaster will assist to improving the safety and security of the transportation system. Educational programs that help travelers understand the particular safety concerns associated with various travel modes can also help all users travel with increased confidence and security.

Objectives:

3.1. Develop a "Major Street Network" classifying existing roadways within the study area by functional usage.

3.2. Reduce the rates of fatalities and crashes occurring on all transportation facilities.

3.3. Identify barriers to effective and prompt emergency response.

3.4. Implement safety initiatives and educational programs for all modes of transportation.

3.5. Coordinate with freight operators and agencies on projects that can enhance the security of the freight transportation system in the region.

Goal 4: Encourage and Solicit Public Involvement

Public involvement is an important component in a successful transportation planning process. Public outreach will educate the public on the critical elements of planning for the future of the transportation system. Public involvement will allow the public to voice their interests and concerns, participate in the planning of the community, and will also increase their investment in the transportation plan.

Objectives:

4.1. Develop and carry out a public participation program that includes activities to educate and engage the public.

4.2. Actively solicit the participation of the local community, special-interest groups and individual citizens in the transportation planning process.

4.3. Reach out to under-represented persons and groups to ensure that decisions are made with their input taken into consideration.

4.4. Ensure that community standards and values, such as aesthetics, neighborhood preservation, and community image are incorporated.

Goal 5: Promote a Financially Sustainable Transportation System

A financially sustainable transportation plan is necessary in order to guide the transportation decision-making process in future years. This will help ensure the use of available funds to their maximum potential by implementing feasible improvement projects that have been previously identified. A sound financial base for the transportation system is provided through responsible management of public assets and resources and identification and implementation of funding strategies to ensure long-term balanced investment in the transportation system.

Objectives:

5.1. Identify available funding mechanisms potentially including federal and state gas tax revenue, impact fees, transportation bond issues, local option gas taxes, and other revenue funding sources used in similar cities.

5.2. Encourage cooperation between public, private and non-profit organizations in the development, funding, and management of transportation projects.

5.3. Promote cost-effective recommendations that balance transportation system needs with available funding and expected expenditures.

Goal 6: Link Transportation and Land Use

Linking transportation and land use planning is important to help ensure that the transportation system effectively and efficiently serves existing and future development within the community. This coordination helps ensure that existing and future industrial, commercial, and service centers and housing concentrations are adequately connected to the region's transportation system and appropriately located to preserve the quality of life in the community. Policies and partnerships should be developed to protect the capacity of the transportation system to strengthen the coordination between land use and transportation planning.

Objectives:

6.1. Integrate land use planning and transportation planning to manage and develop the transportation system.

6.2. Use transportation project programming to encourage desired development patterns within the community and ensure new development is adequately served.

6.3. Develop and implement consistent access management and corridor preservation standards, ordinances and plans appropriate to the roadway network and land use throughout the area.

6.4. Ensure an environmentally responsible and sound transportation system that minimizes adverse environmental impacts within the community.

This page intentionally left blank.

2.0
Existing Transportation System

In an effort to clearly understand the existing and projected traffic conditions and potential problem areas, information was gathered about the transportation system. Traffic data was used to establish exiting conditions on major road segments within the study area. The existing data was forecasted out to the year 2035 using growth projections applied to the travel demand model built for this LRTP. The existing and projected data was used to determine operational characteristics and to identify traffic issues that may exist or are likely to occur within the foreseeable future.

Current information about the transportation system was analyzed to establish the existing traffic conditions and to determine potential problem areas. Existing data was provided by the Montana Department of Transportation (MDT), the City of Laurel, and Yellowstone County. Additional data was collected in the spring and summer of 2013 to supplement available information. The combination of supplied data and collected data was used to determine the existing operational characteristics of the transportation system.

2.1. MAJOR STREET NETWORK

One of the initial steps in trying to understand a community's existing transportation system is to first identify what roadways will be evaluated as part of the larger planning process. A community's transportation system is made up of a hierarchy of roadways, with each roadway being classified according to certain parameters. Some of these parameters are geometric configuration, traffic volumes, spacing in the community transportation grid, speeds, and land use.

Emphasis was placed on roadways that are functionally classified as collectors, minor arterials, and principal arterials within the study area. These functional classifications can be encountered in both the "urban" and "rural" setting. The reasoning for examining the collector, minor arterial and principal arterial roadways, and not local roadways, is that when the major street network (i.e. collectors or above) is functioning to an acceptable level, the local roadways are not used beyond their intended function. When problems begin to occur on the major street network, vehicles and resulting issues begin to infiltrate neighborhood routes (i.e. local routes). As such, the overall health of a regional transportation system can be typically characterized by the major street network.

Roadway functional classifications within the study area include a segment of the interstate system, principal arterials, minor arterials, collector routes, and local streets. Rural roadways in the study area generally carry smaller volumes than urban areas. Although volumes may differ on urban and rural sections of a street, it is important to maintain coordinated right-of-way standards to allow for efficient operation of urban development. A description of these classifications is provided in the following sections. The existing major street network, along with existing functional classifications, is shown in **Figure 2.2**. Note that the functional classifications shown in this figure represent classifications deemed for the purpose of this LRTP and are not the "Federally Approved" Functional Classification system for the Laurel area. The "Federally Approved Functional Classification" system can be seen graphically via maps available at the Montana Department of Transportation's (MDT's) website at the following addresses:

- http://www.mdt.mt.gov/other/urban_maps/fc_internet/LAURELFUNC.PDF (Laurel Urban Area)
- http://www.mdt.mt.gov/travinfo/docs/funct-classification.pdf (Statewide Area)

Principal Arterial System

The purpose of the principal arterial is to serve the major centers of activity, the highest traffic volume corridors, and the longest trip distances in an area. This group of roads carries a high proportion of the total traffic. Most of the vehicles entering and leaving the area utilize principal arterials. Significant intra-area travel, such as between central business districts and outlying residential areas, and between major suburban centers, is served by principal arterials.

The spacing between principal arterials may vary from less than one mile in highly developed areas, to five miles or more on the urban fringes. Principal arterials connect to other principal arterials or to the interstate system. The major purpose of the principal arterial is to provide for the expedient movement of traffic. Service to abutting land is a secondary concern.

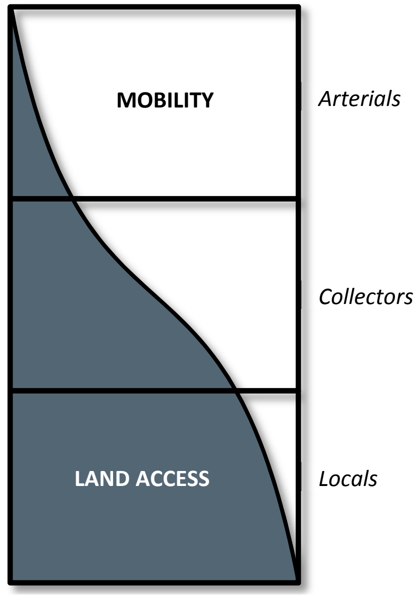


Figure 2.1: Functional Classification Proportion of Service

Minor Arterial Street System

The minor arterial street system interconnects with and augments the principal arterial system. It accommodates trips of moderate length at a somewhat lower level of travel mobility than principal arterials, and it distributes travel to smaller geographic areas. With an emphasis on traffic mobility, this street network includes all arterials not classified as principal arterials while providing access to adjacent lands.

The spacing of minor arterial streets may vary from several blocks to a half-mile in the highly developed areas of town, to several miles in the suburban fringes. They are not normally spaced more than one mile apart in fully developed areas.

Collector Street System

The urban collector street network serves a joint purpose – provide equal priority to the movement of traffic, and access to residential, business, and industrial areas. This type of roadway differs from those of the arterial system in that collector roadways may traverse residential neighborhoods. The collector system distributes trips from the arterials to ultimate destinations. The collector streets also collect traffic from local streets in the residential neighborhoods, channeling it into the arterial system.

The rural collector street network serves the same access and movement functions as the urban collector street network – a link between the arterial system and local access roads. Collectors penetrate but should not have continuity through residential neighborhoods. The actual location of collectors should be flexible to best serve developing areas and the public. Several design guidelines should be kept in mind as new subdivisions are designed and reviewed. The most important concept is that long segments of continuous collector streets are not compatible with a good functional classification of streets. Long, continuous collectors will encourage through traffic, essentially turning them into arterials. This, in turn, results in the undesirable interface of local streets with arterials, causing safety problems and increased costs of construction and maintenance. The collector street system should intersect arterial streets at a uniform spacing of one-half to one-quarter mile in order to maintain good progression on the arterial network. Ideally, collectors should be no longer than one to two miles and should be continuous. Opportunities need to be identified through good design and review of subdivisions to create appropriate collector streets in developing areas.

Local Street System

The local street network comprises all facilities not included in the higher systems. Its primary purpose is to permit direct access to abutting lands and connections to higher systems. Usually service to through-traffic movements is intentionally discouraged.

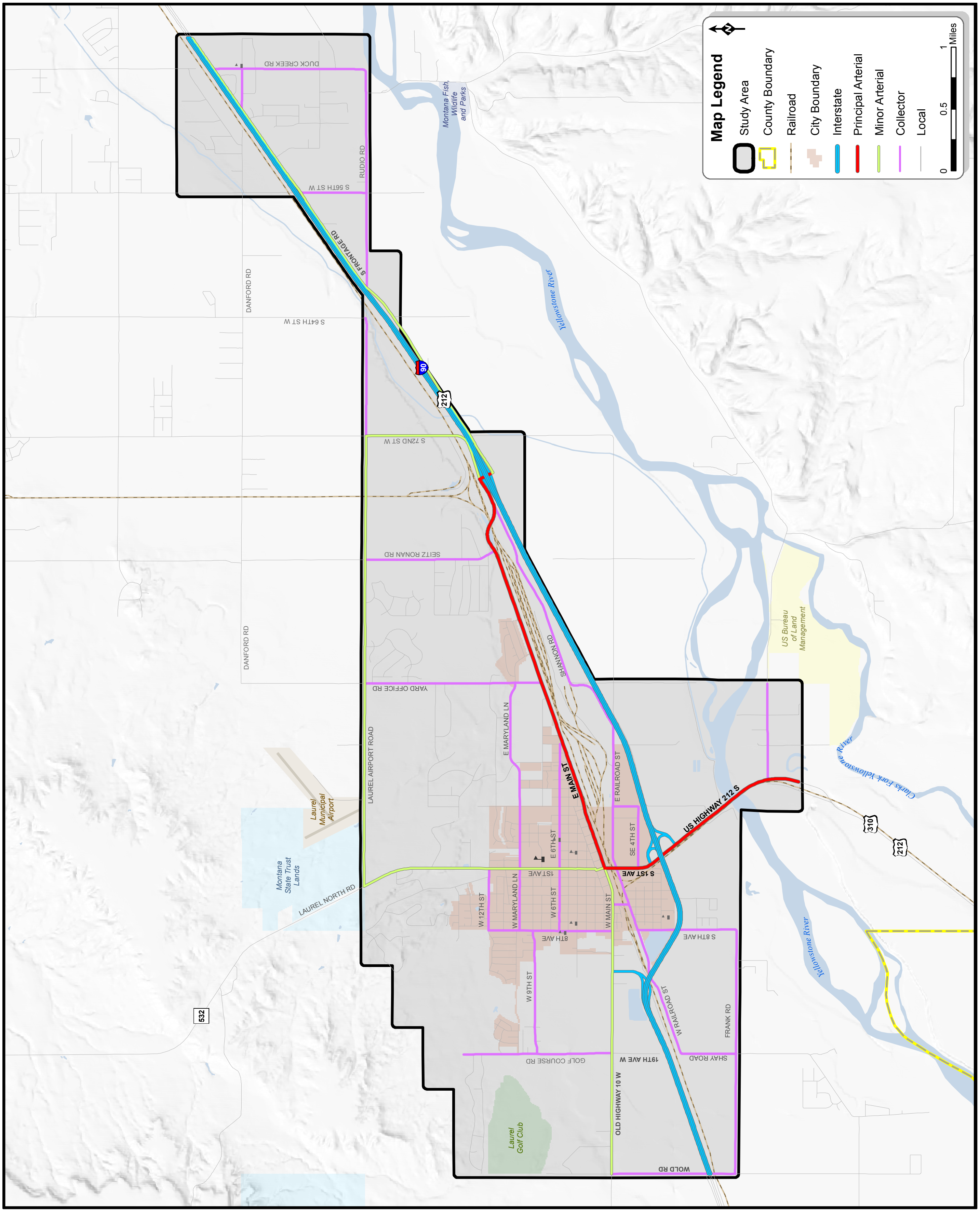


Figure 2.2: Existing Major Street Network

2.2. EXISTING ROADWAY VOLUME AND CAPACITY

Existing and historic roadway traffic data was used to establish existing traffic conditions and to provide reliable data on historic traffic volumes. Average annual daily traffic (AADT) counts for the year 2012 were used to represent existing conditions. **Figure 2.3** shows the existing AADT along the major street network. In addition, the major street network was examined to determine existing facility size. This information is presented in **Figure 2.4**.

Roadway capacity is of critical importance when looking at the growth of a community. As traffic volumes increase, vehicle flow deteriorates. When traffic volumes approach and exceed the available capacity, the road begins to "fail". For this reason it is important to look at the size and configuration of the current roadways and determine if these roads need to be expanded to accommodate the existing or projected traffic needs.

The capacity of a roadway is based on a number of features including number of lanes, intersection function, access, intersection spacing, vehicle fleet mix, and geometrics. Roadway capacity varies greatly and should be calculated on an individual basis. For planning and comparison purposes, however, theoretical roadway capacities were developed based on simplistic roadway configurations as shown in **Table 2.1**. These values are not intended to be used to set any thresholds for roadway performance, but rather provide some general information to be used to compare roadway performance. Note that traffic is not evenly distributed during the day. The transportation system experiences significant peaks of demand generally during the peak hours. These limited times create the greatest periods of stress on the transportation system. By concentrating large volumes in a brief period of time, a road's short-term capacity may be exceeded and a road user's perception of congestion is strongly influenced.

Table 2.1: Theoretical Roadway Capacity

Road Configuration	Capacity (vpd)*	
	Undivided	Divided / TWLTL
2 Lane	12,000	18,000
3 Lane	18,000	24,000
4 Lane	24,000	32,000
Interstate	-	68,000

**Values represent planning level daily capacities developed for this Transportation Plan and are intended for comparison purposes only. Actual physical roadway capacity can vary greatly depending on road design features and access control.*

A critical factor in roadway performance analysis is the proportion of the facility's capacity being utilized by current or projected traffic. This factor, called the volume to capacity (v/c) ratio, is often used as a measure of sufficiency of roadway capacity. By definition, the v/c ratio is the result of the traffic volume of a roadway divided by the capacity. A v/c ratio of 1.00, for example, means that the amount of traffic volume on the roadway is equal to the amount of available capacity.

Roadway capacity and v/c ratio can be used as a comparison tool when looking at the transportation system. A high v/c ratio indicates congestion and resultant vehicle delay. As the v/c ratio increases, vehicle delay related to congestion increases. Vehicle speed and travel times may be impacted on roadways with high v/c ratios. A v/c ratio of 0.85 to 1.00 indicates that a roadway is approaching capacity and that vehicle flow may start to deteriorate. A v/c ratio greater than 1.00 indicates that the volumes on a roadway exceed available capacity which may result in "grid-lock" traffic conditions. A v/c ratio may be lowered by either increasing roadway capacity (i.e. additional lanes, turn restrictions, etc.) or by decreasing traffic volumes.

Figure 2.5 shows the resultant v/c ratios of the existing major street network. The v/c ratios help identify potential capacity deficiencies for the transportation system. Locations where v/c ratios are greater than 0.85 may indicate issues related to vehicle congestion.

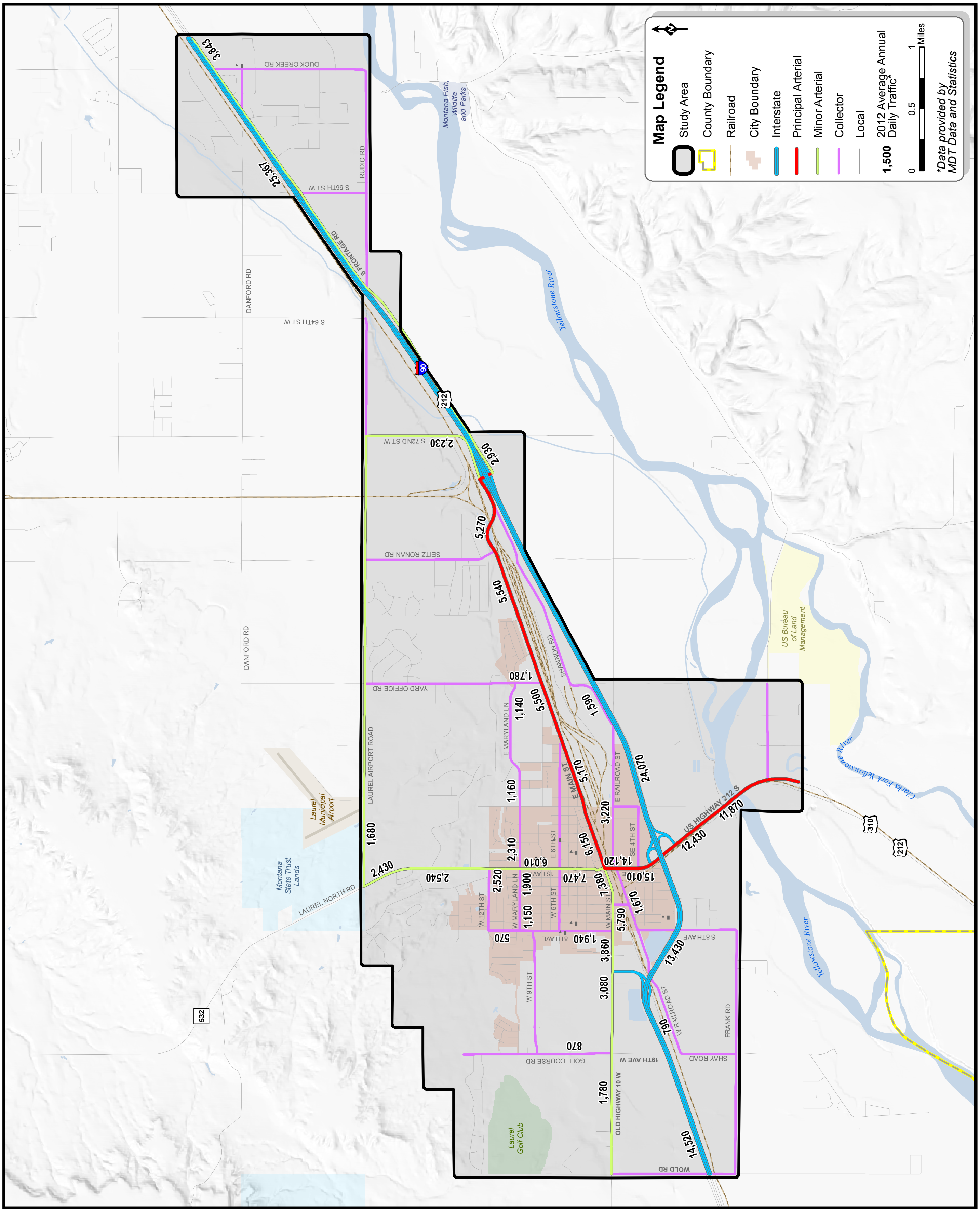


Figure 2.3: Existing Average Annual Daily Traffic

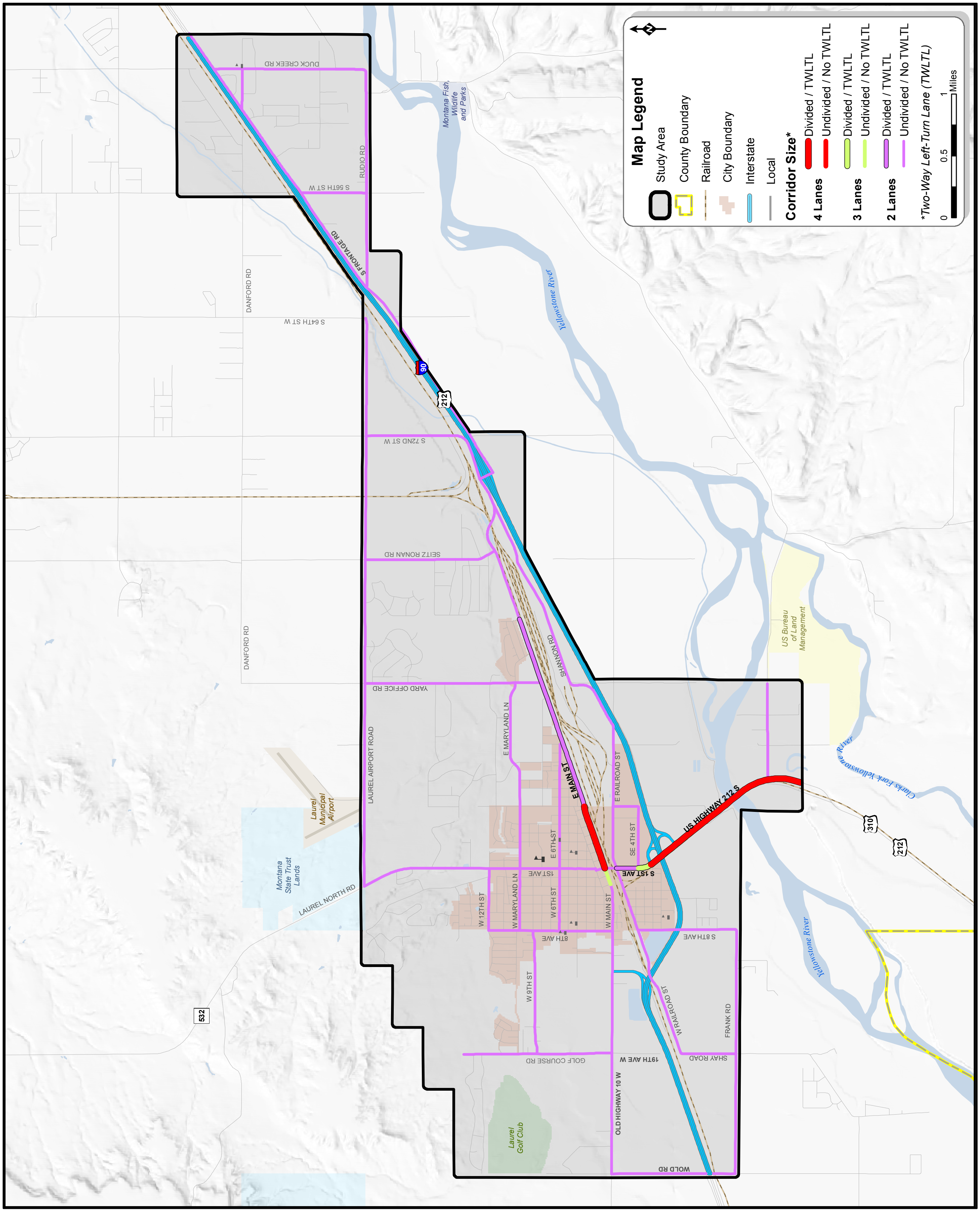


Figure 2.4: Existing Corridor Facility Size

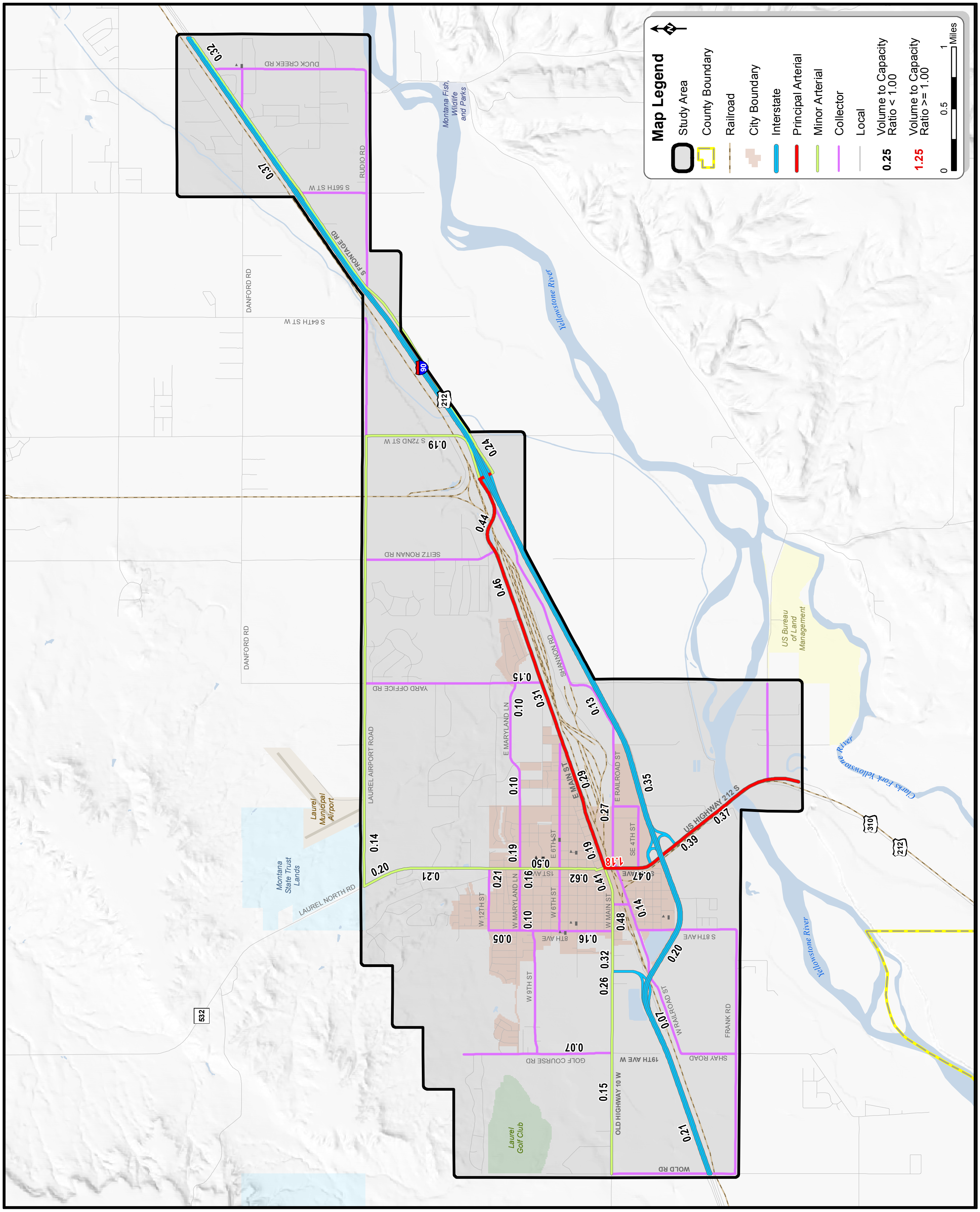


Figure 2.5: Existing Volume to Capacity Ratios

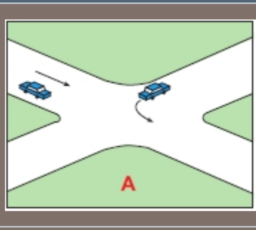
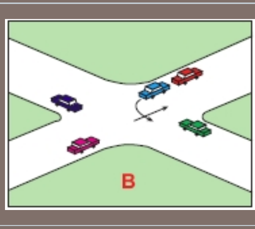
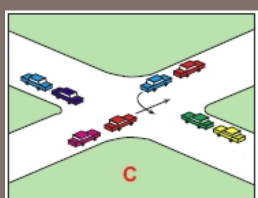
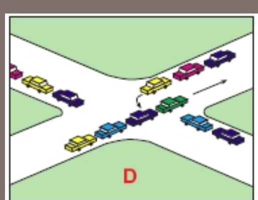
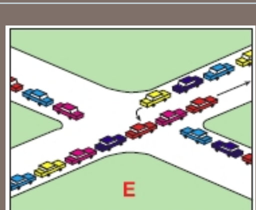
2.3. EXISTING INTERSECTION LEVEL OF SERVICE

Urban road systems are ultimately controlled by the function of the major intersections. Intersection failure directly reduces the number of vehicles that can be accommodated during the peak hours that have the highest demand and the total daily capacity of a corridor. As a result of this strong impact on corridor function, intersection improvements can be a cost-effective means of increasing a corridor's traffic volume capacity. In some circumstances, corridor expansion projects may be able to be delayed with correct intersection improvements. Due to the significant portion of total expense for road construction projects used for project design, construction mobilization, and adjacent area rehabilitation, a careful analysis must be made of the expected service life from intersection improvements. If adequate design life can be achieved with only improvements to the intersection, then a corridor expansion may not be the most efficient solution. With that in mind, it is important to determine how well the major intersections are functioning by determining their Level of Service (LOS).

LOS is a qualitative measure developed to quantify driver perception for elements such as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles. LOS provides a scale that is intended to match the perception by motorists of the operation of the intersection. LOS is used as a means for identifying intersections that are experiencing operational difficulties, as well as a comparison tool to other intersections. The LOS scale represents the full range of operating conditions. The scale is based on the ability of an intersection or street segment to accommodate the amount of traffic using it. The scale ranges from "A" which indicates little, if any, vehicle delay, to "F" which indicates significant vehicle delay and traffic congestion. **Table 2.2** provides a description of each LOS value.

A total of 12 intersections were analyzed for LOS, including 3 signalized and 9 unsignalized. Data was collected during the spring and summer of 2013. Each intersection was evaluated during the peak hours, defined as 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM. **Figure 2.6** shows the intersections where peak hour turning movement counts were collected.

Table 2.2: Intersection LOS Descriptions

LOS	Description	Average Delay per Vehicle (sec)	
		Signalized	Unsignalized
	Traffic moves freely, low volumes accompany the free flow condition. At signalized intersections, progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. At unsignalized intersections, nearly all drivers find freedom of operation with very little time spent waiting for an acceptable gap. Very seldom is there more than one vehicle in queue.	< 10	< 10
	Traffic moves fairly freely, volumes are somewhat low. At signalized intersections, there is good progression and/or short cycle lengths. Vehicles generally clear on one green phase. At unsignalized intersections, some drivers begin to consider the average control delay an inconvenience, but acceptable gaps are still very easy to find. Occasionally there is more than one vehicle in queue.	10 to 20	10 to 15
	Traffic moves smoothly, volumes are beginning to increase. At signalized intersections, higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, although many still pass through the intersection without stopping. At unsignalized intersections, average control delay becomes noticeable to most drivers, even though acceptable gaps are found on a regular basis. It is not uncommon for an arriving driver to find a standing queue of at least one additional vehicle.	20 to 35	15 to 25
	Traffic approaching unstable flow, the influence of congestion becomes more noticeable. At signalized intersections, longer delays may result from some combination of unfavorable progression, long cycle length, or high volume/capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable. At unsignalized intersections, average control delay is long enough to be an irritation to most drivers. Acceptable gaps are hard to find because there is a standing queue of vehicles already waiting when the driver arrives.	35 to 50	25 to 35
	Unstable traffic flow, volumes at or near capacity. At signalized intersections, the high delays generally indicate poor progression, long cycle lengths, and high volume/capacity ratios. Individual cycle failures are frequent occurrences. At unsignalized intersections, drivers find the length of the average control delay approaching intolerable levels. Acceptable gaps are hard to find because there is a standing queue of vehicles already waiting when the driver arrives.	50 to 80	35 to 50
	Saturation condition, volumes are over capacity. This is considered to be unacceptable to most drivers. This condition occurs with oversaturation. At signalized intersections, it may occur at high volume/capacity ratios with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such high delay values. At unsignalized intersections, delays are high because acceptable gaps are hard to find. Acceptable gaps are hard to find because there is a standing queue of vehicles already waiting when the driver arrives.	> 80	> 50

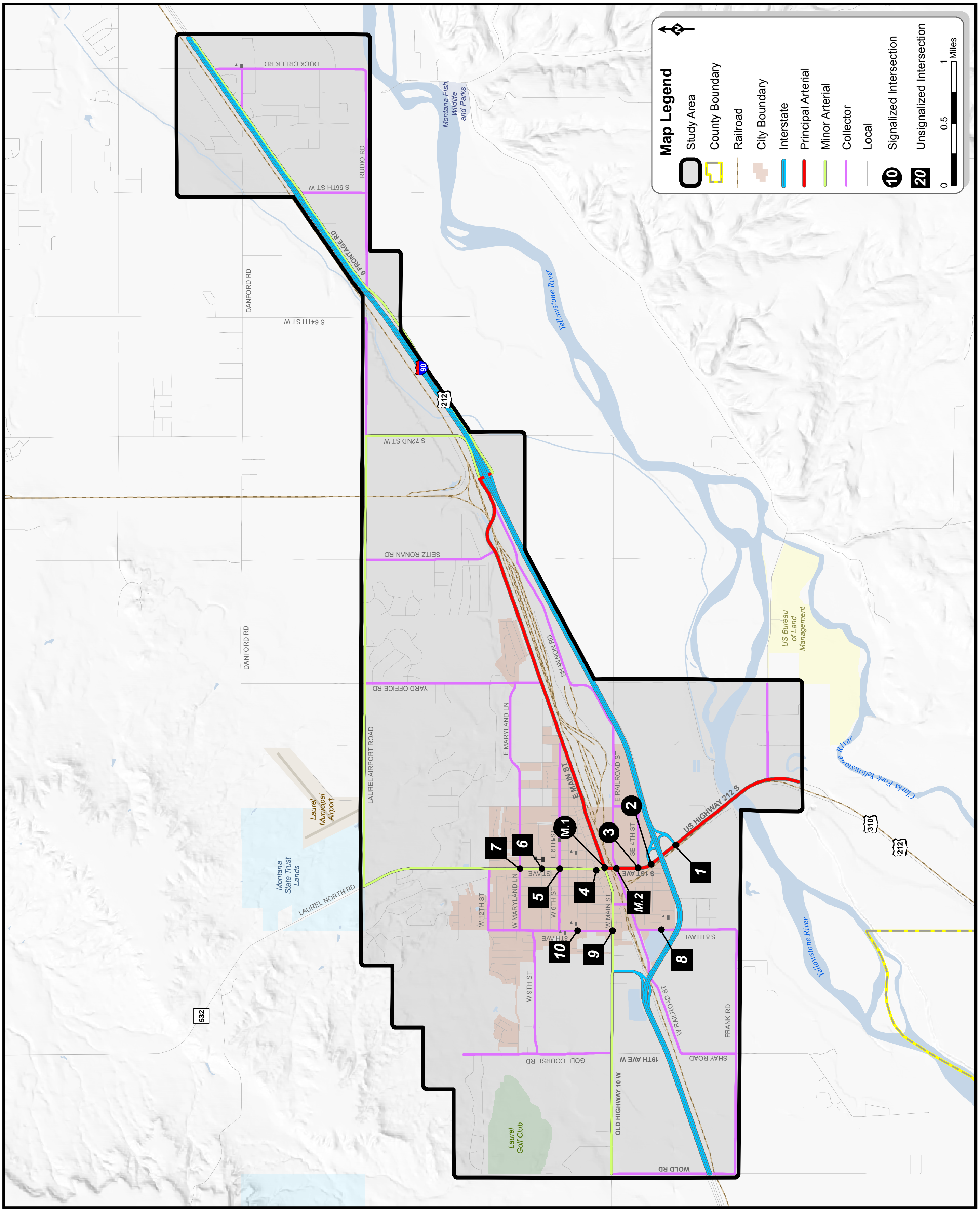


Figure 2.6: Intersection Count Locations

2.3.1. Level of Service Analysis

For signalized intersections, the LOS is based on the average stopped delay per vehicle. **Table 2.2** identifies the relationship between LOS and average stopped delay per vehicle. The procedures used to evaluate signalized intersections uses detailed information on geometry, lane use, signal timing, peak hour volumes, arrival types and other parameters. This information is then used to calculate delays and determine the capacity of each intersection. An intersection is generally determined to be functioning adequately if operating at LOS C or better.

LOS for two-way stop-controlled intersections is based on the delay experienced by each movement within the intersection, rather than on the overall stopped delay per vehicle at the intersection. This difference from the method used for signalized intersections is necessary since the operating characteristics of stop-controlled intersection are substantially different. Driver expectations and perceptions are also entirely different. For two-way stop controlled intersections the through traffic on the major (uncontrolled) street experiences no delay at the intersection. Conversely, vehicles turning left from the minor street experience more delay than other movements and at times can experience significant delay. Vehicles on the minor street which are turning right or going across the major street experience less delay than those turning left from the same approach. Due to this situation, the LOS assigned to a two-way stop controlled intersection is based on the maximum delay for vehicles on the minor street approach.

For all-way stop-controlled intersections, LOS is based on average vehicle delay experienced at the intersection. This methodology is similar to that of signalized intersections. **Table 2.3** shows the LOS and average vehicle delay for the study intersections during the AM and PM peak hours. The existing intersection LOS is shown in **Figure 2.7**.

Table 2.3: Existing Intersection LOS

ID	Intersection*	AM Peak Hour		PM Peak Hour	
		Delay (Sec)	LOS	Delay (Sec)	LOS
1	**US Highway 212 / EB Ramps (U)**	**14.5**	**B**	**26.6**	**D**
	Westbound Left/Thru	*54.3*	*F*	*59.0*	*F*
	Westbound Right	*10.5*	*B*	*10.1*	*B*
2	**S 1st Ave / WB Ramps (S)**	**18.4**	**B**	**36.2**	**D**
	Eastbound Left/Thru/Right	*21.3*	*C*	*9.3*	*A*
	Westbound Left	*40.7*	*D*	*67.6*	*E*
	Westbound Thru/Right	*20.5*	*C*	*13.3*	*B*
	Northbound Left	*10.2*	*B*	*37.2*	*D*
	Northbound Thru	*12.6*	*B*	*25.0*	*C*
	Northbound Right	*10.2*	*B*	*25.1*	*C*
	Southbound Left	*26.1*	*C*	*30.5*	*C*
	Southbound Thru	*9.4*	*A*	*51.6*	*D*
	Southbound Right	*9.4*	*A*	*52.3*	*D*
3	**S 1st Ave / SE 4th St (S)**	**11.9**	**B**	**19.9**	**B**
	Eastbound Left/Thru/Right	*29.6*	*C*	*21.1*	*C*
	Westbound Left	*39.1*	*D*	*34.6*	*C*
	Westbound Thru/Right	*31.2*	*C*	*20.4*	*C*
	Northbound Left	*8.3*	*A*	*13.7*	*B*
	Northbound Thru	*10.0*	*B*	*22.6*	*C*
	Northbound Right	*9.3*	*A*	*17.9*	*B*
	Southbound Left	*3.9*	*A*	*13.6*	*B*
	Southbound Thru/Right	*4.0*	*A*	*11.6*	*B*

ID	Intersection*	AM Peak Hour		PM Peak Hour	
		Delay (Sec)	LOS	Delay (Sec)	LOS
4	**1st Ave / 1st St (U-A)**	**11.0**	**B**	**11.8**	**B**
	Eastbound Left/Thru/Right	*9.5*	*A*	*9.7*	*A*
	Westbound Left/Thru/Right	*9.4*	*A*	*9.9*	*A*
	Northbound Left/Thru/Right	*11.3*	*B*	*13.1*	*B*
	Southbound Left/Thru/Right	*11.6*	*B*	*11.6*	*B*
5	**1st Ave / 6th St (U-A)**	**12.6**	**B**	**15.9**	**C**
	Eastbound Left/Thru/Right	*10.8*	*B*	*10.2*	*B*
	Westbound Left/Thru/Right	*12.3*	*B*	*9.9*	*A*
	Northbound Left/Thru/Right	*13.2*	*B*	*19.8*	*C*
	Southbound Left/Thru/Right	*13.1*	*B*	*12.5*	*B*
6	**1st Ave / 8th St (U)**	**22.8**	**C**	**19.7**	**C**
	Eastbound Left/Thru/Right	*22.8*	*C*	*17.0*	*C*
	Westbound Left/Thru/Right	*19.3*	*C*	*19.7*	*C*
7	**1st Ave / Maryland Ln (U)**	**44.8**	**E**	**34.6**	**D**
	Eastbound Left/Thru/Right	*20.7*	*C*	*17.3*	*C*
	Westbound Left/Thru/Right	*44.8*	*E*	*34.6*	*D*
8	**S 8th Ave / S 5th St (U)**	**9.0**	**A**	**11.0**	**B**
	Westbound Left/Right	*9.0*	*A*	*11.0*	*B*
9	**8th Ave / Main St (U)**	**17.1**	**C**	**18.5**	**C**
	Northbound Left/Thru/Right	*9.4*	*A*	*10.6*	*B*
	Southbound Left/Thru/Right	*17.1*	*C*	*18.5*	*C*
10	**8th Ave / 4th St (U)**	**11.1**	**B**	**10.5**	**B**
	Eastbound Left/Thru/Right	*11.1*	*B*	*9.9*	*A*
	Westbound Left/Thru/Right	*11.1*	*B*	*10.5*	*B*
M.1	**Main St / 1st Ave (S)**	**16.3**	**B**	**18.8**	**B**
	Eastbound Left	*18.1*	*B*	*29.5*	*C*
	Eastbound Thru	*17.2*	*B*	*26.4*	*C*
	Eastbound Right	*18.7*	*B*	*31.9*	*C*
	Westbound Left	*20.8*	*C*	*44.3*	*D*
	Westbound Thru	*16.8*	*B*	*26.4*	*C*
	Westbound Right	*16.2*	*B*	*24.9*	*C*
	Northbound Left/Thru	*11.8*	*B*	*9.9*	*A*
	Northbound Right	*9.7*	*A*	*5.2*	*A*
	Southbound Left/Thru/Right	*18.7*	*B*	*10.9*	*B*
M.2	**1st Ave / Railroad St (U)**	**18.0**	**C**	**75.5**	**F**
	Eastbound Left/Thru/Right	*18.0*	*C*	*34.9*	*D*
	Westbound Left/Thru/Right	*14.5*	*B*	*75.5*	*F*

**"S" = Signalized, "U" = Unsignalized, "U-A" = All-way stop control*

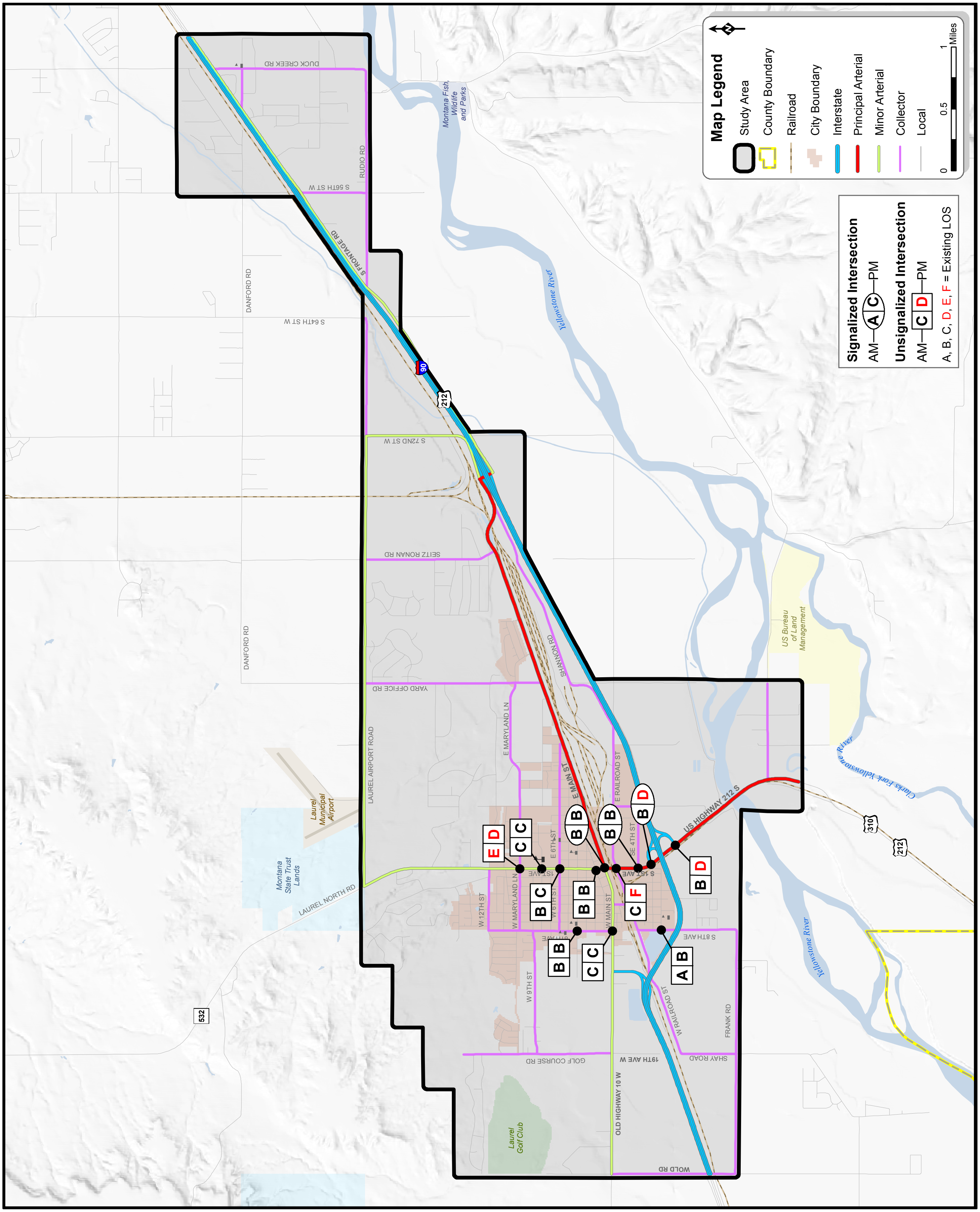


Figure 2.7: Existing Intersection LOS

2.4. ALTERNATIVE TRAVEL MODES

Alternative travel modes include those modes outside of personal vehicle travel. Alternative travel modes supplement standard vehicular traffic and encompass bicycle and pedestrian travel (non-motorized) and transit travel (motorized). This section highlights the importance of alternative travel modes and presents the current status of these facilities in the community. The following documents provided information on alternative travel modes in the Laurel community:

- **Non-Motorized:** Laurel Bicycle and Pedestrian (BikePed) Plan 2003
- **Transit:** Adult Resource Alliance of Yellowstone County, Annual Report 2011/12

These documents represent the latest information regarding alternative travel modes in the Laurel area. Relevant information regarding existing conditions of alternative travel modes have been extracted from these documents and modified as appropriate to reflect existing conditions. Additionally, future system recommendations arising out of these plans were used as a basis for determining community desires and needs.

2.4.1. Multi-Modal Transportation

Multi-modal transportation includes auto, bicycle, pedestrian, and transit travel. Incorporating multi-modal travel into the transportation system maximizes transportation efficiency and provides mode choices to enhance the relationship between the transportation system, land use, and design.

The multi-modal network should be anchored by mixed-use development areas where travel demand is generally highest. A high-quality multi-modal network may have the following characteristics:

- Connections to multiple mixed-use activity centers;
- Transit service with ease of access;
- Pedestrian and bicycle facilities allowing for safe and convenient travel;
- Safe and convenient crossing opportunities;
- Mix of uses and connectivity to residential areas, commercial retail, office and business activity centers; and
- Context sensitivity.

2.4.2. Demographics

Demographic information for the City of Laurel was reviewed to establish characteristics that may influence travel mode choice. Information was evaluated from the US Census Bureau American Community Survey (ACS) regarding population age, transportation mode, and work commute characteristics.

Population age characteristics may help determine transportation needs for a community. An older population, for example, may point to the need for easy access to health care facilities and improved transit availability. As the population ages, the degree to which it can participate in community life and access necessary services is influenced by the availability of and access to viable means of transportation.

Figure 2.8 shows the age distribution of the City of Laurel between 2008 and 2012 according to the ACS.   The median age for the City of Laurel is 36 years old, with approximately 22 percent of the total population under the age of 15 (too young to drive). Conversely, those aged 75 and older (typically less likely to drive) make up 8 percent of the population.   All told, roughly 30 percent of the population in Laurel cannot drive, or are less likely to drive. Increasing opportunities and infrastructure for alternative travel modes is aimed at benefitting not only those who chose not to drive, but also those who cannot drive.

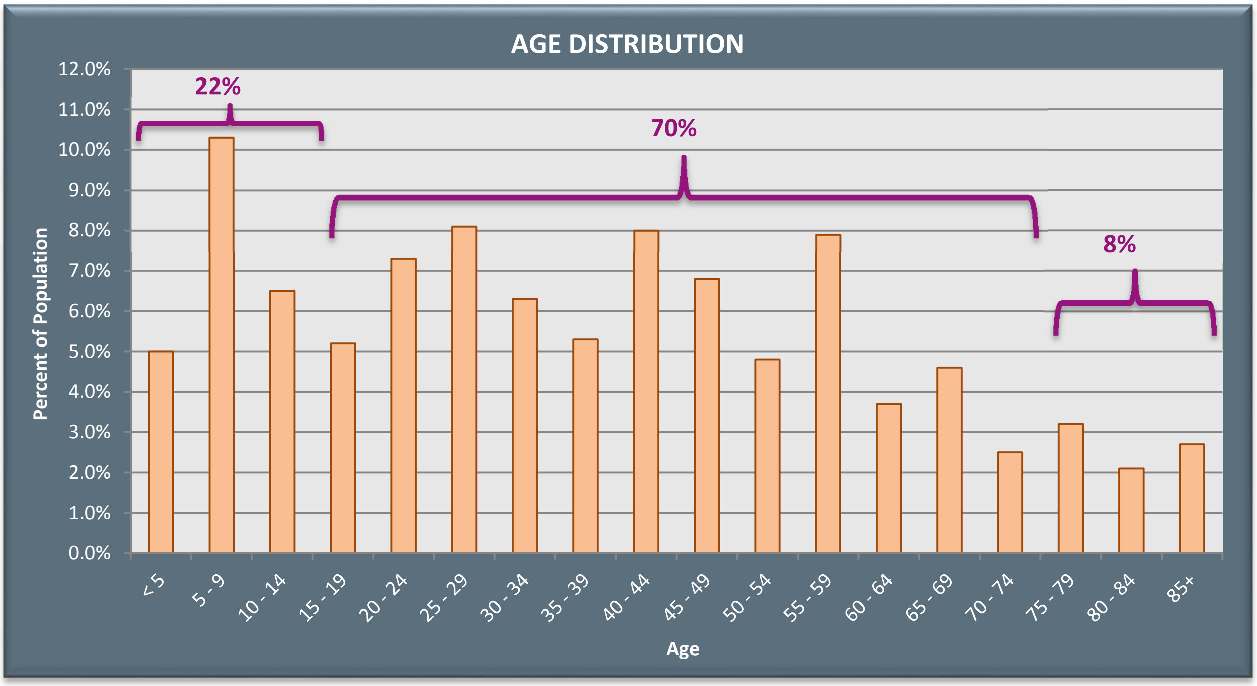


Figure 2.8: Statistics for Population Age Distribution

Source: US Census Bureau, 2008 – 2012 American Community Survey 5-year.

The vehicle or type of transportation individuals choose for commuting to work is summarized in **Figure 2.9**. According to the ACS, almost 93 percent of the City of Laurel population travels to work by means of a standard motor vehicle. Alternative travel modes include bicycle (1.3 percent), walking (2.5 percent), and public transportation (0.4 percent). All told, just over 4 percent of people choose alternative travel modes as a means of transportation to work.

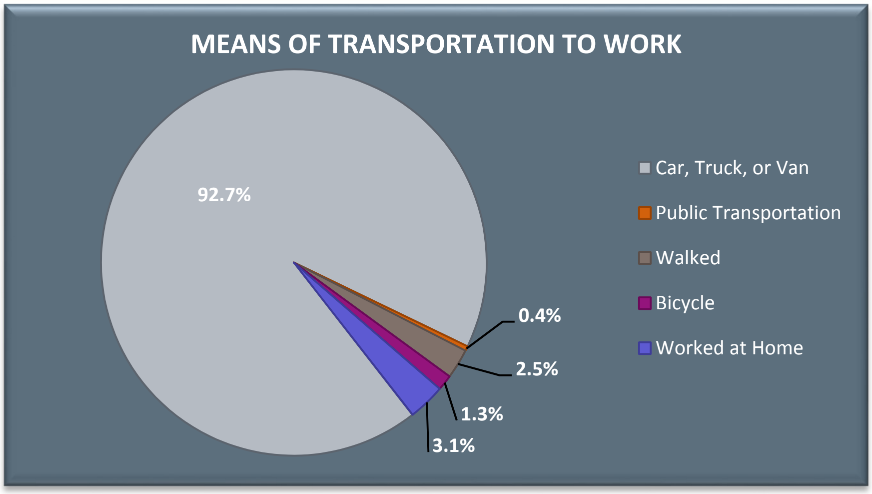


Figure 2.9: Statistics for Means of Transportation to Work

Source: US Census Bureau, 2008 – 2012 American Community Survey 5-year.

Travel time to work has a direct correlation to transportation mode choice. **Figure 2.10** summarizes the amount of time spent traveling to work for City of Laurel residents. According to the ACS, approximately 28 percent of commuters spend less than 10 minutes traveling to work. This segment of the population represents those individuals who may choose to use non-motorized travel methods due to the close proximity to work. Conversely, over 50 percent of the commuting population spends more than 20 minutes traveling to work. This segment of population represents those who travel longer distances and are more restricted to their mode choice. The mean travel time to work is 18.4 minutes. Additionally, approximately 35 percent of residents work within the City of Laurel.

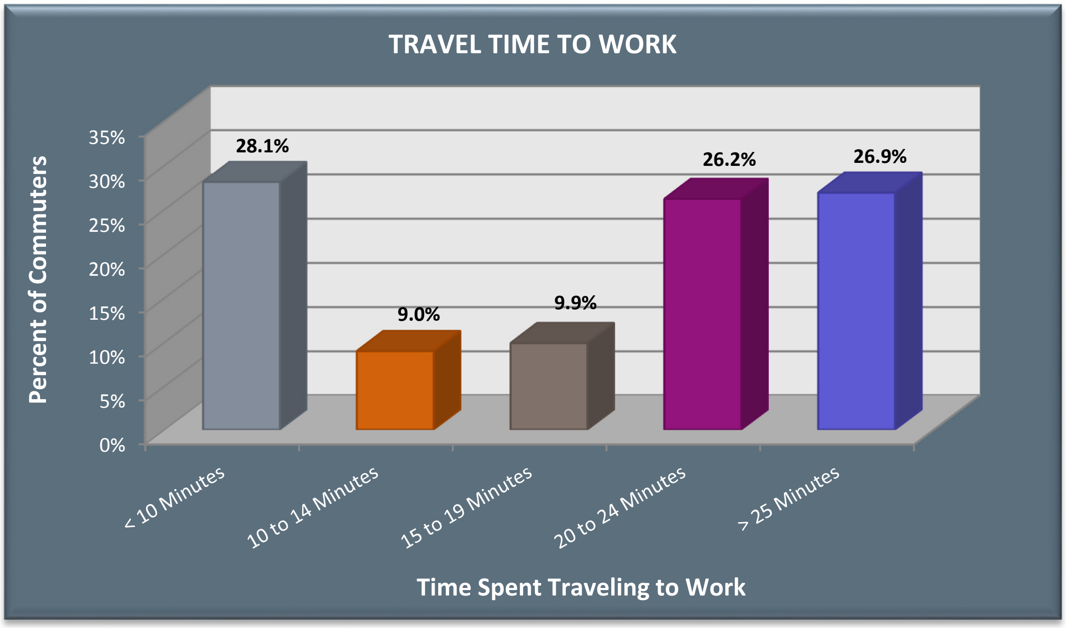


Figure 2.10: Statistics for Travel Time to Work

Source: US Census Bureau, 2008 – 2012 American Community Survey 5-year.

2.4.3. Non-Motorized Transportation

Recently constructed pedestrian facilities near West Elementary School.

Well-designed non-motorized transportation facilities should be safe, attractive, convenient and easy to use. Poorly designed or inadequate facilities can discourage users and waste valuable money and resources. The characteristics of non-motorized travel vary greatly and may compete for the same street and roadway space. Non-motorized facilities are often found at the roadway edge and are often allocated insufficient space for their needs. This puts them close to right-of-way lines and in conflict with other demands such as parking, utility poles and signs. It is in the community's best interest to plan new non-motorized facilities in a manner that can best accommodate the needs of the anticipated users.

Montana statutes (61-8-602 M.C.A.) make bicycle riders legal road users. They are, however, slower, less visible and more vulnerable than motorists. Bicyclists operate vehicles under their own power and are vulnerable in crashes. Well-designed bicycle facilities guide cyclists of various skill levels to ride on the roadway in a safe manner that conforms to the uniform vehicle code.

Pedestrians prefer greater separation from traffic and are slower than bicyclists. They need extra time for crossing roadways, special consideration at intersections and traffic signals, and other improvements to enhance the walking environment. Pedestrians are particularly vulnerable roadway users, as significant numbers are often small children, handicapped individuals, or the elderly.

2.4.3.1. Existing Plans and Policies

The *Laurel Bicycle and Pedestrian (BikePed) Plan 2003* was developed as a comprehensive non-motorized plan for the Laurel area. Much of the information contained in the *BikePed* plan was assembled from two studies the City of Laurel prepared:

- *Laurel Bicycle and Pedestrian Considerations*, Tracy-Williams Consulting
- *Looking at Laurel, Walkability and Redevelopment Study – A Special Place to Live*, Walkable Communities, Inc., 1999

The goal of the *BikePed* plan is to identify an integrated system of pedestrian trails and bikeways for the City of Laurel. The plan contains a map showing the future proposed non-motorized network. The map was published in the local newspaper for public review and comment.

Ultimately, the proposals and recommendations contained in the plan are dynamic and are expected to change over time. The plan is intended to provide guidelines and high-level information to plan for and develop a non-motorized system as opportunities arise.

2.4.3.2. Existing Network

The existing transportation system in the City of Laurel generally consists of wide roads with sidewalks. No bike lanes or routes currently exist within the city. The subdivision north of the Laurel Golf Club outside of the city limits does not have sidewalks but instead contains non-motorized paths.

Most of the established areas of Laurel have a very cohesive and continuous sidewalk network. There are areas, however, where gaps in the sidewalk network exist. These gaps are common in areas developed before being incorporated into the City.

Figure 2.11 shows the existing non-motorized network within the study area. The figure shows the existing trails in the Laurel area as well as locations within the city limits and along the major street network where sidewalks do not currently exist.

Existing non-motorized path.

W Railroad Avenue lacks sidewalk connectivity.

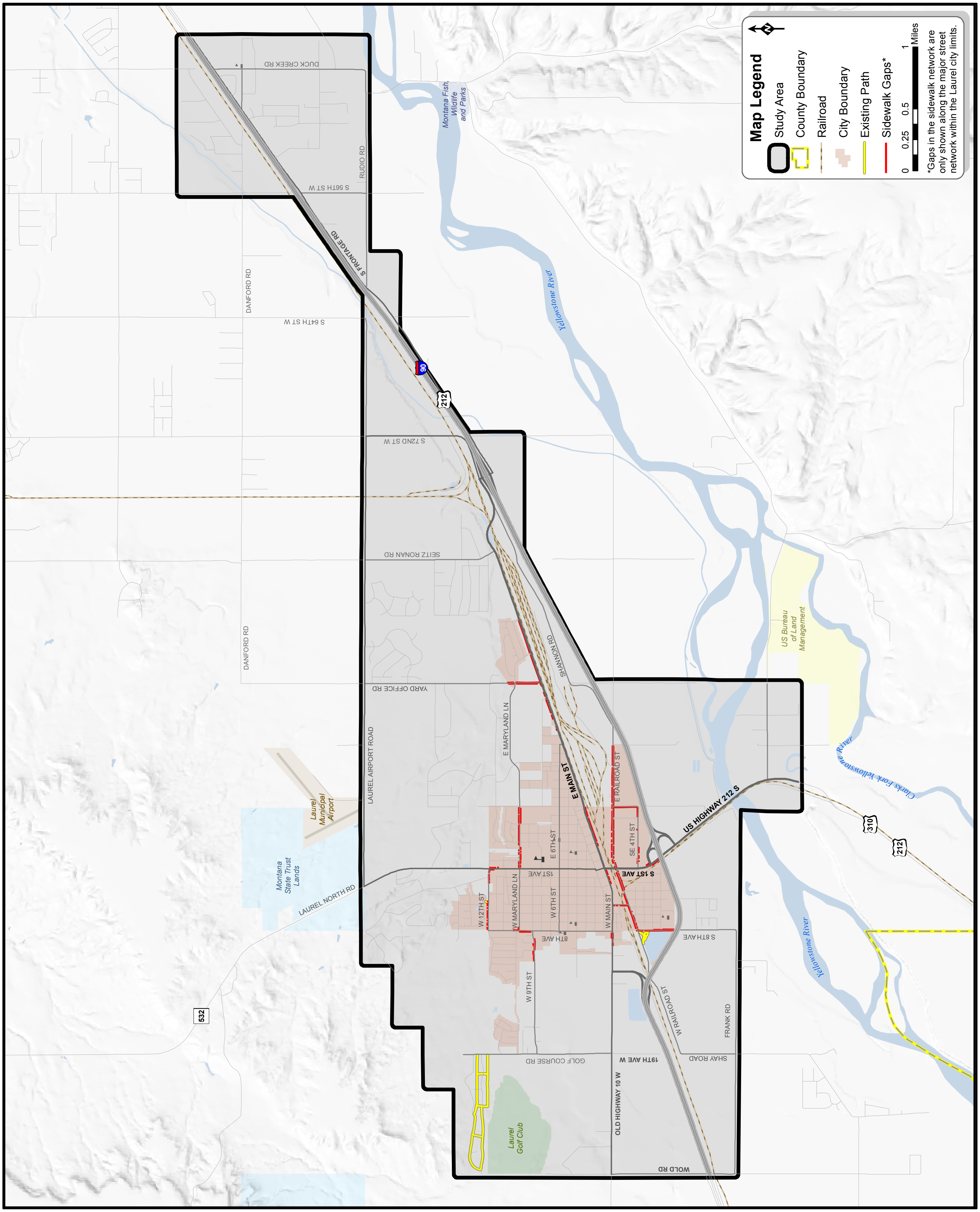


Figure 2.11: Existing Non-Motorized Network

2.4.3.3. Types of Facilities and Considerations

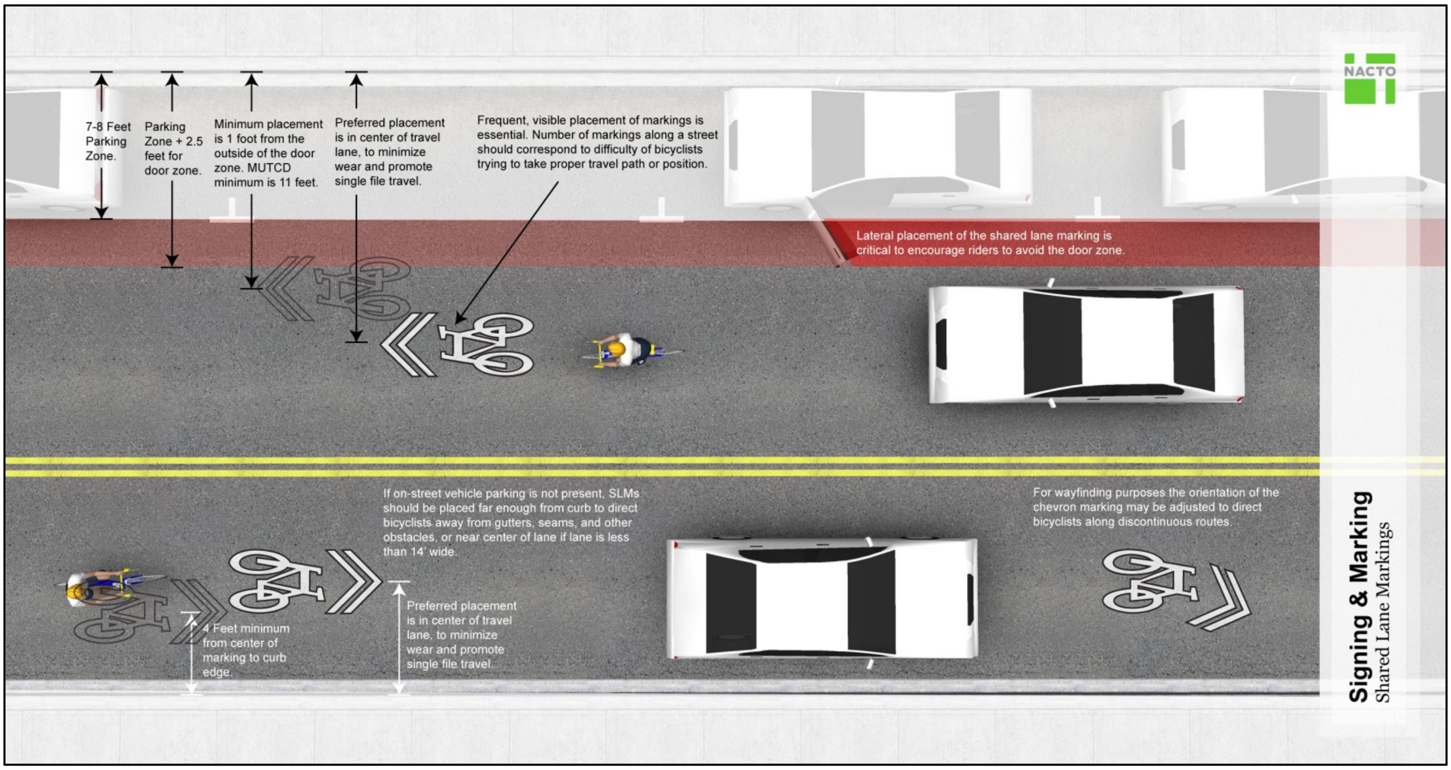
There are a number of treatments to accommodate non-motorized users within the transportation system. For pedestrians, sidewalks are the most common facility type along the road network. Bicycle treatments typically include paved shoulders, dedicated bike lanes, and shared lane markings. Shared use paths can be used to accommodate both bicyclists and pedestrians along off-street locations. The type of facility most appropriate for a given situation may depend on traffic volume, speed, vehicle mix, sight distance, parking, demographics, and land use. The following sections summarize guidelines and general information for common non-motorized treatments.

Shared Lane Markings

Shared lane markings, commonly referred to as "sharrows", consist of pavement markings designed to indicate a shared environment between bicycles and automobiles. Sharrows provide visual clues to motorists and bicyclists about the shared use environment. Among other benefits, shared lane markings reinforce the legitimacy of bicycle traffic on the street and recommend proper bicyclist positioning. Sharrows are not a designated facility type; they should be used to complement the bicycle network.

Sharrows are most common in areas where roadway width is too narrow to accommodate separate bike lanes. This pavement treatment requires no additional street space and is most appropriate for roadways with low speed differentials between motorists and bicyclists. Example design guidelines for shared lane markings are shown in **Figure 2.12**. Note that sharrows should be strategically placed to optimize their usage. If sharrows are overused, they may become lost in the network.

Figure 2.12: Example Shared Lane Markings Design Guidelines



Source: NACTO Urban Bikeway Design Guide, April 2011

Bike Lanes

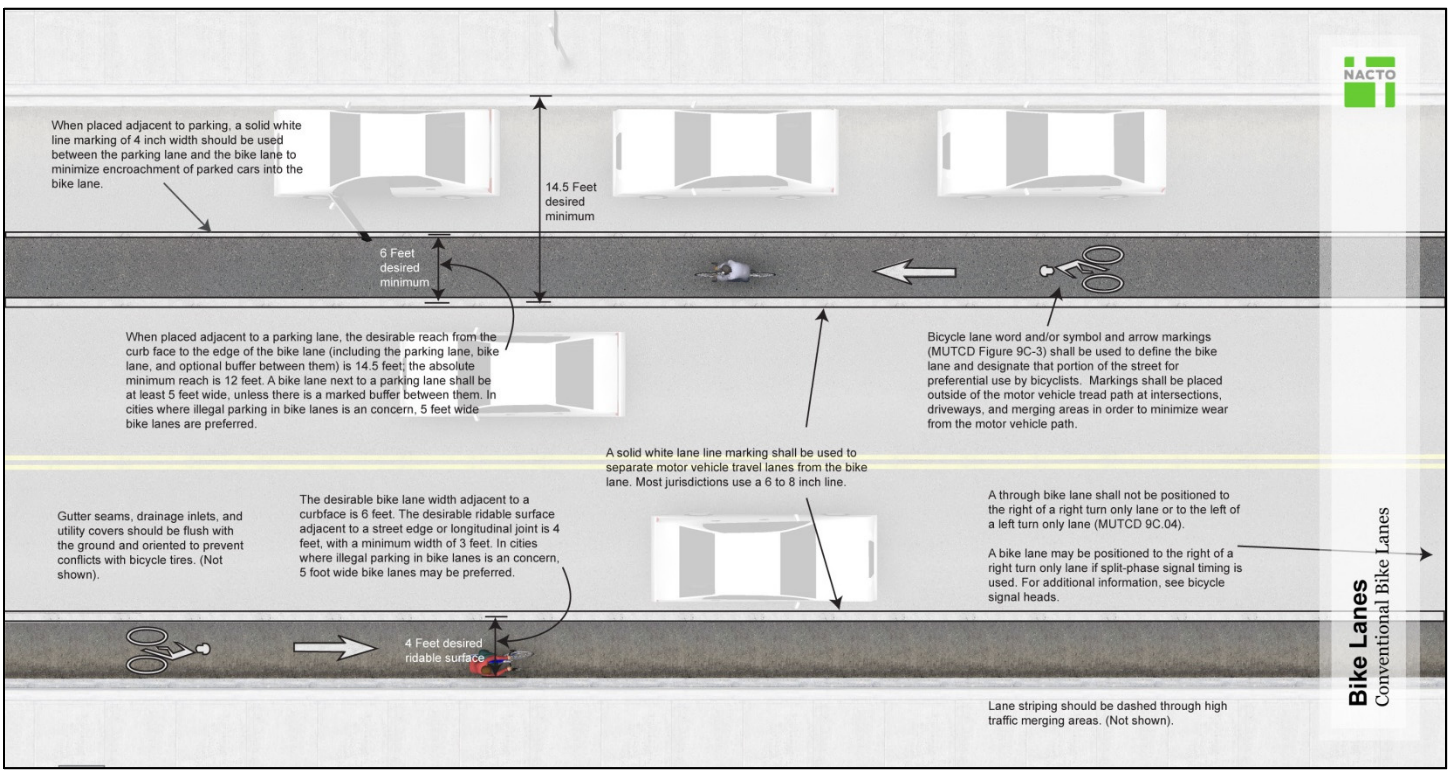
Bike lanes are located adjacent to the motor vehicle travel lane, typically to the right side of the street between the travel lane and curb, road edge, or parking lane. Bicycle travel flows in the same direction as the motor vehicles. This type of facility uses signage and pavement striping to delineate the area assigned to bicyclists and to motorists. Bike lanes help to foster a shared-use environment with predictable behavior and movements between travel modes.

Bike lanes define the road space for bicyclists and motorists, reduce the chance that motorists will stray into the cyclists' path, discourage bicyclists from riding on the sidewalk, and remind motorists that cyclists have a right to the road. Bike lanes also create the illusion of a visibly narrower roadway for drivers resulting in a traffic calming effect which may lower average vehicle speeds.

Most commuter bicyclists would argue that on-street facilities are the safest and most functional facilities for bicycle transportation. Bicyclists have stated their preference for marked on-street bicycle lanes in numerous surveys. Many bicyclists, particularly less experienced riders, are far more comfortable riding on a busy street if it has a striped and signed bike lane.

On streets with low traffic volumes and speeds (usually defined as under 3,000 vehicles per day and under 30 mph vehicle speeds), striped bike lanes may not be needed for cyclists to comfortably share the road with low risk of conflicts. On these types of low-traffic neighborhood streets, designated and signed bike routes can serve as important connectors to schools and recreational areas such as parks. Example design guidelines for bike lanes are shown in **Figure 2.13**.

Figure 2.13: Example Bike Lane Design Guidelines



Source: NACTO Urban Bikeway Design Guide, April 2011

Shared Use Path

Shared use paths are generally physically separated from motorized vehicular traffic by an open space or barrier. Shared use paths are located either within the right-of-way of the adjacent roadway or are located within an independent right-of-way. Shared use paths accommodate the two-way travel of all non-motorized users.

Shared use paths facilitate two-way off-street traffic and may be used by bicyclists, pedestrians, skaters and other non-motorized users. In general, shared use paths are desirable for transportation and cycling by slower cyclists, families and children, or anyone who prefers physical separation from the roadway. These paths provide recreation and alternate transportation opportunities for non-motorized users. Shared use paths are complimentary to facilities such as sidewalks and bike lanes and should not be used to preclude the use of on-street facilities. The width of a shared use path is dependent on a number of factors, such as use and terrain. Under most conditions, a 10-foot width is recommended to accommodate two-way non-motorized traffic. Example design guidance can be found in the American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities*.

Given the mix of uses, there is the potential for conflicts on heavily-used shared use facilities, necessitating lower bicycle speeds on these paths. Shared use paths are ideally suited for corridors along waterways, rail corridors, or utility corridors where there are few intersections or crossings, to reduce the potential for conflicts with motor vehicles.

If improperly designed, sidepaths can create dangerous travel conditions.

Shared use facilities located immediately adjacent to roadways are often referred to as "sidepaths". One issue of sidepaths are that they create a situation where a portion of the bicycle traffic rides against the normal flow of motor vehicle traffic and can result in bicyclists going against traffic when either entering or exiting the path. This can also result in an unsafe situation where motorists entering or crossing the roadway at intersections and driveways do not notice bicyclists coming from their right, as they are not expecting traffic coming from that direction. Stopped cross-street motor vehicle traffic or vehicles exiting side streets or driveways may frequently block path crossings. Even bicyclists coming from the left may go unnoticed, especially when sight distances are poor. Because of these operational challenges, sidepaths should be provided on both sides of the roadway to reduce the numbers of bicyclists travelling against vehicle traffic.

2.4.3.4. Available Resources and Publications

AASHTO's *Guide for the Development of Bicycle Facilities* is the principal resource for bicycle facility design and has been adopted by many state and local governments. The fourth addition was published in 2012. The guide discusses general design characteristics of roadway improvements for bicycles and identifies design standards for bicycle paths. The guide is comprehensive but does not set strict standards for bicycle facilities. Instead, it presents sound design guidelines for attaining designs sensitive to the needs of bicyclists and other users. Minimum design values are provided only where further deviation from desirable "standards" would result in unacceptable safety compromises.

The National Association of City Transportation Officials (NACTO) *Urban Bikeway Design Guide* was published in 2011 and includes new and updated information from the previous addition of the AASHTO guide. The NACTO guide is intended to provide "state-of-the-practice solutions" to help create safe and enjoyable environments for bicyclists. This guide recognizes that every design is different and bikeway designs should be tailored to individual situations. For each treatment discussed in the guide, there is guidance for required, recommended, and optional design elements.

Signing and marking of bikeways and paths must be uniform and consistent to command the respect of the public and provide safety to the users of these facilities. Signing and markings must be warranted by use and need. Signing and markings of bikeways and paths should conform to the most current edition of the Federal Highway Administration (FHWA) *Manual on Uniform Traffic Control Devices (MUTCD)*.

2.4.4. Transit

This section is intended to provide a "snapshot" of current transit service and operations in the Laurel area. It is important to recognize that transit service in the community is for some citizens the only mode of transportation utilized. This is especially true for many of the community's elderly and disabled citizen population. The primary goal of the transit system should be to provide reliable service to its users and make that service available to all members of the public. A secondary goal is to make mass transit work for the community, by reducing parking demand, traffic congestion, and the need for roadway expansion wherever possible.

Laurel Transit vehicle.

Laurel Transit is operated by the City with help of 5311 operating funds secured through an annual transit grant. Currently the City of Laurel partners with the Adult Resource Alliance of Yellowstone County and Residential Support services to provide transportation within Laurel and the City of Billings. For fiscal year 2014, Laurel Transit received a federal operating grant of $59,961. Additionally there was a local match of $41,355.

Door-to-door service is currently provided to all Laurel residents living within one mile of the city limits. This service is provided by a 12-passenger lift-equipped bus Monday through Friday between 10:00 AM and 4:00 PM. Additionally, service is provided to and from Billings on the first and third Tuesday of each month between 1:30 PM and 5:00 PM, dependent upon demand. For rides within Laurel, the fare is $1.25 per trip. For rides to and from Billings, the fare is $6.00 per round trip.

2.4.5. School Transportation Considerations

Schools commonly attract high volumes of vehicle traffic. Students are often driven to and from school which generates a round trip in the morning and another in the afternoon, totaling four daily trips. Automobile trips to schools are commonly short distance trips that have opportunity to be supplemented with non-motorized travel. Establishing a network of bicycle and pedestrian accommodations helps promote safe non-motorized travel for students.

Within the Laurel school district there are currently five public schools (three elementary, one middle school, and one high school). In addition, there is one private school and one public school located outside the Laurel school district but within the LRTP study area. The school grades and current release schedules are listed below. A map showing the school locations is provided in **Figure 2.14**.

South Elementary

- Grades: K – 2 — 8:05 AM to 2:45 PM (Daily except Wednesday)
8:05 AM to 2:15 PM (Wednesday only)

West Elementary

- Grades: K – 2 — 8:00 AM to 3:05 PM (Daily except Wednesday)
8:00 AM to 2:20 PM (Wednesday only)

Graff Elementary

- 3rd Grade — 8:20 AM to 3:20 PM (Daily except Wednesday)
  8:20 AM to 2:30 PM (Wednesday only)
- 4th Grade — 8:15 AM to 3:30 PM (Daily except Wednesday)
  8:15 AM to 2:30 PM (Wednesday only)

Laurel Middle School

- Grades: 5 – 8 — 8:10 AM to 3:20 PM (Daily except Wednesday)
  8:10 AM to 2:30 PM (Wednesday only)

Laurel High School

- Grades: 9 – 12 — 8:20 AM to 3:35 PM (Daily except Wednesday)
  8:20 AM to 2:25 PM (Wednesday only)

Canyon Creek School

- Grades: K-8 — 8:15 AM to 3:05 PM

Yellowstone Valley Christian (Private)

- Grades: K – 12

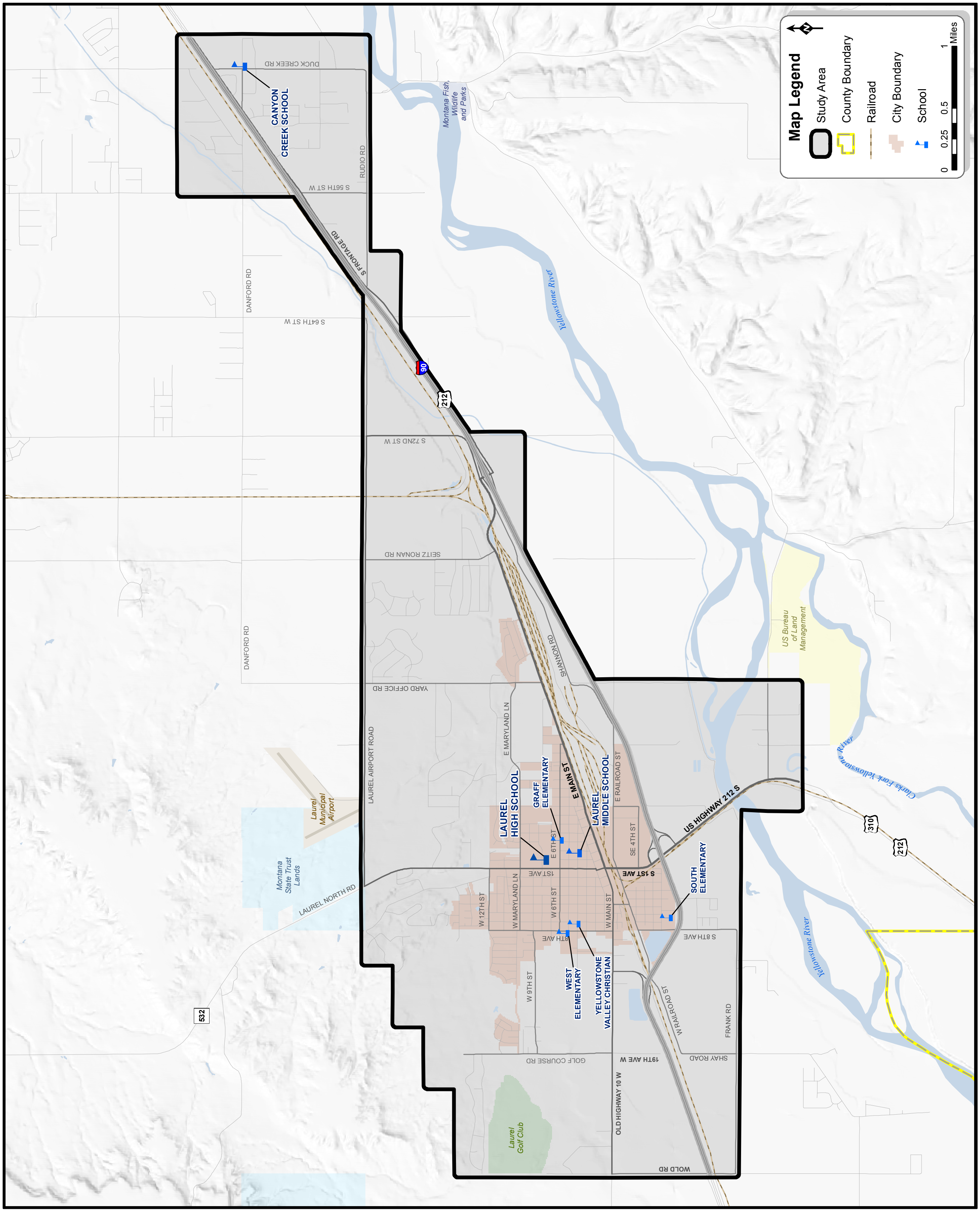


Figure 2.14: School Locations

2.4.5.1. SRTS Survey

As part of a grant application for Safe Routes to School (SRTS) funding in 2012, the City of Laurel conducted a survey of the current school travel environment. When students at Laurel Middle School were asked about their current form of transportation to and from school, less than 20 percent identified a non-motorized travel mode. However, when students were asked their preferred mode of transportation, over 50 percent responded with a non-motorized travel mode. The student survey results for mode of transportation are summarized in **Figure 2.15**.

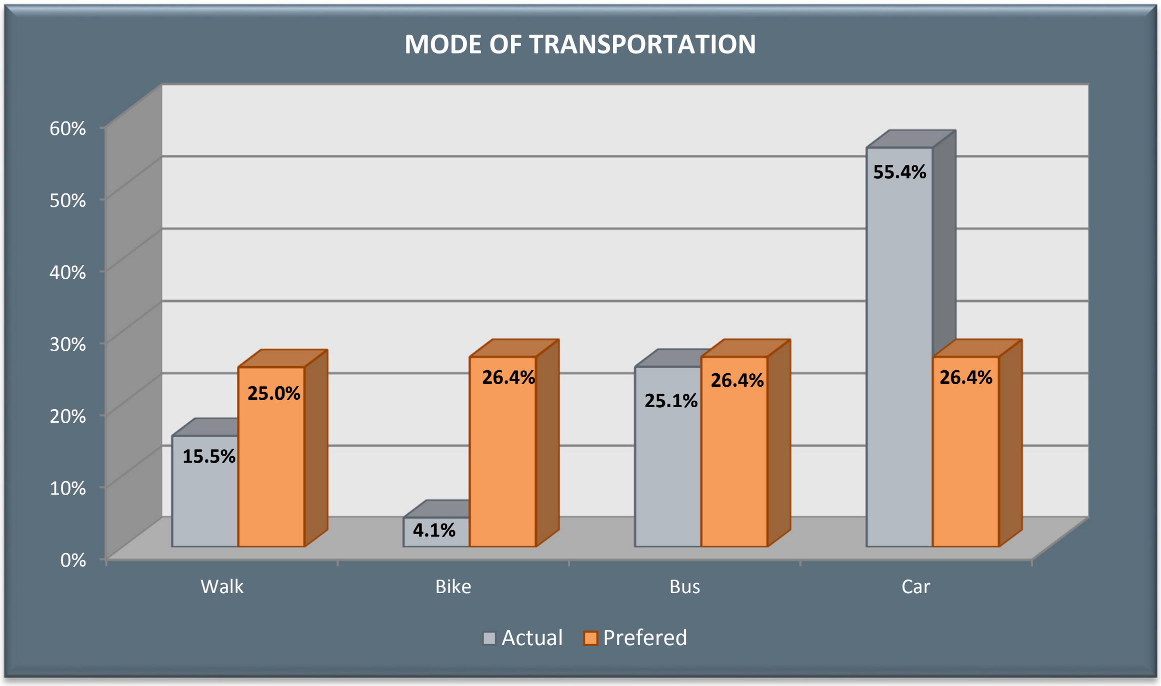


Figure 2.15: Mode of Transportation Student Survey Results

In addition to the student survey, a parent survey was conducted to help identify why parents would not let their child bike or walk to school. The question was asked "would you probably let your child bike to/from school if this problem were changed or improved?" The survey illustrated the importance of child safety with the most common responses relating to vehicle traffic characteristics or non-motorized facilities. The results of the parent survey are shown in **Figure 2.16**.

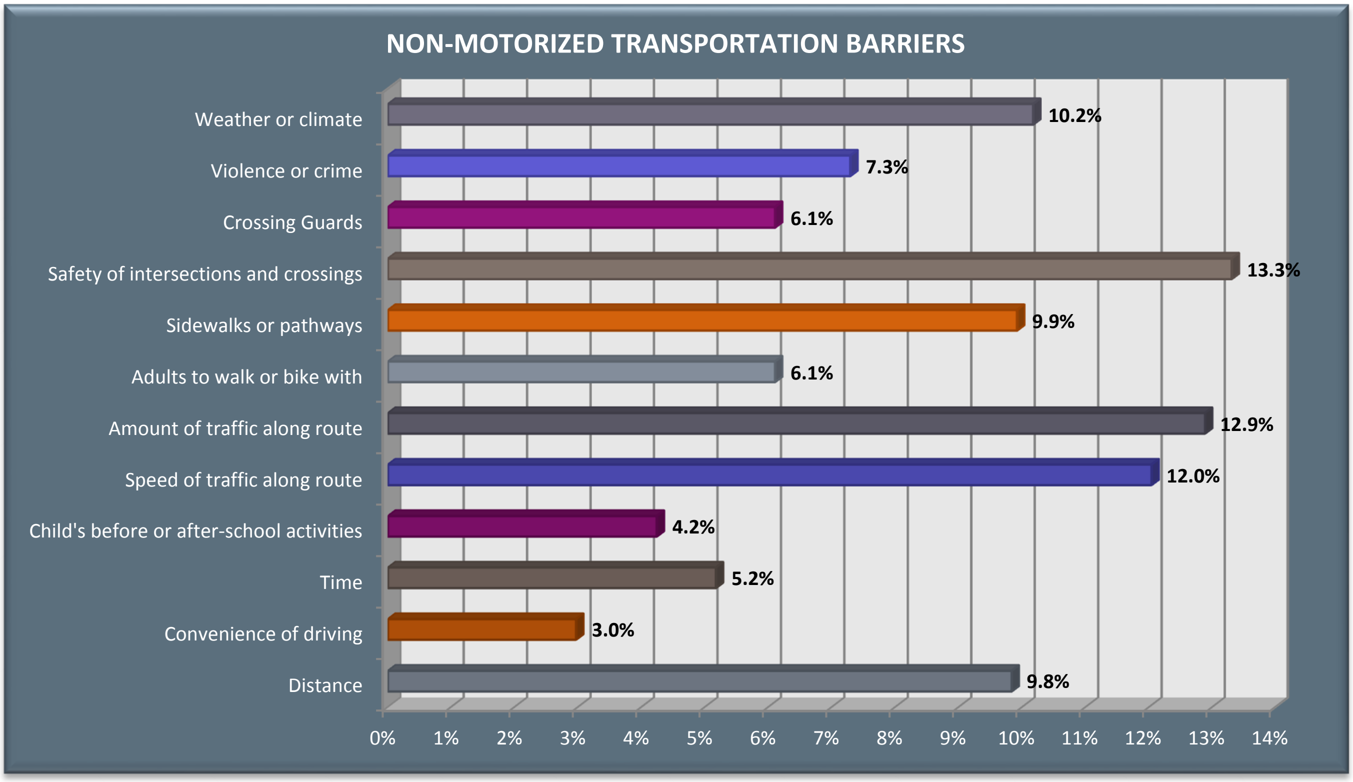


Figure 2.16: Identified Barriers to Non-Motorized Transportation

The survey results indicate a desire for a safe and connected non-motorized transportation system for students. Schools are generally in close proximity to housing which can help promote non-motorized travel. Establishing a network for bicyclist and pedestrian circulation that will provide access to schools, neighborhoods, commercial centers, and parks is desired within the Laurel community.

3.0
Projected Transportation System

Projected transportation conditions were analyzed to estimate how traffic patterns and characteristics may change compared to existing conditions. The analysis was based on known existing conditions and anticipated land development expected to occur out to the year 2035.

A summary of the traffic modeling effort conducted to project anticipated future travel conditions is provided in this section. The projected future travel conditions are used to identify potentially deficient areas within the transportation system.

3.1. SOCIOECONOMICS

Local and regional population and economic characteristics have important influences on motor vehicle travel in Laurel. A review of demographics within Laurel and Yellowstone County is appropriate to gain an understanding of historical trends in population, age, race and ethnicity.

Understanding the composition of the population is necessary, as the data may influence the types of improvements that are 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, while the presence of a disadvantaged population may warrant other considerations.

It is also important to review community development patterns and understand where community conditions may be favorable for new residential and economic growth. Existing land uses and potential land use changes have a direct influence on the transportation network and its use.

This section discusses the background and assumptions used to project growth in the Laurel area to the year 2035. By using population, employment and other socioeconomic trends as aids, the future transportation requirements can be defined. A travel demand model of the transportation system for the Laurel area was developed by MDT. Information from this analysis was used to update the allocations of future residential and employment growth. Using the updated model, various scenarios were developed to test a range of transportation improvements to determine what affects they might have on the transportation system within the study area.

3.1.1. Historic Population Trends

The City of Laurel has grown steadily since 1910. The population showed a decline during the 1960's but rebounded significantly between 1970 and 1980 when the community grew by 24%.

Table 3.1 shows the total populations for the City of Laurel, Yellowstone County, the State of Montana, and the United States since 1980. The Census Bureau releases population estimates each year for various geographies to update information collected in the most recent census. Included in the table are Census Bureau estimates of current (2012) populations for the City of Laurel and Yellowstone County, as well as for the state and nation. These estimates show the populations of City and County have continued to increase since 2010.

The City of Laurel grew in population by 26.5% between 1980 and 2012. This is an annual increase in population over the period of 0.7%. During the same period, the populations of Yellowstone County and the State of Montana increased by 40.6% and 27.8%, respectively. Annually, Yellowstone County has grown by 1.1% and the State of

Montana has grown by 0.8% between 1980 and 2012. Overall, the population of the United States grew by 38.6% (1.0% annually) during the same period.

Table 3.1: Historic Population Data

Location	1980	1990	2000	2010	2012	% Change (1980 - 2012)	Annual Growth Rate (1980 - 2012)
City of Laurel	5,481	5,686	6,255	6,718	6,931	26.5%	0.7%
Yellowstone County	108,035	113,419	129,352	147,972	151,882	40.6%	1.1%
State of Montana	786,690	799,065	902,195	989,415	1,005,141	27.8%	0.8%
United States	226,542,199	248,718,301	281,421,906	308,745,538	313,914,040	38.6%	1.0%

Source: US Bureau of the Census, Current Estimates Data

3.1.2. Population Characteristics

Table 3.2 depicts the race characteristics in the City of Laurel, Yellowstone County, and the State of Montana at the time of the 2010 Census. The populations show a predominately white race with the most common minority race being American Indian. The City of Laurel has a population with a lower percentage of American Indians than does Yellowstone County and the State of Montana.

Table 3.2: Race and Ethnicity (2010)

Race	City of Laurel		Yellowstone County		State of Montana	
White	6,399	95.25%	134,228	90.71%	891,529	90.11%
Black or African American	24	0.36%	935	0.63%	4,215	0.43%
American Indian and Alaska Native	101	1.50%	5,881	3.97%	63,495	6.42%
Asian	24	0.36%	939	0.63%	6,379	0.64%
Native Hawaiian and Other Pacific Islander	3	0.04%	114	0.08%	734	0.07%
Some Other Race	167	2.49%	5,875	3.97%	23,063	2.33%
Total	6,718		147,972		989,415	

Source: US Census Bureau, Population Division

Figure 3.1 compares three age categories (residents less than 18 years old, residents 18 to 64 years old, and residents over age 65) for the City of Laurel, Yellowstone County, and the State of Montana. Of note is that the City of Laurel has a higher percentage of population in the less than 18 and greater than 65 age groups than Yellowstone County and the State of Montana.

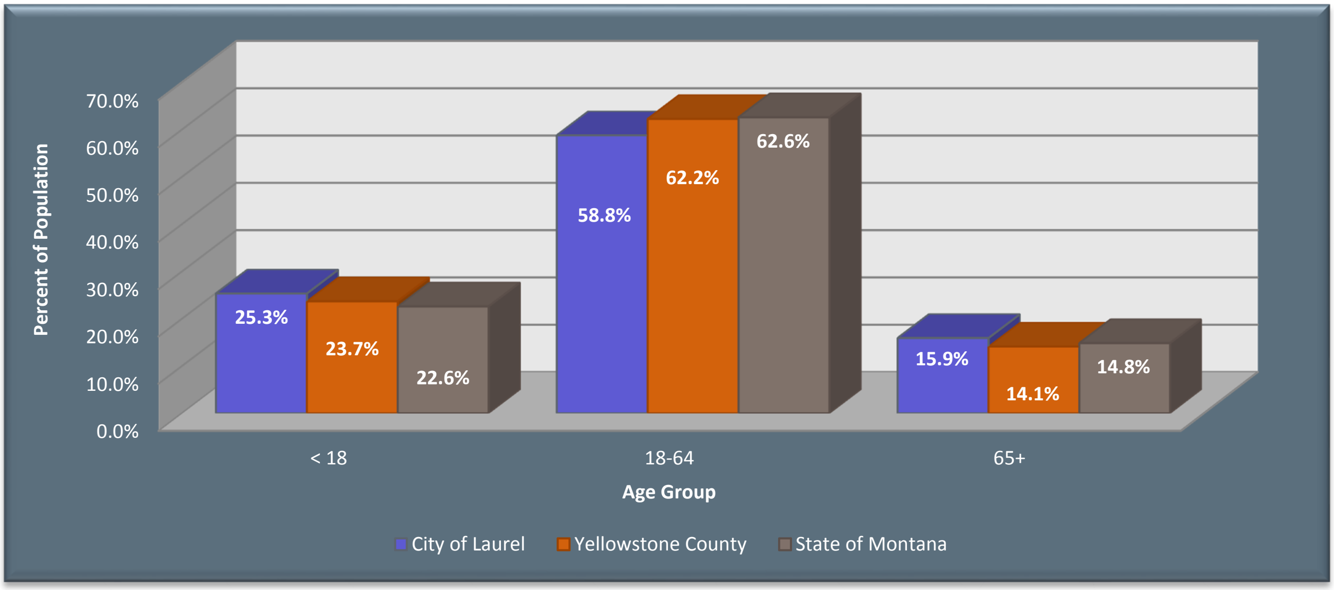


Figure 3.1: Population Age Distribution Percentage (2010)

Source: US Census Bureau, Population Division

The median age of Yellowstone County residents continues to increase. At the time of the 2000 Census, the median age of County residents was 36.9. In 2010, the median age of County residents increased to 38.3. These statistics point to the aging of the population, and corresponds to similar trends within Montana and the United States. The median age of the City of Laurel's residents decreased slightly (from 38.4 years to 37.0 years) between 2000 and 2010.

3.1.3. Housing

The Census Bureau identifies a "housing unit" as a house, an apartment, a mobile home, a group of rooms, or a single room that is occupied (or if vacant, is intended for occupancy) as separate living quarters. Separate living quarters are those in which the occupants live and eat separately from any other persons in the building and which have direct access from the outside of the building or through a common hall. The occupants may be a single family, one person living alone, two or more families living together, or any other group of related or unrelated persons who share living arrangements. A "household" includes all the persons who occupy a housing unit according to the Census Bureau definition. For purposes of allocating future residential growth, housing units are of interest since they are inputs to the traffic model.

Table 3.3 lists the number of housing units that existed within the City of Laurel and Yellowstone County during recent decennial censuses. Overall, the number of housing units in the City has increased by 13.3% over the last 20 years including an 11.1% increase in housing units occurring between 2000 and 2010. Yellowstone County experienced a 49.6% increase in the number of housing units since 1980 including a 17.2% increase during the 2000-2010 period. The City of Laurel's *Growth Management Plan* estimates there are currently about 3,010 housing units within the community.

Table 3.3: Number of Housing Units (1980 - 2010)

Location	1980	1990	2000	2010
City of Laurel	--	2,596	2,647	2,943
Yellowstone County	42,756	48,781	54,563	63,943

Source: US Census Bureau, Population and Housing Unit Counts, 2010

Table 3.4 provides a comparison of housing statistics based on the 2010 census. The data shows that the City of Laurel and Yellowstone County had a lower percentage of vacant housing units than the statewide average. According to 2010 Census data, there are approximately 2,790 occupied housing units in the City of Laurel. On average, there are 2.28 people per household in the City of Laurel which is close to that of Yellowstone County (2.31) and higher than the statewide average (2.05). Laurel's population per housing unit has shown slight fluctuations in recent decades. In general, the population per housing unit has been on a declining trend for Yellowstone County and the State of Montana.

Table 3.4: Housing Characteristics (2010)

Housing	City of Laurel		Yellowstone County		State of Montana	
Occupied Housing Units	2,790	94.8%	60,672	94.9%	409,607	84.8%
Owner Occupied	*1,898*	*68.0%*	*41,529*	*68.4%*	*278,418*	*68.0%*
Renter Occupied	*892*	*32.0%*	*19,143*	*31.6%*	*131,189*	*32.0%*
Vacant Housing Units	153	5.2%	3,271	5.1%	73,218	15.2%
Total Housing Units	2,943		63,943		482,825	
Total Population	6,718		147,972		989,415	
Population per Housing Unit	**2.28**		**2.31**		**2.05**	

Source: US Census Bureau, Population Division

3.1.4. Employment Trends

Yellowstone County is the most populous county in Montana and Billings serves a regional trade area covering more than 125,000 square miles with nearly 400,000 people[1]. Billings represents a commercial and transportation hub for the state, as well as a major center for education and medical services. The county's economy is dominated by resource industries and agriculture.

The City of Laurel is well-positioned in the regional trade area due its proximity to the economic activity Billings and important highway and rail transportation facilities. The Cenex Harvest States (CHS) Refinery, Montana Rail Link (MRL), Woods Powr-Grip, and Walmart are key local employers. Laurel is also situated on U.S. Highway 212 which provides access to Red Lodge and to several Wyoming communities.

Table 3.5 presents employment by industry for Yellowstone County since 1980.

[1] Yellowstone County and City of Billings – 2008 Growth Policy Update

Table 3.5: Historical Employment Trends for Yellowstone County (1980 – 2010)

Employment	1980	1990	2000	2010	% Change (1980 - 2010)	Annual Growth Rate (1980 – 2010)
Farm Employment	1,335	1,288	1,474	1,384	4%	0.1%
Agricultural services, forestry, and fishing	471	549	947	320	-32%	-1.3%
Mining	820	882	693	1,078	31%	0.9%
Construction	3,513	2,803	5,179	6,472	84%	2.1%
Manufacturing	4,450	3,539	3,759	3,300	-26%	-1.0%
Transportation and public utilities	4,890	4,564	5,725	4,212	-14%	-0.5%
Wholesale trade	5,797	5,781	6,671	5,696	-2%	-0.1%
Retail trade	12,171	13,867	17,905	12,921	6%	0.2%
Finance, insurance, and real estate	4,939	5,941	6,274	8,967	81%	2.0%
Services	14,918	21,935	30,822	46,327	310%	3.8%
Government and government enterprises	7,834	8,760	9,006	9,789	25%	0.7%
Total Employment	**61,138**	**69,909**	**88,455**	**100,466**	**64.3%**	**1.67%**

Source: US Department of Census Bureau of Economic Analysis – Table CA25 and CA25N

The data in **Table 3.5** shows that total full and part-time employment in Yellowstone County exceeded 100,000 in 2010 with about 99% of the jobs being non-farm related employment. Total full and part-time employment in Yellowstone County in 2010 was 64.3% higher than that recorded in 1980. Industries with notable increases in employment since 1980 include the services (which more than tripled); construction; and finance, insurance, and real estate categories. Notable declines in employment were seen in the agricultural services, forestry and fishing; manufacturing; and transportation and public utilities categories.

Table 3.6 presents data on the estimated number of civilian employees (age 16 years and older) and the industries in which they are employed for the City of Laurel, Yellowstone County, and the State of Montana.

Table 3.6: Civilian Employment by Industry (2011)

Industry	City of Laurel		Yellowstone County		State of Montana	
Agriculture, forestry, fishing and hunting, and mining	196	5.7%	2,346	3.1%	33,965	7.6%
Construction	233	6.8%	5,773	7.6%	40,498	9.1%
Manufacturing	291	8.5%	4,223	5.5%	23,083	5.2%
Wholesale trade	183	5.4%	3,828	5.0%	12,773	2.9%
Retail trade	550	16.1%	10,091	13.2%	28,639	6.4%
Transportation and warehousing, and utilities	203	5.9%	4,479	5.9%	24,063	5.4%
Information	30	0.9%	1,435	1.9%	9,109	2.0%
Finance and insurance, and real estate and rental and leasing	188	5.5%	5,254	6.9%	27,130	6.1%
Professional, scientific, and management, and administrative and waste management services	252	7.4%	6,838	9.0%	38,824	8.7%
Educational services, and health care and social assistance	753	22.0%	16,578	21.8%	106,962	23.9%
Arts, entertainment, and recreation, and accommodation and food services	312	9.1%	8,426	11.1%	50,404	11.3%
Other services, except public administration	127	3.7%	4,106	5.4%	22,490	5.0%
Public administration	97	2.8%	2,827	3.7%	29,142	6.5%
Civilian employed population 16 years and over	3,415		76,204		447,082	

Source: US Bureau of the Census, ACS Profile Report 2007-2011 Estimates, available at http://mcdc1.missouri.edu/acsprofiles/acsprofilemenu.html

Note that all ACS data are survey estimates with varying margins of error. Many of the employment numbers presented for the City of Laurel are estimates with high margins of error and should be integrated with caution.

The employment by industry data from the 2007-2011 ACS for the City of Laurel and Yellowstone County generally supports the information presented earlier in **Table 3.5**. The largest share of the employment in the City and County is associated with the service industries followed by the retail trade and construction industries.

Unemployment rates are represented in **Table 3.7** and are current as of July 2013. The data shows an unemployment rate for Yellowstone County lower than that for the State of Montana (3.9% versus 4.8%) and for the United States (7.7%). Please note the unemployment numbers presented for the State and U.S. are "seasonally adjusted." Seasonal adjustment is a statistical technique that attempts to measure and remove the influences of predictable seasonal patterns to reveal how employment and unemployment change from month to month. Corresponding unemployment information for the City of Laurel is unavailable so information from the 2007-2011 ACS profile is presented. The ACS for the 2007-2011 period suggests the City's unemployment rate is lower than those seen for the County, State, and nation.

Table 3.7: Employment Statistics

Employment Status	City of Laurel [a]	Yellowstone County [b]	State of Montana [c]	United States [c]
In Labor Force	3,495	84,723	517,273	157,196,000
Employed	3,415	81,396	492,357	145,113,000
Unemployed	80	3,327	24,916	12,083,000
Unemployment Rate	**2.3%**	**3.9%**	**4.8%**	**7.7%**

Source: [a] *US Census Bureau, 2007 – 2011 American Community Survey*
[b] *Montana Department of Labor and Industry, July 2013 (data is not seasonally adjusted)*
[c] *US Department of Labor, Bureau of Labor Statistics, July 2013 (seasonally adjusted)*

3.1.5. Income Levels, Income Distribution, and Poverty

Estimates of median household income and per capita income for Yellowstone County, the City of Laurel, and other geographies are available in the 2007-2011 ACS profile and shown in **Table 3.8**. The ACS shows estimated median household incomes for in Yellowstone County and the City of Laurel as $50,185 and $46,530, respectively. Both the County and City of Laurel median household income levels were above the median household income for the State of Montana ($45,324) according to the ACS data. In general, households within the City of Laurel earn about 2.7% more than what is earned by an average Montana household. Yellowstone County's median household income was about 95% of that estimated for the nation ($52,762). Household income levels in Laurel are about 88% of that seen for the U.S. as a whole.

Relationships change somewhat when reviewing ACS data on per capita income levels. **Table 3.8** shows the per capita income level for Yellowstone County exceeds that of the state and nation. However, the per capita income level for residents of Laurel are notably below those of Yellowstone County, State of Montana, and U.S. residents.

Estimates of per capita personal income for 2011 are available from the U.S. Department of Commerce, Bureau of Economic Analysis (BEA) for the nation, states, counties, and other selected geographies. Personal income is the income received by all persons from all sources. Per capita personal income (PCPI) is calculated as the total personal income of the residents of an area divided by the population of the area. BEA data for 2011 shows that Yellowstone County had a PCPI of $39,640. This PCPI ranked 8th in the state and was 110% of the state average ($36,016) and 95% of the national average ($41,560).

Table 3.8: Household Income

Income	City of Laurel	Yellowstone County	State of Montana	United States
Median Household Income	$46,530	$50,185	$45,324	$52,762
Per Capita Income	$21,631	$27,273	$24,640	$27,915

Source: US Census Bureau, 2007 – 2011 American Community Survey (in 2011 inflation-adjusted dollars)

Figure 3.2 shows the estimated distribution of household income and benefits for residents of the City of Laurel, Yellowstone County, the State of Montana and the nation. It is notable that these income levels in Laurel are above those for the County, State, and nation for the "less than $10,000" income category and for the $35,000 to $100,000 income categories.

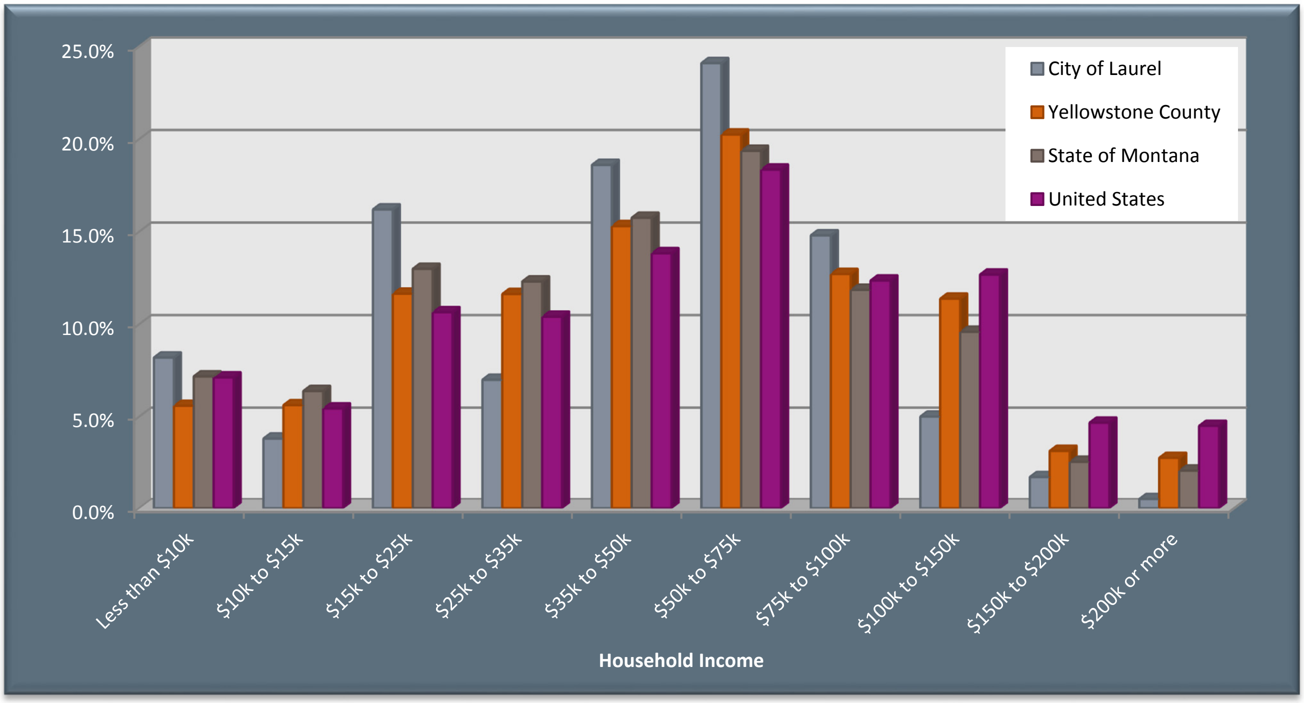


Figure 3.2: Household Income and Benefits

Source: US Census Bureau, 2007 – 2011 American Community Survey (in 2011 inflation-adjusted dollars)

Table 3.9 presents poverty statistics for the City of Laurel and Yellowstone County and compares them with those for the State of Montana and the nation. These statistics show that fewer individuals likely live below the poverty line in both Laurel and Yellowstone County when compared to similar poverty measures for the state and nation. Note that the poverty statistics for the City of Laurel are estimates with high margins of error and should be integrated with caution.

Table 3.9: Poverty Status (2007-2011)

Poverty Measure	City of Laurel	Yellowstone County	State of Montana	United States
Persons Living in Poverty (%)	11.5%	11.4%	14.6%	14.3%
Persons Under 18 Living in Poverty (%)	17.1%	15.4%	19.4%	19.4%
Persons Over 65 Living in Poverty (%)	6.5%	7.7%	8.7%	9.4%

Source: US Census Bureau, 2007 – 2011 American Community Survey (in 2011 inflation-adjusted dollars)

3.1.6. Commuting to Work

Information about the number of workers and their commuting characteristics is shown in **Table 3.10**. The information provides estimates of the total share of workers who commute or work at home, the transportation modes used by commuters, and the mean travel times to work for commuters. The table provides a comparison of commuting characteristics for workers in the City of Laurel, Yellowstone County, and the State of Montana.

The data shows that workers living in the City of Laurel are more likely to drive alone than those living in Yellowstone County. The mean travel time to work for City of Laurel residents is slightly higher than for Yellowstone County and the State of Montana. These characteristics are likely influenced by Laurel residents commuting to Billings for work.

Table 3.10: Commuting to Work Statistics

Commuting to Work	City of Laurel		Yellowstone County		State of Montana	
Workers 16 years and over	**3,345**		**75,212**		**468,895**	
Drove Alone	2,831	84.6%	60,777	80.8%	350,476	74.7%
Carpooled	212	6.3%	7,119	9.5%	48,231	10.3%
Public Transportation	9	0.3%	1,090	1.4%	4,709	1.0%
Walked	89	2.7%	2,293	3.0%	22,975	4.9%
Other Means	78	2.3%	1,082	1.4%	11,471	2.4%
Worked at Home	126	3.8%	2,856	3.8%	31,033	6.6%
Mean Travel Time to Work	**18.3 min**		**17.9 min**		**17.9 min**	

Source: US Census Bureau, 2007 – 2011 American Community Survey

3.2. EXISTING LAND USE AND FUTURE DEVELOPMENT

Land use plays a critical role in shaping transportation networks. Land use decisions affect the transportation system and can increase viable options for people to access work and recreation sites, goods, services, and other resources in the community. In turn, the existing and future transportation system may be impacted by the location, type, and design of land use developments through changes in travel demands, travel mode choices, and travel patterns.

Railroad transportation was responsible for the establishment of Laurel as the Northern Pacific, Great Northern, and the Chicago, Burlington, and Quincy Railroads all met in Laurel in the early 1900s. As a result, a large rail yard developed which influenced the original layout of the community and this feature continues to be a prominent feature of the community today.

The City of Laurel was built on a grid system of streets and has a defined Central Business District north of Main Street which adjoins the rail facilities in the community. Commercial and industrial uses were typically concentrated in the Central Business District (now the City's historic downtown district) or along major roads and streets. Laurel has evolved over the years as population growth and new development has been realized and in response to the development of I-90 around the southern perimeter of the community. After I-90 was built, commercial expansion occurred in areas near the interchange and fronting South 1st Avenue which leads to Laurel's downtown area. The area bounded by South 1st Avenue, East Railroad Street, and I-90 has also evolved into a busy commercial industrial area. The CHS refinery and other industrial lands exist south of I-90 and are not within the incorporated city limits.

Extensive residential uses are still seen in the area north of the downtown and Main Street. Residential uses are also seen in the southwest portion of the city between I-90 and the railroad. Rural residential development has occurred on the fringe areas to the north and east of the City and to a lesser extent in areas south and west of the City. Multiple-family and mobile home residential development is widely scattered throughout the community. **Figure 3.3** illustrates current land uses in the City and on adjoining county lands.

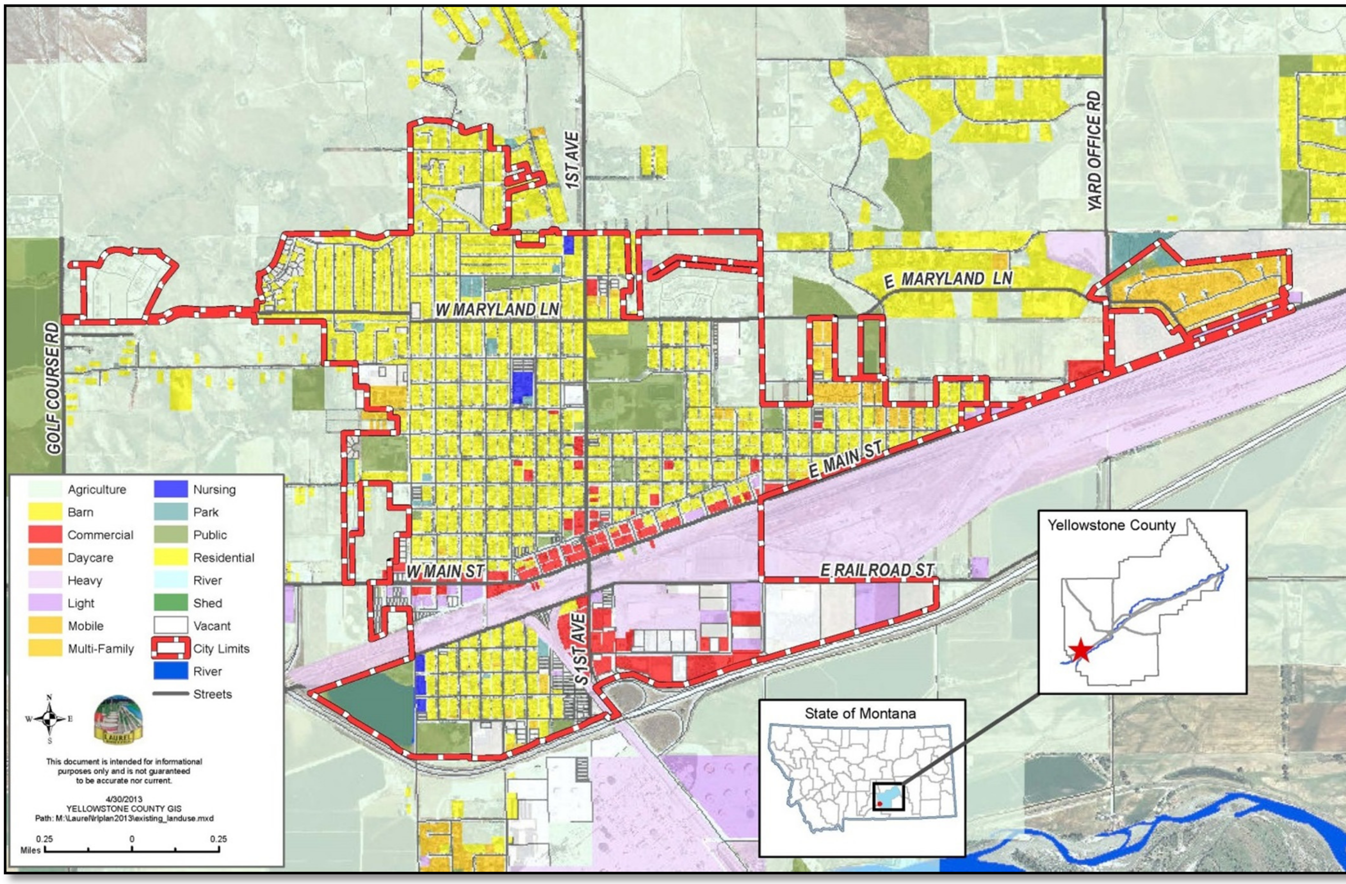


Figure 3.3: Existing Land Use

Source: City of Laurel Growth Management Plan (2013)

The City's *Growth Management Plan* identifies areas to the west and north of the current city limits as key areas for future residential growth. These areas include sizable areas of undeveloped land but will require the extension of water and sewer before growth can occur. The *Growth Management Plan* also advocates compatible infill development to replace vacant or underutilized sites in existing neighborhoods.

Within the city limits, the Highway 10 and South East 4th Street corridors have been identified as areas that provide opportunities for business growth with some vacant industrial and commercial zoned tracts. Redevelopment of vacant commercial buildings located in the downtown area and along South 1st Avenue south of the underpass is also a recognized future development opportunity.

Figure 3.4 illustrates proposed future land use for the community.

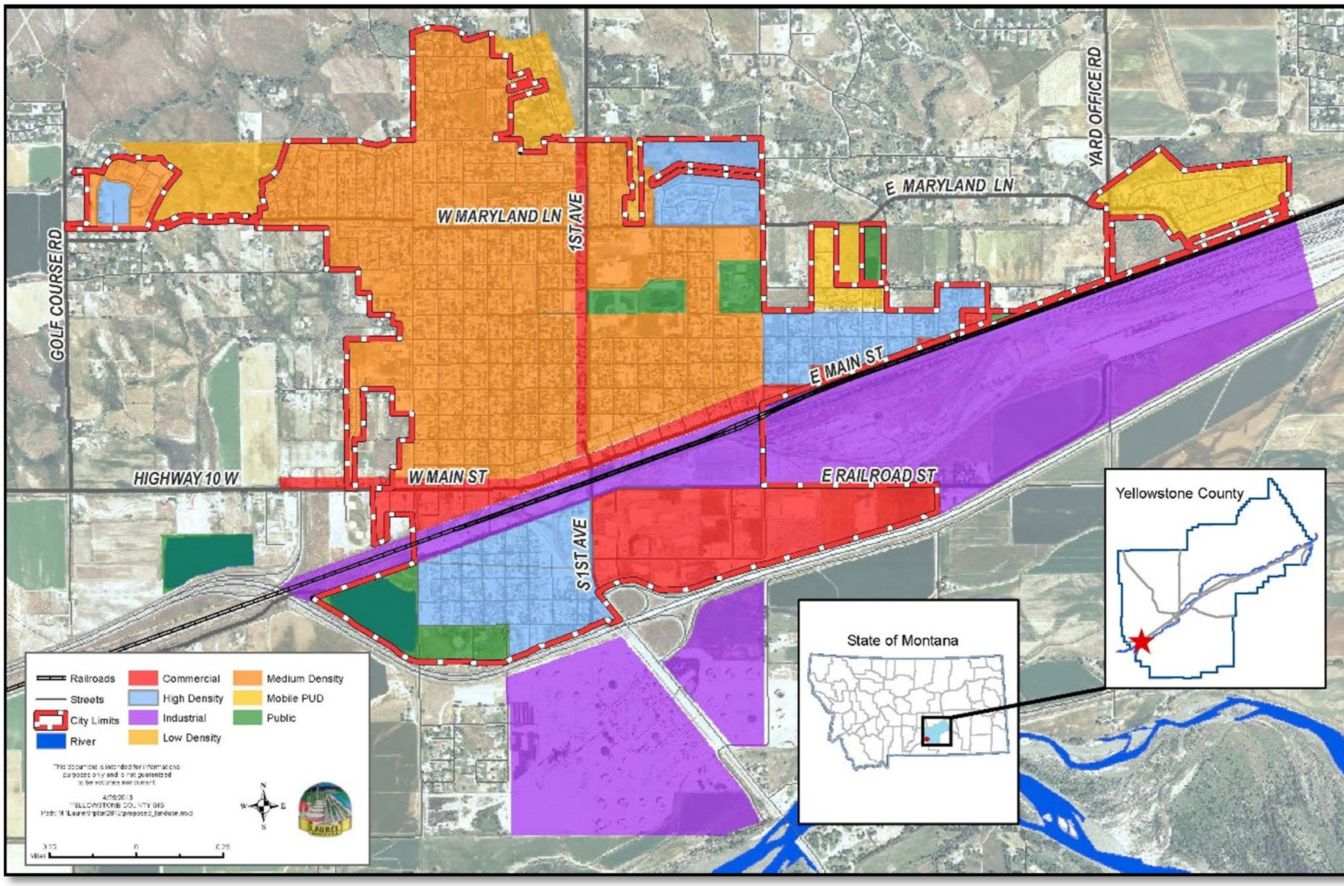


Figure 3.4: Proposed Land Use

Source: City of Laurel Growth Management Plan (2013)

3.2.1. Population and Housing Projections

Projections are estimates of the population for future dates. They illustrate reasonable estimates of future population based on assumptions about current or expected demographic trends. Population projections (along with forecasts of the number of future housing units and employment conditions) are used to help predict future travel patterns and assess the performance of the transportation system.

County level population projections are available from Montana Department of Commerce Census & Economic Information Center (CEIC). The CEIC projections were developed by Regional Economic Models, Inc. (REMI) and provide complete annual demographic forecasts through 2060 for the State of Montana and each county. Similar projections are not available from the CEIC for other geographies in the State.

The REMI model projects Yellowstone County's population of 182,191 for the year 2035. This represents an overall increase in population of 23.1% over the 2010 population and an annual growth rate of approximately 0.84%.

Population within the study area was applied by the average annual growth rate estimated by REMI for Yellowstone County (0.84%). Based on this annual growth rate, the population in the study area is projected to be 13,751 by the year 2035. The City's *Growth Management Plan* used annual growth rates of 0.75% and 1.00% to project future populations. These rates are consistent with the annual growth seen during the 1990 to 2010 period in Laurel. The *Growth Management Plan* notes the 0.75% rate is conservative, but realistic, and 1.00% growth rate accounts for possible increased growth due to energy development in eastern Montana. The REMI growth rate for Yellowstone County was chosen to project the City's population. This growth is generally in line with locally-identified annual rates.

The number of housing units is a key component in the traffic model. Housing units distribute people throughout the network to given locations. This represents the population and acts as a hub for traffic within the network. Having an accurate value for number of people per housing unit helps distribute the traffic more accurately. However, it is often quite difficult to accurately represent the population through housing units. This is in part because the number of people per housing units varies based on location and can change in time. The best that can be done is to take an average for the entire study area and apply that value to the model.

The population in Yellowstone County was 147,972 people distributed among 63,943 housing units according to the 2010 Census. This represents an overall occupancy rate of about 2.31 people per housing unit. If the current occupancy rate for housing units in the County is held constant, there will be approximately 78,871 housing units in 2035 based on a projected population of 182,191. This means the County would have about 14,928 more housing units by 2035 than were recorded in 2010.

Future numbers of housing units in the study area were similarly estimated by applying the same overall housing unit occupancy rate to the projected population at various milestone years to 2035. This process showed the number of housing units within the study area may increase from 4,660 (in 2010) to 5,953 housing units by the year 2035—an increase of 1,293 housing units.

Table 3.11 shows population and housing unit projections for the study area as well as Yellowstone County for the year 2035.

Table 3.11: Population and Housing Unit Projections

Year	Study Area		Yellowstone County [a]	
	Population	Housing Units	Population	Housing Units
2010	11,168	4,660	147,972	63,943
2015	11,642	5,040	160,556	69,505
2020	12,137	5,254	170,586	73,847
2025	12,653	5,477	177,106	76,669
2030	13,190	5,710	180,520	78,147
2035	13,751	5,953	182,191	78,871
Net Change (2010 - 2035)	**2,583**	**1,293**	**34,219**	**14,928**

Note: The number of future housing units determined based on an occupancy rate of 2.31 persons per housing unit.
[a] Montana Department of Commerce, CEIC, Montana County Population Projections-County Comparison, 1990-2060, eREMI projections, released April 2013.

3.2.2. Employment Projections

Employment numbers are used in the traffic model to help distribute vehicle traffic as accurately as possible within the street and road network. Places with high levels of employment will tend to generate high levels of vehicle traffic. The traffic generated is based in part on the employment type: either retail or non-retail jobs. Non-retail jobs consist of all types of jobs broken out by the North American Industry Classification System classifications excluding "retail trade."

The traffic model establishes the total employment for Yellowstone County at 94,503 jobs—including 19,883 retail jobs and 74,620 non-retail jobs. Future employment for Yellowstone County was projected using an annual growth rate of 1.67%—which represents the overall annual rate of employment growth between 1980 and 2010 in the county. Retail jobs and non-retail jobs accounted for about 21% and 79%, respectively, of the total employment in the county in 2010. These percentages were held constant and used to estimate the number of retail and non-retail jobs to the year 2035. Based on the 25-year growth rate for employment and the breakdown of retail versus non-retail jobs, the total employment in Yellowstone County is projected to be 142,956 by 2035 consisting of 30,077 retail jobs and 112,879 non-retail jobs. This suggests there would be 48,453 more jobs in the county by 2035 than were seen in 2010.

Within the study area, the traffic model showed a total employment of 4,955 consisting of 1,277 retail jobs and 3,768 non-retail jobs in 2010. Future employment was projected to 2035 using the same long-term annual employment growth rate seen for the county (1.67% per year) and the same distribution of retail versus non-retail jobs seen within the study area. This methodology resulted in a 2035 projection of 7,495 total jobs within the study area (1,932 retail jobs and 5,564 non-retail jobs). This indicates there would be 2,540 more jobs in the study area by 2035 than were estimated in 2010. The projection appears reasonable given the likelihood of persons residing outside the City traveling to Laurel to work at locations like the CHS refinery, the MRL yard, and Walmart.

Table 3.12 presents employment projections for the study area and Yellowstone County for the year 2035.

Table 3.12: Employment Projections

Year	Study Area			Yellowstone County		
	Retail	Non-Retail	Total	Retail	Non-Retail	Total
2010	1,277	3,678	4,955	19,883	74,620	94,503
2015	1,387	3,995	5,383	21,599	81,060	102,659
2020	1,507	4,340	5,847	23,463	88,056	111,519
2025	1,637	4,715	6,352	25,488	95,655	121,143
2030	1,778	5,122	6,900	27,688	103,911	131,598
2035	1,932	5,564	7,495	30,077	112,879	142,956
Net Change (2010 - 2035)	**655**	**1,886**	**2,540**	**10,194**	**38,259**	**48,453**

3.3. TRAVEL DEMAND MODEL DEVELOPMENT

A travel demand model was developed by MDT for Yellowstone County using *TransCAD* software. The process to develop the model consists of generating, distributing, and assigning vehicle trips to the roadway system to generate vehicle traffic. The following steps are made for developing the model:

- **Trip Generation** – Trip generation consists of applying nationally developed trip rates to land use quantities by the type of land use in the area. The trip generation step actually consists of two individual steps: trip production and trip attraction. Trip production and trip attraction help to "explain" why the trip is made. Trip production is based on relating trips to various household characteristics. Trip attraction considers activities that might attract trip makers, such as offices, shopping centers, schools, hospitals and other households. The number of productions and attractions in the area is determined and is then used in the distribution phase.
- **Trip Distribution** – Trip distribution is the process in which a trip from one area is connected with a trip from another area. These combined trips are referred to as trip exchanges.
- **Mode Split** – Mode choice is the process by which the amount of travel will be made by each available mode of transportation. There are two major types: automobile and transit. The automobile mode is generally split into drive alone and shared ride modes. For this travel demand model, there were no "mode split" assignments (i.e. all trips are assumed to be automobile mode).
- **Trip Assignment** – Once the trip distribution element is completed, the trip assignment tags those trips to the major street network. The variables that influence the street or location tagged are travel time, length, and capacity.

To reflect existing conditions, the model uses 2010 population census information, 2010 employment information from *GeoResults*, and Geographic Information System (GIS) information for the existing roadway network. Traffic volumes generated by the existing conditions model are compared to existing physical traffic counts and adjustments are made to “calibrate” the model to ensure accuracy.

The projected conditions model was developed specifically for the year 2035 planning horizon. Additional housing and employment centers were added to the system to analyze projected traffic conditions. Census blocks were used to distribute the population and employment growth that is projected to occur between now and 2035.

Built into the model are assumptions about traffic characteristics. The model assumes that traffic characteristics in the future will be similar to those seen today. Changing factors such as fuel costs, technological advances, and other unknown issues may affect the amount and type of traffic on the road network in the future. The model also assumes that the socioeconomic projections will be realized by the year 2035. Ultimately, the projected conditions model is used as a planning tool to help predict how traffic patterns might be affected by anticipated future developments.

3.3.1. Allocation of Future Growth

Modeling of future travel patterns out to the year 2035 planning horizon using MDT’s traffic model requires identification of future socioeconomic characteristics within each census tract and census block. County population and employment projections were translated into predictions of increases in housing and employment within the study area.

To accomplish this task, an initial allocation of future housing and employment growth within the study area was made based on a review of existing land use and zoning maps for the City of Laurel and surrounding county area and the City’s *Growth Management Plan*. County growth policy updates, and other community planning documents. These planning documents helped identify where residential, commercial and industrial development has occurred in the Laurel area and provided information about where future residential and commercial growth is expected in the community. The initial allocation of future housing units and employment attempts to reflect known patterns of growth and potential new growth areas within the study area.

Figure 3.5 shows where future housing units are expected to be developed by the year 2035. As discussed previously, 1,293 new housing units were allocated within the study area, while a total of 14,928 new housing units were applied to Yellowstone County.

Similarly, **Figures 3.6** and **3.7** shows where the projected increases in retail and non-retail employment are anticipated through the year 2035. As noted earlier, 655 retail and 1,886 non-retail jobs were allocated within the study area, with a total of 10,194 retail and 38,259 non-retail jobs for Yellowstone County.

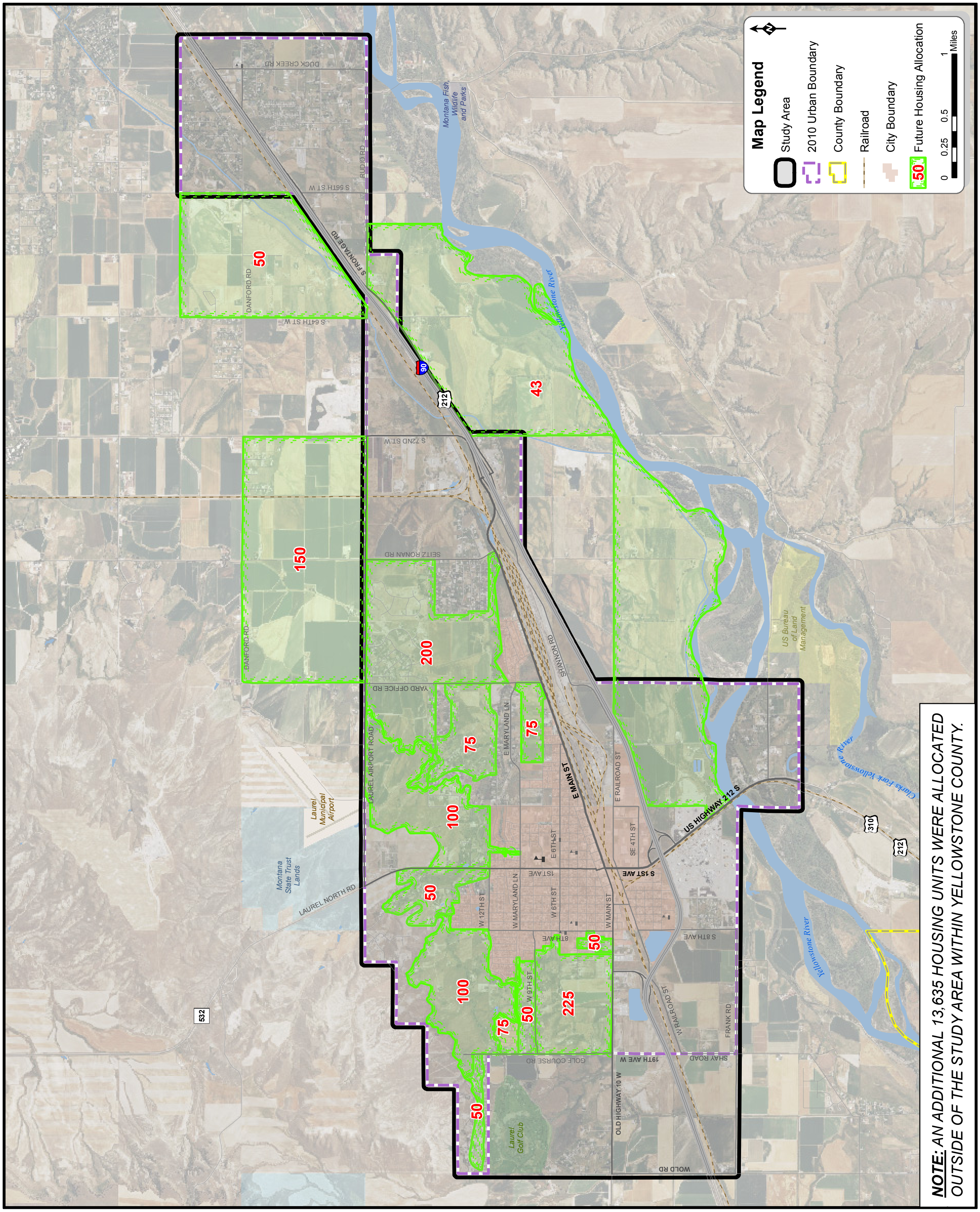


Figure 3.5: Housing Unit Allocation

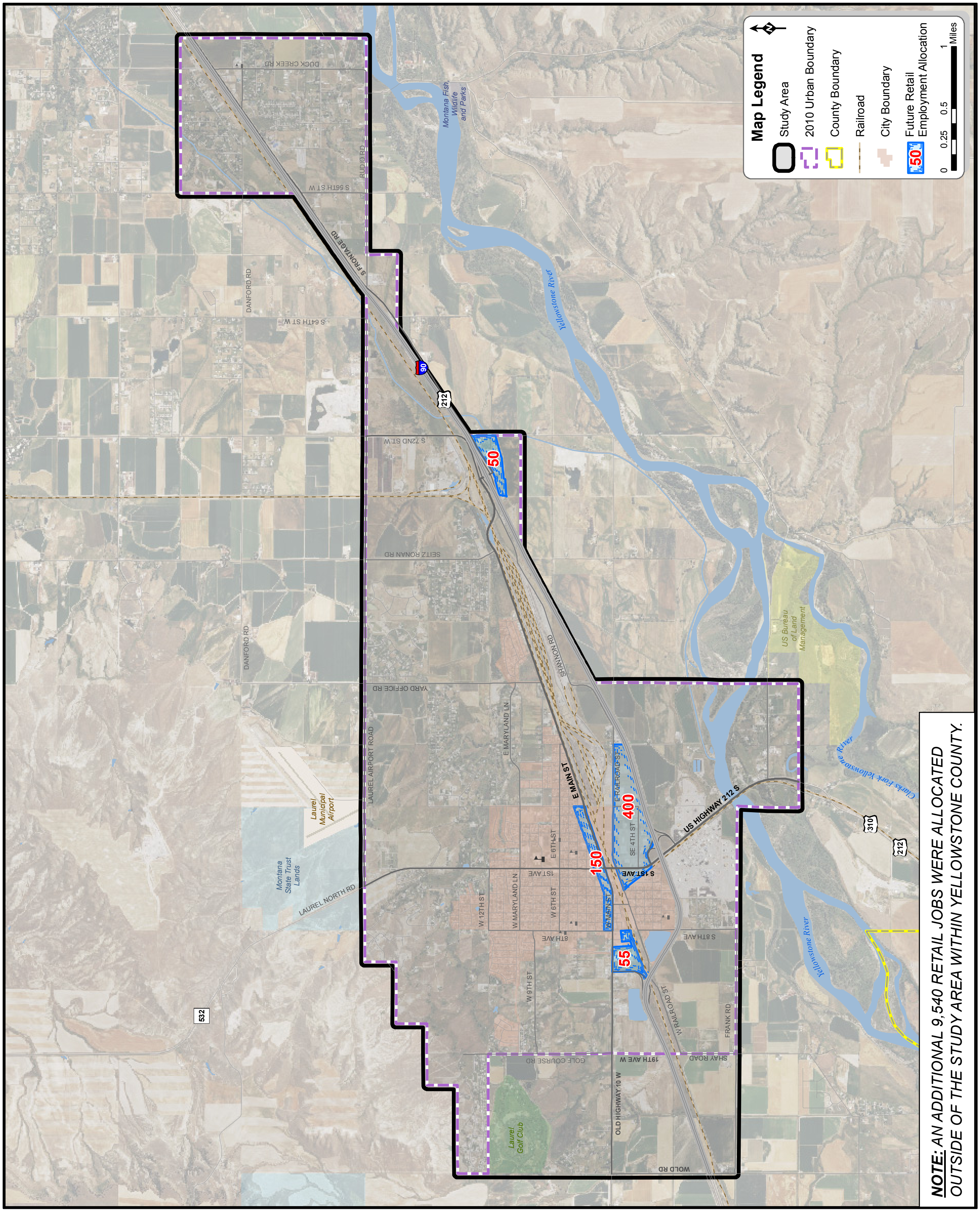


Figure 3.6: Retail Employment Allocation

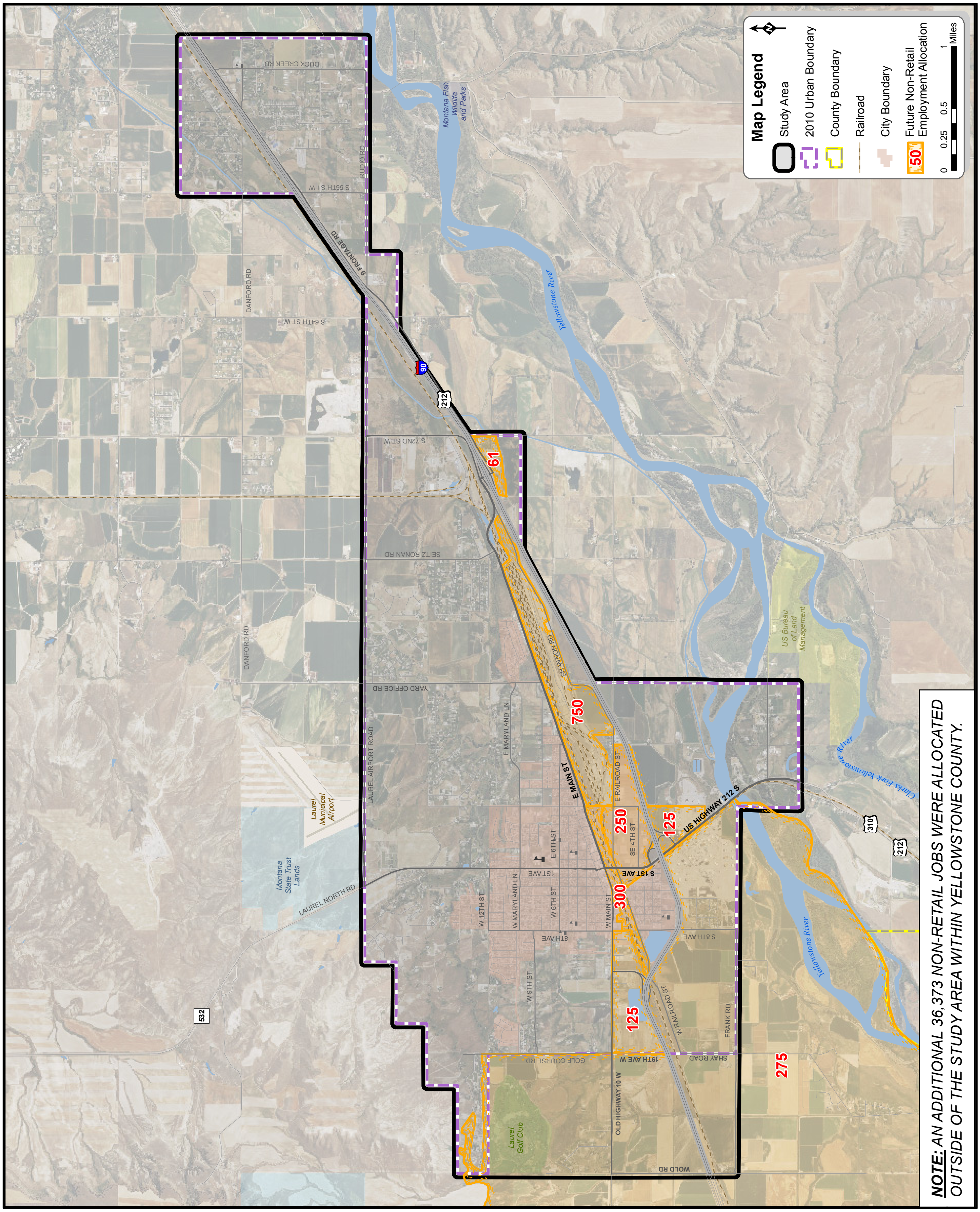


Figure 3.7: Non-Retail Employment Allocation

3.4. PROJECTED ROADWAY VOLUMES AND CAPACITY

Projected traffic volumes were estimated using the travel demand model. A comparison of the existing and projected conditions models was made to determine the percent change in traffic volume. The percent change was then applied to known existing AADT count sites to reflect projected daily traffic volumes. **Figure 3.8** shows the resulting projected daily traffic volumes within the study area; similarly, **Figure 3.9** shows the projected v/c ratios.

Note that the volumes shown on **Figure 3.8** and the v/c ratios shown on **Figure 3.9** are based on the existing roadway network. In other words, these are the volumes and v/c ratios if no changes to the transportation system are made.

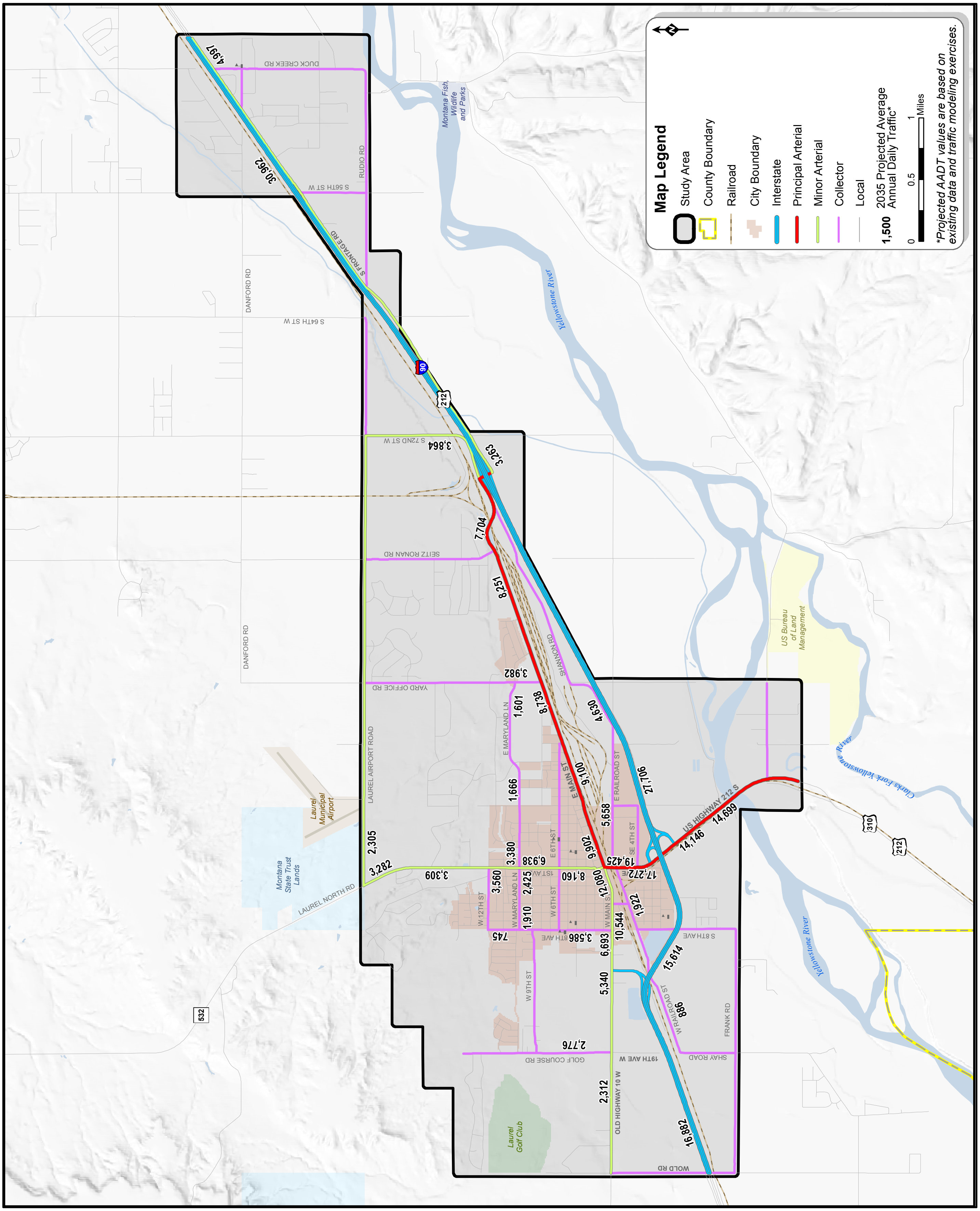


Figure 3.8: Projected Average Annual Daily Traffic

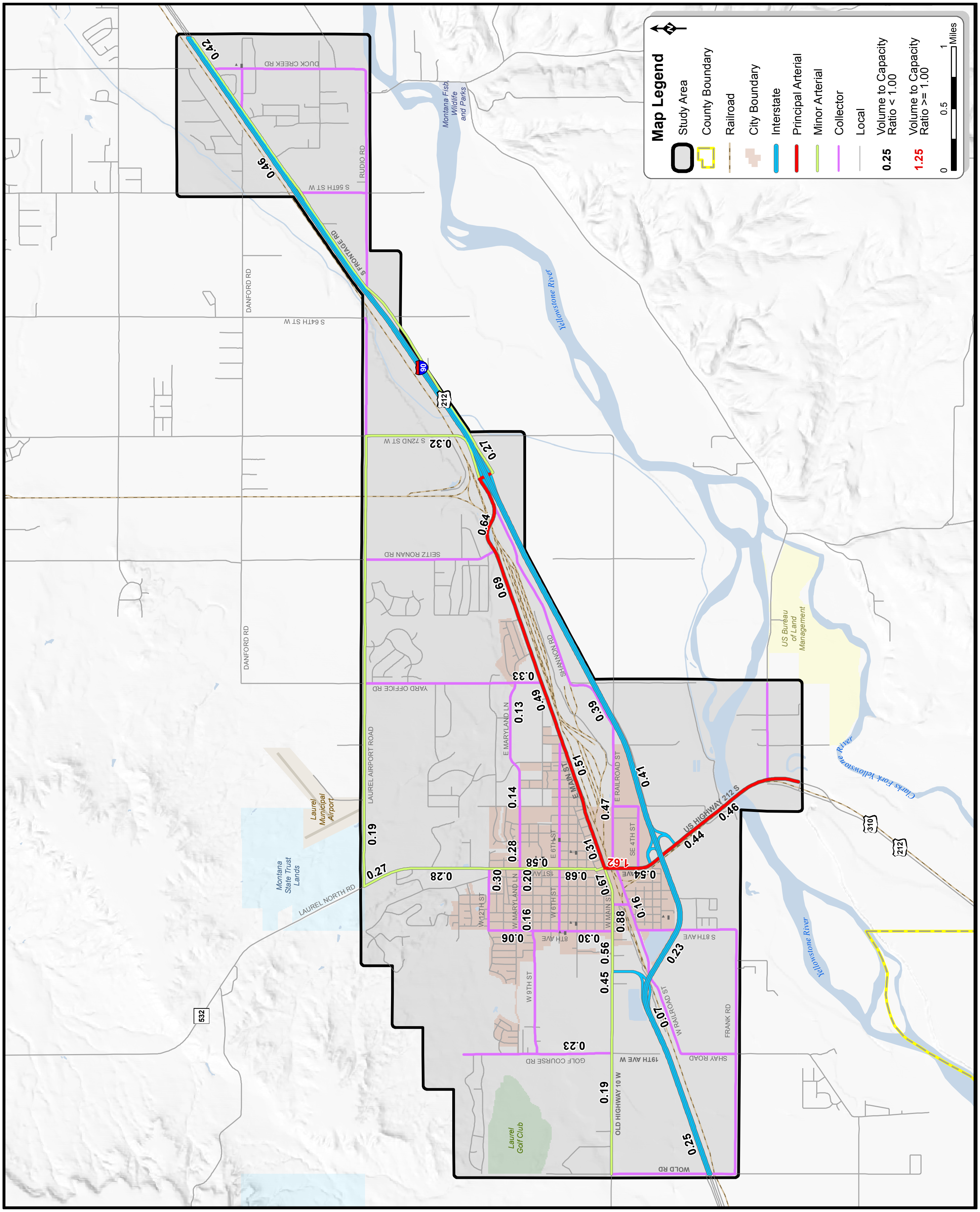


Figure 3.9: Projected Volume to Capacity Ratios

3.5. PROJECTED INTERSECTION LEVELS OF SERVICE

Projections for intersection traffic volumes were made for the 12 intersections analyzed previously in **Section 2.3**. These projections were based on percent growth rates calculated from the travel demand model for the year 2035. A growth rate determined for the intersection as a whole was applied to each individual turning movement to represent projected conditions. The intersection LOS was calculated using the existing street layouts, lane-use configurations, and traffic control devices. The results of the analysis are shown in **Table 3.13**. **Figure 3.10** shows the projected conditions LOS graphically.

Table 3.13: Projected Intersection LOS

ID	Intersection*	AM Peak Hour		PM Peak Hour	
		Delay (Sec)	LOS	Delay (Sec)	LOS
1	**US Highway 212 / EB Ramps (U)**	**17.6**	**C**	**45.1**	**E**
	Westbound Left/Thru	*94.8*	*F*	*112.1*	*F*
	Westbound Right	*10.9*	*B*	*10.4*	*B*
2	**S 1st Ave / WB Ramps (S)**	**27.9**	**C**	**86.1**	**F**
	Eastbound Left/Thru/Right	*23.0*	*C*	*13.2*	*B*
	Westbound Left	*87.8*	*F*	*172.1*	*F*
	Westbound Thru/Right	*21.3*	*C*	*15.6*	*B*
	Northbound Left	*10.8*	*B*	*61.7*	*E*
	Northbound Thru	*14.1*	*B*	*40.1*	*D*
	Northbound Right	*10.8*	*B*	*40.2*	*D*
	Southbound Left	*41.7*	*D*	*54.7*	*D*
	Southbound Thru	*9.8*	*A*	*143.5*	*F*
	Southbound Right	*9.8*	*A*	*144.1*	*F*
3	**S 1st Ave / SE 4th St (S)**	**13.1**	**B**	**29.9**	**C**
	Eastbound Left/Thru/Right	*27.0*	*C*	*21.6*	*C*
	Westbound Left	*37.2*	*D*	*52.9*	*D*
	Westbound Thru/Right	*28.6*	*C*	*19.6*	*B*
	Northbound Left	*9.8*	*A*	*17.4*	*B*
	Northbound Thru	*12.5*	*B*	*34.4*	*C*
	Northbound Right	*11.3*	*B*	*21.6*	*C*
	Southbound Left	*5.3*	*A*	*40.8*	*D*
	Southbound Thru/Right	*6.1*	*A*	*14.8*	*B*
4	**1st Ave / 1st St (U-A)**	**12.1**	**B**	**13.0**	**B**
	Eastbound Left/Thru/Right	*10.0*	*A*	*10.2*	*B*
	Westbound Left/Thru/Right	*9.8*	*A*	*10.4*	*B*
	Northbound Left/Thru/Right	*12.4*	*B*	*14.7*	*B*
	Southbound Left/Thru/Right	*12.9*	*B*	*12.8*	*B*
5	**1st Ave / 6th St (U-A)**	**14.5**	**B**	**20.1**	**C**
	Eastbound Left/Thru/Right	*12.0*	*B*	*10.8*	*B*
	Westbound Left/Thru/Right	*14.0*	*B*	*10.5*	*B*
	Northbound Left/Thru/Right	*15.5*	*C*	*26.8*	*D*
	Southbound Left/Thru/Right	*15.4*	*C*	*14.1*	*B*
6	**1st Ave / 8th St (U)**	**27.7**	**D**	**23.9**	**C**
	Eastbound Left/Thru/Right	*27.7*	*D*	*19.5*	*C*
	Westbound Left/Thru/Right	*23.2*	*C*	*23.9*	*C*
7	**1st Ave / Maryland Ln (U)**	**277.2**	**F**	**146.7**	**F**
	Eastbound Left/Thru/Right	*44.0*	*E*	*27.0*	*D*
	Westbound Left/Thru/Right	*277.2*	*F*	*146.7*	*F*

ID	Intersection*	AM Peak Hour		PM Peak Hour	
		Delay (Sec)	LOS	Delay (Sec)	LOS
8	**S 8th Ave / S 5th St (U)**	**9.0**	**A**	**11.0**	**B**
	Westbound Left/Right	*9.0*	*A*	*11.0*	*B*
9	**8th Ave / Main St (U)**	**224.5**	**F**	**329.8**	**F**
	Northbound Left/Thru/Right	*10.5*	*B*	*13.7*	*B*
	Southbound Left/Thru/Right	*224.5*	*F*	*329.8*	*F*
10	**8th Ave / 4th St (U)**	**14.7**	**B**	**12.5**	**B**
	Eastbound Left/Thru/Right	*14.6*	*B*	*11.4*	*B*
	Westbound Left/Thru/Right	*14.7*	*B*	*12.5*	*B*
M.1	**Main St / 1st Ave (S)**	**23.2**	**B**	**136.0**	**F**
	Eastbound Left	*27.6*	*C*	*47.4*	*D*
	Eastbound Thru	*25.9*	*C*	*82.0*	*F*
	Eastbound Right	*54.6*	*D*	*310.9*	*F*
	Westbound Left	*43.4*	*D*	*796.8*	*F*
	Westbound Thru	*24.9*	*C*	*89.5*	*F*
	Westbound Right	*23.7*	*C*	*35.1*	*D*
	Northbound Left/Thru	*7.5*	*A*	*14.2*	*B*
	Northbound Right	*5.4*	*A*	*3.3*	*A*
	Southbound Left/Thru/Right	*12.7*	*B*	*8.0*	*A*
M.2	**1st Ave / Railroad St (U)**	**33.1**	**D**	**263.7**	**F**
	Eastbound Left/Thru/Right	*33.1*	*D*	*263.7*	*F*
	Westbound Left/Thru/Right	*24.5*	*C*	*NA*	*NA*

**"S" = Signalized, "U" = Unsignalized, "U-A" = All-way stop control*

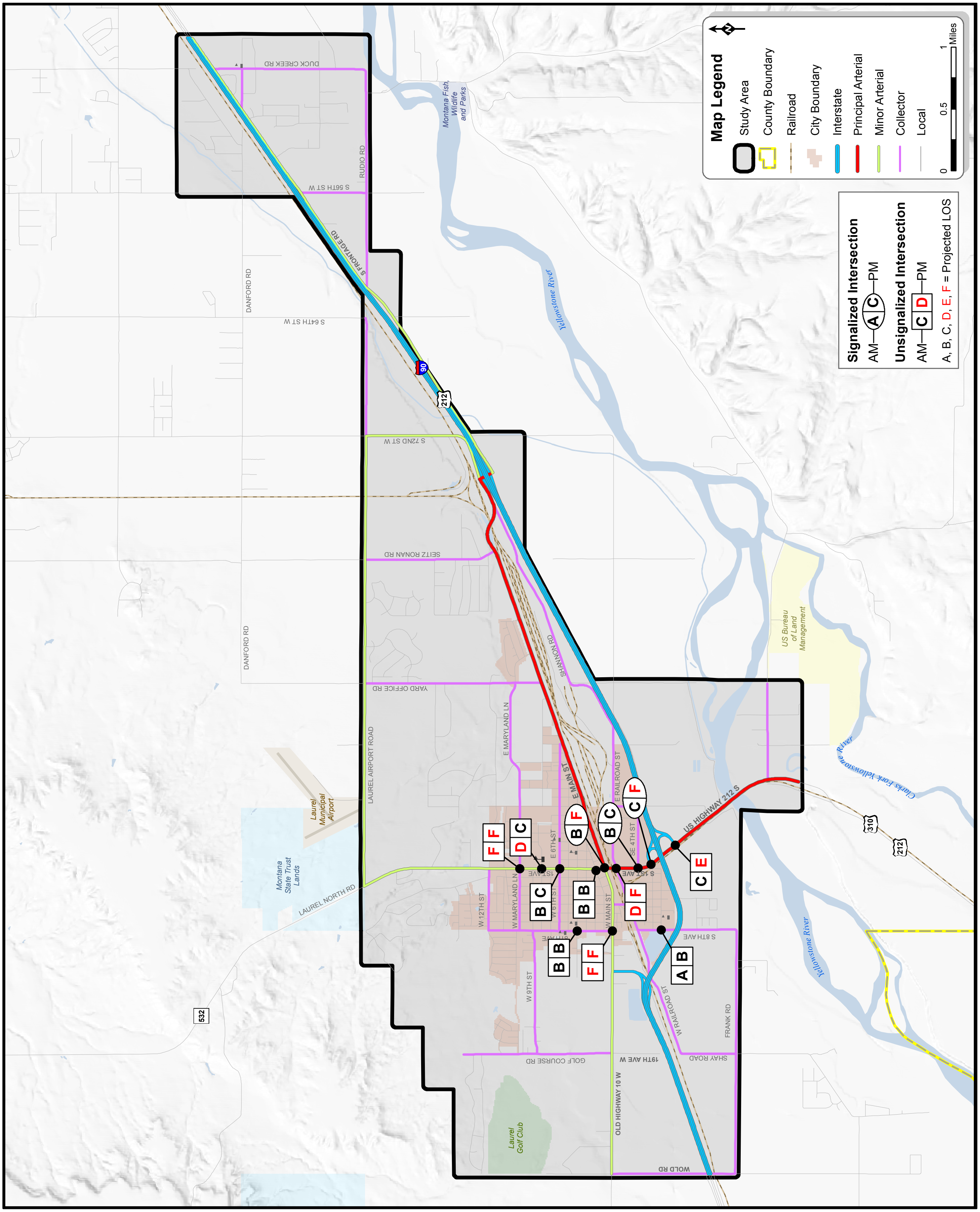


Figure 3.10: Projected Intersection Level of Service

3.6. ALTERNATIVE NETWORK MODELING

The travel demand model developed for the LRTP was used to analyze the effects that various network improvements would have on the transportation network. Using the traffic model provided by MDT, it is possible to produce traffic assignments that predict the effects of major modifications and additions to the street network.

Various transportation system alternatives, such as interchange modifications and new major facilities, were identified based on theoretical long-term improvements to the network. Modeling scenarios were ultimately developed to include new roadway links in areas where transportation needs presently exist, or where future investment may be needed as a result of expected population/employment growth. **Figure 3.11** gives a graphical representation of the alternative scenarios.

The alternatives presented in this section are for modeling purposes only and do not represent actual project recommendations at this time. The analysis of these alternatives was made to give a theoretical idea of how certain network modifications made to the transportation system may affect the overall network and surrounding area. Should projects arise in the future along these corridors, design alternatives to those discussed in this section will need to be analyzed to determine the appropriate configuration of the roadways.

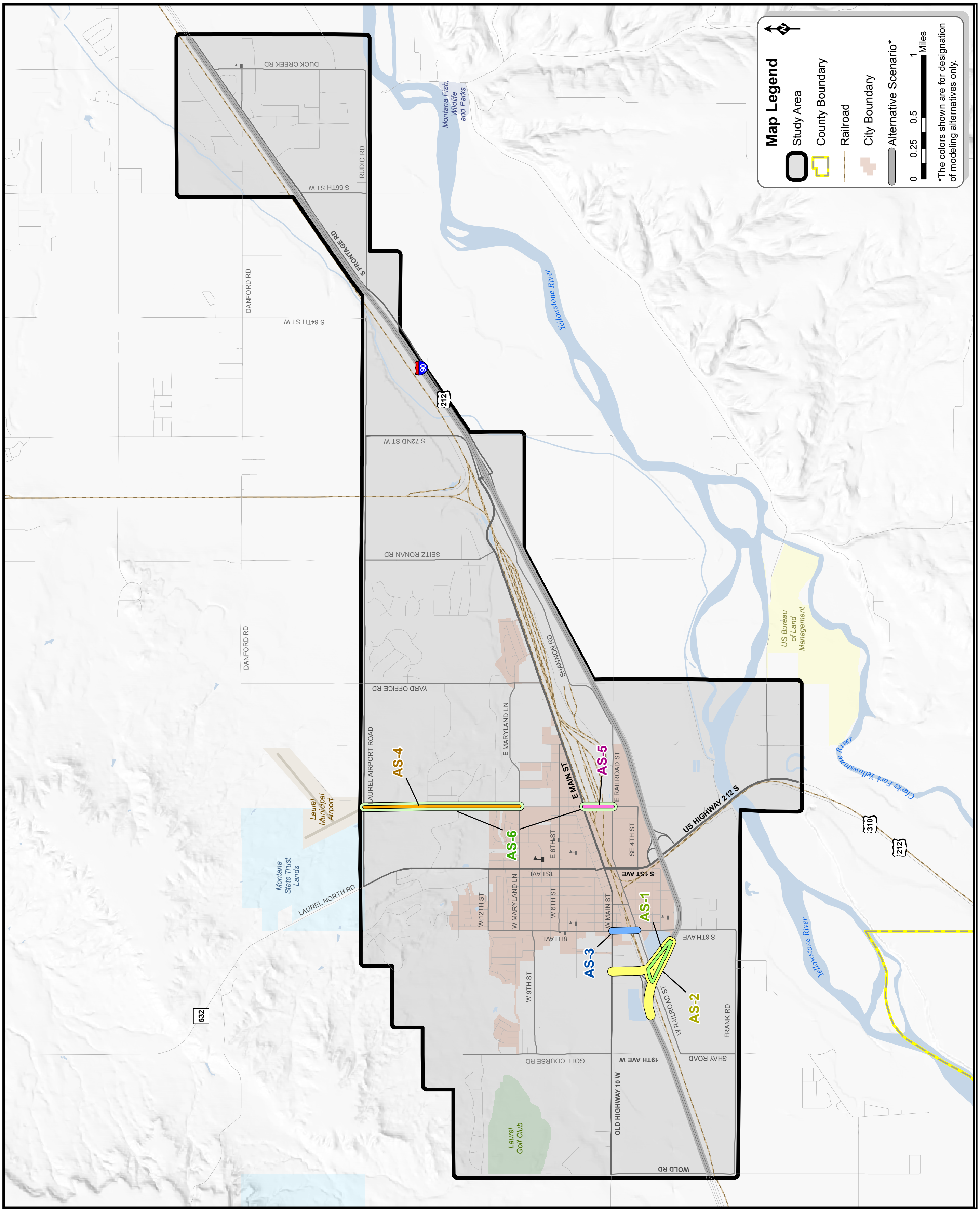


Figure 3.11: Alternative Modeling Scenarios

3.6.1. Alternative Scenarios

Six modeling scenarios were developed for the purposes of this exercise and are discussed in the following sections. The alternative scenarios are generally localized and create new links or expand existing facilities in a particular study subarea. The effect of each scenario on the network generally occurs most noticeably in a concentrated area where changes to the network are made. Because all scenarios involve new links and/or roadway capacity additions, the scenario analysis is focused on how traffic volumes are shifted on key facilities throughout the major effected area.

Listed in this section are narrative descriptions of the network modifications made for each model run, along with a brief description of the results. The modeling of each alternative scenario was completed under projected year 2035 conditions assuming that no other modifications to the existing traffic network were made. For comparison purpose, the projected year 2035 modeling results were used as baseline conditions. The results of each alternative scenario model were compared to the baseline model. The main attribute used for determining the affect that the alternative scenario has on the transportation system is the percent change in traffic volumes compared to the baseline traffic model.

Alt-1: West Laurel Interchange (Modification A)

Alt-1 would consist of modifications to the West Laurel Interchange to include a full movement interchange. Additional connections would be constructed to include a westbound off-ramp and an east bound on-ramp. The new interchange ramps would connect to W Railroad Avenue. The existing westbound on-ramp and eastbound off-ramp would remain unchanged under this scenario.

Table 3.14: Alt-1 Modeling Results

Location	2035 Base Volume	2035 Scenario Volume	Net Change	Percent Change
I-90 WB (east of West Laurel Int.)	9,614	11,062	1,448	15.1%
I-90 EB (east of West Laurel Int.)	9,929	11,345	1,416	14.3%
New WB Off Ramp	-	1,147	-	-
New EB On Ramp	-	1,416	-	-
W Railroad St (east of Shay Rd)	2,324	3,478	1,154	49.7%
W Railroad St (west of S 8th Ave)	2,324	1,541	-783	-33.7%
W Railroad St (west of S 1st Ave)	3,982	2,482	-1,500	-37.7%
S 1st Ave (north of Laurel Int.)	12,914	11,141	-1,773	-13.7%
S 1st Ave (at R/R underpass)	16,020	15,303	-717	-4.5%
Main St (east of West Laurel Int.)	4,770	3,729	-1,041	-21.8%
Main St (west of S 1st Ave)	8,580	7,507	-1,073	-12.5%

Modeling Results Summary:

Note that reconstruction of the West Laurel Interchange is included as committed project **C-2** later in this LRTP. This project will include full reconstruction of the interchange to include full access in both the eastbound and westbound directions.

The new interchange ramps modeled under this scenario are shown to attract approximately 1,000 to 1,500 vehicles per day (vpd) under future projected conditions. The traffic along the new interchange ramps is shown to result in decreased usage of the existing Laurel Interchange at S 1st Avenue. In addition, reductions in traffic volumes are realized along W Railroad Street (between S 1st Avenue and the new interchange ramps), Main Street (between the West Laurel Interchange and S 1st Avenue), and S 1st Avenue (between the Laurel Interchange and Main Street). Overall, this scenario results in a modest reduction in traffic along the major congested corridors.

ALT-2: WEST LAUREL INTERCHANGE (MODIFICATION B)

This alternative includes the new interchange ramp connections discussed previously in Alt-1. In addition, Alt-2 would provide a connection between Railroad Avenue (south of the railroad) and Old US Highway 10 (north of the railroad). The eastbound off-ramp would also be reconstructed to connect to Railroad Avenue. The purpose of this scenario is to determine the impact of connecting the new reconstructed West Laurel Interchange to the south side of the railroad tracks.

Table 3.15: Alt-2 Modeling Results

Location	2035 Base Volume	2035 Scenario Volume	Net Change	Percent Change
I-90 WB (east of West Laurel Int.)	9,614	12,052	2,438	25.4%
I-90 EB (east of West Laurel Int.)	9,929	11,846	1,917	19.3%
New WB Off Ramp	-	2,459	-	-
New EB On Ramp	-	2,160	-	-
W Railroad St (east of Shay Rd)	2,324	2,762	438	18.8%
W Railroad St (west of S 8th Ave)	2,324	1,858	-466	-20.1%
W Railroad St (west of S 1st Ave)	3,982	2,638	-1,344	-33.8%
S 1st Ave (north of Laurel Int.)	12,914	9,985	-2,929	-22.7%
S 1st Ave (at R/R underpass)	16,020	14,131	-1,889	-11.8%
Main St (east of West Laurel Int.)	4,770	5,371	601	12.6%
Main St (west of S 1st Ave)	8,580	6,084	-2,496	-29.1%

Modeling Results Summary:

Daily traffic volumes along the new ramps at the interchange range from approximately 2,000 vpd to 2,500 vpd. Traffic volumes are shown to decrease along S 1st Avenue by approximately 12 percent at the railroad underpass and by 23 percent north of the Laurel Interchange. Decreased volumes are also shown along portions of W Railroad Street and Main Street. This scenario is shown to attract more vehicles at the West Laurel Interchange than Alt-1, thus resulting in a larger decrease in traffic along the major routes.

While the traffic analysis shows only modest benefits, this scenario is envisioned as a long-term desire for the Laurel community to increase connectivity to the south side of the railroad. Additional connectivity is seen to help promote economic growth and to increase emergency response capabilities. The basis of this scenario was included as recommended project **MSN-1** later in this LRTP.

ALT-3: SOUTH 8TH AVENUE RAILROAD CROSSING

Alt-3 envisions a new connection along 8th Avenue between Old US 10 and Railroad Avenue. A new railroad crossing along the projected continuation of 8th Avenue would be included. This alternative would provide an alternate western route parallel to 1st Avenue with crossings of the railroad and Interstate 90. As with the previous scenario, this alternative was developed to address the limited connectivity to the south side of the railroad tracks.

Table 3.16: Alt-3 Modeling Results

Location	2035 Base Volume	2035 Scenario Volume	Net Change	Percent Change
N 8th Ave (north of Main St)	3,580	3,893	313	8.7%
8th Ave Extension (new R/R crossing)	-	1,558	-	-
W Railroad St (east of S 8th Ave)	2,475	3,189	714	28.8%
W Railroad St (west of S 1st Ave)	3,982	4,481	499	12.5%
S 1st Ave (north of Laurel Int.)	12,914	12,756	-158	-1.2%
S 1st Ave (at R/R underpass)	16,020	15,166	-854	-5.3%
Main St (east of 8th Ave)	7,324	6,363	-961	-13.1%
Main St (west of S 1st Ave)	8,580	7,794	-786	-9.2%

Modeling Results Summary:

Modeling of Alt-3 showed approximately 1,600 vpd along the new 8th Avenue railroad crossing. Changes in traffic volumes to the major transportation system were shown to be moderate. The model shows a decrease in traffic of approximately 5 percent along S 1st Avenue at the railroad underpass. Main Street also realized a moderate reduction in traffic. Conversely, traffic along W Railroad Street was shown to increase. Overall, this scenario was shown to have only modest impacts on the major congested roadways. This scenario was not included as a recommended project for this LRTP.

ALT-4: ALDER AVENUE EXTENSION

This alternative includes an extension of Alder Avenue from its northern termini (north of East Ridge Drive) to Laurel Airport Road. The connection would result in a continuous route along Alder Avenue between East Main Street and Laurel Airport Road.

Table 3.17: Alt-4 Modeling Results

Location	2035 Base Volume	2035 Scenario Volume	Net Change	Percent Change
Alder Ave Extension (south of Laurel Airport Rd)	-	833	-	-
Alder Ave (north of Main St)	150	871	721	480.7%
Main St (east of Alder Ave)	6,942	6,136	-806	-11.6%
Main St (west of Alder Ave)	6,967	6,872	-95	-1.4%
Main St (east of 1st Ave)	7,734	7,680	-54	-0.7%
S 1st Ave (at R/R underpass)	16,020	16,031	11	0.1%
Laurel Airport Rd (east of S-532)	4,042	4,044	2	0.0%

Modeling Results Summary:

The new Alder Avenue extension modeled under this alternative showed approximately 800 vpd. Overall traffic along Alder Avenue was shown to increase as a result of the new connection. Traffic along Main Street saw a minor decrease, while S 1st Avenue was mostly unaffected. While this scenario is shown to result in a very minor impact on traffic along the major corridors, it is envisioned that as development occurs in the area, Alder Avenue would be extended to connect with Laurel Airport Road. The extension would serve future development and offer additional north/south connectivity east of S 1st Avenue.

ALT-5: ALDER AVENUE / BERNHARDT ROAD CONNECTION

Alt-5 consists of a new connection along Alder Avenue / Bernhardt Road between East Main Street and East Railroad Street. This connection would cross the existing railroad tracks and a portion of the rail yard.

Table 3.18: Alt-5 Modeling Results

Location	2035 Base Volume	2035 Scenario Volume	Net Change	Percent Change
Alder Ave R/R Crossing (south of Main St)	-	5,839	-	-
Alder Ave (north of Main St)	150	2,046	1,896	1264.0%
Main St (east of Alder Ave)	6,942	7,409	467	6.7%
Main St (west of Alder Ave)	6,967	7,546	579	8.3%
Main St (east of 1st Ave)	7,734	8,058	324	4.2%
E 6th St (east of 1st Ave)	1,338	2,778	1,440	107.6%
E 6th St (west of Alder Ave)	982	2,671	1,689	172.0%
S 1st Ave (at R/R underpass)	16,020	11,952	-4,068	-25.4%
E Railroad St (east of S 1st Ave)	5,514	1,157	-4,357	-79.0%

Modeling Results Summary:

The results of this alternative show approximately 5,800 vpd along the new railroad crossing at the theoretical extension of Alder Avenue. The new railroad crossing is shown to have substantial impacts on the major corridors in the area. S 1st Avenue is shown to have a 25 percent reduction in traffic at the railroad overpass crossing. Similarly, traffic along E Railroad Street decreased by almost 80 percent. However, traffic along E 6th Street is shown to increase due to the change in travel patterns. This alternative provides the benefit of reducing traffic along the major congested routes, with the negative impact of increased traffic along E 6th Street. While this scenario results in a substantial benefit to traffic along S 1st Avenue, it was not carried forward as a recommendation due to the constraints with developing a railroad overpass at this location.

ALT-6: ALDER AVENUE EXTENSION WITH BERNHARDT ROAD CONNECTION

This alternative includes all aspects of Alt-4 and Alt-5 as discussed previously. Ultimately, Alt-6 would provide an alternate parallel route to 1st Avenue to the east. A crossing of the railroad tracks and rail yard is included with this alternative.

Table 3.19: Alt-6 Modeling Results

Location	2035 Base Volume	2035 Scenario Volume	Net Change	Percent Change
Alder Ave Extension (south of Laurel Airport Rd)	-	833	-	-
Alder Ave (north of Main St)	150	2,787	2,637	1758.0%
Alder Ave R/R Crossing (south of Main St)	-	5,839	-	-
Main St (east of Alder Ave)	6,942	6,588	-354	-5.1%
Main St (west of Alder Ave)	6,967	7,467	500	7.2%
Main St (east of 1st Ave)	7,734	8,005	271	3.5%
E 6th St (east of 1st Ave)	1,338	2,779	1,441	107.7%
E 6th St (west of Alder Ave)	982	2,677	1,695	172.6%
S 1st Ave (at R/R underpass)	16,020	11,953	-4,067	-25.4%
E Railroad St (east of S 1st Ave)	5,514	1,157	-4,357	-79.0%
Laurel Airport Rd (east of S-532)	4,042	4,033	-9	-0.2%

Modeling Results Summary:

The results of this alternative are similar to Alt-5. Ultimately, substantial traffic reductions are shown along S 1st Avenue and E Railroad Street, while increases in traffic volumes are realized along E 6th Street. This scenario is shown to have considerable benefits to the transportation system, however, as with Alt-5 this scenario was not carried forward as a recommendation due to the constraints with developing a railroad overpass at this location.

The development of this scenario would require cooperation with the railroad and would result in sizable impacts to nearby developed lands. This scenario should be viewed as a long-term vision if changes in land use are realized and as development occurs in the area.

3.6.2. Alternative Network Modeling Summary

The alternative scenarios modeled and described previously are reflective of theoretical modifications to the major street network that may or may not have value to the transportation system in the community. The scenarios were identified based on input from local staff and desired improvements to the transportation system. The results of the modeling effort are theoretical in nature and may not represent actual real-world conditions. This modeling exercise is used as a tool to help make educated decisions on whether or not to develop project recommendations from the alternative scenarios. The recommendations made in this LRTP are ultimately based on a number of factors including anticipated traffic impacts.

4.0
Safety

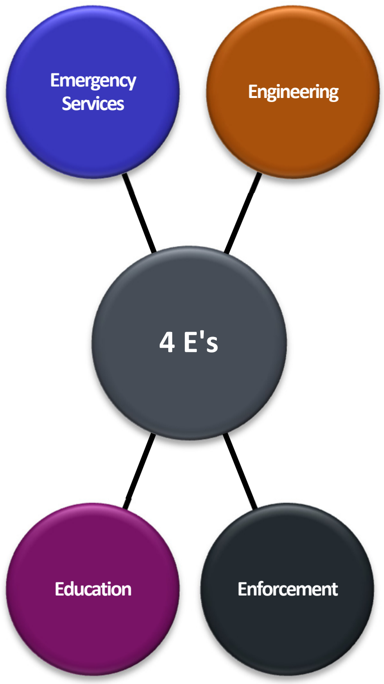


Figure 4.1: Four E's of Transportation Safety

Improving transportation safety requires more than just fixing a road or increasing police patrols. In order to be the most effective, safety improvements need to consider the “four E’s” of transportation safety: Education, Enforcement, Engineering, and Emergency Services.

Crash data within the study area was analyzed to determine problem areas, “hot-spot” crash locations, and behavioral characteristics. Trend analysis comparisons were also made for the City of Laurel, Yellowstone County, and the State of Montana to help identify unique trends. The following sections provide an analysis of available crash data to help identify crash trends and contributing factors.

4.1. STUDY AREA CRASH ANALYSIS

The MDT Traffic and Safety Bureau provided crash data for the five-year period from January 1st, 2008 to December 31st, 2012. The crash data was obtained from the MDT Safety Management System. The crash reports are a summation of information from the scene of the crash provided by responding officers. As such, some of the information contained in the crash reports may be subjective.

According to the MDT crash database, there were 993 crashes reported within the study area during the analysis time period. The crash database was plotted spatially based on the XY coordinates recorded for each crash. **Figure 4.2** shows the density of crashes within the study area based on the spatial data. Crash clusters are generally noted at intersections with the highest traffic volumes.

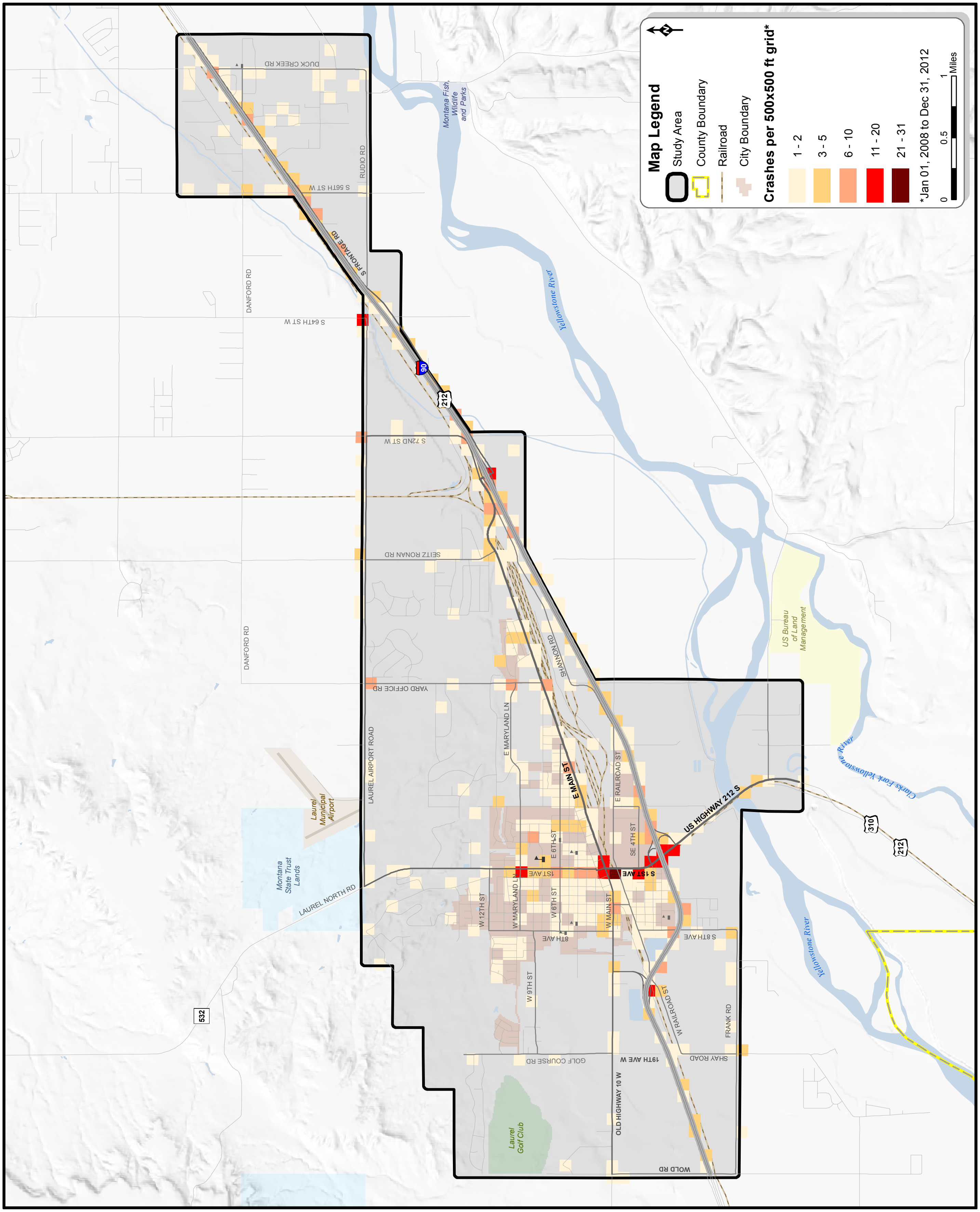


Figure 4.2: Crash Density

4.1.1. Crash Period

Crash data for the study area was evaluated based on the period of time when the crash occurred. With regards to time of day, spikes in the number of crashes occur during the peak hours. Almost 40 percent of crashes were reported between 12:00 PM and 6:00 PM. The PM peak hours (3:00 PM to 6:00 PM) accounted for over 20 percent of reported crashes.

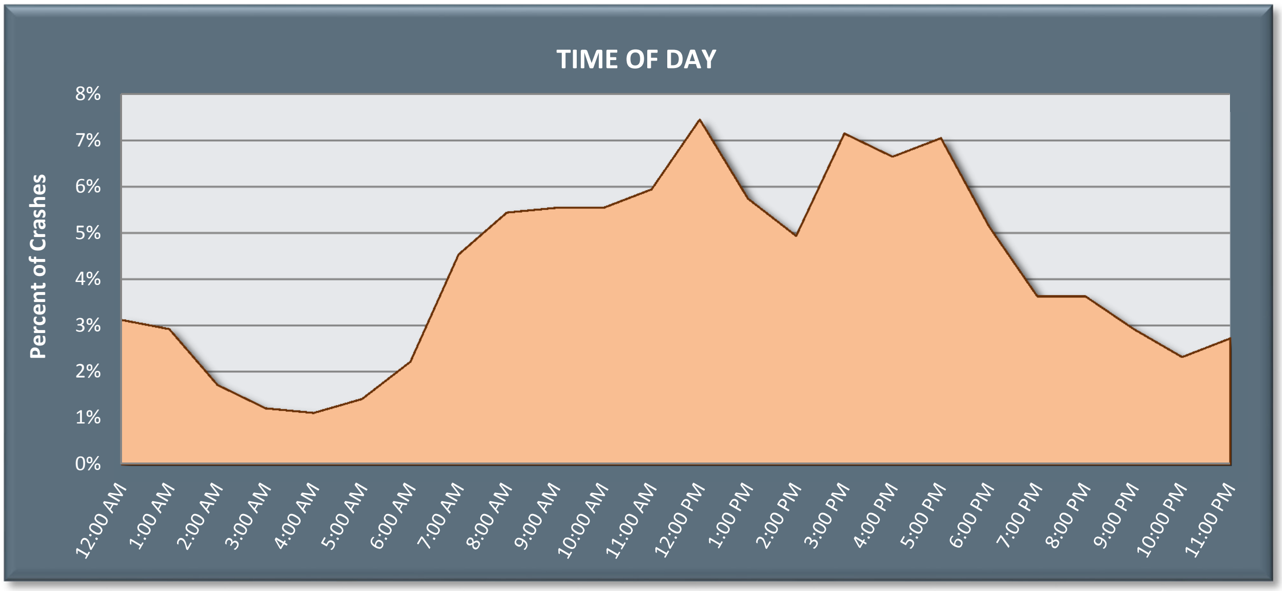
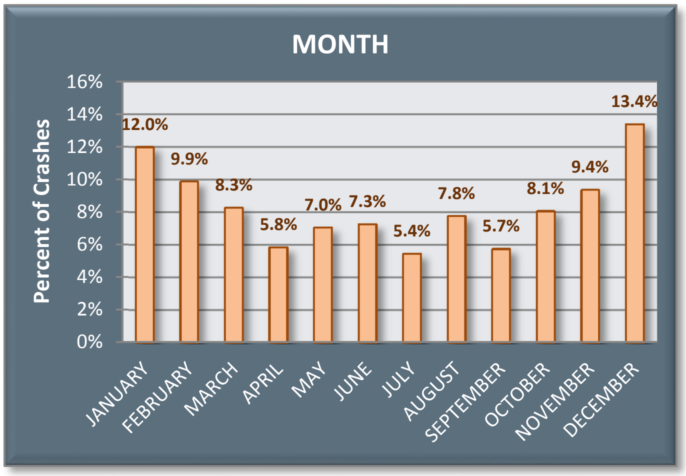


Figure 4.3: Crash Statistics for Time of Day

The most common month for crashes is December, followed by January and February. During these months, inclement weather conditions often exist which can contribute to an increase in the number of crashes. Traffic volumes also commonly increase during the month of December due to increased holiday related traffic. Over 73 percent of crashes occur on a weekday, with Monday being the most common day with 16.7 percent of crashes. The fewest number of crashes were reported on Sundays.



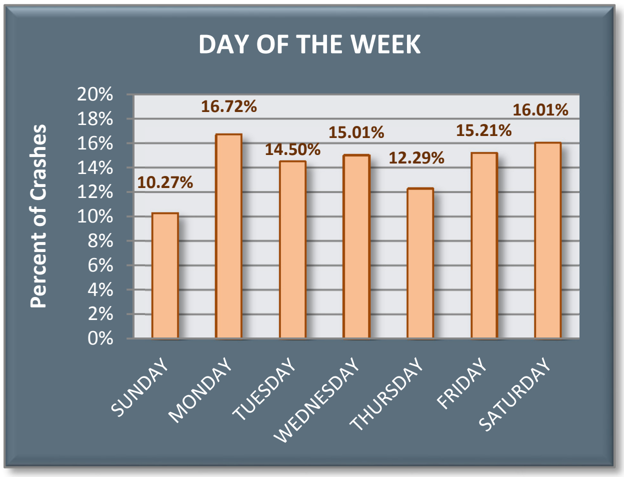


Figure 4.4: Crash Statistics for Month and Day of the Week

4.1.2. Environmental Factors

Crash data was reviewed to see if any trends exist related to environmental factors such as weather, roadway surfacing and light conditions. Over 61 percent of the reported crashes occurred while road surfacing was dry while over 38 percent occurred on wet, icy, snowy or slushy surfacing. Inclement weather conditions (i.e. rain, snow, sleet, or fog) were present for just over 18 percent of crashes. Over 67 percent of reported crashes occurred during the daylight, while 7 percent were reported as under dark lighted conditions.

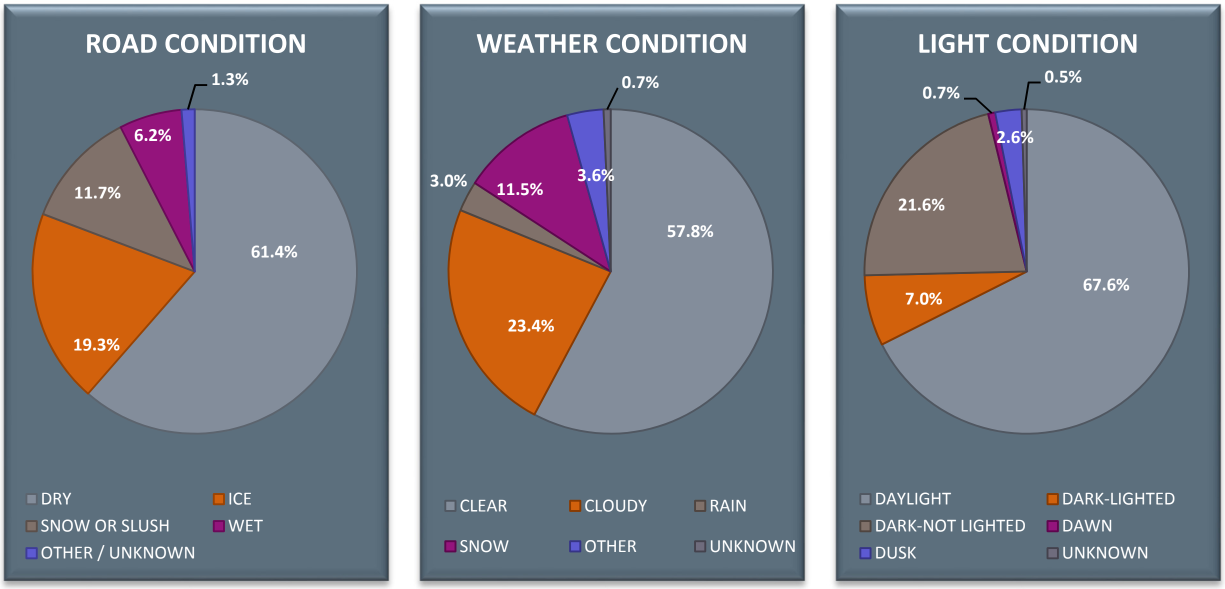


Figure 4.5: Crash Statistics for Environmental Factors

4.1.3. Crash Type

Approximately 65 percent of crashes occurred at non-junction locations, while just over 28 percent occurred in an intersection or were related to an intersection. Over 56 percent of crashes occurred on the roadway, while approximately 25 percent occurred on the shoulder. Over 55 percent of crashes involved two or more vehicles, while single vehicle crashes accounted for approximately 45 percent of reported crashes.

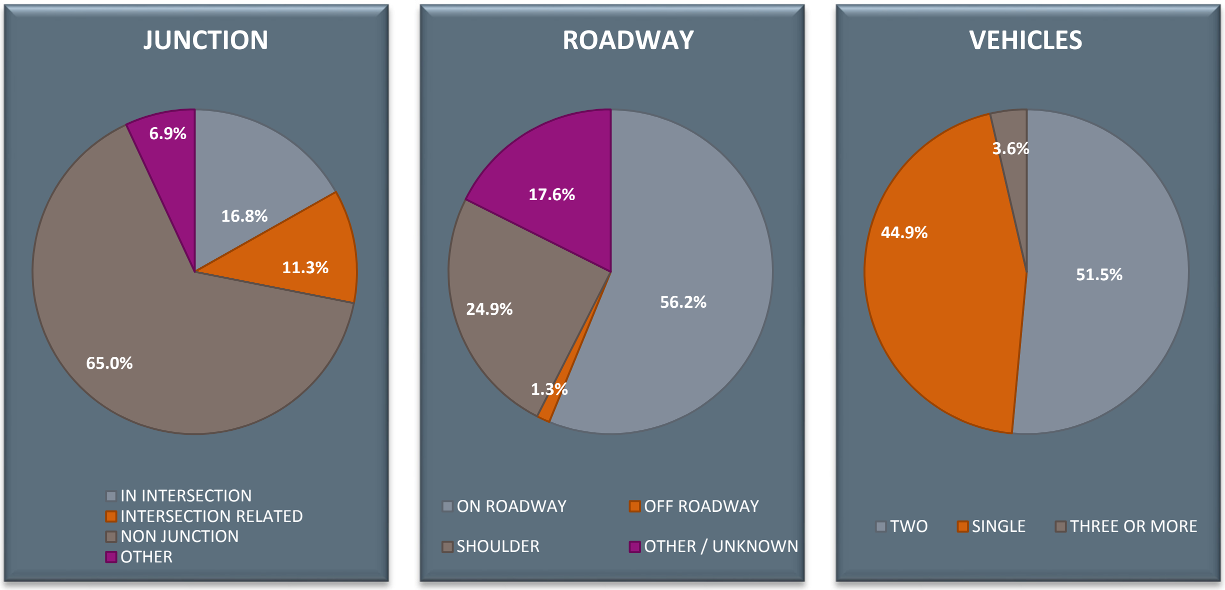


Figure 4.6: Crash Statistics for Location and Number of Vehicles

Fixed object crashes were the most common type of reported collisions, accounting for approximately 29 percent of reported crashes. Rear end crashes and right angle crashes were the next most common, accounting for approximately 21 and 15 percent, respectively.

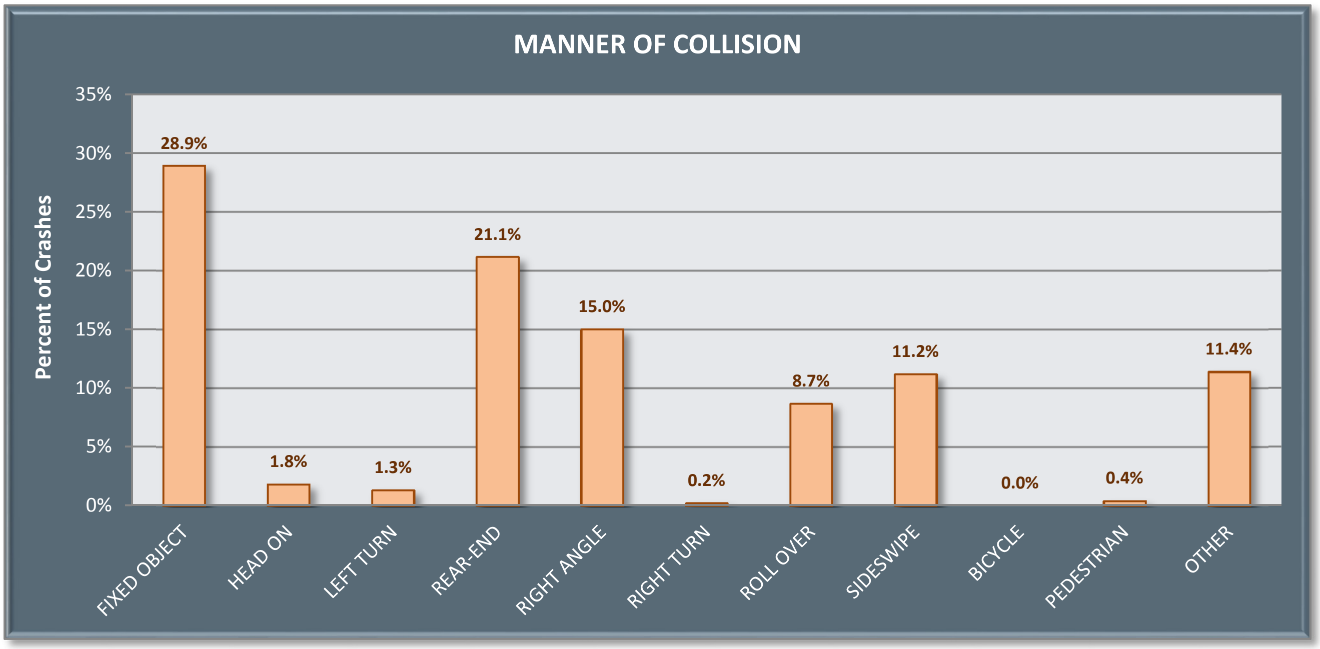


Figure 4.7: Crash Statistics for Collision Type

4.1.4. Crash Severity

Reported crashes are categorized by crash severity. The most severe injury defines the severity of the crash. For example, if a crash results in a fatality and an injury, the cash would be defined as a fatal crash.

The location of the crashes within the study area which resulted in incapacitating injuries and/or fatalities are shown in **Figure 4.9**. An incapacitating injury is defined as an injury, other than a fatality, which prevents the injured person from walking, driving, or normally continuing the activities they were capable of performing before the injury.

During the five-year analysis period, there were 240 injury crashes (24.2 percent) which resulted in 339 injuries. Of the injury crashes, 42 resulted in incapacitating injuries. In addition, there were 8 fatal crashes resulting in 8 fatalities.

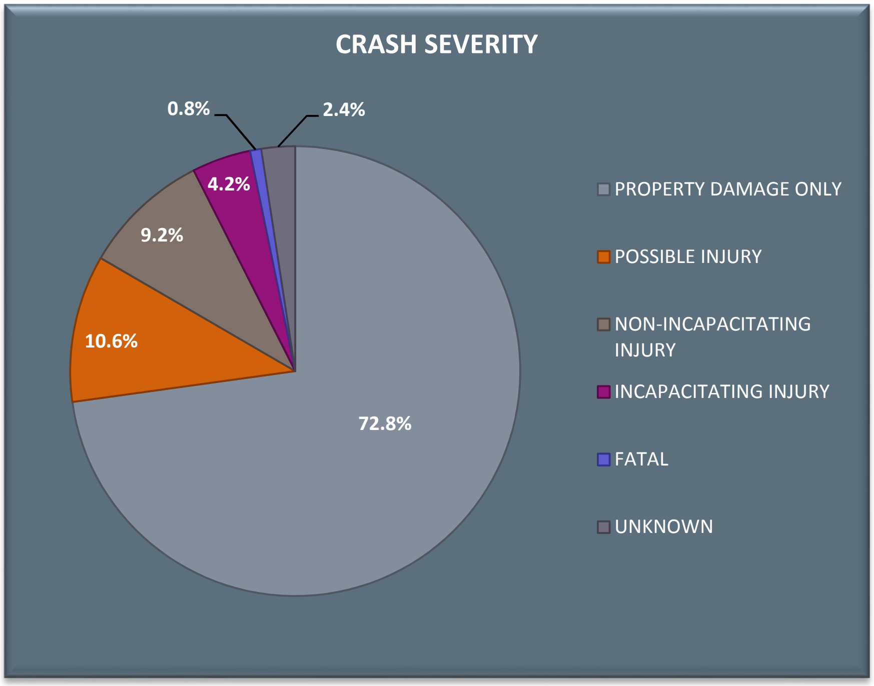


Figure 4.8: Crash Statistics for Severity

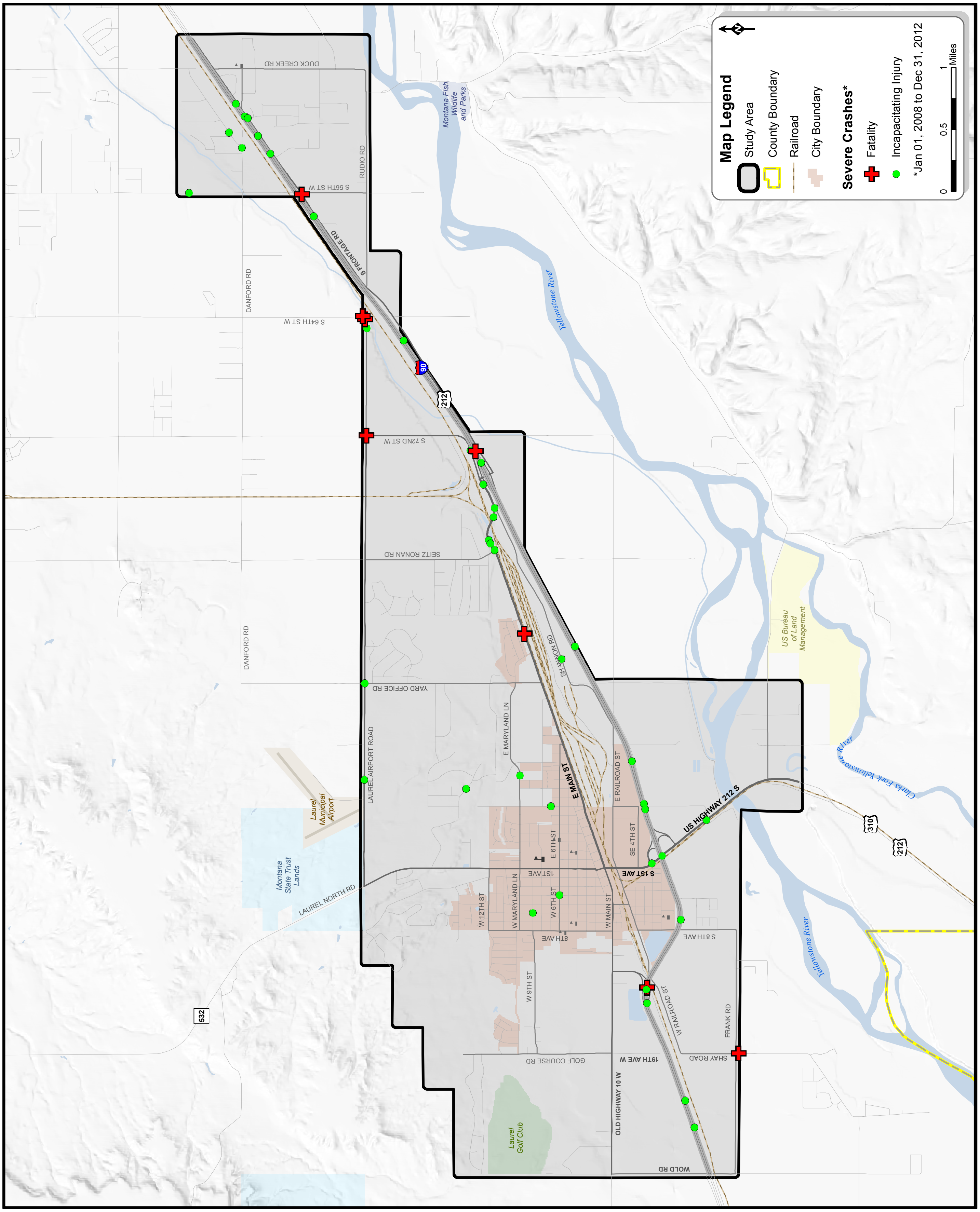


Figure 4.9: Severe Crash Locations

4.1.5. Intersection Crashes

The 12 intersections that were studied for LOS were also evaluated for crash statistics. The crash information was analyzed to identify those intersections with crash characteristics that may warrant further study.

The number of crashes at each intersection was determined spatially from the GIS crash database. Any crash located within 150 feet was counted for that intersection. Intersection traffic volumes were determined from PM peak hour turning movement counts. A design hourly vehicle (DHV) factor of 10.30 percent was applied to the peak hour counts to estimate daily volumes based on MDT permanent count sites located within the study area.

The crash rate represents the number of crashes against the daily traffic volumes of the intersection. The rate is expressed as the number of crashes per million entering vehicles. The following equation is used to calculate crash rate:

$$\frac{Total\ Number\ of\ Crashes\ \times 1{,}000{,}000\ vehicles}{Vehicles\ per\ day\ \times Number\ of\ Years\ \times 365\ days/year} = Crash\ Rate$$

The severity index is calculated by applying multipliers to crashes based on severity. For the severity index, crashes were broken into three categories of severity: property damage only (PDO), non-incapacitating injury, and fatality or incapacitating injury crashes. Each of these three types is given a different multiplier: one (1) for PDO, three (3) for injury, and eight (8) for fatality or incapacitating injury crashes. The following equation is used to calculate severity index:

$$\frac{(\#PDO \times 1) + (\#Injury \times 3) + (\#Fatal\ or\ Incap \times 8)}{Total\ Number\ of\ Crashes} = Severity\ Index$$

The severity rate was determined by multiplying the crash rate by the severity index. **Table 4.1** lists the crash statistics for the studied intersections.

Table 4.1: Intersection Crashes

ID	Intersection	Total Crashes	Fatal	Incap. Injury	Injury	Crash Rate	Severity Index	Severity Rate
1	US Highway 212 / EB Ramps	10	0	0	2	0.40	1.40	0.56
2	S 1st Ave / WB Ramps	14	0	1	4	0.40	2.07	0.84
3	S 1st Ave / SE 4th St	12	0	0	2	0.43	1.33	0.57
4	1st Ave / 1st St	5	0	0	0	0.36	1.00	0.36
5	1st Ave / 6th St	4	0	0	1	0.25	1.50	0.38
6	1st Ave / 8th St	5	0	0	1	0.35	1.40	0.49
7	1st Ave / Maryland Ln	8	0	0	1	0.60	1.25	0.76
8	S 8th Ave / S 5th St	1	0	0	0	0.15	1.00	0.15
9	8th Ave / Main St	1	0	0	0	0.08	1.00	0.08
10	8th Ave / 4th St	0	0	0	0	0.00	0.00	0.00
M.1	Main St / 1st Ave	25	0	0	3	0.87	1.24	1.07
M.2	1st Ave / Railroad St	21	0	0	7	0.75	1.67	1.26

4.2. SAFETY DATA TREND ANALYSIS

The MDT Highway Traffic Safety Section supplied crash statistics for January 01, 2008 to December 31, 2012. A safety data trend analysis was conducted to compare the crash characteristics of the City of Laurel, City of Billings, Yellowstone County, and the State of Montana.

4.2.1. Impairment

Of the reported crashes for Laurel, less than 8 percent were alcohol and/or drug related. Billings had a similar rate of alcohol / drug related crashes, while Yellowstone County and the State of Montana had slightly higher rates, at 9.0 and 9.2 percent, respectively.

Table 4.2: Crash Statistics for Alcohol / Drug Related

Location	Total Crashes	Alcohol / Drug Related Crashes	
Laurel	404	34	7.8%
Billings	13,565	1,152	7.8%
Yellowstone County	17,530	1,738	9.0%
State of Montana	103,024	10,388	9.2%

4.2.2. Safety Belt Use

Crashes in Laurel had a higher rate of occupants using proper restraint than Billings, Yellowstone County, and the State of Montana. Fewer than 5 percent of occupants involved in crashes in Laurel were either not using safety belts, or not using safety belts properly. Billings, Yellowstone County, and the State of Montana all had higher rates of improper restraint practices at 5.9, 6.8, and 7.9 percent, respectively.

Table 4.3: Crash Statistics for Safety Belt Usage

Location	Occupants Using Proper Restraint	Occupants Not Using Proper Restraint	
Laurel	675	31	4.4%
Billings	22,669	1,429	5.9%
Yellowstone County	29,109	2,138	6.8%
State of Montana	165,720	14,191	7.9%

4.2.3. Driver Age

The trends for drivers' age in Laurel follow similar trends as the City of Billings, Yellowstone County, and the State of Montana. The rate of younger drivers (under the age of 21) in Laurel, however, showed the highest variance, being involved in almost 22 percent of crashes, compared to 17.6 percent in Billings, 17.5 percent in Yellowstone County, and 17.0 percent in the State of Montana. Drivers over the age of 65 were involved in 12.9 percent of crashes in Laurel, compared to 9.6 percent in Billings, 9.3 percent in Yellowstone County, and 9.5 percent in the State of Montana.

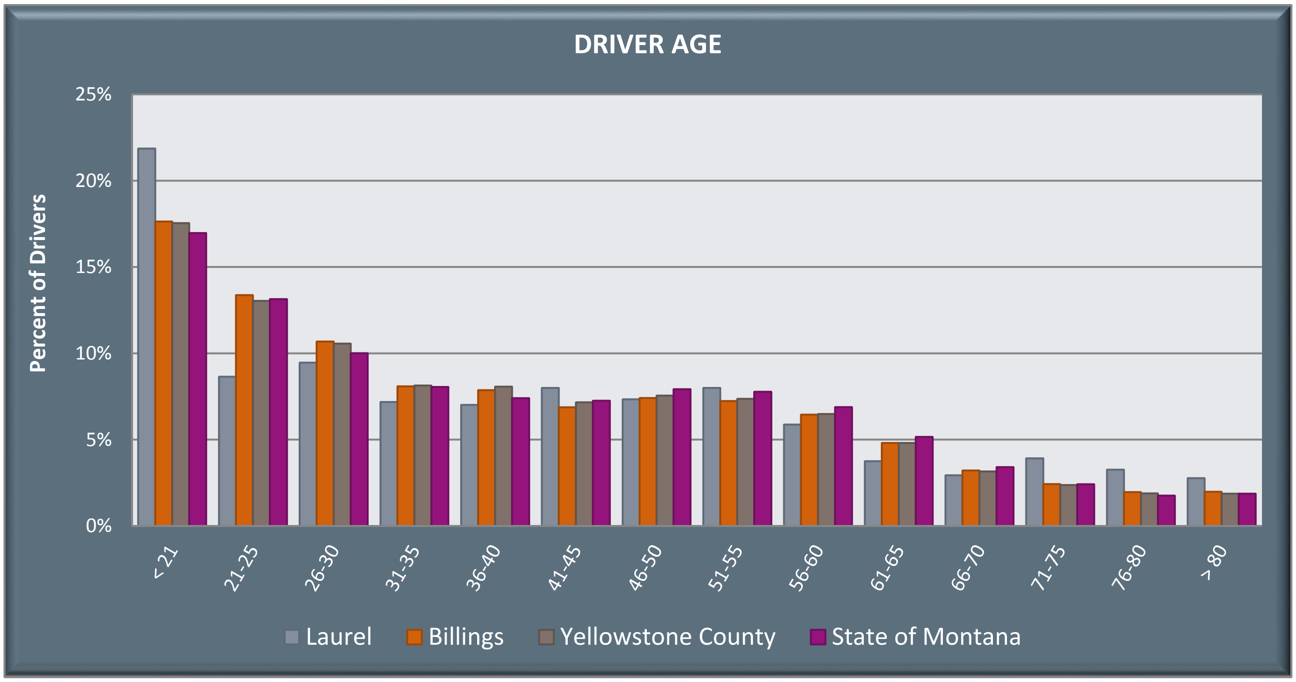


Figure 4.10: Crash Statistics for Driver Age

4.2.4. Vehicle Type

Reported crashes within Laurel involved motorcycles 1.2 percent of the time. Motorcycles were involved in 2.0 percent of crashes within the City of Billings, 2.2 percent within Yellowstone County, and 2.1 percent in the State of Montana. Large vehicles were involved in 10.6 percent of crashes in Laurel, which is greater than Billings (8.0 percent), Yellowstone County (8.9 percent), and the State of Montana (9.1 percent).

Table 4.4: Crash Statistics for Vehicle Type

Location	Total Crashes	Motorcycle Crashes		Large Vehicle Crashes	
Laurel	404	5	1.2%	43	10.6%
Billings	13,565	272	2.0%	1,082	8.0%
Yellowstone County	17,530	377	2.2%	1,553	8.9%
State of Montana	103,024	2,181	2.1%	9,415	9.1%

4.3. SAFETY SUMMARY

Transportation system safety improvements were identified in the form of recommendations in **Section 5.0** based on the safety analysis discussed previously. Facility recommendations related to safety were identified with the focus on reducing the frequency and severity of crashes. Note that the facility recommendations should be analyzed further with regards to safety and cost-benefit to determine the appropriate mitigation measure as future projects develop.

Specific behavioral recommendations were not included as part of the facility recommendations. A high-level look at the behavioral crash data did not result in identified trends warranting recommendations. The Laurel area had a lower level of alcohol / drug related crashes and a lower level of occupants not using proper restraints than the statewide and county averages. The Laure area did, however, have a higher percentage of large vehicle crashes than the statewide and county averages. If behavioral recommendations are desired in the future, a more detailed evaluation of safety and crash tends will be necessary.

5.0
Facility Recommendations

A list of recommendations for facility improvements to the transportation system was developed to address current and anticipated future transportation needs. The recommended improvements were developed through a combination of public process, project solicitation from partnering agencies, travel demand modeling, traffic analysis, and policy choices to support the LRTP goals and objectives defined previously.

The recommendations are categorized based on the scale of the project determined by estimated cost. Each section contains a planning level description of the proposed project in addition to a preliminary project cost estimate. These preliminary project cost estimates are "planning level" estimates and do not include allowances for right-of-way, utility, traffic management, or other heavily variable costs.

The project recommendations made as part of this Plan were specifically aimed at improving issues identified along the major street network. The recommendations are focused on areas currently experiencing issues as well as on areas expected to need mitigation due to anticipated future growth. The facility recommendations are shown graphically in **Figure 5.1**.

5.1. COMMITTED PROJECTS

A projected is deemed committed if construction is likely to occur within five years and a funding source has been identified and assigned to the specific project. A brief description of each of these committed projects is presented in this section. The committed projects are not listed in any particular order. An anticipated construction date is included, however, projects will be implemented as soon as practical.

C-1: Rockvale – Laurel

MDT initiated the design for the reconstruction of US Highway 212 (US 212) from Rockvale to south of Laurel. The project will follow the preferred alignment as presented in the *Record of Decision for the Final Environmental Impact Statement* for the US 212 Reconstruction of Rockvale to Laurel, completed in September 2009[2].

This project will reconstruct approximately 10.8 miles of US 212 on a new alignment beginning at milepost 42.1 near Rockvale and continue northeast to milepost 52.7, south of Laurel. This project will be designed and constructed in multiple phases.

Four individual projects have been identified to facilitate design and construction of improvements along this corridor in phases. The projects are identified below along with the anticipated year when construction is expected to commence. All schedules are tentative and dependent on the completion of all project development activities and the availability of funding. Note that not all projects listed are within the LRTP study area; they are included in this discussion for completeness, however.

1. **South of Laurel - RR Overpass:** This project consists of the replacement of the railroad underpass and full reconstruction of the existing substandard two-lane roadway alignment

[2] *Record of Decision for the Final Environmental Impact* Statement, Montana Department of Transportation, http://mdt.mt.gov/pubinvolve/docs/eis_ea/eis_rockvale_rod.pdf, September 2009

at the northern end of the project corridor. The underpass will be replaced with a new grade-separated overpass of the Burlington Northern Santa Fe (BNSF) railway on a new alignment and include a new two-lane roadway connection back to the existing US 212 alignment approximately one-mile further south. The new roadway will consist of a four-lane roadway with depressed median.

Construction: Completed in 2013
Estimated Cost: $16,800,000

2. **Rockvale - North (US 212 / 310):** This project consists of intersection and roadway improvements for the intersection of US 212 and US 310 at Rockvale. This project includes roadway reconstruction, overhead lighting, turn lanes, and replacement of the flashing beacon. The project will extend approximately 1.3 miles northeasterly of the intersection where it will connect with the existing US 212 / 310 alignment.

Anticipated Construction: 2014
Estimated Cost: $5,400,000

3. **Rockvale - Laurel (2 Lanes):** This project will construct a two-lane roadway segment between the limits of the Rockvale - North (US 212 / 310) project and the South of Laurel - RR Overpass project. Completion of earthwork and drainage features for the full build out template (four lane divided roadway with depressed median) will be evaluated in areas of large excavations and embankments. The length of this project is approximately 9.7 miles.

Anticipated Construction: 2015
Estimated Cost: $26,500,000

4. **Rockvale - Laurel (NB Lanes):** This project represents the construction of the remaining portions of the full build-out 4-lane sections. The overall project limits will correspond with the limits of the Rockvale - Laurel (2 Lanes) project identified above.

Anticipated Construction: 2016 or beyond
Estimated Cost: $16,400,000

C-2: West Laurel Interchange

The West Laurel Interchange is to be rebuilt to include a full movement interchange. This project includes two phases as described below:

- **Phase 1:** Includes construction of the eastbound and westbound interstate bridges and necessary reconstruction of the interstate roadway. During phase 1 construction, embankment will be placed for the new on and off ramps to be connected to 19th Avenue W.

Anticipated Construction: 2017
Estimated Cost: $31.2M

- **Phase 2:** Reconstruction of the intersection of 19th Avenue W, Old US Highway 10, and Golf Course Road to accommodate the new interchange ramps. A new interstate overpass will be constructed during this phase.

Anticipated Construction: 2018
Estimated Cost: $8.1M

C-3: S 1st Avenue – Railroad Underpass

This project includes improvements to the existing railroad underpass along S 1st Avenue. The scope of the project includes the following:

- Replace the existing surfacing with reinforced concrete surfacing;
- Replace the existing storm and groundwater collection system;
- Replace deteriorated curb, gutter, and sidewalk;
- Install a liner into a leaking irrigation pipe; and
- Rebuild wet well pumps.

Anticipated Construction: 2014
Estimated Cost: $600,000

C-4: Railroad Street GR & Sign

This is a roadway and roadside safety improvement project consisting of rehabilitation, guardrail, skid treatment, and bridge rail between RP 0.80 and RP 1.80.

Anticipated Construction: 2014
Estimated Cost: $130,000

5.2. RECOMMENDED IMPROVEMENTS

Recommended improvements were developed to address existing needs or to meet anticipated traffic demands. The recommendations were identified through a combination of public process, project solicitation from partnering agencies, travel demand modeling, traffic engineering analysis, and policy choices to support LRTP goals and objectives previously defined. The following sections describe the recommended improvements. Note that the estimated costs represent present day values and need to be adjusted for inflation if projecting past the year 2014.

5.2.1. Short Range (SR) Improvements

Short Range (SR) projects are relatively low cost, "tune-up" type improvements. For the purposes of the LRTP, an improvement project was classified as a SR project if the cost of the project was estimated to be less than $500,000 and/or there was a reasonable chance that the project could be implemented within a five- to ten-year timeframe. The following SR improvements were identified for the Laurel area and are not listed in any particular order with respect to priority.

SR-1: Laurel Interchange

This project includes recommendations contained in the *Billings Area I-90 Corridor Planning Study*[3]. The study recommends that additional lighting be installed at the Laurel Interchange to meet current Complete Interchange Lighting (CIL) standards. Note that the appropriate level of lighting for this location will be identified during project development. CIL is warranted at this location, although MDT standards state that Partial Interchange Lighting (PIL) is generally MDT's preferred method for interchange lighting.

Estimated Cost: $450,000

[3] *Billings Area I-90 Corridor Planning Study*, March 2012, http://www.mdt.mt.gov/pubinvolve/i90corridor/

SR-2: Mossmain Interchange

This project includes recommendations contained in the *Billings Area I-90 Corridor Planning Study*. The study recommends that additional lighting be installed at the Mossmain Interchange to meet current CIL standards. Note that the appropriate level of lighting for this location will be identified during project development. CIL is warranted at this location, although MDT standards state that PIL is generally MDT's preferred method for interchange lighting.

Estimated Cost: $450,000

SR-3: S 1st Avenue / Railroad Street Intersection

This intersection has stop control along the Railroad Street approach legs. Operational analysis shows the intersection currently experiencing a failing LOS during PM peak hours. Delay at the intersection is shown to increase in the future resulting in a failing LOS during both the AM and PM peak hours.

It is recommended that the installation of a traffic signal, or other traffic control device, be evaluated and installed when warrants are met. Existing analysis shows vehicle delay associated with traffic along Railroad Street due to heavy traffic volumes along S 1st Avenue. If the traffic control is modified at this intersection, the impacts to nearby intersections, notably 1st Avenue / Main Street and S 1st Avenue / SE 4th Street, will need to be evaluated. This recommendation could be implemented as a stand-along project or in conjunction with **MSN-7** discussed later.

Estimated Cost: $400,000

SR-4: 1st Avenue / 1st Street Intersection

This intersection presently has stop control along all legs while the north and south legs have a skewed alignment. Existing development along all corners of the intersection results in poor sight distances and non-standard geometrics. Existing and projected operational analysis shows that this intersection experiences little delay, resulting in a good LOS. However, the non-standard intersection geometrics and limited sight distances results in safety concerns and operational challenges.

As traffic volumes increase in the future, the traffic issues experienced at this intersection are expected to increase. It is recommended that a traffic study be performed at this intersection to evaluate geometrics and traffic control.

Estimated Cost: $50,000

SR-5: 1st Avenue / Maryland Lane

This intersection currently experiences a failing LOS during the AM peak hour and is projected to fail during both the AM and PM peak hours in the future. Stop control is provided along the Maryland Lane approach legs. Vehicles along the east leg of the intersection currently experience delay due to a lack of available gaps necessary for left-turning vehicles. In addition to general vehicle delay, this area experiences school related traffic, including non-motorized usage. It is recommended that a traffic signal, or other traffic control device, be evaluated and installed when warrants are met.

Estimated Cost: $300,000

SR-6: S 8th Avenue / Main Street Intersection

This intersection is projected to have a failing LOS during the AM and PM peak hours as development occurs in the area. While existing conditions do not appear to necessitate the need for an improvement project, anticipated impacts from future development may result in the need to evaluate additional traffic control. It is recommended that a traffic signal, or other traffic control device, be installed when warrants are met.

Estimated Cost: $300,000

SR-7: Laurel Airport Road / N 64th Street W Intersection

A safety evaluation at this location showed two fatalities during a five-year period. Laurel Airport Road intersects N 64th Street W along a curve. The curve has a small radius and is signed for an advisory speed of 25 mph. The curve also has vertical deflection and limited sight distances.

It is recommended that this curve be reconstructed to meet existing standards and to provide increased sight distances. A more detailed safety analysis could be conducted to identify potential short-term safety enhancements. Possible treatments may include advance signing, dynamic curve warning signs, and rumble strips. Note that if realignment is considered, land along the northwest quadrant is owned by MDT and consists of identified wetlands.

Estimated Cost: $450,000

SR-8: E Main Street (Sietz Ronan Road to Mossmain Interchange)

E Main Street has experienced 26 crashes within the last 5 years between RP 57.5 and RP 58.1. Of the 26 crashes, seven resulted in incapacitating injuries. This location is currently signed for a 45 mph speed limit and includes an S curve along the railroad overpass.

It is recommended that a safety and speed study be developed for this location. Some short-term safety treatments that may be considered include centerline rumble strips, shoulder rumble strips, advance intersection signing for Sietz Ronan Road, and dynamic curve warning signs.

Estimated Cost: $100,000

5.2.2. Major Street Network (MSN) Improvements

Major Street Network (MSN) improvements are typically larger scale projects that may take many years to implement. These projects are anticipated to cost more than $500,000 and are envisioned as long-term improvements. The following MSN improvements were identified for the Laurel area and are not listed in any particular order with respect to priority.

MSN-1: West Laurel Interchange – Railroad Overpass

The committed project **C-2** discussed previously will reconstruct the West Laurel Interchange. A local desire is to include connectivity to the south side of the railroad at the anticipated new construction of the interchange. Previous preliminary design was conducted to accommodate a new railroad overpass along the new alignment of 19th Avenue W. The overpass would connect the eastbound interstate ramps to W Railroad Street via a new bridge structure. This new connection is a long-term vision of the community to increase connectivity to the south side of Laurel, help relieve traffic congestion on S 1st Avenue, and spur economic activity.

Estimated Cost: $6.86M

MSN-2: Laurel Interchange

This project includes recommendations contained in the *Billings Area I-90 Corridor Planning Study*. The study recommends that the eastbound and westbound ramps be extended to meet current standards. Also included in the recommendation is to flatten the horizontal curves at the westbound off-ramp and eastbound on-ramp. The bridge crossing US 212 along I-90 in the eastbound direction would also be reconstructed to accommodate the additional with needed to support the ramp improvements.

Estimated Cost: $7.75M

MSN-3: Mossmain Interchange (A)

This project includes recommendations contained in the *Billings Area I-90 Corridor Planning Study*. The study recommends that the eastbound and westbound ramps be extended to meet current standards. Note that this recommendation could be implemented as a stand-alone project or in conjunction with **MSN-4** as discussed below.

Estimated Cost: $850,000

MSN-4: Mossmain Interchange (B)

This project includes recommendations contained in the *Billings Area I-90 Corridor Planning Study*. The study recommends that the Mossmain Interchange be reconstructed to address operational issues. Multiple variations for reconstruction were considered, including:

- Braided ramps;
- Roundabouts;
- Single Point Urban Interchange (SPUI); and
- Reconstruction of the frontage roads.

These variations would require substantial modifications to adjacent transportation systems, structure improvements, drainage and irrigation features, and right-of-way acquisition to accommodate final design. A traffic analysis and geometric design would be developed during a future project design phase. Note that this recommendation could be implemented as a stand-alone project or in conjunction with **MSN-3** as discussed previously.

Estimated Cost: $12.3M

MSN-5: I-90 (S 56th Street Crossing)

This project includes recommendations contained in the *Billings Area I-90 Corridor Planning Study*. The study recommends that the eastbound and westbound I-90 bridge crossings of S 56th Street be reconstructed. Reconstruction of the structures would bring them to compliance with current MDT design standards. The bridges are anticipated to retain their current lane configuration. Additional analysis should be conducted during project development to verify traffic demands and mainline capacity needs at this location.

Estimated Cost: $2.7M

MSN-6: E 6th Street (1st Avenue to Juniper Avenue)

E 6th Street is a local road that provides access to schools and parks. The roadway also connects 1st Avenue to E Main Street and is a commonly used corridor. The existing surfacing is experience failure and appears to have issues related to poor sub-surfacing. It is recommended that the roadway be reconstructed to address surfacing and subgrade issues. It is expected that all work would be conducted within existing curb and gutter constraints. It has been noted that existing parking issues exist along E 6th Street near the school and athletic fields, particularly during sporting events. There may be opportunity to enhance parking amenities with the development of this project.

Estimated Cost: $3.0M

MSN-7: W Railroad Street (US 212 to S 8th Avenue)

W Railroad Street is an urban route and serves as the main connection to the south side of Laurel. The existing typical section does not meet urban design standards as there is no curb and gutter and there are areas that lack sidewalks. It is recommended that the roadway be reconstructed to meet current urban design standards. This improvement could be implemented as a stand-alone project or in conjunction with **SR-3**.

Estimated Cost: $2.7M

MSN-8: S 1st Avenue – Railroad Underpass

The existing S 1st Avenue railroad underpass is a bottleneck for the transportation system in Laurel. This location is narrow (consists of one travel lane in each direction), has steep grades, and has height clearance restrictions. Existing traffic analysis shows that this location lacks capacity to accommodate existing traffic volumes. The overpass structure is likely in need of repair / replacement in the near future. It is unknown at this time, however, the best approach to remedy this bottleneck location. Existing topography and land use constraints exist making the development of a new underpass difficult.

Ultimately, it is recommended that a new crossing structure be constructed to increase capacity, flatten grades, increase vertical clearance, and address existing structural issues. An engineering study will be needed to determine the best course of action to address the needs at this location.

Estimated Cost: Unknown, additional analysis needed

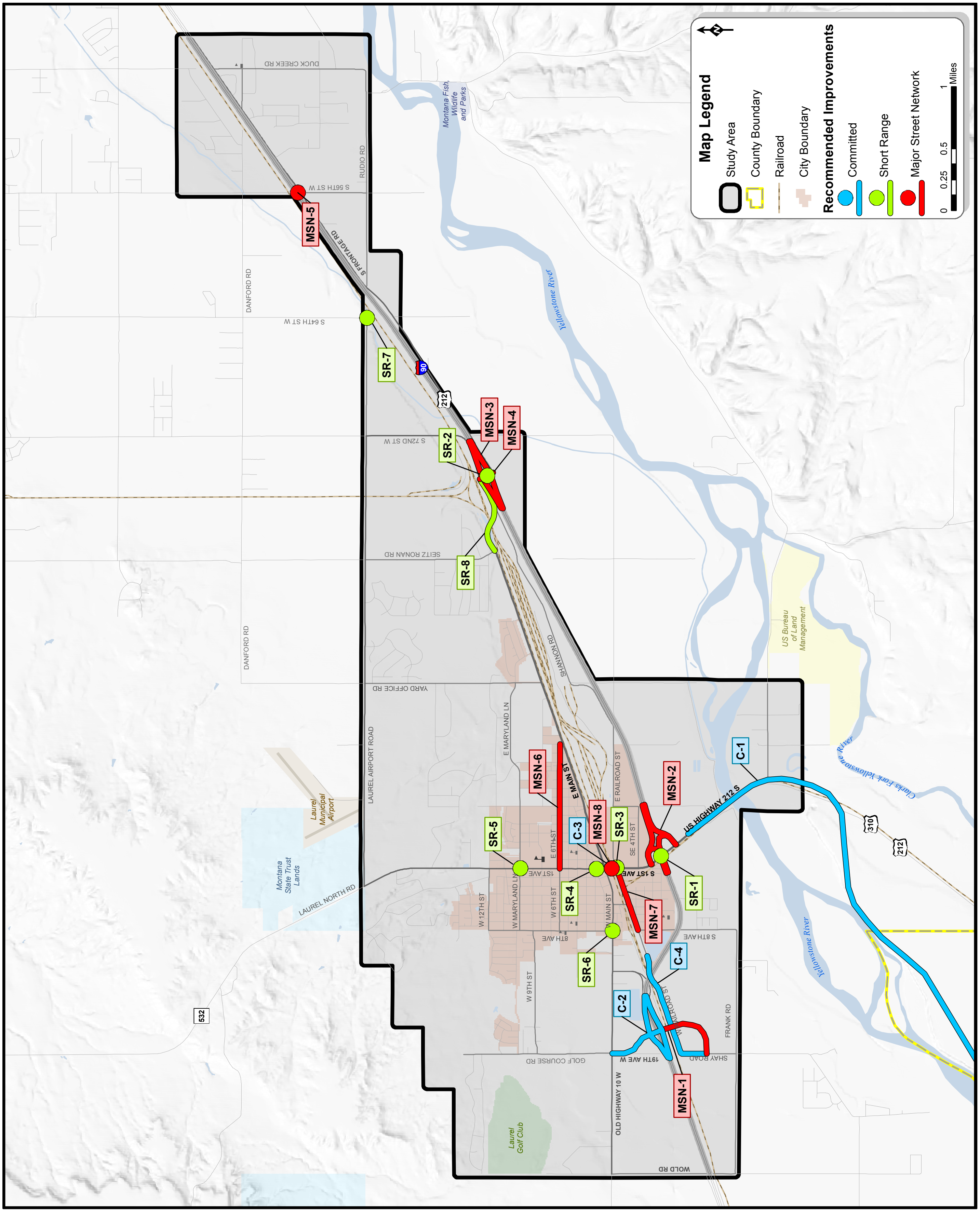


Figure 5.1: Recommended Improvements

5.3. ALTERNATIVE TRANSPORTATION IMPROVEMENTS

Providing opportunities for alternative modes of travel promote good health, reduce traffic demands, and consider the needs of the elderly. The alternative travel modes discussed in this section are intended as guidelines for the implementation of a multi-modal transportation system aimed at creating a better community.

5.3.1. Proposed Non-Motorized Network

The *BikePed* plan identified a goal for the City of Laurel to create and maintain an integrated system of trails and bikeways. The envisioned non-motorized network discussed in this section builds on the network proposed in the *BikePed* plan and keeps the same goals in mind. The non-motorized network seeks to promote mode choice through connectivity to schools, mixed use development areas, local businesses, and transit. The network included on-street and off-street routes. The *BikePed* plan stated that “having more and better bike paths and pedestrian trails is one of the top goals of the people of Laurel as reflected in surveys and workshops the City has done over the past several years.”

Since the plans completion in 2003, there has been no completion of any recommended on-street facilities. Some off-street trails have been built with new development outside of the city limits. The recommendations contained in the *BikePed* plan were used as a starting point for the proposed network contained in this LRTP. Modifications were made to the 2003 recommendations to reflect changes in engineering guidelines, demographics, and existing facilities.

Figure 5.2 shows the proposed non-motorized network for this LRTP. This proposed network is based on a future “vision” of the Laurel transportation system and does not necessarily indicate recommended improvement projects. Over time, as develop occurs and infrastructure projects are implemented, this network should be considered as a long-term goal.

It is important to note that bicycles are permitted on all public roads in the State of Montana and in the Laurel area. As such, the entire street network is effectively the region’s bicycle network, regardless of whether or not a bikeway stripe, stencil, or sign is present on a given street. The designation of certain roads as having bike lanes or shared lanes is not intended to imply that these are the only roadways intended for bicycle use, or that bicyclists should not be riding on other streets. Rather, the designation of a non-motorized network recognizes that certain roadways are optimal bicycle routes, for reasons such as directness or access to significant destinations, and allows the county to then focus resources on building out this primary network. A connected, comprehensive network of shared-use paths, bike lanes, and shared lane roadways is the best approach to increasing bicycle use.

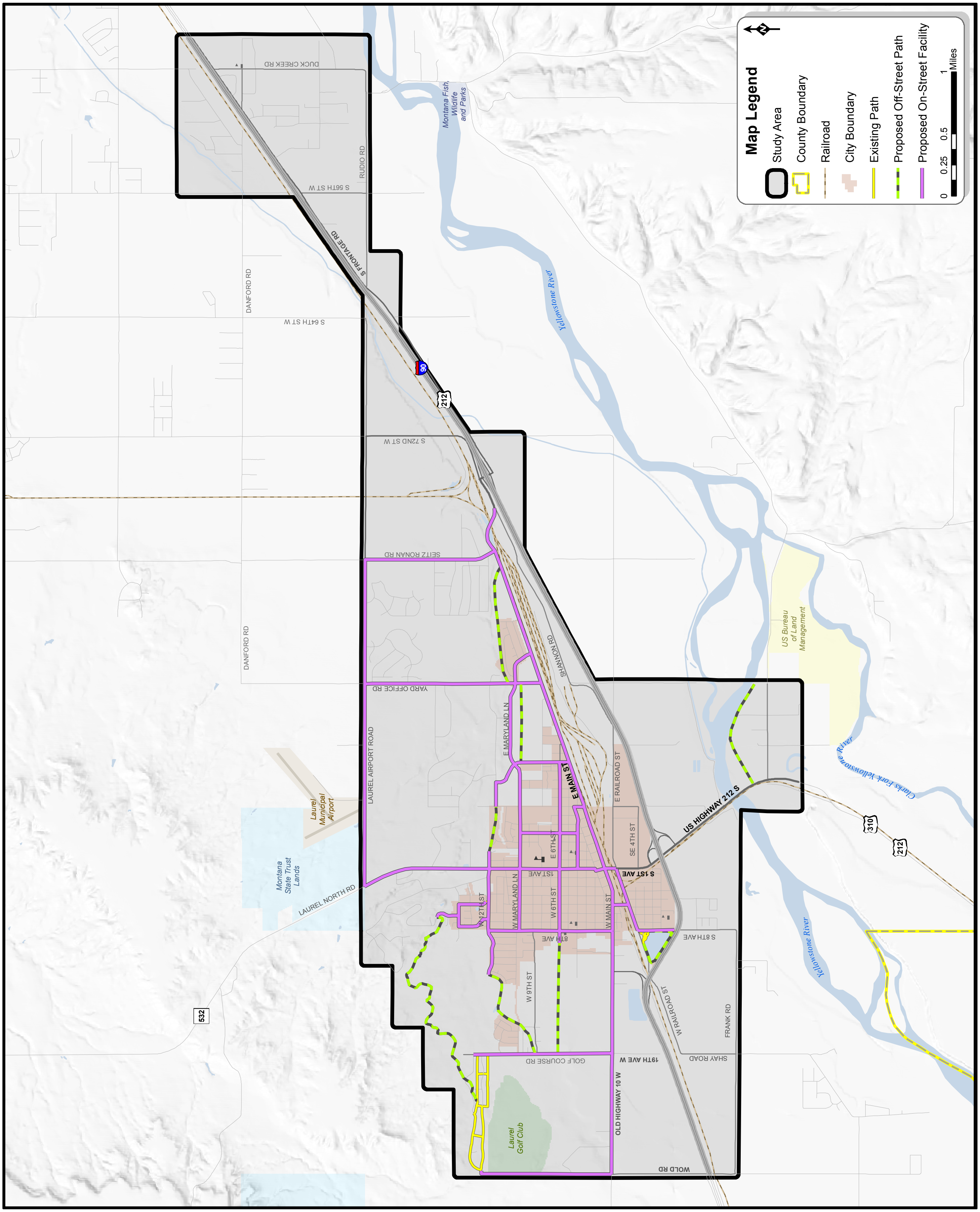


Figure 5.2: Proposed Non-Motorized Network

5.3.2. Transit

Laurel Transit is working to provide a successful on-demand service for public transportation within the city limits of Laurel while offering regular service to Billings. Laurel Transit is looking to contract with as many agencies in the area as possible to provide expanded service. It is currently not feasible for Laurel to have a fixed route system; however, accommodations for such a system are being discussed with bus benches and signs within the City.

Increasing ridership is the biggest goal for Laurel Transit. City of Laurel staff has been working to communicate and setup meetings with various agencies within the City. With contracts established, the City would begin to be able to charge an equitable rate for the services being provided. The Laurel Transit has stepped up its advertising strategies to include the transit phone number to the driver and passenger side doors of the vehicles. Laurel Transit has created a new rack card complete with contact information and operating times and costs.

5.4. RECOMMENDED MAJOR STREET NETWORK

The major street network consists of all interstate, principal arterial, minor arterial, and collector routes. Local streets are not included on the major street network. Establishing a plan for a community's future street layout is essential to proper land development and community planning. It is important that planners, landowners, and developers know the intent and location of the future road network. This will assist with future facility planning for right-of-way needs and appropriate land-uses.

The study area was examined to determine the most appropriate placement for the future major street network. A series of future desired collector routes were identified to be constructed as development occurs. The recommended future major street network is shown in **Figure 5.3**.

The future network is intended to be used as a planning tool to assist in the evaluation of long-term traffic needs as development occurs over time. The identified future alignments are conceptual in nature and may vary based on development patterns, geographic features, land ownership, and other issues unknown at this time. Most of these routes are not recommended for construction at this time. The development of these conceptual routes will take time to become reality, and will only be constructed if traffic needs materialize as a result of development in the area. If development is proposed in a particular area, the recommended major street network is intended to help establish desired corridors that produce an efficient and logical road network. Note that presenting the major street network at this time is not intended to control or influence development. It is presented in an effort to help plan for the future development of the road system in the community.

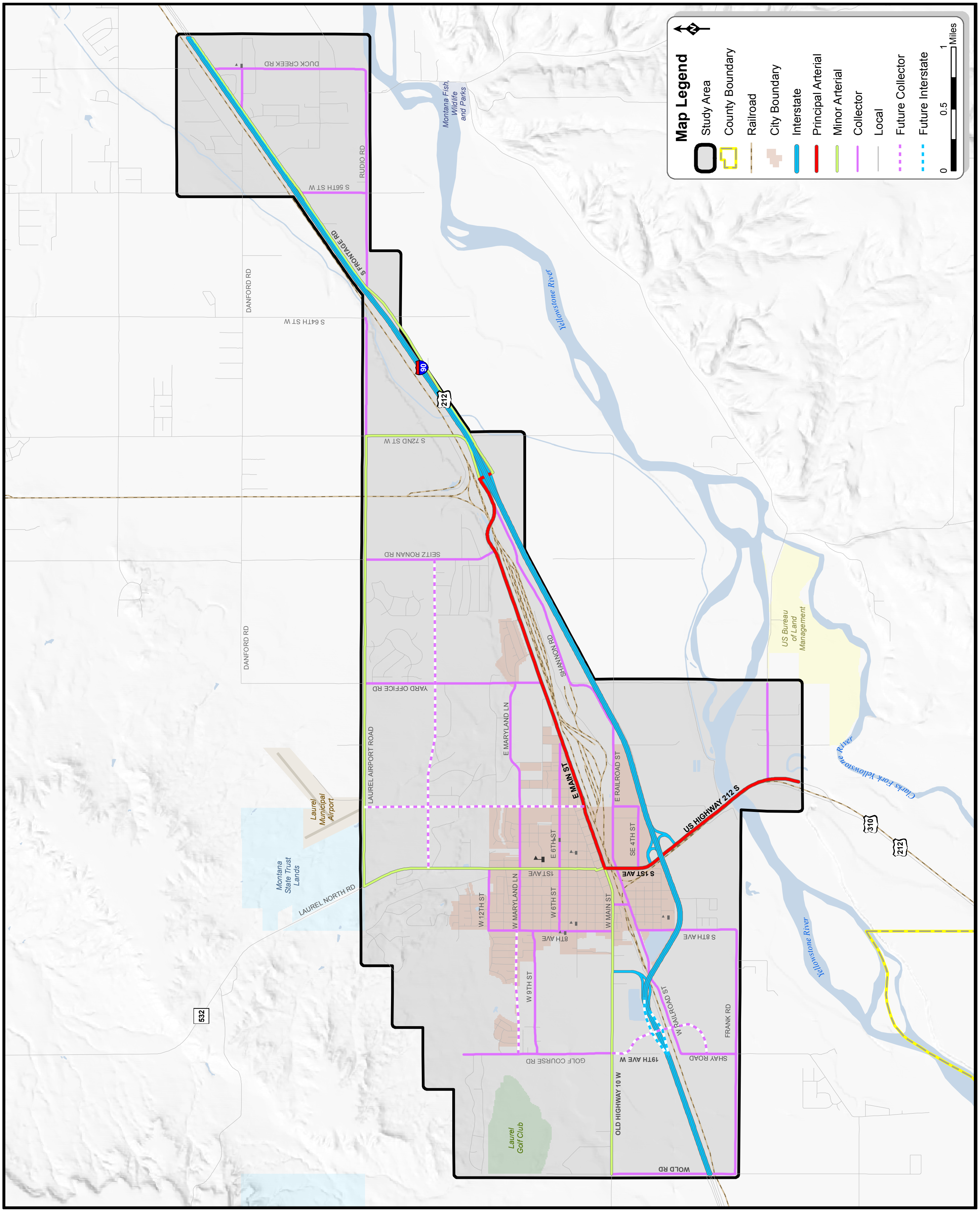


Figure 5.3: Future Major Street Network

6.0
Other Transportation Considerations

This section addresses several topics for the Laurel LRTP that link the transportation system to broader quality of life considerations within the community. The LRTP is intended to include long- and short-range programs that lead to the development of an integrated multi-modal transportation system that facilitates the efficient movement of people and goods. The design, modal mix, and location of transportation infrastructure and facilities can directly affect urban form and functions as well as community character.

Current directions in transportation planning place importance on developing transportation systems that help reduce unnecessary travel delays and on managing travel demands in ways that create balanced multimodal networks that offer multiple transportation choices. Transportation systems also need to provide facilities and services to help achieve reliable and timely access to jobs, community services, affordable housing, and schools while helping to create safe streets, improve economic competitiveness, and enhance community characteristics.

Topics addressed include: freight and truck traffic, corridor preservation, access management, system operations and maintenance, and traffic calming. These topics are all key considerations to the development of a LRTP that helps support and enhance the overall quality of life in the Laurel area.

6.1. FREIGHT AND TRUCK TRAFFIC

Moving goods efficiently and safely in the region is critical to the economy and quality of life in the Laurel area. Local businesses engaged in industrial, agricultural, office and retail activities rely on timely deliveries to supply finished goods and services to their customers. These businesses contribute primary jobs that grow the region's economy and maintain long-term economic competitiveness. Goods movement is important to local consumers, as increasing numbers of people shop online and expect goods delivered quickly to their homes. The Laurel area is part of long-distance goods movement corridors supporting interstate and international commerce.

Goods movement affects all modes of transportation and a broad mix of land uses in the Laurel area. Goods move through the region alongside drivers, pedestrians, cyclists, and passengers traveling by bus, rail, and air. The transportation network connects and passes through commercial districts, residential neighborhoods, and parks. Demand for goods movement is increasing as the region's economy and population grows. Integrating goods movement into the transportation system and local land uses is critical to protecting safety and quality of life.

The information in this section relies on information from a range of publicly available resources, most notably the *2010 Montana State Rail Plan*, and the *City of Laurel Growth Management Plan*.

6.1.1. Goods Movement and the Regional Economy

The movement of goods is a major component to the Laurel area economy. Laurel serves as a key destination and transfer point for goods carried regionally by truck and rail. The CHS refinery, BNSF and MRL, and Woods Power Grip are major industrial businesses in the Laurel area that help stabilize and contribute to area economics.

Goods movement is typically associated with heavy industry. Businesses in these industries make location decisions based on access to efficient, secure, and safe transportation infrastructure to support their growth. Laurel is ideally situated to attract major industries due to direct access to the Interstate system, the National Highway system, and multiple rail lines. However, aging infrastructure in and around the city has limited Laurel's ability to attract new industrial businesses. These industries are experiencing tremendous growth and are expected to continue to grow to support developments in oil and gas extraction and refining as well as coal mining and transportation.

Oil and Gas

The oil and gas industry represents a nine billion dollar economic sector in Montana, accounting for 4,600 jobs across the state. Expansion in this industry is leading businesses to locate to Yellowstone County due to its skilled workforce, access to major transportation routes, and proximity to oil and gas resources such as the Alberta Basin Bakken Fairway and Williston Basin oil fields. The CHS refinery located in Laurel is expected to expand and generate increased volumes of crude and refined oil products.

Coal

Montana is the fifth largest coal producing state, accounting for about 4 percent of the national production. Wyoming is the largest coal producer at approximately 42 percent national production. Over 73 percent of coal produced in Montana is shipped via rail. Yellowstone County is located near a number of Montana coal mines and experiences a high-volume of coal-related rail traffic. Analysis indicates that rail traffic is approaching capacity levels along main lines in Yellowstone County. Future projections show significant congestion as a result of anticipated increases in overall national rail traffic if railroad capacity is not increased.

6.1.2. Existing System

Montana is part of a trade corridor linking midwestern and northwestern port markets. This leads to a large share of through-bound goods movement. For rail, 74 percent of goods by value and over half of the goods by weight pass through Montana. Trucking serves a greater share of locally serving trips – those originating and terminating in Montana – due to the ability of trucks to serve diffuse markets. While the Laurel area is affected by through trips on the highway and rail networks, locally serving trips have the greatest impact on the regional economy and quality of life.

Much of the locally serving goods movement is destined for industrial or commercial districts. Industrial areas are located along the rail line south of Main Street, around the CHS refinery on both sides of S 1st Avenue, and along the south side of East Railroad Street. Agriculture lands are located throughout the outskirts of the city limits. **Figure 3.3** shows the existing land use in the Laurel area.

The importance of providing safe and efficient truck routes through the community is a priority for Laurel. A large economic sector of the community relies on the presence of trucking for the convenient movement of goods. There is prime access to Interstate facilities (I-90) and to the National Highway System (US 212) within Laurel. In addition, Laurel houses the largest rail yard between Minneapolis, MN and Seattle, WA. **Figure 6.1** shows the existing freight system and large truck restrictions.

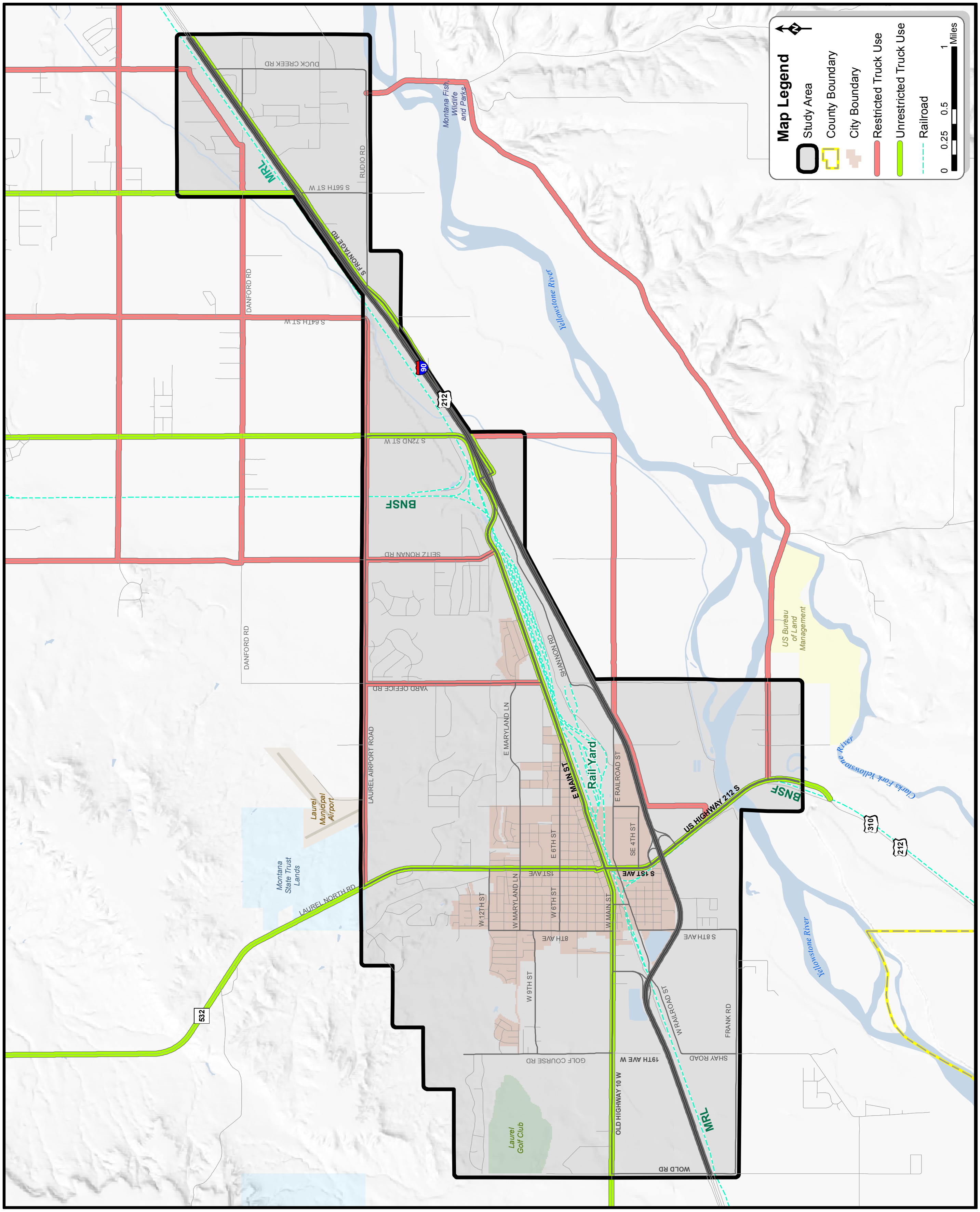


Figure 6.1: Existing Truck Restrictions and Freight Routes

Rail

Laurel is located at the confluence of the BNSF and MRL rail lines. The BNSF lines run generally north to south and connects Laurel to the Great Falls and Casper mainlines. The BNSF railway operates in 28 states and two provinces in Canada. The total system consists of approximately 32,000 route miles.

The MRL lines travel east to west and originate in Huntley, MT to the east. The lines travel west to the Idaho border in northern Montana and ultimately end in Spokane, WA. MRL operates more than 900 miles of track throughout Montana, Idaho, and Washington. The MRL rail yard located in Laurel is 2 ½ miles long and is the busiest in Montana.

Grade-separated crossings exist along S 1^{st} Avenue south of E Main Street, along E Main Street just west of the East Laurel Interchange, and along I-90 at the West Laurel Interchange. There are at-grade crossings along S 5^{th} Avenue south of Old Highway 10, and along W Railroad Street west of S 1^{st} Avenue.

Trucks

Trucks carry 59 percent of goods by value that originate in Montana, and 82 percent of goods by value destined for Montana. Truck and intermodal modes represent large proportions of overall value because more valuable commodities tend to be transported as containerized or truck trailer freight.

Height restrictions exist along S 1st Avenue.

Trucks travel on I-90 to access markets outside the region. I-90 is part of the National Highway System and serves as a primary means of moving people, goods, and services throughout the country. Locally-serving trucks access Laurel via I-90 from the east and west, US 212 from the south, and Secondary Highway 532 (S-532) from the north. Note that there are clearance constraints with larger trucks traveling along S 1^{st} Avenue (US 212) due the existing railroad bridge. The clearance height is listed as 14 feet. In addition, longer trucks have difficulties with clearance due to the steep grades on each side of the bridge.

6.1.3. Future Needs

The Laurel area is expected to see continued population, employment, and overall economic growth. A strong goods movement network will support economic growth by maintaining capacity, safety, and security of the transportation system, and preserve quality of life for local businesses and residents.

Production and consumption will likely increase along with population increases. Population and economic projections across the state suggest that the proportional share of goods shipped by truck, rail and intermodal service are likely to remain the same as they are today, even as demand for goods movement increases. This means that higher-value finished goods produced and consumed in Montana will continue to rely on trucks to distribute goods between dispersed origins and destinations.

Tons of goods shipped in Montana are forecast to increase by 101 percent to 216.8 million tons by year 2035. Truck shipments will continue to account for the largest share of in-state goods movement by weight, while rail will continue to account for nearly all of the outbound shipments by weight. **Table 6.1** shows the forecasted change in shipments by weight in 2035, with truck shipments showing the greatest growth, at 156 percent.

Table 6.1: Montana Forecast Change in Shipments by Weight (2002 to 2035, Millions of Tons)

Mode	Total Growth (2002-2035)[a]	Percent Change
Truck	82	156%
Rail	25	47%
Air	0	33%
Intermodal	2	150%
Total	109	101%

[a] Millions of Tons
Source: Montana State Rail Plan, Montana Department of Transportation, 2010. Does not include pipeline and intermodal shipments.

Forecasts of truck traffic show an expected growth of truck volumes by the year 2035 within the Laurel area. Truck traffic is expected to increase locally due to expected increases in truck-dependent industrial manufacturing, supported by infrastructure improvements to support these industrial sectors. I-90 in particular is expected to see an increase in truck traffic due to increased demand from the oil sands in Alberta, Canada, and the Bakken oil fields. Rail traffic is also expected to see an increase in large part due to increase coal mining in eastern Montana and Wyoming.

Important issues to address in long range planning emerge from this assessment of the goods movement transportation system, including reducing traffic congestion, preserving quality of life, balancing land uses, and creating a safe multimodal transportation network.

Reducing Traffic Congestion

Trucks make up a relatively small share of overall traffic in the Laurel area. However, trucks contend with – and contribute to – traffic congestion. Transportation modeling results indicate that traffic will become increasingly congested. Congested roadway routes will hamper economic growth by reducing efficiency of goods movement. Less efficient goods movement can result in higher prices for local goods, which reduces the economic competitiveness of the region, deters future businesses relocations in the region, and increases out-of-pocket costs for residents.

Preserving Quality of Life

Quality of life issues related to goods movement include vehicle and loading noise, air quality, and traffic safety. Goods movement directly affects these issues due to interactions with land uses, and interactions with other users of the transportation system. It is essential for trucks to access local markets by using local streets, while through-bound truck traffic is required to use official truck routes. Unfortunately, the volume of truck traffic on local streets is negatively affecting quality of life, as reported by residents and officials in previous regional plans.

Balancing Land Use

The City of Laurel, Yellowstone County, and regional economic development organizations are advocating for continued growth in the regional economy by attracting commercial businesses, industrial businesses, and residents. As the region grows, conflicts may arise between incompatible land uses. In addition, conflict may arise between users of the transportation system. 1st Avenue is an unrestricted truck route along a busy commercial district, with nearby access to multiple businesses. The area currently experiences traffic congestion issues and is not equipped to handle large trucks due to height restrictions under the railroad bridge. Adequate planning can facilitate growth that preserves quality of life while allowing local businesses and industries the ability to efficiently move goods into and out of the region.

Truck and Rail Access

Continued growth is expected in the heavy industry sectors, which include agriculture and oil and gas extraction and refining. These industries are dependent upon the movement of goods such as extraction materials and equipment, grains, aerospace, and wind energy equipment. Accessibility to the Interstate and rail systems is critical for these industries and their daily processes. The City of Laurel and surrounding region can help support the growth of these industries by providing efficient truck routes and easy access to the Interstate and freight rail systems.

Creating a Safe Multimodal Transportation Network

Preserving multimodal access will be important as demands for transportation, and in particular goods movement, grow. Community leaders should be particularly mindful of balancing transportation needs in downtown areas where major motorized transportation routes intersect with people walking to school, riding bikes, or accessing public transit.

6.2. CORRIDOR PRESERVATION

Corridor preservation is the application of measures to prevent or minimize development within the right-of-way of a planned transportation facility or improvement within a defined corridor. That includes corridors, both existing and future, in which a wide array of transportation improvements may be constructed including roadways, bikeways, multi-use trails, high occupancy vehicle lanes, or fixed route transportation infrastructure.

The objective of corridor preservation is to enable local governments to better plan for future growth. Corridor preservation helps to assure that a transportation system will effectively and efficiently serve existing and future development within a community, region or state, and prevent costly and difficult acquisitions after the fact. Preserving right-of-way for planned transportation facilities promotes orderly and predictable development. As communities expand, land must be set aside for the transportation infrastructure needed to support development and to maintain a desired level of transportation service. The decisions made about the location and design of the transportation network will have a lasting impact on growth patterns, community design, and modal alternatives.

Corridor preservation policies, programs and practices provide numerous benefits to communities, taxpayers and the public at large. These include, but are not limited to, the following:

- **Reducing transportation costs by preservation of future corridors in an undeveloped state.** Right-of-way costs often represent a large expenditure for a transportation improvement, particularly in growing urbanized areas where transportation improvement needs are the greatest. By acquiring or setting aside right-of-way well in advance of construction, the high cost to remove or relocate private homes or businesses is eliminated or reduced.

- **Enhancing economic development by minimizing traffic congestion and improving traffic flow, saving time and money.** Low cost, efficient transportation helps businesses contain final costs to customers and makes them more competitive in the marketplace. Freight costs, for instance, accounts for ten percent of the value of agricultural products, the highest for any industry.

- **Increasing information sharing so landowners, developers, engineers, utility providers, and planners understand the future needs for developing corridors.** An effective corridor preservation program ensures that all involved parties understand the future needs within a corridor and that state, local and private plans are coordinated. Clarifying public intentions about the location, timing, and desired level of access control for roadway improvements reduces the risk associated with the timing and phasing of development projects for the private sector. Advanced notice of such intentions also enables developers to plan projects and site-related improvements in a manner that is more compatible with the planned transportation functions of the corridor.

- **Preserving arterial capacity and right-of-way in growing corridors.** Corridor preservation includes the use of access management techniques to preserve the existing capacity of corridors. When it is necessary, arterial capacity can be added before it becomes cost prohibited by preserving right-of-way along growing transportation corridors.

- **Minimizing disruption of private utilities and public works.** Corridor preservation planning allows utilities and public works providers to know future plans for their transportation corridor and make their decisions accordingly.

- **Promoting urban and rural development compatible with local plans and regulations.** The state and local agencies must work closely together to coordinate their efforts. Effective corridor preservation will result in development along a transportation corridor that is consistent with local policies.

- **Reducing adverse social, economic, and environmental impacts on people and communities.** The social and economic costs of relocation can be high for some communities, particularly low-income, ethnic, or elderly populations and small businesses that serve such populations. In addition, where viable transportation corridors are foreclosed by development, roadways may need to be relocated into more environmentally sensitive areas, thereby increasing adverse impacts on the environment.

A variety of techniques have been applied by communities to help preserve right-of-way for future transportation corridors, ranging from setback ordinances to mandatory dedication. Although many jurisdictions have some method of right-of-way preservation in place, no single method works for all situations. Communities that have been most successful at corridor preservation are those that have assembled a variety of tools that they can mix and match to the circumstances at hand. The following are viewed as important elements of successful corridor preservation programs:

- Develop a long-range transportation plan with broad community support;
- Set clear priorities for transportation improvement projects and complete them in a timely manner;
- Identify a funding source for advance acquisition of necessary or desired rights-of-way; and
- Provide a range of mitigation measures to address potential hardship on property owners and to preserve property rights.

National experience in corridor preservation practices has also shown it is helpful to determine desired design objectives and cross-sections for transportation improvements in the community to establish a basis for future right-of-way needs. This helps to facilitate administration of and public support for the program by identifying in advance the amount of right-of-way that will be needed and why.

6.3. ACCESS MANAGEMENT

Access management is the proactive management of vehicular access points to land parcels adjacent to all manner of roadways. Good access management promotes safe and efficient use of the transportation network. Access management techniques are increasingly fundamental to preserving the safety and efficiency of a transportation facility. Access control can extend the carrying capacity of a roadway, reducing potential conflicts.

There are six basic principles of access management that are used to achieve the desired outcome of safer and efficient roadways. These principles are:

- Limit the number of conflict points.
- Separate the different conflict points.
- Separate turning volumes from through movements.

- Locate traffic signals to facilitate traffic movement.
- Maintain a hierarchy of roadways by function.
- Limit direct access on higher speed roads.

Access management encompasses a set of techniques that local governments can use to control access to highways, major arterials, and other roadways. Access management includes several techniques that are designed to increase the capacity of these roads, manage congestion, and reduce crashes. These techniques include:

- **Signal Spacing:** Increasing the distance between traffic signals improves the flow of traffic on major arterials, reduces congestion, and improves air quality for heavily traveled corridors.

- **Access and Driveway Spacing:** Fewer driveways spaced further apart allows for more orderly merging of traffic and presents fewer challenges to drivers.

- **Safe Turning Lanes:** Dedicated left- and right-turn, indirect left-turns and U-turns, and roundabouts keep through-traffic flowing. Roundabouts represent an opportunity to reduce an intersection with many conflict points or a severe crash history (T-bone crashes) to one that operates with fewer conflict points and less severe crashes (sideswipes) if they occur.

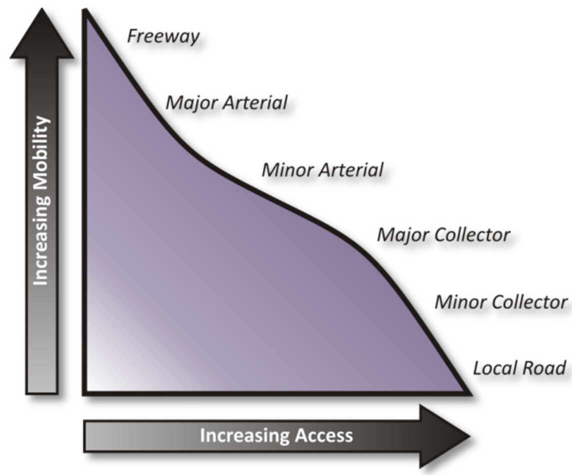


Figure 6.2: Relationship between Access and Mobility

- **Median Treatments:** Two-way left-turn lanes (TWLTL) and non-traversible, raised medians are examples of some of the most effective means to regulate access and reduce crashes.

- **Service and Frontage Roads:** Helps alleviate congestion on major limited access thoroughfares by providing parallel routes which can separate local traffic from through traffic.

- **Right-of-Way Management:** As it pertains to right-of-way reservation for future widenings, good sight distance, access location, and other access-related issues.

Transportation systems for communities, regions, and states are made up of networks of many different roadway types that perform different functions, ranging from freeways to local residential streets. Access control guidelines should reflect and maintain this hierarchy of roadway facilities. Access should be granted based on necessity and roadway function. Normally, a higher functional classification of roadway will result in limited access with greater spacing requirements between access points, while a lower classification allows for more densely packed access points.

For roadways on the State system and under the jurisdiction of the MDT, access control guidelines are available which define minimum access point spacing, access geometrics, etc., for different roadway facilities.

For other roadways (non-State), the adoption of an access classification system based upon the functional classification of the roadway (principal arterial, minor arterial or major collector) is desirable. These local regulations should serve to govern minimum spacing of drive approaches/connections and median openings along a given roadway in an effort to fit the given roadway into the context of the adjacent land uses and the roadway purpose.

6.3.1. Rural vs. Urban Access Management

Appropriate access management techniques may differ greatly based on whether the area in consideration is an urban area or a rural area. Urban areas experience higher traffic volumes and often have densely packed developments directly adjacent to the roadway. If access control regulations do not currently exist for established urban areas, then the bulk of the access management techniques adopted will be techniques to reduce the effects of closely-spaced existing access points, such as adding turn lanes and medians or restricting, relocating, and consolidating access. The potential legal issues involved with relocating or closing an existing access point can be substantial and can make accomplishing the goals of the new access management regulations difficult.

Generally, rural areas have lower traffic volumes and less dense development patterns. In most situations, this allows for access management techniques that deal more with preventing the closely-spaced access points seen regularly in urban areas rather than mitigating the effects of such dense development. Regulations governing the spacing, location, number, and operation of access points along a facility can usually be established before extensive development has occurred to limit the addition of new access points.

Establishing access management standards in rural areas enforce new developments to implement shared driveways, frontage roads, and driveways connected to minor street networks to gain access. However, in those rural areas where properties are closely-spaced or development has already occurred, techniques involving turn lanes and relocating or consolidating access points may still be necessary for effective access management.

Extensive development can quickly turn a rural area into an urban area. Having access management regulations in place before such development occurs can preserve traffic flow and prevent legal battles over relocating or consolidating access points. The need for access management techniques involving turn lanes, medians, and traffic signals will often increase as the rural area begins to see traffic flows of an urban setting.

6.4. SYSTEM OPERATIONS AND MAINTENANCE

There is an ongoing debate for many local jurisdictions as to what roadway management method is the most effective. Historically, most local jurisdictions have implemented "worst first" roadway management philosophy. Pavements with the worst ride quality generate the most constituent complaints and get moved up the repair priority list. The "worst first" management method allocates resources to the worst roads, trying to maintain roads that are in need of complete reconstruction. However, maintenance dollars used to repair these roads provide only temporary band-aid solutions for roadways that are already "too far gone". Shortly after repairs are made, the original underlying road base problems reflect through to the surface and the maintenance efforts that were made are shown to be in vain. Even after repeated applications, the inevitable will occur and the road will fail. At this point the only remedy for the roadway is to administer a costly complete reconstruction of the roadway. However, if the roadway was originally allowed to fail extra costs associated with ineffective treatments could have been avoided.

As more research is conducted on innovative roadway management methods, light is being shed on new effective management alternatives. The better option for local jurisdictions is to adopt the "best first" roadway management philosophy, in which resources are allocated to preserve the roadways that are already in good condition in order to prevent irreparable damage to the road. This philosophy is one in which preventative measures are taken in order to protect the public's investment.

This method of roadway management can, however, be hard to implement due to being misunderstood by the public. It is hard for many individuals to understand why good roads would receive maintenance while others in worse shape would be allowed to fail. In spite of this, an effort needs to be made in order to understand that the roadways within a jurisdiction need to be thought of as a system and not as individual roads. Meaning that, in order to maintain good working order on the greatest number of roads for the least amount of cost, a well thought out management plan must be used to determine where resources will be most effectively allocated.

If roadway management is thought of as a vehicle, it makes perfect sense that the best way to ensure that the vehicle has a long service life is to conduct routine maintenance. Everyone knows that the small upfront costs associated with changing the oil on a vehicle will prevent engine damage that would later result in costly repairs. Even a brand new vehicle will soon develop problems if not properly maintained. If this mindset is adopted for roadway management, the equivalent to a car's oil change is a roadway chip seal. Even though the vehicle or road may be in perfect working order, the preventative measures taken now will be recovered in the long term investment.

6.4.1. Roadway Preservation

Traditionally, federal, state and local agencies have allowed their roadways to deteriorate to "fair" or "poor" structural condition and ride quality before steps are implemented to rehabilitate the road. However, all that is beginning to change with recent findings showing this management system to be both costly and time consuming. Federal, state, and local agencies are beginning to realize that the most cost effective way for them to manage their roadways is to implement a series of low-cost preventative maintenance treatments in order to preserve their roadways and avoid continual rehabilitation.

In essence, roadway preservation is a system of planned roadway treatments that are implemented at the optimum time to enhance roadway longevity and maximize the useful life of a roadway while minimizing costs.

The purpose of roadway preservation is not to improve traffic flow or increase the level of service of a roadway; it is designed to be the most cost effective way to maintain the current working order of a healthy roadway. Roadway preservation is intended to address minor deficiencies in a roadway and implement low cost solutions that extend the service life of the roadway by preventing minor deficiencies from becoming major problems. **Figure 6.3** shows the concept behind roadway preservation and the emphasis of "Optimal Timing".

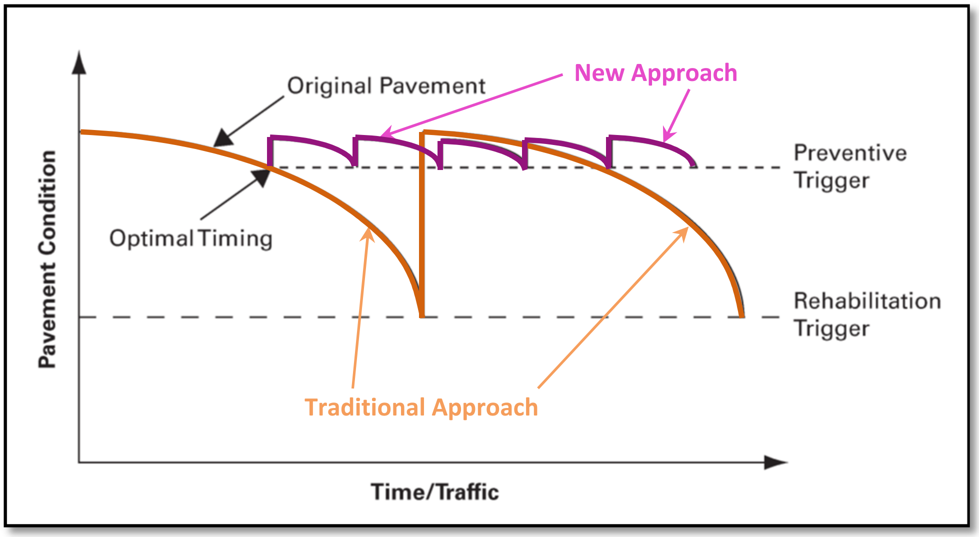


Figure 6.3: Pavement Preservation Concept

The example compares two paved roadways starting at the same condition. One of which is managed under the traditional approach of rehabilitating the roadway and allowing it to deteriorate to a state of failure. Failure occurs when the road is in fair to poor condition shown by the rehabilitation trigger line. At this line, irreversible structural damage has occurred, resulting in the need for costly rehabilitation of the entire roadway. The second road implements regular roadway preservation techniques.

These preservation techniques are low-cost preventative maintenance treatments that are implemented when the roadway reaches a predetermined level. The timing of treatment implementation is crucial for the success of the preservation plan. If the preservation techniques are implemented after the optimal time, the roadway will be deteriorating at a rate from which it cannot recover from and the investment in maintenance will be wasted. However, if the preventative maintenance is implemented at the optimal time, the roadway will be restored to near original condition, and if routine maintenance continues it will result in much greater intervals between roadway rehabilitations.

Roadway preservation is a long-term strategy for enhancing functional roadway performance by using integrated, cost-effective practices that extend roadway life, improve safety and motorist satisfaction while achieving sustainable roadway conditions.

6.4.2. Roadway Reconstruction

Roadway reconstruction is an action that must be utilized when preservation techniques are no longer a cost-effective solution to extend the service life for a specific roadway. If any road is left to the elements without routine maintenance, it will encounter a point in its life when it rapidly deteriorates to a state of failure. Failure of a roadway occurs when the road experiences structural damage. Structural damage takes place when a roadway loses its ability to resist and recover from repeated load applications and sustains permanent deformations.

In order to restore the structural integrity, load capacity, and rideability of a roadway, different treatment options are available depending on the state of the roadway. Roads that have failed can be reconstructed, rehabilitated, or resurfaced. Complete roadway reconstruction is the most drastic treatment option, but must be implemented when structural damage has occurred throughout the road strata. Reconstruction of a roadway replaces an existing road structure with an equivalent or improved new road structure. Rehabilitation involves improving the structural integrity of the existing road strata, and resurfacing restores the surface course of a roadway to like-new condition.

Structural restoration of roadways is a very costly and time consuming part of roadway management. However, it is a crucial part of a well-structured roadway management plan. Roadway preservation is the best treatment option for roadways that still have structural integrity. Though there comes a certain point when low-cost preventative maintenance treatments only offer a short term superficial fix.

Roadways must be closely monitored and rated to determine what treatment option is best for that roadway. Large sums of money can be wasted by reconstructing roads that still have service life, or by applying preventative treatments to roads that have sustained structural damage. Roadway reconstruction is the only option for some roads, but not the only option for every road.

6.4.2.1. Cost/Benefit Analysis

The benefits of roadway preservation are not instantaneous nor are they dramatic. The key to the success of roadway preservation is longevity. Roadways that are generally in good condition and receive preventative treatments do not typically show marked improvements, even after multiple applications. Where the benefits become apparent are in the roadways' ability to stand up to long term use, and avoid permanent structural damage. When compared to roads that are left to the elements, roadways that receive preventative treatments have a longer service life and are in better condition.

Roadways, and particularly paved roadways, perform well and resist the wear and tear subjected to them by traffic and weather until a certain point in their life, after which they begin to deteriorate precipitously and rapidly to a point of failure. However, if preservation efforts are made early in the roads' life, significant gains can be made to protect the longevity of the road. Low-cost preventative maintenance treatments have been shown to not only extend the service life of roads, but also provide for a better ride quality while the road is in service. Reconstructing old roads or constructing new roads is the number one expense for most municipalities; therefore, it makes economic sense to make every effort possible to preserve the taxpayer's investment. A study conducted by FHWA[4] found that when pavement preservation techniques were implemented at the optimal time they resulted in a significant long-term economic savings. In fact, the study showed that every dollar spent on timely pavement preservation could save up to six dollars in the future, by postponing costly reconstruction. **Figure 6.4** highlights the importance of timely pavement preservation vs. rehabilitation.

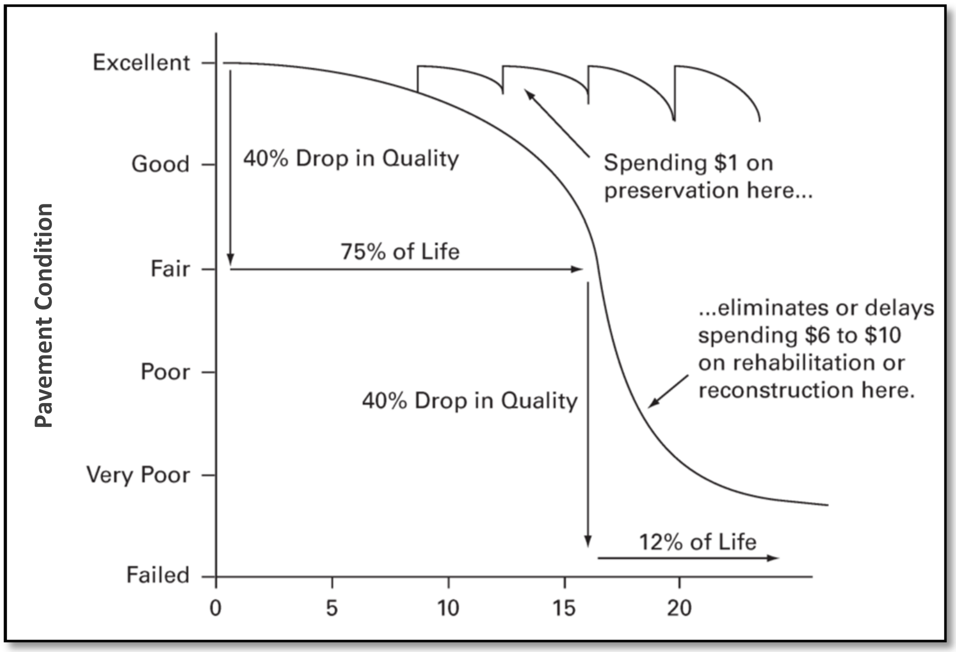


Figure 6.4: Pavement Option Curve

The ultimate goal is to improve roadway conditions, extend roadway life, and enhance roadway performance for local residents. In the past, many roadway management practices around the country have not been successful due to the fact that they are implemented without a definitive long-term plan being in place. Cost savings and efficiencies may be realized by making timely decisions that employ proper treatments and practices.

6.4.3. Roadway Treatments

Several key steps are necessary to develop a meaningful roadway management plan. First you must inventory the existing conditions of the roadways and rank them based on condition. Once the roadways are ranked, the appropriate treatment can be determined. The following sections discuss various treatments.

6.4.3.1. Drainage Improvements

Inadequate drainage greatly contributes to road failure. Proper drainage is vital, as water affects road serviceability. To maintain a healthy roadway network, must keep water away from it. A drainage system reduces water damage and saves money. The major elements to a drainage system are:

- Traveled Way
- Shoulders
- Ditches

---

[4] *Pavement Preservation Compendium II*, US Department of Transportation, Federal Highway Administration, September 2006

- Culverts

These elements work together to prevent water from passing through the road surface. The roadway and shoulder move water to the side and carry it away. Even properly designed roads could flood, washout, and develop potholes if drainage is neglected. Damaged shoulders, ditches, and culverts result in poor drainage. They allow water to stand on the road or seep back into the base, which saturates and weakens the base/road. It is important to fix problems immediately.

Smoothing and reshaping roads to provide adequate crowns and cross slopes is critical. This allows the road and shoulders to shed water to the ditches and away from the roadway.

Maintaining vegetation in ditches to prevent erosion is desirable. Mowing vegetation and cutting brush is necessary to keep water flowing smoothly. Keeping culverts free of sediment and debris also helps avoiding road deterioration and flooding.

6.4.3.2. Paved Roadway Treatments

Classic pavement preservation starts with a pavement inventory and condition database. This is used to determine which road surfaces are near the point where they will begin to fail rapidly. Those pavements — not the worst pavements favored by citizens — are the ones that should be targeted with whatever funds are available, prolonging their service life to a degree not possible otherwise.

The problem that Laurel faces is determining which roads need to be improved and how to optimize the budget. Pavements that are falling apart should not receive maintenance dollars, but should be allowed to fail and then be rebuilt. That's why adhering to a pavement preservation program may put Laurel in conflict with citizens, who may demand quick fixes for failing pavements. At that point, the roadway inventories and roadway management plan can be exhibited to show that Laurel is making the right decisions. Those preventive maintenance treatments include:

- Crack sealing
- Fog seals
- Chip seals
- Hot-mix asphalt thin overlays (non-structural)

Too often, maintenance is not driven by pavement management. Through planned, early application of preventive maintenance treatments, good roads are kept in good condition, validating the motto of pavement preservation being "the right treatment for the right road at the right time."

The key to success of road management is implementing the right treatment to the right road at the right time. If any one of these three elements is not correctly decided upon, the road management system will have little chance for success.

Before a specific treatment option can be decided upon, it needs to be decided whether the road should be maintained or improved. This is critical to determine what the most cost-effective treatment option will be. A ranking and treatment analysis should be performed to determine the appropriate treatment measure.

6.4.3.3. Roadway Maintenance

There are many different preventative maintenance techniques that can be implemented to a roadway that will increase the service life of the roadway. The following maintenance treatment options are available for asphalt roads:

- Culvert inspections/maintenance

- Ditch/drainage maintenance
- Crack sealing
- Fog sealing
- Chip seals
- Hot-mix asphalt thin overlays (non-structural)

Table 6.2: Typical Expected Life of Pavement Maintenance Treatments

Treatment	Expected Life of Treatment (years)[a]		
	Minimum	Average	Maximum
Non-Structural Overlay	2	7	12
Chip Seals	3	5	7
Crack Seal	2	3	5

[a] Life is dependent on traffic volumes and environmental conditions.

Each of these pavement treatment options discussed above will be most effective when implemented at the optimal time. Determination of the optimal application time for each roadway treatment should be established in accordance with the roadways rating and field verification.

6.4.3.4. Roadway Improvements

Roadway improvements are treatments that must be utilized when a roadway has sustained structural damage. The severity of structural damage and methods to reverse this damage can vary greatly from road to road. Roadway improvement options include the following:

- Culvert improvements
- Ditch improvements
- Excavation
- Pulverization/milling of old asphalt
- Separation/stabilization fabric installation
- Addition of select sub-base gravel
- Addition of base gravel
- New asphalt
- Structural overlays

6.4.4. Issues and Barriers

There are a number of issues and barriers that may arise as pavement preservation and maintenance projects are implemented. The following summarizes a number of these issues and barriers as discussed in the *Pavement Preservation Compendium II*:

Institutional Changes

Some of the issues and barriers from the city's point of view may include the following:

- **Identifying a champion for the program** – Like any new effort or program within a municipality, pavement preservation needs a champion. Without a champion to promote the importance and benefits, the new effort will not succeed.

- **Dealing with the paradigm shift from worst-first to best-first** – One of the biggest obstacles is convincing personnel to move from the tried and-true practice of fixing the worst pavement problems first to fixing good pavements while the bad ones continue to deteriorate.

- **Gaining commitment from the top management** – The program's success requires top management commitment. This includes a commitment for dedicated funding and for the resources needed to collect information on the effectiveness of preventive maintenance treatments. Pavement preservation projects will not warrant ribbon cutting ceremonies—unless the top management recognizes the program's importance.

- **Showing early benefits** – Pavement management systems that can show the early effects of the preventive maintenance treatments on extending life or on reducing life-cycle costs are essential.

- **Selecting the right treatment for the right pavement at the right time** – Failure can result if the correct treatment is not used. For a new program, a single failure can overshadow hundreds of successes. The right treatment must be applied to the pavement in a timely manner.

Marketplace Pressures

The issues and barriers mostly involve reluctance to disturb the status quo and include the following:

- **Competition between the suppliers of maintenance and rehabilitation treatments** – With the shift from the traditional rehabilitation programs of pavement overlays applied every 10 to 20 years to pavement preservation programs using new or different treatments, resistance can be expected from the suppliers of traditional rehabilitation materials. For example, hot-mix suppliers will resist new cold-mix treatments because of the likely loss in market share.

- **Competition between various suppliers of maintenance treatments** – When markets have been established for certain types of treatments and a new treatment type is being introduced, industry often works to block the new products, whether for technical reasons or for business reasons, again to avoid loss of market share.

- **Political lobbying to prevent use of new maintenance treatments** – In some cases, industry will rely on political lobbying to prevent new technologies from entering the market. Again the reasons may be technical but more likely are related to the effect on the market if an agency adopts the new technology.

- **Establishing the benefits of new technologies or treatments** – Suppliers often introduce new technologies without adequate evidence of the benefits. The supplier must provide the agency with detailed documentation of the product's benefits and performance.

Convincing the Public

The introduction of preservation programs also affects the traveling public—the ultimate customer— raising a different set of issues and barriers:

- **Understanding the shift from repairing the worst pavements first to the best pavements first** – The public does not understand why agencies would be working on good roads but letting the bad roads deteriorate. Most of the public understands the importance of maintaining a car or a house to prevent major repairs. Pavement preservation engineers should be able to explain the value of preventive maintenance treatments now compared with the cost of major repairs later.

- **Understanding the effects of the various maintenance and rehabilitation strategies on delays and vehicle costs** – Primary benefits of pavement preservation include the potential for reducing traffic delays by using faster repair techniques and for reducing user costs by maintaining pavement networks in better condition. Although widely acclaimed, these benefits still lack the documentation of national studies.

- **Understanding safety issues** – Increased safety for the traveling public and for workers in the work zone are other potential benefits from keeping roads in good condition through pavement preservation treatments; these benefits also need to be documented and communicated.

6.5. TRAFFIC CALMING

Traffic calming refers to a number of methods used to reduce vehicle speeds, improve safety, and enhance the quality of life. In the simplest definition, it is changing the physical environment to reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for pedestrians and other non-motorized street users. Traffic-calming techniques are typically aimed at lowering vehicle speeds, decreasing truck volumes, and/or reducing the amount of cut-through traffic in a given area. If applied properly, these techniques result in a more pleasant environment for pedestrians and bicyclists while increasing the overall safety of a roadway or road network.

Some of the most universal goals of traffic calming are as follows:

- Reduce the frequency and severity of accidents.
- Reduce speeding and cut-through traffic.
- Improve the quality of life in residential areas.
- Reduce negative environmental impacts of traffic such as air and noise pollution.
- Promote safe walking and bicycling.

Traffic calming measures can also have the following beneficial effects:

- Reduced need for police enforcement.
- Improved street environment (streetscaping / landscaping).
- Improved safety.

Traffic calming techniques cannot be used with the same degree of success on all roadway facilities. Traffic calming is rarely seen on roadway facilities higher than a collector roadway functional classification. Roadways functionally classified higher than a collector primarily have the purpose of moving traffic, whereas for collector and local roadways the primary purpose tends to shift more towards serving adjacent land uses and infiltration into neighborhoods.

Traffic calming implementation is generally the result of the concerns of residents in the area. Complaints from parents and citizens about speeds and cut-through traffic, particularly on residential streets near schools and parks, commonly spur traffic calming discussions. In many communities, citizens have conveyed their traffic-related concerns to local leaders who, in turn, have sought direction from transportation experts to implement traffic calming measures.

Traffic calming not only affects the roadway where the techniques are applied, but it can also have a ripple effect on the surrounding roadway network. Traffic calming measures applied to local streets may cause an increase in traffic volumes and speeds along other nearby streets often creating identical problems along other roadways. Speeding and cut-through traffic on local streets can be an indicator that the arterial network is not functioning properly. Improvements to the arterial network may be a more effective solution than active traffic calming on smaller streets.

Although many traffic calming techniques benefit pedestrians and bicyclists due to the speed reduction, some traffic calming techniques can be problematic especially if certain needs are not addressed during the planning process. For example, vertical deflection measures, such as speed humps or bumps, may be difficult for pedestrians and bicyclists to navigate. Some narrowing may force pedestrians and bicyclists to travel uncomfortably close to vehicles if proper facilities do not exist or are not properly incorporated into the design. To best serve the needs of all users, including bicyclists and pedestrians, care needs to be taken when implementing any traffic calming technique.

The following guidelines should be considered in traffic calming installations:

- Traffic calming planning should include adequate public involvement.
- Involve experts familiar with the latest traffic calming resources and design standards.
- Planners should consider a variety of traffic calming devices, rather than relying on a single type, such as speed humps or rumble strips.
- Traffic calming projects should support multiple objectives, including enhanced street aesthetics, improved walking and cycling conditions, as well as controlling traffic speeds.
- Stop signs should not be used as traffic calming devices.
- Maintenance of new traffic calming devices should be included in planning and design phases.
- Devices that are new to an area should be implemented on a trial basis with adequate signing. For example, the first traffic circles in an area should have signs showing the path vehicles should follow. After a few years such signs become unnecessary.
- Delays to emergency vehicles should be minimized by the appropriate placement and design of traffic calming devices. In some cases, certain traffic calming devices may not be appropriate.
- Traffic calming installations should not divert traffic to other local residential streets. Traffic calming installations should support the street classifications established in community plans. Traffic may be diverted from residential streets to higher classified through streets. The potential impacts of traffic diversion should be evaluated for all traffic calming installations.
- Traffic calming should not impair the mobility of non-motorized users of the street.
- Traffic calming installations must address drainage, sight distance, and location of utilities.

The traffic calming discussion contained herein is generally aimed at the urban interface area. The use of traffic calming techniques should be determined on a case-by-case basis. This section is intended to provide a general overview of commonly used traffic calming measures.

6.5.1. Types of Traffic Calming Measures

There are two forms of traffic calming, active and passive. Active measures are usually applied after a street has been constructed to correct a perceived problem with driver behavior. Passive measures are more likely to be included during the initial design of a roadway. Generally, active measures are not appropriate for the arterial network as they interfere with the purpose of arterials to move larger volumes of vehicles. However, appropriate use of passive measures may accomplish the purpose of encouraging safer driver, cyclist, or pedestrian behavior without restricting traffic flow.

Arterials should be considered in any active traffic calming plan since speeding and cut-through traffic on local streets can be an indicator that the arterial network is not functioning properly. Therefore, improvements to the arterial network may be a more effective solution than active traffic calming on smaller streets.

Traffic calming measures generally fit into one of the following major categories:

- Passive measures;
- Education and enforcement;
- Signing and pavement marking;
- Deflection or narrowing; and
- Diversions or restrictions.

The traffic calming techniques contained in this section can be effective in a variety of ways. However, while a specific tool may work for some applications, it may not work under every circumstance. Some tools are most effective when used in combination with each other, while others may create hazards in locations where proper bicycle and pedestrian facilities do not exist. The right use for each technique depends on the existing conditions along the roadway in addition to the desired outcomes.

6.5.1.1. Passive Measures

Passive measures are built into the street environment. They are not immediately obvious to the traveling public, but nevertheless produce a calming effect on traffic. Some passive traffic calming measures include:

- Tree-lined streets;
- Streets with boulevards separating the sidewalks;
- Streets with raised center medians (usually landscaped);
- On-street parking (including angled parking);
- Highly visible pedestrian crossings; and
- Short building set-back distances.

These elements tend to slow traffic by giving motorists the impression that the street is narrow and that extra care is required. These elements do not restrict or interfere directly with traffic flow. A combination of more than one of these techniques, or these techniques combined with measures from the other categories, will likely produce more effective results.

6.5.1.2. Education and Enforcement

Several techniques are available to raise public awareness of traffic problems and help change the behaviors contributing to these problems. Some education and enforcement techniques are discussed in this section.

Neighborhood Traffic Program

As a part of the normal neighborhood group activities, newsletters or other materials can be produced containing educational information regarding traffic issues. These materials can be tailored to issues of specific concern to different neighborhoods. These issues can then be addressed at regularly scheduled meetings or at special meetings and recommendations can be put forward to increase neighborhood traffic safety.

A neighborhood speed monitoring program can also be implemented. Residents themselves would measure vehicle speeds with a radar unit and record license plate numbers of speeding vehicles. Follow-up action of the data can include sending letters to the registered owners of the vehicles explaining the safety concerns within the neighborhood and requesting better observance of the speed limits.

Advantages

- Low-cost
- Increased awareness
- Targeted approach

Disadvantages

- Requires volunteers
- Difficult to enforce
- Limited effectiveness

Special Considerations

- Signs
- Enforcement

Estimated Cost

- Varies

Targeted Enforcement

This is a requested, time-limited addition of police enforcement within a neighborhood. Increasing the level of police enforcement on streets that are prone to speeding problems can be an effective way to reduce the number of speeding vehicles. Additional police enforcement can help to discourage drivers from breaking speed limit laws in the area. The speed reduction, however, usually is only reduced for a short period of time or as long as the enforcement is maintained. In order to have a long term effect on speeding, police enforcement must be on a repetitive non-routine basis while having signage and/or brochures in the area to indicate that enforcement will be increased in the area. There can be significant budget and manpower constraints to having increased police enforcement, however. Using police personnel to enforce speed limits is typically a low priority for police departments. The cost of enforcing speed limits on a continual basis can be unjustifiable.

Advantages

- Effective at slowing vehicle speeds down
- Widely accepted
- Increases safety level of the area

Disadvantages

- Requires continual enforcement
- Not of high priority to police departments
- Expensive

Special Considerations

- Signs
- Continual enforcement

Estimated Cost

- Varies

Radar Speed Monitoring Trailer

A pull-behind trailer equipped with speed detection equipment, a readout of vehicle speeds, and a sign with the posted speed limit is brought to an area with speeding problems. These trailers are usually unmanned; however better results are obtained if someone is present. Additionally, the trailer can be equipped with a camera that would record license plate information for possible follow-up.

Advantages

- Widely accepted
- Basically run themselves
- Can save data and be used to determine problem areas and times
- Works as a driver education method
- Portable

Disadvantages

- May require additional enforcement
- Can encourage speeding of some groups of drivers
- Vandalism may occur
- Limited effectiveness when not used in conjunction with additional enforcement

Special Considerations

- Signing
- Enforcement level
- Maintenance

Estimated Cost

- $10,000 to $20,000

6.5.1.3. Signing and Pavement Marking

Traffic control signs and pavement markings can be installed as non-intrusive traffic calming measures. The signs can include speed limit signs, dead-end street signs, and signs indicating school crossings or general pedestrian crossing. Pavement markings can include marked crosswalks, delineation of lanes, and speed limit markings. Traffic calming techniques which specifically fall in this category include:

- **Truck Route Signing:** Signs placed on routes where trucks are allowed, plus signs placed on routes where trucks are not allowed.
- **Basket Weave Stop Sign Pattern:** Stop signs placed at every intersection in a residential neighborhood with stops alternating between east/west and north/south directions. Note that this is appropriate for local access streets only, and it disregards signing warrants.
- **Speed Limit Signs:** Installing new or additional speed limit signs.
- **Edge Lines:** Painted lines on the pavement which narrow traffic lanes and/or provide for bicycle lanes or on-street parking.
- **Stop Bars:** Painted lines on the pavement that shows motorists where to stop for stop signs.

Decreased Speed Limits

Decreasing speed limits in an area prone to speeding is a simple low cost approach to trying to deter drivers from breaking the speed limit. However, the posted speed limit is commonly ignored by the driver. Drivers are likely to travel at speeds they consider reasonable and are often influenced by other drivers in the area. There is usually little to no effect on vehicle speeds by simply lowering the speed limit in the area. To have an effect on vehicles, the lower speed limits must be accompanied by other means of speed control. These other means could be increased law enforcement, speed bumps, or any other method that would help promote lower speeds in the area. Decreasing speed limits in areas such as school zones is common and does tend to have some effect on speeding. The effect can be much higher by using law enforcement to help monitor the area.

Advantages

- Low cost
- Useful when done in conjunction with other speed control methods
- Useful in areas such as school zones

Disadvantages

- Little to no effect on vehicle speeds when done alone
- Often times ignored
- May require additional measures

Special Considerations

- Signs
- Enforcement
- Maintenance

Estimated Cost

- $4,000 to much higher depending on design

Pavement Markings

Pavement markings can be used for anything from on-street parking, to accentuating already existing features, to creating new features. Using pavement markings to indicate areas where on-street parking would occur helps to create a safer parking environment and also directs traffic in the area. A slight speed reduction may occur if the travel lanes are narrowed due to the markings. When pavement markings are used to accentuate already existing features, they can make the features look bigger and give advanced warning about them. Pavement markings can also be used to create turning lanes and to direct traffic flow without having to use expensive medians or curbs.

Pavement markings are generally not overly effective on vehicle speed reduction unless they create the impression of a narrowed roadway. While pavement markings don't force drivers to act, they do give them guidance on how to act.

Advantages

- Inexpensive
- Can accentuate already existing features
- Can help create areas of caution
- Gives guidance to the drives

Disadvantages

- Limited effect on vehicle speed reduction
- Must be maintained
- Not easily visible under snow or water

Special Considerations

- Maintenance
- Signage
- Visibility

Estimated Cost

- Varies

6.5.1.4. Deflection or Narrowing

Deflection and narrowing traffic calming measures create an uncomfortable driving environment which helps to reduce vehicle speeds. Traffic calming is achieved through the use of physical horizontal alignment or vertical deflection measures.

Surface Valley Gutters

Valley gutters are dips in the street that can be used to carry runoff as well as cause discomfort to drivers at high speeds.

Advantages

- Effective if used in series at 300 to 500 foot intervals
- Self-enforcing
- Relatively inexpensive during initial construction

Disadvantages

- Drivers may speed up between dips
- May divert traffic and increase volumes on other streets
- Not usually appropriate for existing streets with established drainage patterns

Special Considerations

- Emergency vehicles
- Drainage
- Signage

Estimated Cost

- $1,000 to $2,000

Speed Bumps, Humps, Tables, and Cushions

Speed bumps, humps, tables, and cushions are all design features which are raised above the roadway. The differences between the four types are in their geometry.

Speed bumps are the smallest and are generally 3 to 6 inches high and 1 to 3 feet wide. They are typically used in parking lots and low speed residential areas. Speed bumps slow vehicles traveling at slow speeds down to approximately 5 miles per hour. Vehicles traveling at higher speeds may be impacted less by the bumps.

Speed humps are larger than speed bumps and range from 3 to 4 inches high and 10 to 14 feet wide. They can be used on streets where a low speed limit is desired. Speed humps generally can slow vehicles down to approximately 15 miles per hour. If traveled over at higher speeds the vehicle will experience a severe jolting effect.

A speed table is a widened speed hump with a flat top. Speed tables are typically wide enough so that the entire wheelbase of a car rests on the table. The design of speed tables allows for higher speeds than those of speed humps, but creates a smoother ride for larger vehicles. The height of speed tables is similar to speed humps, but the width can vary. A typical 22 foot long speed table has a design speed of approximately 30 miles per hour.

Speed cushions are a series of speed humps installed across the width of the roadway with spaces between them. The spaces are spaced so that emergency vehicles can pass between them without being affected by the bumps. Ordinary cars have smaller axels and will therefore need to travel over the bump with at least one side of their car. Speed cushions have about the same effect on slowing cars down as speed humps do while still allowing emergency vehicles to be unaffected by them.

These traffic calming measures can be placed at spaces ranging from 250 feet to 800 feet to gain a continuous effect on slowing vehicle speeds. If they are placed at distances greater than 800 feet, there is enough room between them for driver to speed up between the devices which will limit their effectiveness.

Advantages

- Slows traffic down
- Increases safety levels
- Decreases traffic volume
- Self-enforcing
- Relatively inexpensive

Disadvantages

- May promote speeding between devices
- May increase volume on other streets
- Difficult to properly construct

Special Considerations

- Emergency vehicles
- Drainage
- Signage
- Snow Removal

Estimated Cost

- $1,000 to $8,000

Raised Crosswalks

Raised crosswalks are simply speed tables that have crosswalk signage and markings to allow for pedestrians to cross the roadway. The raised level of the crosswalk makes it more visible to the driver and therefore safer for the pedestrians. Raised crosswalks are ideal in locations where there is heavy pedestrian traffic and high vehicle speeds. Raised crosswalks have the advantage of slowing vehicles down who drive over them and alerting vehicles to possible pedestrian traffic in the area.

Advantages

- Improved safety for vehicles and pedestrians
- Can be visually appealing
- Effective at reducing vehicle speeds
- Makes the crosswalk and pedestrians more visible

Disadvantages

- May promote speeding between them
- Difficult to properly construct
- May slow down emergency vehicles

Special Considerations

- Emergency vehicles
- Drainage
- Signage
- Snow Removal

Estimated Cost

- $2,500 to $8,000

Transverse Rumble Strips

Rumble strips are patterned sections of rough pavement in the street designed to slow traffic. The vibration caused by driving over the rumble strips is intended to cause motorists to slow down. The rumble strip provides visual and audio cues to alert drivers to areas that require special care (shopping centers, schools, entrances to residential neighborhoods). Changes in pavement color and texture (such as bricks or blocks) used in interesting and visually attractive ways, can also have the effect of rumble strips.

Advantages

- Create driver awareness
- Relatively inexpensive to install

Disadvantages

- High maintenance
- May adversely impact bicyclists
- Noisy by design, not recommended for all areas

Special Considerations

- Emergency vehicles

Estimated Cost

- $1,000 to $2,000

Traffic Circles

Raised circular areas placed in the center of an intersection about which drivers must navigate around. They cause vehicles to slow down through the intersection because drivers are forced to make turning movements. In general they are very effective at slowing vehicle speeds down. Large vehicles may have trouble navigating around traffic circles, especially when making left-hand turns. Traffic circles work well for low volume intersections where speeding is a common problem.

Advantages

- Reduces crashes substantially over stop control
- Reduces vehicle speeds
- Cheaper to maintain than traffic signals
- Effective at multi-leg intersections

Special Considerations

- Lighting
- Signage
- Irrigation and maintenance of landscaping

Disadvantages

- May be restrictive for larger vehicles
- Right-of-way may need to be purchased
- Initial safety issues as drivers adjust
- May increase volume on adjacent streets

Estimated Cost

- $10,000 to $50,000 or higher depending on design and location

6.5.1.5. Diversions or Restrictions

Half Closures

Half closures are put in place to block a single lane of traffic. They can be used to prevent vehicles from entering a road while still allowing vehicles to exit the road. This is an effective means of limiting traffic on a roadway and also limiting turns off of the intersecting roadway. Half closures are generally made by extending the curb or placing a barrier to block entry. Ample signage must be put into place to alert drivers to the partial closure. Half closures are commonly used in areas where a residential road is experiencing heavy amounts of traffic due to its connection to a main road. Most of this traffic can be attributed to cut-through traffic and can be significantly decreased through the use of half closures.

Advantages

- Reduces access for residents or businesses
- May increase trip length
- Increases volumes on other streets
- Drivers may be able to drive around the barrier

Special Considerations

- Emergency vehicles
- Signage
- Maintenance

Disadvantages

- Reduces access for residents or businesses
- May increase trip length
- Increases volumes on other streets
- Drivers may be able to drive around the barrier

Estimated Cost

- $10,000 to $40,000

Full Closures

Full street closures are created by placing barriers at an existing intersection. The full closures can be done to create a dead end or a cul-de-sac style road. An opening or trail can be placed to connect pedestrians and bicycles to the abutting road. The type of barrier used to create the closures can range from a bollard style to a full landscaped closure, to installing curb extensions to the roadway.

Road closures are very effective at lowering traffic volumes on the roadway. Cut through traffic can be greatly reduced through the use of full closure. It is common to use full closures to limit the amount of traffic on a residential street that was connected to a main street. By closing the connection to the main street, the traffic that previously used the residential street to connect to the main street would diminish thereby decreasing the overall traffic on that road. This does, however, create more traffic on other roads in the area since those vehicles would still have to access the main street via another street.

Advantages

- Eliminates through traffic
- Improves safety for all street users
- Can still have pedestrian and bicycle access
- Can be aesthetically pleasing

Disadvantages

- Reduces emergency vehicle access
- Reduces access to properties
- May increase trip lengths
- Increases volumes on other streets
- Can be expensive

Special Considerations

- Emergency vehicles
- Signage
- Drainage
- Maintenance

Estimated Cost

- $15,000 to much higher depending on design

Forced Turn Islands

Forced turn islands are small traffic islands placed at intersections to restrict and channelize turning movements. They are generally put in place to block left-turn and through movements while still allowing for right-turn movements. This method is commonly used where smaller side streets intersect with a larger major street. Heavy left-turn or through traffic off of side streets can cause safety and traffic problems for the area. Restricting the movements from the side streets can increase the safety and traffic levels of the intersection. Forced turn islands are common place for parking lots or similar areas that have multiple entrances and exits. The islands encourage people wanting to turn left or go straight out of the area to use the designated intersections that don't have the forced turn islands; the designated intersections are generally larger safer intersections.

Advantages

- Provides space for landscaping
- Reduces traffic conflict points and increases safety
- May reduce cut through traffic
- Causes vehicles to use designated intersections

Disadvantages

- May be an inconvenience to area businesses or residents
- Driver may be able to maneuver around the island
- Diverts traffic to other roads
- May inhibit emergency vehicles

Special Considerations

- Emergency vehicle access
- Lighting
- Signage
- Maintenance

Estimated Cost

- $4,000 to $8,000

6.5.2. Incorporating into Roadway Design

Curb bulb-outs along 8th Avenue.

Roadway designs for new development should be appropriate for the intended function of each roadway or roadway segment. Those designed to function as part of the major roadway system (major collectors and arterials), should be designed primarily to move traffic in as efficient, convenient, and safe a manner as possible. Local roadways and minor collectors, on the other hand, should be designed to provide access to properties while discouraging through-traffic and higher travel speeds that often accompany it. As a result, new developments should include traffic calming strategies to reinforce the appropriate functions of local roads. These would include layout and connectivity of street systems and pedestrian/bicycle facilities, intersection treatments, and basic design standards for width, curvature, parking, and landscaping. Specific traffic calming features which are easily incorporated into the design phase include: gateway treatments; street narrowing; short block lengths; small corner radii; surface valley gutters; "T" intersections; roundabouts; and landscaping to create a "closed-in" environment.

Traffic calming design characteristics should be incorporated into the development review process. Proposed developments would be reviewed by staff to determine whether or not traffic-calming improvements are appropriate for any given location, what strategies are best suited, and what design details are appropriate. The process should be designed to pro-actively assist developers in utilizing traffic strategies to improve quality of life in their developments, while minimizing or eliminating costs for retrofit efforts.

In some cases, traffic problems may be located near a City/County line, or may be caused by conditions inside the City limits, on the State highway system, or at the State complex. For these reasons, it is desirable for the City of Laurel to have cooperative agreements with Yellowstone County and the MDT. Cooperative agreements would enable this process to cross jurisdictional boundaries. Other agencies would take an active role in the traffic calming process and participate in financing permanent solutions when deemed appropriate.

6.5.3. Traffic Calming Program for Existing Roadways

Traffic calming programs are usually implemented by local engineering departments. These programs involve educating planners and traffic engineers about traffic calming strategies, establishing policies and guidelines for implementing traffic calming projects, and developing funding sources. Specific traffic calming projects may be initiated by neighborhood requests, traffic safety programs, or as part of community redevelopment. Traffic calming is initiated and organized by neighborhood residents.

A traffic calming program for Laurel should provide a regular and ongoing opportunity for neighborhoods to nominate, test, and implement improvements to address problems with the local street network. The process should be standardized to minimize administrative effort and cost, while ensuring that improvements are necessary, effective and safe. The process should be repeated as necessary to ensure that resident concerns are addressed with reasonable timeliness, and that projects are advanced in an orderly and efficient manner.

Traffic calming measures are designed to reinforce the perceived need for caution by the user of the transportation system. The primary responsibility for safe use of the streets lies with the individual driver, cyclist, or pedestrian. The need for physical traffic calming devices indicates a consistent occurrence of failure by the transportation user to appropriately interact with their surroundings.

Traffic calming projects depend on the strong support of residents in the immediate area. Traffic calming methods should also be used only to address real, rather than perceived, problems. For these and other related reasons, traffic calming projects should meet several criteria before being considered for implementation.

This page intentionally left blank.

7.0

Transportation Funding

Transportation improvements can be implemented using Federal, State, local and private funding sources. Historically, Federal and State funding programs have been most commonly used to construct and upgrade the major roads in the Laurel area. Considering the current funding limits of these traditional programs, and the extensive list of recommended road projects, it is apparent that more funding will be required from local and private sources if all of the transportation network needs are to be met.

Much of the following information concerning the Federal and State funding programs was assembled with the assistance of the Statewide and Urban Planning Section of MDT. The intent of this chapter is to identify traditional Federal, State and local sources of funds for transportation related projects and programs in the Laurel area. A narrative description of each potential funding source is provided, including: the source of revenue; required match; purpose for which funds are intended; means by which the funds are distributed; and the agency or jurisdiction responsible for establishing priorities for use of the funds.

7.1. OVERVIEW OF TRADITIONAL FUNDING SOURCES

MDT administers a number of programs that are funded from State and Federal sources. Each year, in accordance with 60-2-127, Montana Code Annotated (MCA), the Montana Transportation Commission allocates a portion of available Federal-aid highway funds for construction purposes and for projects located on the various systems in the state as described throughout this chapter.

The following list includes Federal and State funding sources developed for the distribution of Federal and State transportation funding. This includes Federal funds the State receives under the Moving Ahead for Progress in the 21st Century Act (MAP-21). The list also includes local funding sources available through the city and county, as well as private sources. It should be understood that other funding sources are possible, but those listed below reflect the most probable sources at this time. A narrative description of each source is provided in the following sections of this Chapter.

Federal Funding Sources

- National Highway Performance Program (NHPP)
    - Interstate Maintenance
    - National Highway
    - NHPP Bridge (NHPB)
- Surface Transportation Program (STP)
    - Primary Highway System (STPP)
    - Secondary Highway System (STPS)
    - Urban Highway System (STPU)
    - Bridge Program (STP)
    - Surface Transportation Program for Other Routes – Off-system (STPX)
    - Urban Pavement Preservation Program (UPP)
- Highway Safety Improvement Program (HSIP)
- Congestion Mitigation & Air Quality Improvement Program (CMAQ)
- Transportation Alternatives Program

- Federal Lands Highway Program (FLAP)
- Congressionally Directed Funds
- Transit Capital & Operating Assistance Funding
    - Bus and Bus Facilities (Section 5339)
    - Enhanced Mobility of Seniors and Individuals with Disabilities (Section 5310)
    - Formula Grants for Rural Areas (Section 5311)

State Funding Sources
- State Fuel Tax
- State Special Revenue/State Funded Construction
- TransADE
- Rail/Loan Funds

Local Funding Sources
- City of Laurel
- Yellowstone County
- Private Funding Sources

7.2. FEDERAL FUNDING SOURCES

The following summary of major Federal transportation funding categories received by the State through Titles 23-49 U.S.C., including state developed implementation/sub-programs that may be potential sources for projects. In order to receive project funding under these programs, projects must be included in the State Transportation Improvement Program (STIP), where relevant.

7.2.1. National Highway Performance Program (NHPP)

The National Highway Performance Program (NHPP) provides funding for the National Highway System, including the Interstate System and National Highways system roads and bridges. The purpose of the National Highway System (NHS) is to provide an interconnected system of principal arterial routes which will serve major population centers, international border crossings, intermodal transportation facilities and other major travel destinations; meet national defense requirement; and serve interstate and interregional travel. The National Highway System includes all Interstate routes, a large percentage of urban and rural principal arterials, the defense strategic highway network, and strategic highway connectors.

Allocations and Matching Requirements: NHPP funds are Federally-apportioned to Montana and allocated to Districts by the Montana Transportation Commission. Based on system performance, the funds are allocated to three programs:

7.2.1.1. Interstate Maintenance

Interstate Maintenance (IM) funds are Federally-apportioned to Montana and allocated based on system performance by the Montana Transportation Commission. The Commission approves and awards projects for improvements on the Interstate Highway System which are let through a competitive bidding process. The Federal share for IM projects is 91.24% and the State is responsible for 8.76%.

7.2.1.2. National Highway

The Federal share for non-Interstate NHS projects is 86.58% and the State is responsible for the remaining 13.42%. The State share is funded through the Highway State Special Revenue Account.

Eligibility and Planning Considerations: Activities eligible for the National Highway System funding include construction, reconstruction, resurfacing, restoration, and rehabilitation of segments of the NHS roadway; construction, replacement, rehabilitation, preservation and protection of bridges on the National Highway System; and projects or part of a program supporting national goals for improving infrastructure condition, safety, mobility, or freight movements on the National Highway System. Operational improvements as well as highway safety improvements are also eligible. Other miscellaneous activities that may qualify for NHS funding include bikeways and pedestrian walkways, environmental mitigation, restoration and pollution control, infrastructure based intelligent transportation systems, traffic and traveler monitoring and control, and construction of intra or inter-city bus terminals serving the National Highway System. The Transportation Commission establishes priorities for the use of National Highway Performance Program funds and projects are let through a competitive bidding process.

The Billings District is anticipated to receive an average of about $3 million annually of NHPP funds during the next five years. Current Billings District priorities already under development total an estimated construction cost of $15 million. Given the estimated range of planning level costs, NHPP funding for improvements is highly unlikely over the short term, but may be available toward the end of the planning horizon depending on the other NHS needs within the Billings District.

7.2.1.3. NHPP Bridge (NHPB)

Federal and state funds under this program are used to finance bridge inspection, improvement, and replacement projects on Interstate and non-Interstate National Highway System routes. NHPB program funding is established at the discretion of the state. However, Title 23 U.S.C. establishes minimum standards for NHS bridge conditions. If more than 10% of the total deck area of NHS bridges in a state is on structurally deficient bridges for three consecutive years, the state must direct NHPB funds equal to 50% of the state's FY 2009 Highway Bridge Program to improve bridges each year until the state's NHS bridge condition meets the minimum standard.

7.2.2. Surface Transportation Program (STP)

Surface Transportation Program (STP) funds are Federally-apportioned to Montana and allocated by the Montana Transportation Commission to various programs including the Surface Transportation Program Primary Highways (STPP)*, Surface Transportation Program Secondary Highways (STPS)* and the Surface Transportation Program Urban Highways (STPU).* The Federal share for these projects is 86.58% with the non-Federal share typically funded through Highway State Special Revenue (HSSR).

7.2.2.1. Primary Highway System (STPP)*

The Federal and State funds available under this program are used to finance transportation projects on the state-designated Primary Highway System. The Primary Highway System includes highways that have been functionally classified by MDT as either principal or minor arterials and that have been selected by the Montana Transportation Commission to be placed on the primary highway system [MCA 60-2-125(3)].

Allocations and Matching Requirements: Primary funds are distributed statewide (MCA 60-3-205) to each of five financial districts. The Commission distributes STPP funding based on system performance. Of the total received, 86.58% is Federal and 13.42% is State funds from the Highway State Special Revenue Account.

Eligibility and Planning Considerations: STP Primary funds are eligible for a wide range of transportation improvement projects and activities, ranging from roadway reconstruction and rehabilitation, to bridge construction and inspection, to highway and transit safety infrastructure, environmental mitigation, carpooling, and bicycle and pedestrian transportation facilities.

7.2.2.2. Secondary Highway System (STPS)*

The Federal and State funds available under this program are used to finance transportation projects on the state-designated Secondary Highway System. The Secondary Highway System includes any highway that is not classified as a local route or rural minor collector and that has been selected by the Montana Transportation Commission to be placed on the Secondary Highway System. Funding is distributed by formula and is utilized to resurface, rehabilitate and reconstruct roadways and bridges on the Secondary System.

Allocations and Matching Requirements: Secondary funds are distributed statewide (MCA 60-3-206) to each of five financial districts, based on a formula, which takes into account the land area, population, road mileage and bridge square footage. Federal funds for secondary highways must be matched by non-Federal funds. Of the total received 86.58% is Federal and 13.42 % is non-Federal match. Normally, the match on these funds is from the Highway State Special Revenue Account.

Eligibility and Planning Considerations: Eligible activities for the use of Secondary funds fall under three major types of improvements: Reconstruction, Rehabilitation, and Pavement Preservation. The Reconstruction and Rehabilitation categories are allocated a minimum of 65% of the program funds with the remaining 35% dedicated to Pavement Preservation. Secondary funds can also be used for any project that is eligible for STP under Title 23, U.S.C. Priorities are identified in consultation with the appropriate local government authorizes and approved by the Montana Transportation Commission.

7.2.2.3. Urban Highway System (STPU)*

The Federal and state funds available under this program are used to finance transportation projects on Montana's Urban Highway System, as per MCA 60-3-211. STPU allocations are based on a per capita distribution and are recalculated each decade following the census. STPU funds are primarily used for resurfacing, rehabilitation or reconstruction of existing facilities; operational improvements; bicycle facilities; pedestrian walkways and carpool projects.

Allocations and Matching Requirements: State law guides the allocation of Urban funds to projects on the Urban Highway System in Montana's urban areas (population of 5,000 or greater) through a statutory formula based on each area's population compared to the total population in all urban areas. Of the total received, 86.58% is Federal and 13.42% is non-Federal match typically provided from the Special State Revenue Account for highway projects.

Montana's urban areas are as follows:

- Anaconda
- Belgrade
- Billings
- Bozeman
- Butte
- Columbia Falls
- Glendive
- Great Falls
- Hamilton
- Havre
- Helena
- Kalispell
- Laurel
- Lewistown
- Livingston
- Miles City
- Missoula
- Sidney
- Whitefish

Eligibility and Planning Considerations: Urban funds are used primarily for major street construction, reconstruction, and traffic operation projects on the 430 miles on the State-designated Urban Highway System, but can also be used for any project that is eligible for STP under Title 23 U.S. C. Priorities for the use of Urban funds are established at the local level through local planning processes with final approval by the Transportation Commission.

7.2.2.4. Bridge Program (STP)

The Federal and state funds available under this program are used to finance bridge projects for on-system and off-system routes in Montana. Title 23 U.S.C. requires that a minimum amount (equal to 15 percent of Montana's 2009 Federal Bridge Program apportionment) be set aside for off-system bridge projects. The remainder of the Bridge Program funding is established at the discretion of the state. Bridge Program funds are primarily used for bridge rehabilitation or reconstruction activities on Primary, Secondary, Urban or off-system routes. Projects are identified based on bridge condition and performance metrics.

7.2.2.5. Surface Transportation Program for Other Routes - Off-system (STPX)

The Federal and state funds available under this program are used to finance transportation projects on state-maintained highways (or in other areas) that are not located on a defined highway system

7.2.2.6. Urban Pavement Preservation Program (UPP)*

The Urban Pavement Preservation Program (UPP) is a sub-allocation of the larger Surface Transportation Program that provides funding to urban areas with qualifying Pavement Management Systems (as determined jointly by MDT and FHWA). This sub-allocation is approved annually by the Transportation Commission and provides opportunities for pavement preservation work on urban routes (based on system needs identified by the local Pavement Management Systems).

The Montana Transportation Commission establishes priorities for the use of STP funds and projects are let through a competitive bidding process.

**State funding programs developed to distribute Federal funding within Montana*

7.2.3. Highway Safety Improvement Program (HSIP)

HSIP funds are apportioned to Montana for allocation to safety improvement projects approved by the Commission and are consistent with the strategic highway safety improvement plan. Projects described in the State strategic highway safety plan must correct or improve a hazardous road location or feature, or address a highway safety problem. The Commission approves and awards the projects which are let through a competitive bidding process. Generally, the Federal share for the HSIP projects is 90% with the non-Federal share typically funded through the HSSR account.

7.2.4. Congestion Mitigation and Air Quality Improvement Program (CMAQ)

Federal funds available under this program are used to finance transportation projects and programs to help improve air quality and meet the requirements of the Clean Air Act. Montana's air pollution problems are attributed to carbon monoxide (CO) and particulate matter (PM10 and PM2.5).

Allocations and Matching Requirements: CMAQ funds are Federally-apportioned to Montana and allocated to various eligible programs by formula and by the Commission. As a minimum apportionment state a Federally-required distribution of CMAQ funds goes to projects in Missoula since it was Montana's only designated and classified air quality non-attainment area. The remaining, non-formula funds, referred to as "flexible CMAQ" is primarily directed to areas of the state with emerging air quality issues through various state programs. The Transportation Commission approves and awards both formula and non-formula projects on MDT right-of-way. Infrastructure and capital equipment projects are let through a competitive bidding process. Of the total funding received, 86.58% is Federal and 13.42% is non-Federal match provided by the state for projects on state highways and local governments for local projects.

Eligibility and Planning Considerations: In general, eligible activities include transit improvements, traffic signal synchronization, bicycle pedestrian projects, intersection improvements, travel demand management strategies, traffic flow improvements, air quality equipment purchases, and public fleet conversions to cleaner fuels. At the project level, the use of CMAQ funds is not constrained to a particular system (i.e. Primary, Urban, and NHS). A requirement for the use of these funds is the estimation of the reduction in pollutants resulting from implementing the program/project. These estimates are reported yearly to FHWA.

CMAQ (formula)

Mandatory CMAQ funds that come to Montana based on a Federal formula and are directed to Missoula, Montana's only classified, moderate CO non-attainment area. Not applicable to Whitefish. Projects are prioritized through the Missoula Metropolitan planning process.

Montana Air & Congestion Initiative (MACI)–Guaranteed Program (flexible)*

This is state program funded with flexible CMAQ funds that the Commission allocates annually to Billings and Great Falls to address carbon monoxide issues in these designated, but "not classified", CO non-attainment areas. The air quality in these cities is roughly equivalent to Missoula, however, since these cities are "not classified" so they do not get direct funding through the Federal formula. Projects are prioritized through the respective Billings and Great Falls Metropolitan planning processes.

Montana Air & Congestion Initiative (MACI)–Discretionary Program (flexible)*

The MACI – Discretionary Program provides funding for projects in areas designated non-attainment or recognized as being "high-risk" for becoming non-attainment. Since 1998, MDT has used MACI-Discretionary funds to get ahead of the curve for CO and PM10 problems in non-attainment and high-risk communities across Montana. District Administrators and local governments nominate projects cooperatively. Projects are prioritized and selected based on air quality benefits and other factors. The most beneficial projects to address these pollutants have been sweepers and flushers, intersection improvements and signal synchronization projects.

7.2.5. Transportation Alternatives Program

The Transportation Alternatives Program (TA) requires MDT to obligate 50% of the funds within the state based on population, using a competitive process, while the other 50% may be obligated in any area of the state. The Federal share for these projects is 86.58, with the non-Federal share funded by the project sponsor through the HSSR.

Funds may be obligated for projects submitted by:

- Local governments
- Transit agencies
- Natural resource or public land agencies
- School district, schools, or local education authority
- Tribal governments
- Other local government entities with responsibility for recreational trails for eligible use of these funds.

Eligibility and Planning Considerations: Eligible categories include:

- On-road and off-road trail facilities for pedestrians and bicyclists, including ADA improvements;
- Historic Preservation and rehabilitation of transportation facilities;
- Archeological activities relating to impacts for a transportation project;
- Any environmental mitigation activity, including prevention and abatement to address highway related stormwater runoff and to reduce vehicle/animal collisions including habitat connectivity;
- Turnouts, overlooks, and viewing areas;
- Conversion/use of abandoned railroad corridors for trails for non-motorized users;

- Inventory, control, and removal of outdoor advertising;
- Vegetation management in transportation right of way for safety, erosion control, and controlling invasive species;
- Construction, maintenance, and restoration of trails and development and rehabilitation of trailside and trailhead facilities;
- Development and dissemination of publications and operation of trail safety and trail environmental protection programs;
- Educations funds for publications, monitoring, and patrol programs and for trail-related training;
- Planning, design, and construction of projects that will substantially improve the ability of students to walk and bicycle to school; and
- Non-infrastructure-related activities to encourage walking and bicycling to school, including public awareness campaigns, outreach to press and community leaders, traffic education and enforcement school vicinities, student sessions on bicycle and pedestrian safety, health, and environment, and funding for training.

Competitive Process: The State and any Metropolitan Planning Organizations required to obligate Transportation Alternative funds must develop a competitive process to allow eligible applicants an opportunity to submit projects for funding. MDT's process emphasizes safety, ADA, relationships to State and community planning efforts, existing community facilities, and project readiness.

7.2.6. Federal Lands Highway Program (FLAP)

The Federal Lands Access Program was created by MAP-21 to improve access to Federal lands. Western Federal Lands administers the funds, not MDT. However, MDT is an eligible applicant for the funds.

The program is directed towards Public Highways, Roads, Bridges, Trails, and Transit systems that are under State, county, town, township, tribal, municipal, or local government jurisdiction or maintenance and provide access to Federal lands. The Federal lands access program funds improvements to transportation facilities that provide access to, are adjacent to, or are located within Federal lands. The program supplements State and local resources for public roads, transit systems, and other transportation facilities, with an emphasis on high-use recreation sites and economic generators. Program funds are subject to the overall Federal-aid obligation limitation. Funds are allocated among the states using a statutory formula based on road mileage, number of bridges, land area, and visitation.

Eligibility and Planning Considerations: The following activities are eligible for consideration on Federal Lands Access Transportation Facilities:

1. Preventive maintenance, rehabilitation, restoration, construction and reconstruction
2. Adjacent vehicular parking areas
3. Acquisition of necessary scenic easements and scenic or historic sites
4. Provisions for pedestrian and bicycles
5. Environmental mitigation in or adjacent to Federal land to improve public safety and reduce vehicle-wildlife mortality while maintaining habitat connectivity
6. Construction and reconstruction of roadside rest areas, including sanitary and water facilities.
7. Operation and maintenance of transit facilities

Proposed projects must be located on a public highway, road, bridge, trail or transit system that is located on, is adjacent to, or provides access to Federal lands for which title or maintenance responsibility is vested in a State, county, town, township, tribal, municipal, or local government.

Allocation and Matching Requirements: Projects are funded in Montana to the ratio of 87.58% federal funds and 13.42% non-federal matching funds. Funding is authorized and allocated for each state under USC, Title 23, Chapter 2, MAP-21, Division A, Title I, Subtitle A, Section 1119 distribution formula.

7.2.7. Congressionally Directed Funds

Congressionally Directed funds may be received through either highway program authorization or annual appropriations processes. These funds are generally described as "demonstration" or "earmark" funds. Discretionary funds are typically awarded through a Federal application process or Congressional direction. If a local sponsored project receives these types of funds, MDT will administer the funds in accordance with the Montana Transportation Commission Policy #5 – *"Policy resolution regarding Congressionally directed funding: including Demonstration Projects, High Priority Projects, and Project Earmarks."*

7.2.8. Transit Capital & Operating Assistance Funding

The MDT Transit Section provides federal and state funding to eligible recipients through Federal and state programs. Federal funding is provided through the Section 5310 and Section 5311 transit programs and state funding is provided through the TransADE program. The new highway bill MAP-21 incorporated the JARC and New Freedoms Programs into the Section 5311 and 5310 programs, respectively. It also created a new bus and bus facilities discretionary formula program (Section 5339) for fixed route bus operators. All projects funded must be derived from a locally developed, coordinated public transit-human services transportation plan (a "coordinated plan").

The coordinated plan must be developed through a process that includes representatives of public, private, and nonprofit transportation and human service providers and participation from the public.

7.2.8.1. Bus and Bus Facilities (Section 5339)

This program provides capital funding to replace, rehabilitate and purchase buses and related equipment and to construct bus-related facilities. Federal funds pay 80 percent of capital costs. The remaining 20 percent must come from the local recipient. Funds are eligible to be transferred by the state to supplement urban and rural formula grant programs (5307 and 5311, respectively).

7.2.8.2. Enhanced Mobility of Seniors and Individuals with Disabilities (Section 5310)

Section 5310 authorizes capital grants to eligible organizations to assist in providing transportation for the elderly and/or persons with disabilities. Federal Transit Administration (FTA) funds 80 percent of all costs for equipment, with 20 percent match provided by the local recipient. Eligible recipients for this program are private, nonprofit organizations; public bodies approved by the State to coordinate services for elderly persons and persons with disabilities; or public bodies which certify to the Governor that no nonprofit organization is readily available in a service area to provide this transportation service. Ten percent of the state's Section 5310 apportionment can be used to administer the program, to plan, and to provide technical assistance.

7.2.8.3. Formula Grants for Rural Areas (Section 5311)

This program enhances the access of people in non-urbanized areas by providing public transportation. Federal funds pay 86.58 percent of capital costs and 54.11 percent of deficit operating costs, 80 percent of administrative costs, and 80 percent of maintenance costs. The remaining 13.42, 45.89, 20, and 20 percent respectively must come from the local recipient. Eligible recipients of these funds can be a state agency, a local public body, a nonprofit agency, or an operator of public transportation services. Ten percent of the state's Section 5311 apportionment is dedicated to carry out a program to develop and support intercity bus transportation.

7.3. STATE FUNDING SOURCES

7.3.1. State Fuel Tax

The State of Montana assesses a tax of $0.2775 per gallon on gasoline and diesel fuel used for transportation purposes. According to State law, each incorporated city and town within the State receives an allocation of the total tax funds based upon:

1. the ratio of the population within each city and town to the total population in all cities and towns in the State, and
2. the ratio of the street mileage within each city and town to the total street mileage in all incorporated cities and towns in the State. (The street mileage is exclusive of the Federal-Aid Interstate and Primary Systems.)

State law also establishes that each county be allocated a percentage of the total tax funds based upon:

1. the ratio of the rural population of each county to the total rural population in the state, excluding the population of all incorporated cities or towns within the county and State;
2. the ratio of the rural road mileage in each county to the total rural road mileage in the State, less the certified mileage of all cities or towns within the county and State; and
3. the ratio of the land area in each county to the total land area of the State.

For State Fiscal Year 2014, the City of Laurel will receive $130,562 and Yellowstone County will receive $292,330 in State fuel tax funds. The amount varies annually, but the current level provides a reasonable base for projection throughout the planning period.

All fuel tax funds allocated to the city and county governments must be used for the construction, reconstruction, maintenance, and repair of rural roads or city streets and alleys. The funds may also be used for the share that the city or county might otherwise expend for proportionate matching of Federal funds allocated for the construction of roads or streets that are part of the primary, secondary or urban system.

Priorities for the use of these funds are established by each recipient jurisdiction.

7.3.2. State Special Revenue/State Funded Construction

Allocations and Matching Requirements: The State Funded Construction Program, which is funded entirely with state funds from the Highway State Special Revenue Account, provides funding for projects that are not eligible for Federal funds. This program is totally State funded, requiring no match.

Eligibility and Planning Considerations: This program funds projects to preserve the condition and extend the service life of highways. Eligibility requirements are that the highways be maintained by the State. MDT staff nominates the projects based on pavement preservation needs. The District's establish priorities and the Transportation Commission approves the program.

7.3.3. TransADE

The TransADE grant program offers operating assistance to eligible organizations providing transportation to the elderly and persons with disabilities.

Allocations and Matching Requirements: This is a state funding program within Montana statute. State funds pay 54.11 percent of deficit operating costs, 80 percent of administrative costs, and 80 percent of maintenance costs.

The remaining 45.89, 20, and 20 percent respectively must come from the local recipient. Applicants are also eligible to use this funding as match for the Federal transit grant programs.

Eligibility and Planning Considerations: Eligible recipients of this funding are counties, incorporated cities and towns, transportation districts, or non-profit organizations. Applications are due to the MDT Transit Section by the first working day of March each year. To receive this funding the applicant is required by state law (MCA 7-14-112) to develop a strong, coordinated system in their community and/or service area.

7.3.4. Rail/Loan Funds

Administration and Matching Requirements: The Montana Rail Freight Loan Program (MRFL) is a revolving loan fund administered by the Montana Department of Transportation to encourage projects for construction, reconstruction, or rehabilitation of railroads and related facilities in the State and implements MCA 60-11-113 to MCA 60-11-115. Loans are targeted to rehabilitation and improvement of railroads and their attendant facilities, including sidings, yards, buildings, and intermodal facilities. Rehabilitation and improvement assistance projects require a 30 percent loan-to value match. Facility construction assistance projects require a 50 percent match.

Eligibility and Planning Consideration: Eligible applicants for loans under the program include railroads, cities, counties, companies, and regional rail authorities. Port authorities may also qualify, provided they have been included in the state transportation planning process. Projects must be integrally related to the railroad transportation system in the State and demonstrate that they will preserve and enhance cost-effective rail service to Montana communities and businesses.

7.4. LOCAL FUNDING SOURCES

Local governments generate revenue through a variety of funding mechanisms. Typically, several local programs related to transportation exist for budgeting purposes and to disperse revenues. These programs are tailored to fulfill specific transportation functions or provide particular services. The following text summarizes programs that are or could be used to finance transportation improvements by the city and county.

7.4.1. City of Laurel

General Fund

This fund provides revenue for most major city functions like the administration of local government, and the departments of public services, including police, fire, and parks. Revenues for the fund are generated through the general fund mill levy on real and personal property and motor vehicles; licenses and permits; state and federal intergovernmental revenues; intergovernmental fund transfers; and charges for services.

Several transportation-related services are supported by this fund including public services (engineering and streets) and the police department. The street department is responsible for maintaining the city streets and alleys including: pavement repair, street cleaning, striping and signing, lighting and traffic signal maintenance, and plowing and sanding during the winter. In addition to revenue from the General Fund, some revenue used to operate the street department is generated from gas tax funds and street maintenance district funds. The police department is obviously responsible for enforcing traffic laws on the street system.

Although most of the highway-designated monies are oriented toward maintenance activities, some new construction and street-widening projects may be financed through the General Fund. This revenue source has been used in conjunction with other resources to finance local street and highway projects.

Special Revenue Funds

These funds are used to budget and distribute revenues that are legally restricted for a specific purpose. Several such funds that benefit the transportation system are discussed briefly in the following paragraphs.

SID Revolving Fund

This fund provides financing to satisfy bond payments for special improvement districts in need of additional funds. The city can establish street SID's with bond repayment to be made by the adjoining landowners receiving the benefit of the improvement. The city has provided labor and equipment for past projects through the General Fund, with an SID paying for materials.

Gas Tax Apportionment

Revenues are generated through State gasoline taxes apportioned from the State of Montana. Transfers are made from this fund to the General Fund to reimburse expenditures for construction, reconstruction, repair and maintenance of streets. Half of the City's allocation is based upon population, and half is based on the miles of streets and alleys in the City.

Tax Increment Financing (TIF)

The funds generated from TIF districts could be used to finance projects including street and parking improvements; tree planting; installation of new bike racks; trash containers and benches; and other streetscape beautification projects.

7.4.2. Yellowstone County

Road Fund

The County Road Fund provides for the construction, maintenance, and repair of all county roads outside the corporate limits of cities and towns in Yellowstone County. Revenue for this fund comes from intergovernmental transfers (i.e., state gas tax apportionment and motor vehicle taxes) and a mill levy assessed against county residents living outside cities and towns.

County Road Fund monies are used primarily for maintenance with little allocated for new road construction. Only a small percentage of the total miles on the county road system is located in the study area. Projects eligible for financing through this fund will be competing for available revenues on a countywide basis.

Bridge Fund

The Bridge Fund provides financing for engineering services, capital outlays, and necessary maintenance for bridges on all off-system and secondary routes within the county. These monies are generated through intergovernmental fund transfers (i.e., vehicle licenses and fees), and a countywide mill levy. There is a taxable limit of four mills for this fund.

Special Revenue Funds

Special revenue funds may be used by the county to budget and distribute revenues legally restricted to a specific purpose. Several such funds that benefit the transportation system are discussed briefly below.

Capital Improvements Fund: This fund is used to finance major capital improvements to county infrastructure. Revenues are generated by loans from other county funds and must be repaid within ten years. Major road construction projects are eligible for this type of financing.

Rural Special Improvement District Revolving Fund: This fund is used to administer and distribute monies for specified Rural Special Improvement District projects. Revenue for this fund is generated primarily through a mill levy and motor vehicle taxes and fees. A mill levy is assessed only when delinquent bond payments dictate such an action.

Special Bond Funds: The County may establish a fund of this type on an as-needed basis for a particularly expensive project. The voters must approve authorization for a special bond fund. The county is not currently using this mechanism.

7.4.3. Private Funding Sources

Private financing of roadway improvements, in the form of right of way donations and cash contributions, has been successful for many years. In recent years, the private sector has recognized that better access and improved facilities can be profitable due to increases in land values and commercial development possibilities. Several forms of private financing for transportation improvements used in other parts of the United States are described in this section.

Cost Sharing

The private sector pays some of the operating and capital costs for constructing transportation facilities required by development actions.

Transportation Corporations

These private entities are non-profit, tax exempt organizations under the control of state or local government. They are created to stimulate private financing of highway improvements.

Road Districts

These are areas created by a petition of affected landowners, which allow for the issuance of bonds for financing local transportation projects.

Private Donations

The private donation of money, property, or services to mitigate identified development impacts is the most common type of private transportation funding. Private donations are very effective in areas where financial conditions do not permit a local government to implement a transportation improvement itself.

Private Ownership

This method of financing is an arrangement where a private enterprise constructs and maintains a transportation facility, and the government agrees to pay for public use of the facility. Payment for public use of the facility is often accomplished through leasing agreements (wherein the facility is rented from the owner), or through access fees whereby the owner is paid a specified sum depending upon the level of public use.

Privatization

Privatization is either the temporary or long term transfer of a public property or publicly owned rights belonging to a transportation agency to a private business. This transfer is made in return for a payment that can be applied toward construction or maintenance of transportation facilities.

General Obligation (G.O.) Bonds

The sale of general obligation bonds could be used to finance a specific set of major highway improvements. A G.O. bond sale, subject to voter approval, would provide the financing initially required for major improvements to the transportation system. The advantage of this funding method is that when the bond is retired, the obligation of the taxpaying public is also retired. State statutes limiting the level of bonded indebtedness for cities and counties restrict the use of G.O. bonds. The present property tax situation in Montana, and recent adverse citizen responses to proposed tax increases by local government, would suggest that the public may not be receptive to the use of this funding alternative.

Tax Increment Financing (TIF)

Increment financing has been used in many municipalities to generate revenue for public improvements projects. As improvements are made within the district, and as property values increase, the incremental increases in property tax revenue are earmarked for this fund. The fund is then used for improvements within the district. Expenditures of revenue generated by this method are subject to certain spending restrictions and must be spent within the district. Tax increment districts could be established to accomplish transportation improvements in other areas of the community where property values may be expected to increase. A TIF is currently being utilized in downtown Bozeman. Additional TIF districts could be established in other areas of the city and county to accomplish a variety of transportation-related improvements.

Multi-Jurisdictional Service District

This funding option was authorized in 1985 by the State Legislature. This procedure requires the establishment of a special district, somewhat like an SID or RSID, which has the flexibility to extend across city and county boundaries. Through this mechanism, an urban transportation district could be established to fund a specific highway improvement that crosses municipal boundaries (e.g., corporate limits, urban limits, or county line). This type of fund is structured similar to an SID with bonds backed by local government issued to cover the cost of a proposed improvement. Revenue to pay for the bonds would be raised through assessments against property owners in the service district.

Local Improvement District

This funding option is only applicable to counties wishing to establish a local improvement district for road improvements. While similar to an RSID, this funding option has the benefit of allowing counties to initiate a local improvement district through a more streamlined process than that associated with the development of an RSID.

7.5. TRANSPORTATION FUNDING SUMMARY

Current financial information was obtained from the MDT Statewide and Urban Planning for the Laurel area. This information is summarized in **Table 7.1**.

Table 7.1: Transportation Funding Summary

Funding Source	Current Annual Allocation – 2014	Historic Five Year Average
NHPP - NH, IM	-	$13,850,943*
HSIP - Safety	-	$1,403,748
STP-Urban	$217,400	-
STPS - Secondary	-	$53,886
UPP - Preservation	-	$238,341
State Fuel Tax - City	$130,562	-
State Fuel Tax - County	$292,335	-
Transportation Alternatives**	-	-
Transit 5311	$50,000	-
Operations and Maintenance	$266,114	-
TOTAL	**$956,411**	**$15,546,918**

Notes: *Although MAP-21 only provides for Federal funding through FFY2015, 2025 and 2035 projections should be based on continuance of current levels of funding unless otherwise noted. It is important to note that the projected funding estimates are based on the best information available at this time and that there is no guarantee that these funding sources will be available beyond MAP-21. Estimated Federal fund allocations do not include amounts of any required local matching funds. Federal revenues, local revenues and local and state matching funds are held constant and do not inflate over time due to uncertainty with federal transportation program reauthorization. Accordingly, future year allocation for year 2025 and 2035 should be based on current carryover (if available) plus annual allocations, equal to current annual allocations. Reevaluation of revenue estimation may be necessary as part of any updates to the Laurel LRTP if a trend of shorter authorizations continues.*

**Estimates from MDT are based on a five year average of past obligations, with input from district. Two projects within the Laurel planning area are bringing the five year average of NHPP obligations higher than expected, these projects are the West Laurel Interchange and Railroad Overpass. It is not anticipated that projects of this size and cost will occur in the near future.*

***Transportation Alternative Grants are awarded through a competitive application process. In 2013, the City of Laurel did not apply for a grant to fund any projects in the Laurel study area; however, this is still a viable funding source if the City wishes to pursue for future projects.*

HELENA, MT – CORPORATE OFFICE
825 Custer Avenue
Helena, MT 59604
(P) 406.447.5000

KALISPELL, MT
102 Cooperative Way, Suite 300
Kalispell, MT 59903
(P) 406.752.5025

FORT COLLINS, CO
400 Remington Street, Suite B
Fort Collins, CO 80524
(P) 970.484.3205

www.rpa-hln.com