2.1 INTRODUCTION

In an effort to clearly understand the existing traffic conditions, it was necessary to gather current information about different aspects of the transportation system. Existing traffic volume data from 2005 was used to determine weighted annual average daily traffic (AADT) volumes on major road segments within the community. Additional traffic data was collected during the summer/fall of 2007. The data was used to determine current operational characteristics, and to identify any traffic problems that may exist or are likely to occur within the foreseeable future. A variety of information was gathered to help evaluate the system including:

- Existing functional classifications & study roadways;
- Existing machine traffic volume counts (2005);
- Existing roadway corridor size;
- Intersection turning movement counts;
- Current traffic signal operation information;
- Intersection data required to conduct level of service analyses;
- Traffic crash records.

2.2 MOTORIZED

2.2.1 Existing Functional Classifications & Study Roadways

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, etc. It is standard practice to examine roadways that are functionally classified as a collector, minor arterial, or principal arterial in a regional transportation plan project. 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 roadway system (i.e. collectors or above) is functioning to an acceptable level, then the local roadways are not used beyond their intended function. When problems begin to occur on the major roadway system, then 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 health of the major roadway network. The roadways being studied under this Transportation Plan update, along with the appropriate functional classifications, are shown on **Figure 2-1** and **Figure 2-2**. It should be noted that the functional classifications shown on these figures are recommended as part of the Transportation Plan and do not reflect the "federally approved" functional classification criteria which is based on current conditions rather than anticipated future conditions.

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:

www.mdt.mt.gov/other/urban_maps/fc_internet/BOZEMANFUNC.pdf (Urban Area)

www.mdt.mt.gov/travinfo/docs/funct-classification.pdf (Statewide Area)

Roadway functional classifications within the city of Bozeman include principal arterials; minor arterials; collector routes; and local streets. The rural areas of Gallatin County are also served by a similar hierarchy of streets. However, due to their rural nature the volumes on these streets are generally smaller than in 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.

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 urban area. This group of roads carries a high proportion of the total traffic within the urban area. Most of the vehicles entering and leaving the urban area, as well as most of the through traffic bypassing the central business district, 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 (e.g., the central business district), to five miles or more on the urban fringes.

The major purpose of the principal arterial is to provide for the expedient movement of traffic. Service to abutting land is a secondary concern. It is desirable to restrict on-street parking along principal arterial corridors. The speed limit on a principal arterial could range from 25 to 70 mph depending on the area setting.

Minor Arterial Street System – The minor arterial street system interconnects with and augments the urban 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.

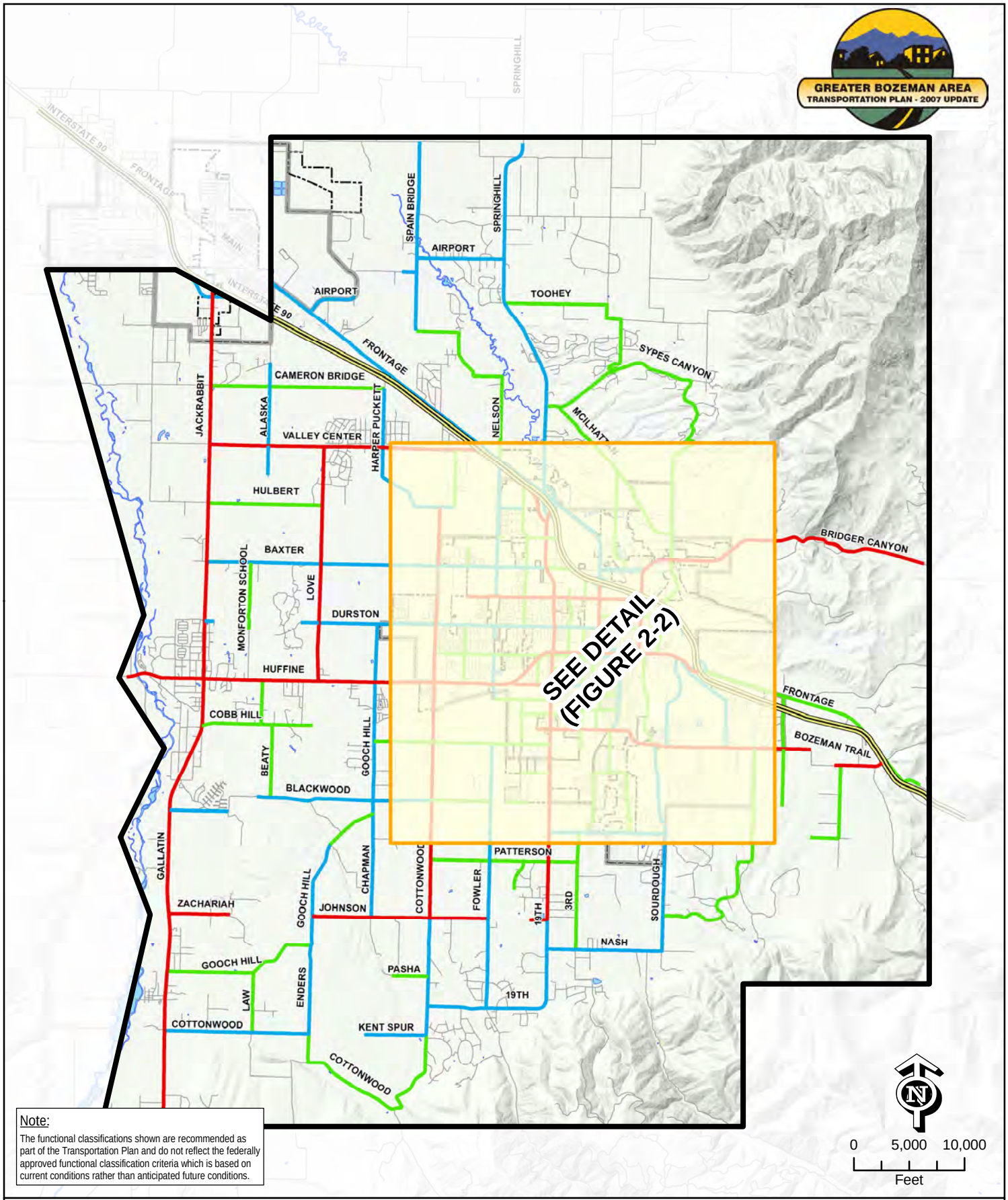
The spacing of minor arterial streets may vary from several blocks to a half-mile in the highly developed areas of town, to several miles in the suburban fringes. They are not normally spaced more than one mile apart in fully developed areas.

On-street parking may be allowed on minor arterials if space is available. In many areas on-street parking along minor arterials is prohibited during peak travel periods. Posted speed limits on minor arterials would typically range between 25 and 55 mph, depending on the setting.

Collector Street System – The urban collector street network serves a joint purpose. It provides equal priority to the movement of traffic, and to the access of 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. On-street parking is usually allowed on most collector streets if space is available. Posted speed limits on collectors typically range between 25 and 45 mph.

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. On-street parking is usually allowed on the local street system. The speed limit on local streets is usually 25 mph.

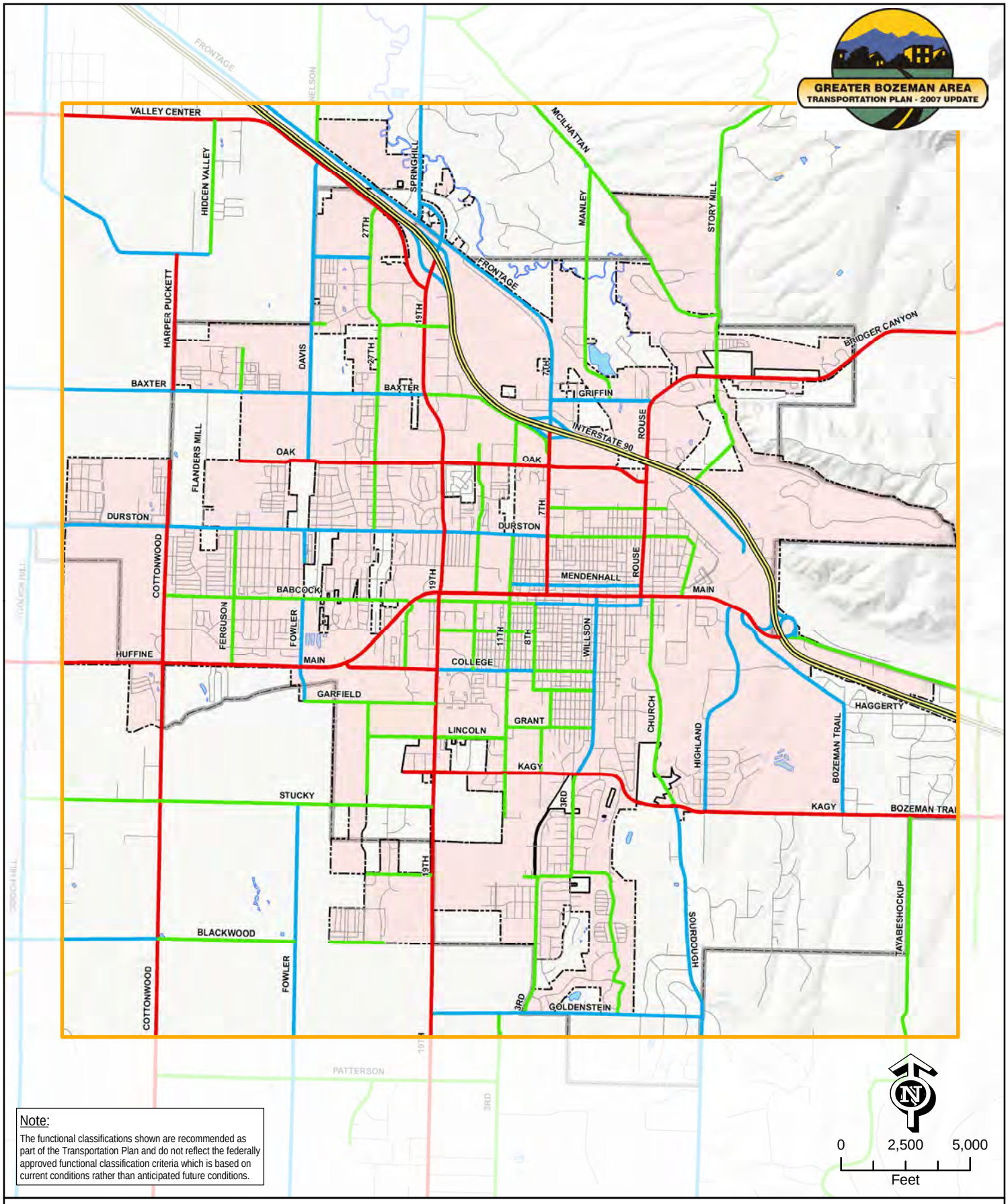


Legend

- Interstate
- Principal Arterial
- Minor Arterial
- Collector
- Local
- Study Area Boundary
- Detail Area
- City Boundary
- Urban Boundary

Greater Bozeman Area Transportation Plan (2007 Update)

Existing Functional Classification System
Figure 2-1



Note:
The functional classifications shown are recommended as part of the Transportation Plan and do not reflect the federally approved functional classification criteria which is based on current conditions rather than anticipated future conditions.

Legend

- Interstate
- Principal Arterial
- Minor Arterial
- Collector
- Local
- Detail Area
- City Boundary
- Urban Boundary

RPA

Greater Bozeman Area Transportation Plan (2007 Update)

Existing Functional Classification System
Figure 2-2

2.2.2 Existing Traffic Volumes and Corridor Facility Size

When evaluating a street system it is good practice to compare the traffic volumes to the approximate capacity of each road. Traffic volumes collected by the Montana Department of Transportation (MDT) were used to determine current traffic conditions, and to provide reliable data on historic traffic volumes.

Existing traffic volume data from 2005 was used to determine annual average daily traffic (AADT) volumes on major road segments within the community. This information is shown on **Figure 2-3** and **Figure 2-4**. These figures show that the most highly traveled corridors are Main Street, 19th Avenue, Huffine Lane and Jackrabbit Lane. Traffic volumes on these corridors range between 10,000 vehicles per day (vpd) and 25,000 vpd.

After identifying the current traffic volumes, the existing road network was examined to determine the current size of the major routes. This information is presented on the "Corridor Size" graphics on **Figure 2-5** and **Figure 2-6**. The information shows the following:

Existing five-lane corridors – Five-lane road corridors are generally defined as two travel lanes in each direction with a continuous center two-way turn lane or a raised median with left-turn bays at the major intersections. The five lane corridors found in the Greater Bozeman Area include:

- Huffine Lane (from Jackrabbit Lane to Main Street)
- Main Street (from Huffine Lane to 7th Avenue)
- Main Street (from Cypress Avenue to I-90)
- 19th Avenue (from Main Street to I-90)
- 7th Avenue (from Main Street to Griffin Drive)
- Valley Center Road (from 19th Street to 27th Avenue)
- Oak Street (from 7th Avenue to Davis Lane)
- Jackrabbit Lane (from Frank Road to W Madison Avenue)

Existing four-lane corridors – Four-lane road corridors have two travel lanes in each direction, with or without left-turn bays at major intersections. The four lane corridors found in the Greater Bozeman Area include:

- Main Street (from 7th Avenue to Cypress Avenue)

Existing three-lane corridors – Three-lane roads are one travel lane in each direction with a continuous center two-way turn lane, or any combination of three-lanes (i.e. two travel lanes in one direction with one lane in the opposite direction). The three lane corridors found in the Greater Bozeman Area include:

- 7th Avenue (from Flora Lane to Griffin Drive)
- Oak Street (from 7th Street to Wal-Mart entrance)
- Baxter Lane (East of 19th Avenue)
- Durston Road (from 7th Avenue to Fowler Road)

- Durston Road (from Ferguson Road to Flanders Mill Road)
- Babcock Street (from Main Street to Ferguson Road)
- 19th Avenue (from Main Street to Kagy Boulevard)
- Kagy Boulevard (from S Willson Avenue to Highland Boulevard)

Roadways not listed above are all two-lane corridors for the major street network with either two-way or one-way flow characteristics.

2.2.3 Existing Traffic Signal System

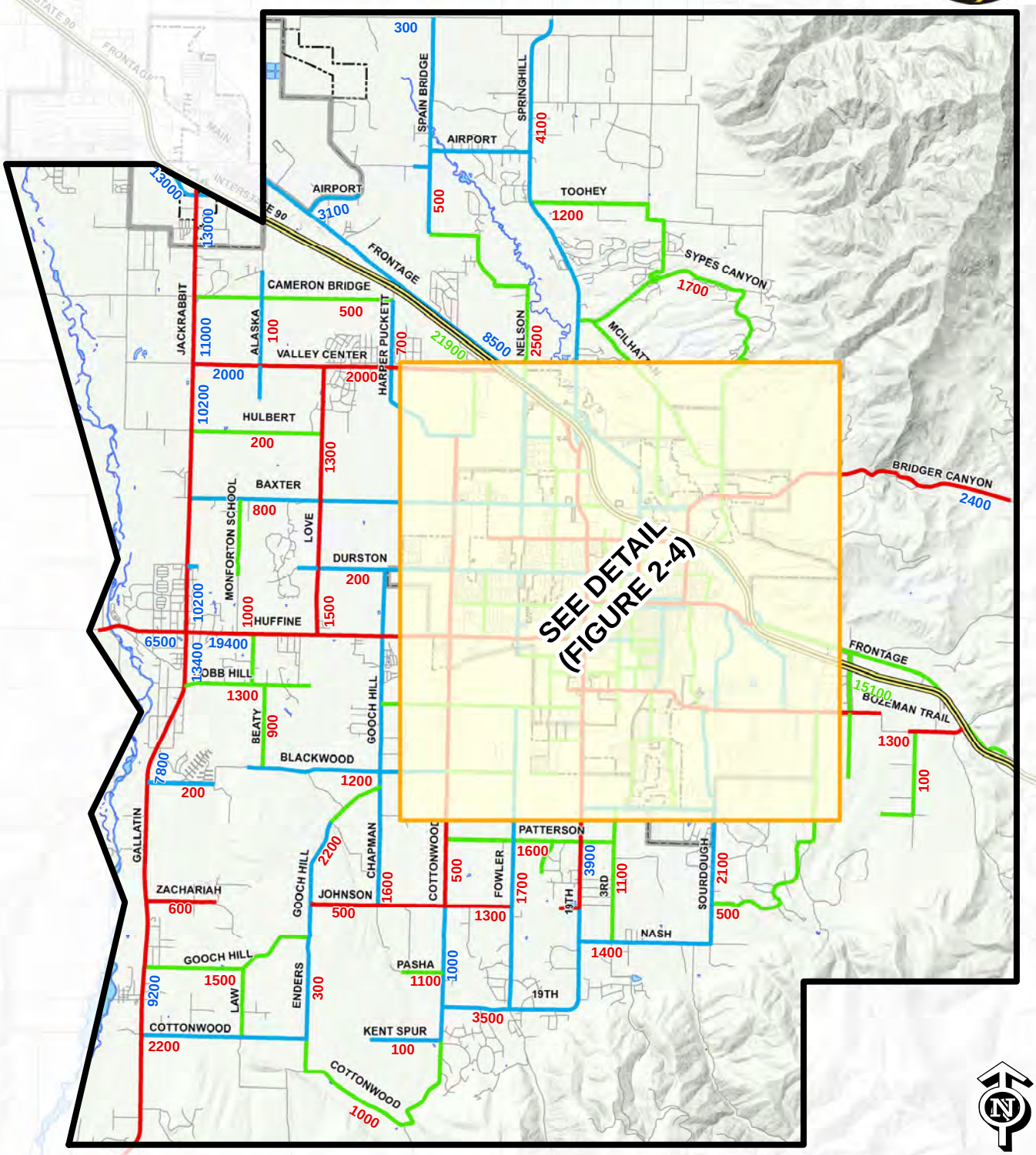
When analyzing the operation of an entire road network it is best to examine the existing signalized intersections. Forty-one (41) existing signalized intersections in the Greater Bozeman Area were evaluated as part of this *Transportation Plan 2007 Update*. Most of the signals are located along Main Street, 19th Avenue, 7th Avenue, or located in the downtown central business district (CBD). **Figure 2-7** and **Figure 2-8** shows all of the current signalized intersections and the coordinated signal system. It should be noted that the Montana Department of Transportation (MDT) is currently revising the signal timings for all of the signals located within the City of Bozeman. This effort is expected to be completed in the winter of 2007 and may change the current coordinated signal operations.

*Note:

Traffic volumes determined through the traffic model were used in locations where current ADT counts do not exist.

The functional classifications shown are recommended as part of the Transportation Plan and do not reflect the federally approved functional classification criteria which is based on current conditions rather than anticipated future conditions.

GREATER BOZEMAN AREA
TRANSPORTATION PLAN - 2007 UPDATE



0 5,000 10,000
Feet

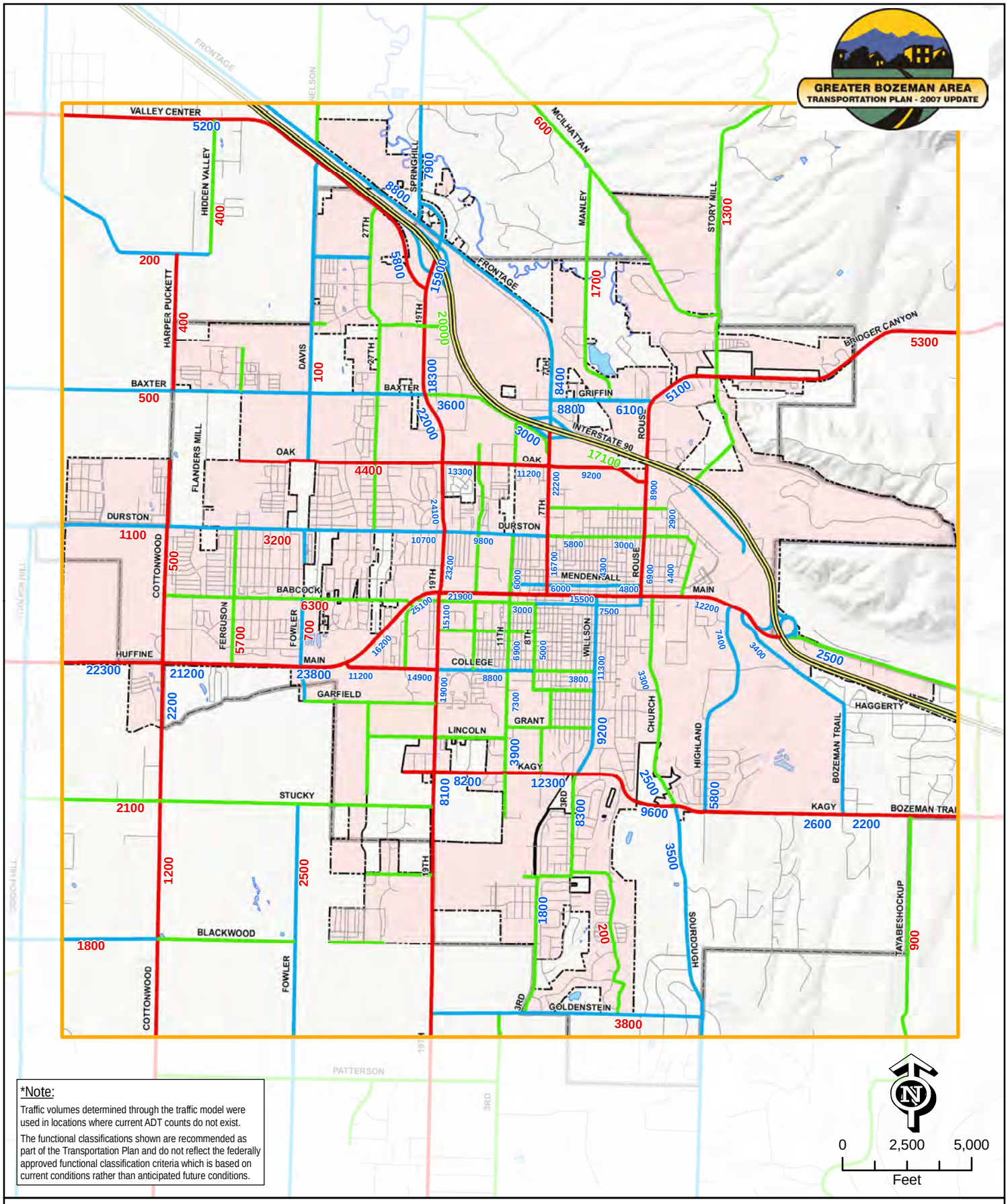
Legend

- Interstate
- Principal Arterial
- Minor Arterial
- Collector
- Local
- 1200 2005 Average Daily Traffic (ADT)
- 1200 2004 Average Daily Traffic (ADT)
- 1200 2005 Traffic Model Volume*
- Study Area Boundary
- Detail Area
- City Boundary
- Urban Boundary

RPA

Greater Bozeman Area Transportation Plan (2007 Update)

Existing (2005) ADT Traffic Volumes
Figure 2-3



*Note:

Traffic volumes determined through the traffic model were used in locations where current ADT counts do not exist.

The functional classifications shown are recommended as part of the Transportation Plan and do not reflect the federally approved functional classification criteria which is based on current conditions rather than anticipated future conditions.

0 2,500 5,000
Feet

Legend

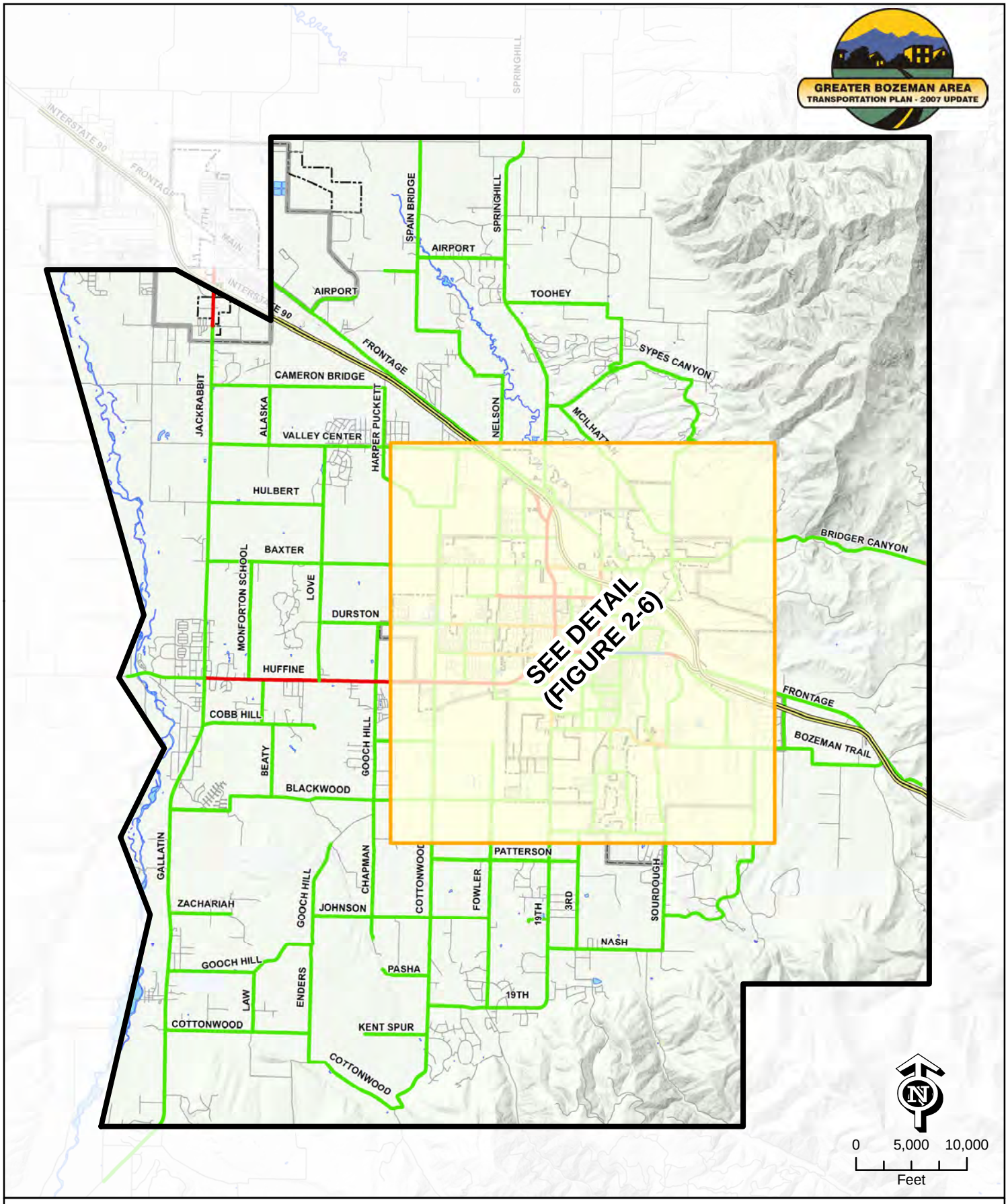
- Interstate
- Principal Arterial
- Minor Arterial
- Collector
- Local
- Detail Area
- City Boundary
- Urban Boundary
- 1200 2005 Average Daily Traffic (ADT)
- 1200 2004 Average Daily Traffic (ADT)
- 1200 2005 Traffic Model Volume*

RPA

Greater Bozeman Area Transportation Plan (2007 Update)

Existing (2005) ADT Traffic Volumes

Figure 2-4



Legend

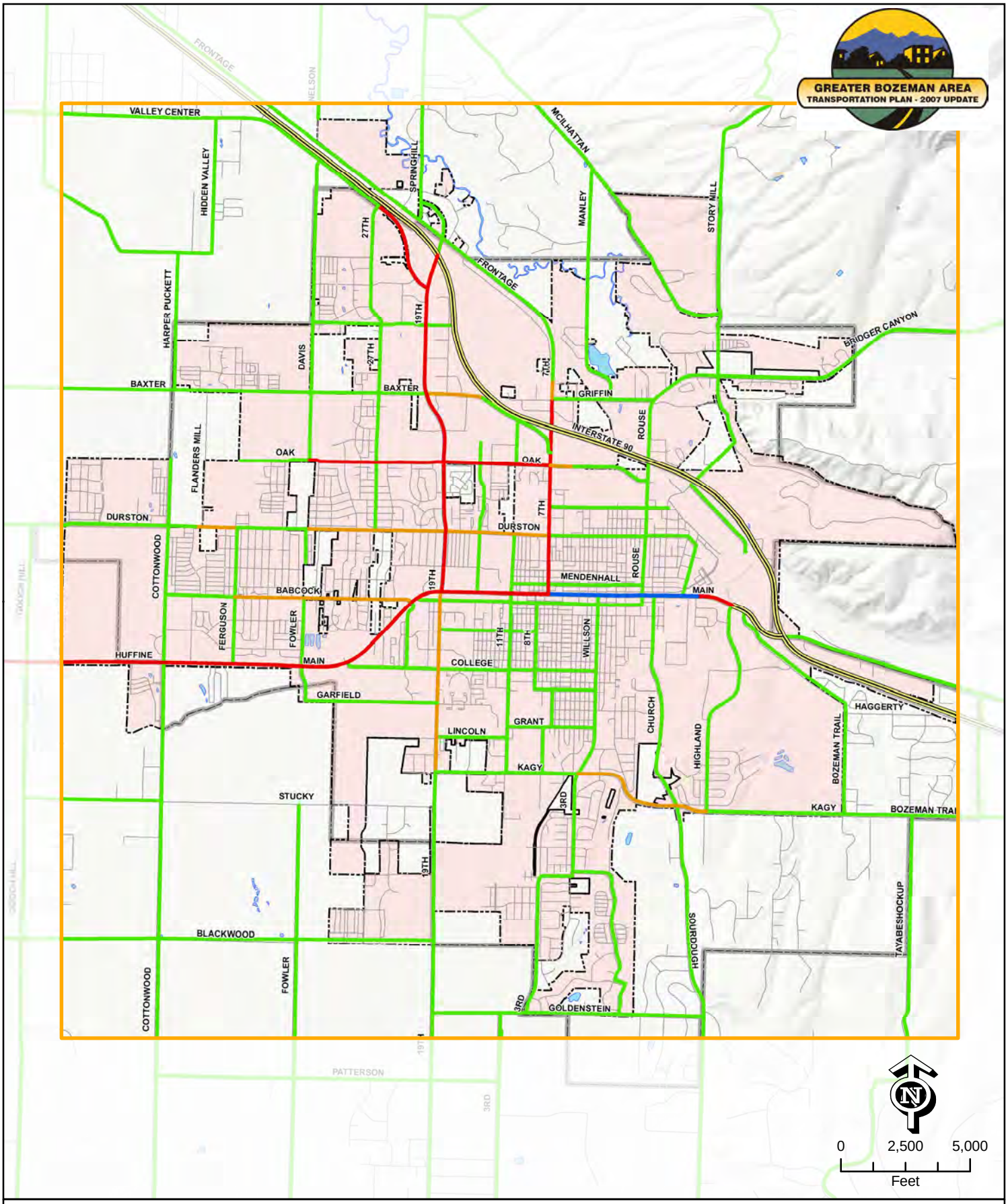
Corridor Size

- 2-Lane
- 3-Lane
- 4-Lane
- 5-Lane
- Interstate

- Study Area Boundary
- Detail Area
- City Boundary
- Urban Boundary

Greater Bozeman Area Transportation Plan (2007 Update)

Existing Corridor Size
Figure 2-5



Legend

Corridor Size

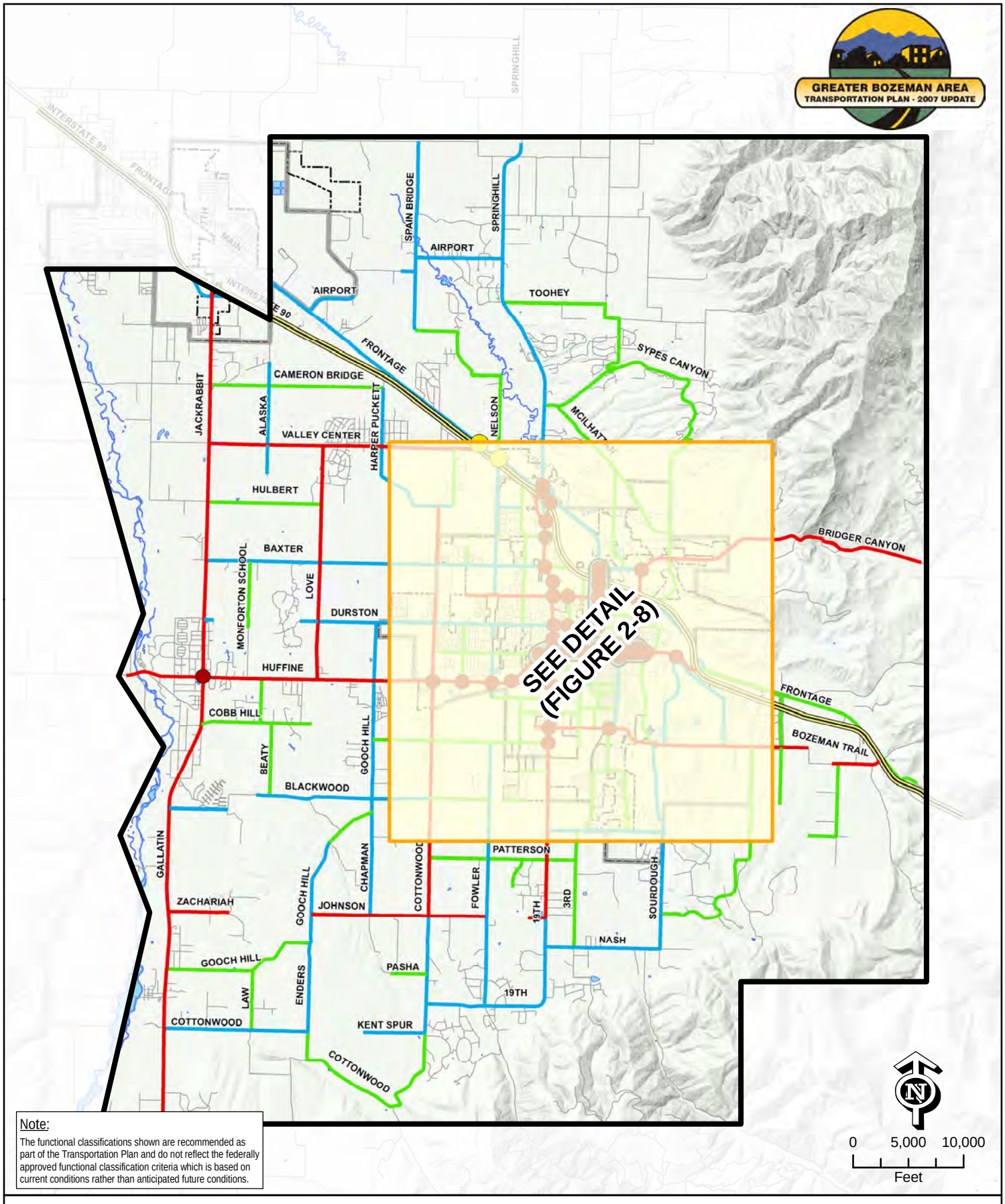
- 2-Lane
- 3-Lane
- 4-Lane
- 5-Lane
- Interstate

- Detail Area
- City Boundary
- Urban Boundary

RPA

Greater Bozeman Area Transportation Plan (2007 Update)

Existing Corridor Size
Figure 2-6



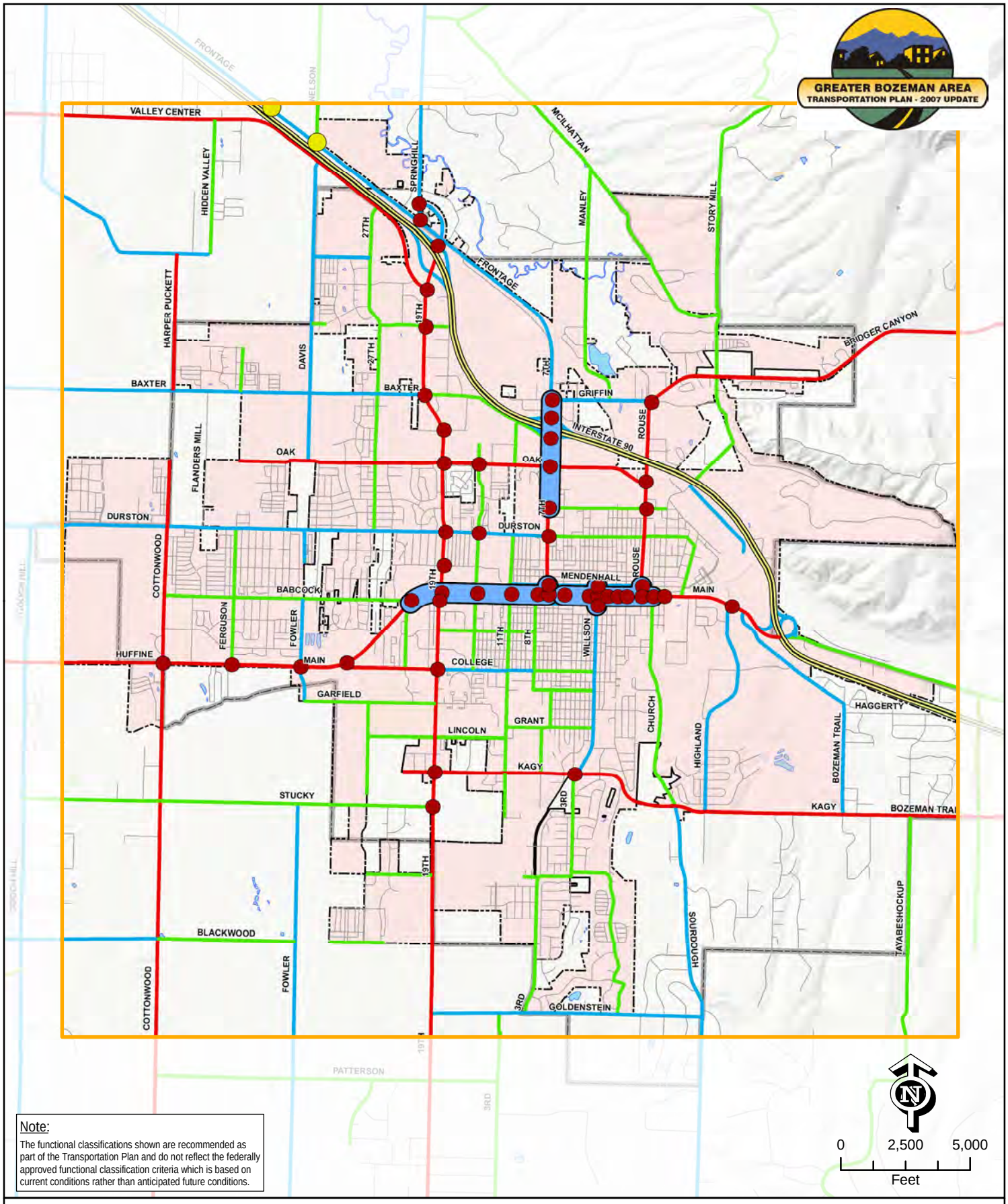
Note:
The functional classifications shown are recommended as part of the Transportation Plan and do not reflect the federally approved functional classification criteria which is based on current conditions rather than anticipated future conditions.

Legend

- Interstate
- Principal Arterial
- Minor Arterial
- Collector
- Local
- Coordinated Signal
- Study Area Boundary
- Detail Area
- City Boundary
- Urban Boundary
- Flashing Light
- Traffic Signal

Greater Bozeman Area Transportation Plan (2007 Update)

Existing Traffic Signal System Map
Figure 2-7



Legend

- Interstate
- Principal Arterial
- Minor Arterial
- Collector
- Local
- Coordinated Signal
- Detail Area
- City Boundary
- Urban Boundary
- Flashing Light
- Traffic Signal

RPA

Greater Bozeman Area Transportation Plan (2007 Update)

Existing Traffic Signal System Map
Figure 2-8

2.2.4 Existing Levels 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 very 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-only 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 by the transportation profession to quantify driver perception for such elements as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles. It provides a scale that is intended to match the perception by motorists of the operation of the intersection. LOS provides a means for identifying intersections that are experiencing operational difficulties, as well as providing a scale to compare intersections with each other. The LOS scale represents the full range of operating conditions. This 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. The LOS analysis was conducted according to the procedures outlined in the Transportation Research Board's *Highway Capacity Manual – Special Report 209* using the Highway Capacity Software, version 4.1f.

In order to calculate the LOS, 74 intersections on the major street network were counted during the summer/fall of 2007. These intersections included 41 signalized intersections and 33 high-volume unsignalized intersections in the Greater Bozeman area (noting that eight signalized intersections could not be counted due to construction activities and that two intersections that were counted while unsignalized were recently signalized). Each intersection was counted between 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m., to ensure that the intersection's peak volumes were represented. Based upon this data, the operational characteristics of each intersection were obtained.

2.2.4.1 Signalized Intersections

For signalized intersections, recent research has determined that average control delay per vehicle is the best available measure of level of service. Control delay takes into account uniform delay, incremental delay, and initial queue delay. The amount of control delay that a vehicle experiences is approximately equal to the time elapsed from when a vehicle joins a queue at the intersection (or arrives at the stop line when there is no queue) until the vehicle departs from the stopped position at the head of the queue. The control delay is primarily a function of volume, capacity, cycle length, green ratio, and the pattern of vehicle arrivals.

The following table identifies the relationship between LOS and average control delay per vehicle. The procedures used to evaluate signalized intersections use 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. Generally, an intersection is determined to be functioning adequately if operating at LOS C or better. However, for the City of Bozeman, an intersection operating at a LOS D or better is considered to be functioning adequately. **Table 2-1** shows the LOS by control delay for signalized intersections.

Table 2-1
Level of Service Criteria (Signalized Intersections)

Level of Service	Control Delay per Vehicle (sec)
A	< 10
B	10 to 20
C	20 to 35
D	35 to 50
E	50 to 80
F	> 80

Source: The Transportation Research Board's *Highway Capacity Manual*

Using these techniques and the data collected in the summer/fall of 2007, the LOS for the signalized intersections was calculated. **Tables 2-2** & **2-3** show the AM and PM peak hour LOS for each individual leg of the intersections, as well as the intersections as a whole. The intersection LOS is shown graphically in **Figure 2-9** and **Figure 2-10**.

It should be noted that the LOS shown in the following tables for the intersections along Rouse Avenue may not be identical to those shown in the recently published *Rouse Avenue Environmental Assessment*. Variations to the LOS at these intersections may be the result of variations in the peak hour factor, type of analysis software, the amount of truck traffic observed, construction activities in the area, or the time of year and day of the week that the intersection traffic counts were made.

Table 2-2
2007 AM Peak Hour LOS (Signalized Intersections)

INTERSECTION	EB	WB	NB	SB	INT	INTERSECTION	EB	WB	NB	SB	INT
Huffine Lane & Ferguson Road[1]	F	B	-	C	E	North 19th Avenue & Beall Street[2]	D	C	A	A	B
Huffine Lane & Cottonwood Road[2]	B	A	D	D	B	North 19th Avenue & Durston Road[1]	B	B	C	C	B
Huffine Lane & Jackrabbit Lane	C	B	C	C	C	North 19th Avenue & Oak Street[1]	E	C	B	B	C
Huffine Lane & Fowler Lane[2]	B	B	C	D	B	North 19th Avenue & Baxter Lane[2]	C	C	B	B	B
Main Street & West College Street[1]	C	C	D	B	C	North 19th Avenue & Valley Center Road[2]	B	B	A	B	B
Main Street & West Babcock Street[1]	C	C	C	C	C	Springhill Road & Frontage Road[2]	A	A	-	C	B
Main Street & South 19th Avenue[1]	C	C	D	E	D	North 7th Avenue & Griffin Drive[2]	B	C	A	A	A
Main Street & North 15th Avenue[1]	B	C	C	C	B	North 7th Avenue & I-90 Interchange Ramp (north)[1]	-	C	B	C	B
Main Street & 11th Avenue[1]	D	C	C	C	C	North 7th Avenue & I-90 Interchange Ramp (south)[1]	B	-	C	B	C
Main Street & South 8th Avenue[1]	B	A	D	-	B	North 7th Avenue & Oak Street[1]	D	D	C	C	C
Main Street & North 7th Avenue[1]	B	C	C	C	C	North 7th Avenue & Tamarack Street[1]	-	C	C	B	B
Main Street & 5th Avenue[1]	A	A	B	B	A	North 7th Avenue & Durston Road[1]	D	D	C	D	D
Main Street & Rouse Avenue	B	B	B	B	B	North Rouse Avenue & Tamarack Street[1]	B	B	B	B	B
Main Street & Wallace Avenue	B	B	B	B	B	North 19th Avenue & Deadman's Gulch[2]	D	D	A	A	B
Main Street & Highland Boulevard	C	C	D	C	C	North 19th Avenue & Tschache Lane[2]	D	D	A	A	A
Mendenhall Street & North 7th Avenue[1]	-	C	B	B	B	North 19th Avenue & Springhill Road[2]	-	C	A	A	A
Mendenhall Street & North Willson Avenue[1]	-	A	C	B	B	North 19th Avenue & I-90 Interchange (north)[2]	-	D	A	A	A
Babcock Street & South Willson Avenue[1]	A	-	B	B	B	North 19th Avenue & Babcock Street[2]	C	C	A	A	A
Kagy Boulevard & South Willson Avenue	C	E	D	C	D	North 19th Avenue & Stucky Road[2]	C	-	A	A	A
Kagy Boulevard & South 19th Avenue[2]	C	B	B	C	B	Durston Road & 15th Avenue[2]	B	A	C	B	B
West College Street & South 19th Avenue[1]	D	D	F	F	E						

(Abbreviations used in the table are as follows: EB = eastbound; WB = westbound; NB = northbound; SB = southbound; INT = intersection as a whole)

[1] Signal timing and phasing from the Greater Bozeman Area Transportation Plan – 2001 Update.

[2] Signal timing and phasing optimized under pretimed conditions.

Table 2-3
2007 PM Peak Hour LOS (Signalized Intersections)

INTERSECTION	EB	WB	NB	SB	INT	INTERSECTION	EB	WB	NB	SB	INT
Huffine Lane & Ferguson Road[1]	F	B	-	C	E	North 19th Avenue & Beall Street[2]	D	C	A	A	B
Huffine Lane & Cottonwood Road[2]	B	B	C	D	B	North 19th Avenue & Durston Road[1]	B	B	D	C	C
Huffine Lane & Jackrabbit Lane	C	D	D	C	C	North 19th Avenue & Oak Street[1]	E	C	C	C	C
Huffine Lane & Fowler Lane[2]	B	B	D	C	B	North 19th Avenue & Baxter Lane[2]	C	C	C	B	C
Main Street & West College Street[1]	C	C	C	B	C	North 19th Avenue & Valley Center Road[2]	C	B	A	B	B
Main Street & West Babcock Street[1]	D	F	C	C	D	Springhill Road & Frontage Road[2]	A	A	-	C	B
Main Street & South 19th Avenue[1]	C	D	D	E	D	North 7th Avenue & Griffin Drive[2]	A	B	B	B	B
Main Street & North 15th Avenue[1]	B	C	C	D	C	North 7th Avenue & I-90 Interchange Ramp (north)[1]	-	C	B	B	B
Main Street & 11th Avenue[1]	C	C	C	C	C	North 7th Avenue & I-90 Interchange Ramp (south)[1]	C	-	C	B	C
Main Street & South 8th Avenue[1]	B	A	D	-	B	North 7th Avenue & Oak Street[1]	E	D	C	C	D
Main Street & North 7th Avenue[1]	F	D	C	C	E	North 7th Avenue & Tamarack Street[1]	-	C	C	B	C
Main Street & 5th Avenue[1]	A	A	B	B	A	North 7th Avenue & Durston Road[1]	D	D	D	D	D
Main Street & Rouse Avenue	B	B	B	B	B	North Rouse Avenue & Tamarack Street[1]	B	B	B	C	C
Main Street & Wallace Avenue	B	C	B	B	B	North 19th Avenue & Deadman's Gulch[2]	D	C	C	B	C
Main Street & Highland Boulevard	D	C	F	C	F	North 19th Avenue & Tschache Lane[2]	C	D	B	A	B
Mendenhall Street & North 7th Avenue[1]	-	D	B	B	C	North 19th Avenue & Springhill Road[2]	-	C	B	B	B
Mendenhall Street & North Willson Avenue[1]	-	A	C	B	B	North 19th Avenue & I-90 Interchange (north)[2]	-	D	C	B	C
Babcock Street & South Willson Avenue[1]	A	-	B	C	B	North 19th Avenue & Babcock Street[2]	C	C	A	A	B
Kagy Boulevard & South Willson Avenue	D	D	C	D	D	North 19th Avenue & Stucky Road[2]	B	-	A	A	B
Kagy Boulevard & South 19th Avenue[2]	B	C	B	B	B	Durston Road & 15th Avenue[2]	A	B	C	C	B
West College Street & South 19th Avenue[1]	D	F	F	E	F						

(Abbreviations used in the table are as follows: EB = eastbound; WB = westbound; NB = northbound; SB = southbound; INT = intersection as a whole)

[1] Signal timing and phasing from the Greater Bozeman Area Transportation Plan – 2001 Update.

[2] Signal timing and phasing optimized under pretimed conditions.

2.2.4.2 Unsignalized Intersections

Level of service for unsignalized 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 a 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 average delay for vehicles on the minor street approach.

Levels of service for all-way stop controlled intersections are also based on delay experienced by the vehicles at the intersection. Since there is no major street, the highest delay could be experienced by any of the approaching streets. Therefore, the level of service is based on the approach with the highest delay as shown in **Table 2-4**. This table shows the LOS criteria for both the all-way and two-way stop controlled intersections.

Table 2-4
Level of Service Criteria (Stop Controlled Intersections)

LEVEL OF SERVICE	DELAY (SEC/VEH)
A	< 10
B	10 to 15
C	15 to 25
D	25 to 35
E	35 to 50
F	> 50

Source: The Transportation Research Board's *Highway Capacity Manual*

Using the above guidelines, the data collected in the summer/fall of 2007, and calculation techniques for two-way stop controls and all-way stop controls, the LOS was calculated for 33 intersections. The results of these calculations are shown in **Table 2-5**. The intersection LOS is shown graphically in **Figure 2-9** and **Figure 2-10**.

Table 2-5
2007 LOS (Stop-Controlled Intersections)

INTERSECTION	AM	PM	INTERSECTION	AM	PM
Frontage Road & Nelson Road	C	C	Jackrabbit Lane & Valley Center Road	D	E
Frontage Road & Valley Center Underpass	C	E	Jackrabbit Lane & Hulbert Road	C	D
Highland Boulevard & Ellis Street	C	E	Jackrabbit Lane & Baxter Lane	C	D
Highland Boulevard & Kagy Boulevard	E	C	Jackrabbit Lane & Durston Road	C	D
East Main Street & Haggerty Lane	C	E	Jackrabbit Lane & Ramshorn Drive	D	C
Haggerty Lane & Bozeman Trail Road	A	A	Jackrabbit Lane & Forkhorn Trail	E	E
Kagy Boulevard & Bozeman Trail Road	B	B	Jackrabbit Lane & Shedhorn Trail	C	E
Kagy Boulevard & Sourdough Road	F	F	Jackrabbit Lane & Spanish Peak Drive	C	C
Main Street & I-90 Off-Ramp	C	B	Huffine Lane & Monforton School Road	B	C
Main Street & I-90 On-Ramp	B	B	Huffine Lane & Love Lane	C	C
Story Mill Road & Bridger Canyon Drive	B	C	Huffine Lane & Gooch Hill Road	B	C
North Rouse Avenue & Peach Street	C	C	Valley Center Road & Harper Puckett Road	B	B
South 11th Avenue & College Street	D	F	8th Avenue & College Street	C	D
College Street & Willson Avenue	E	F	U.S. 191 & Gooch Hill Road	B	C
South 11th Avenue & Kagy Boulevard	D	F	U.S. 191 & Mill Street	C	C
South 19th Avenue & Goldenstein Road	B	B	U.S. 191 & Cottonwood Road	B	C
Jackrabbit Lane & Cameron Bridge Road	D	F			

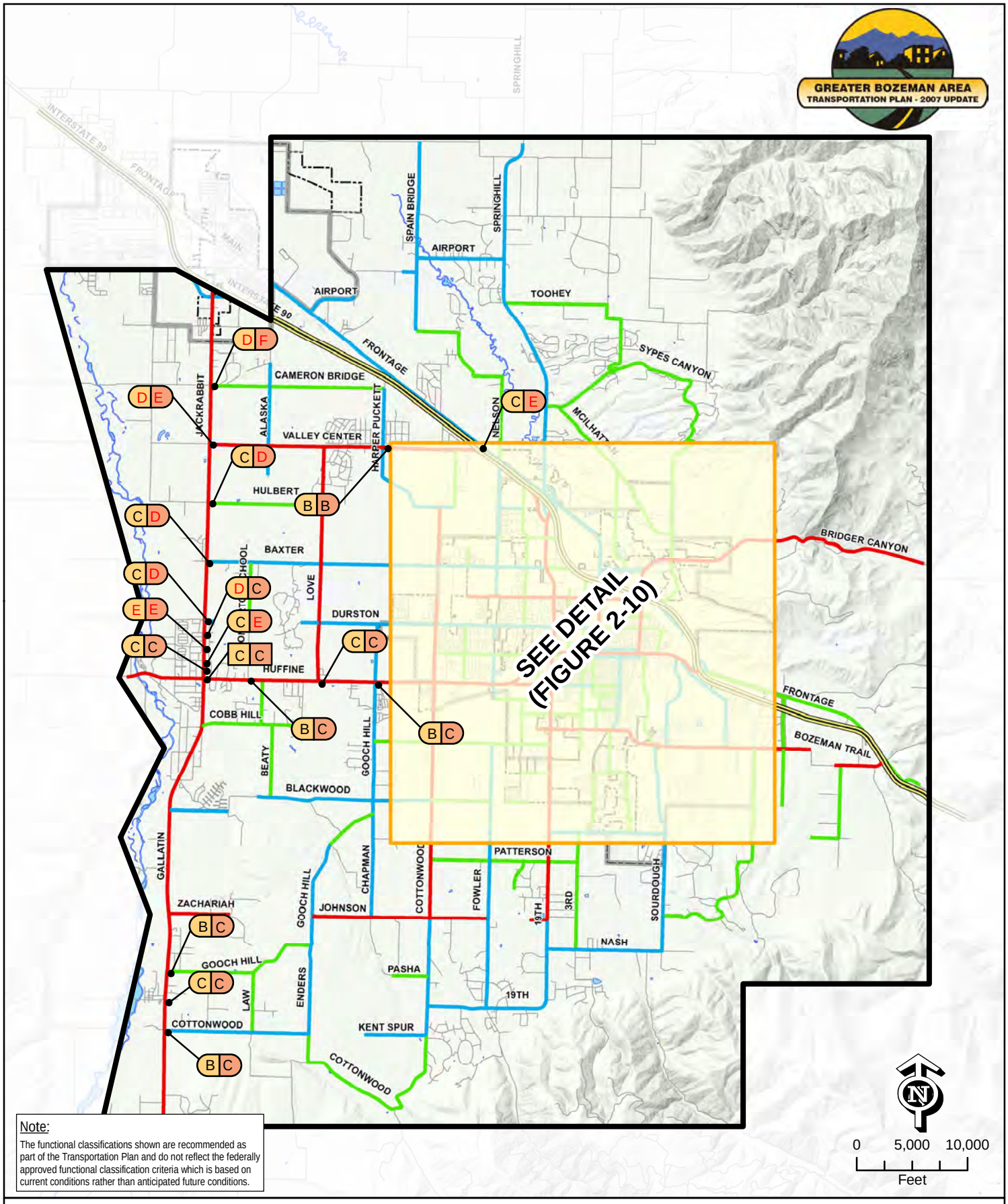
The LOS analyses of the existing conditions in the Greater Bozeman Area reveals that several signalized and unsignalized intersections are currently functioning at LOS D or lower. These intersections are shown in **Table 2-6** and are ideal candidates for closer examination and potential intersection improvements measures. Refer to **Table 4-3** in **Chapter 4** for a detailed performance level turning movement breakout for each unsignalized intersection.

Table 2-6
Existing Intersections Functioning at LOS D or Lower

INTERSECTION		AM PEAK	PM PEAK
8th Avenue & College Street	U	C	D
College Street & Willson Avenue	U	E	F
East Main Street & Haggerty Lane	U	C	E
Frontage Road & Valley Center Underpass	U	C	E
Highland Boulevard & Ellis Street	U	C	E
Highland Boulevard & Kagy Boulevard	U	E	C
Huffine Lane & Ferguson Road	S	E	E
Jackrabbit Lane & Cameron Bridge Road	U	D	F
Jackrabbit Lane & Valley Center Road	U	D	E
Jackrabbit Lane & Hulbert Road	U	C	D
Jackrabbit Lane & Baxter Lane	U	C	D
Jackrabbit Lane & Durston Road	U	C	D
Jackrabbit Lane & Ramshorn Drive	U	D	C
Jackrabbit Lane & Forkhorn Trail	U	E	E
Jackrabbit Lane & Shedhorn Trail	U	C	E
Kagy Boulevard & South Willson Avenue	S	D	D
Kagy Boulevard & Sourdough Road	U	F	F
Main Street & 7th Avenue	S	C	E
Main Street & Babcock Street	S	C	D
Main Street & Haggerty Lane	U	C	E
Main Street & Highland Boulevard	S	C	F
Main Street & South 19th Avenue	S	D	D
North 7th Avenue & Durston Road	S	D	D
North 7th Avenue & Oak Street	S	C	D
South 11th Avenue & College Street	U	D	F
South 11th Avenue & Kagy Boulevard	U	D	F
West College Street & South 19th Avenue	S	E	F

(S)ignalized

(U)nsignalized



Note:
The functional classifications shown are recommended as part of the Transportation Plan and do not reflect the federally approved functional classification criteria which is based on current conditions rather than anticipated future conditions.

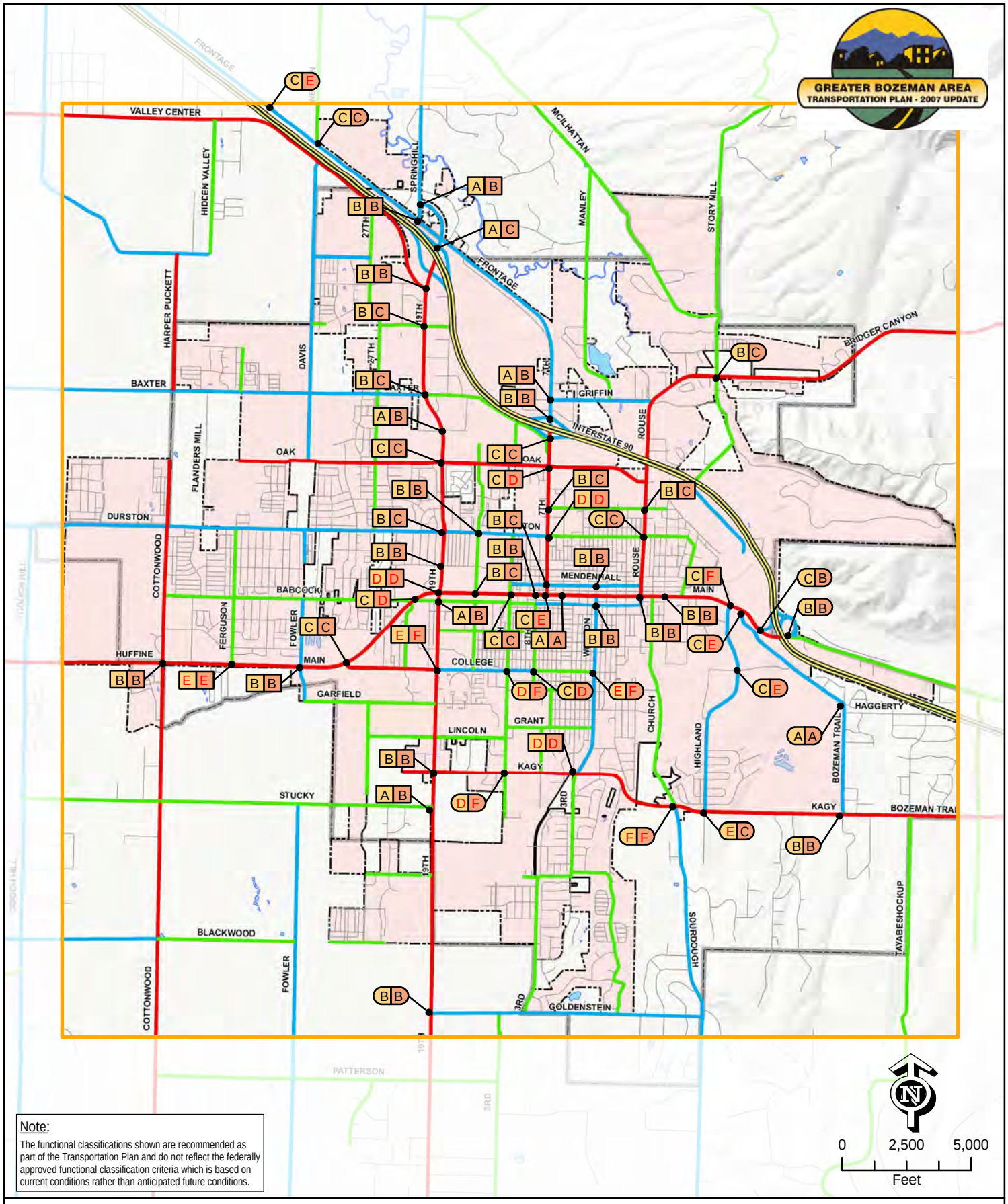
Legend

- Interstate
- Principal Arterial
- Minor Arterial
- Collector
- Local
- Study Area Boundary
- Detail Area
- City Boundary
- Urban Boundary

Signalized Intersection
A.M. A A P.M.
Unsignalized Intersection
A.M. C F P.M.
A, B, C, D, E, F = Level of Service

Greater Bozeman Area Transportation Plan (2007 Update)

Existing (2005) LOS Level of Service
Figure 2-9



Note:
The functional classifications shown are recommended as part of the Transportation Plan and do not reflect the federally approved functional classification criteria which is based on current conditions rather than anticipated future conditions.

Legend

- Interstate
- Principal Arterial
- Minor Arterial
- Collector
- Local
- Detail Area
- City Boundary
- Urban Boundary

Signalized Intersection
A.M: A A P.M.

Unsignalized Intersection
A.M: C F P.M.

A, B, C, D, E, F = Level of Service

Greater Bozeman Area Transportation Plan (2007 Update)

Existing (2005) LOS Level of Service Figure 2-10

2.2.5 Crash Analysis

The MDT Traffic and Safety Bureau provided crash information and data for use in the *Greater Bozeman Area Transportation Plan – 2007 Update*. The crash information was analyzed to identify intersections with crash characteristics that may warrant further study. General crash characteristics were determined along with probable roadway deficiencies and solutions. The crash information covers the three-year time period from January 1st, 2004 to December 31st, 2006.

Three analyses were performed to rank the intersections based on different crash characteristics. First, the intersections were ranked by number of crashes. For this analysis, intersections with 12 or more crashes in the three-year period were included. If an intersection did not have 12 crashes in the three-year period the data was available, it was not included at all in this analysis. A summary of these intersections, along with the number of crashes at each intersection, is shown in **Table 2-7**.

The second analysis involved a more detailed look at the crashes to determine the MDT "severity index rating". Crashes were broken into three categories of severity: property damage only (PDO), non-incapacitating injury crash, and fatality or incapacitating injury. Each of these three types is given a different rating: one (1) for a property damage only crash; three (3) for an injury crash; and eight (8) for a crash that resulted in a fatality.

The MDT severity index rating for the intersections in the analysis is shown in **Table 2-8**. The calculation used to arrive at the severity index rating is as follows:

$$\frac{[(\#\ PDO) \times (1)] + [(\#\ Non\text{-}Incapacitating\ Crashes) \times (3)] + [(\#\ Fatalities\ or\ Incapacitating\ Crashes) \times (8)]}{Total\ Number\ of\ Crashes\ in\ a\ Three\text{-}Year\ Period} = \textbf{\textit{(MDT Severity Index Rating)}}$$

The third analysis ranked the number of crashes against the annual average daily traffic (AADT) at each intersection, expressed in crashes per million entering vehicles (MEV). A summary of the intersections in the analysis is shown in **Table 2-9**. The calculation used to arrive at the crash rates, expressed in crashes per million entering vehicles (MEV), as shown in **Table 2-9**, is as follows:

$$\frac{Total\ Number\ of\ Crashes\ in\ a\ Three\text{-}Year\ Period}{(AADT\ for\ Intersection) \times (3\ years) \times (365\ days/year) / (1{,}000{,}000\ vehicles)} = \textbf{\textit{(Crash Rate)}}$$

Table 2-7
Intersections with 12 or More Crashes in the Three-Year Period (January 1, 2004-December 31, 2006)

INTERSECTION		# CRASHES
Intersections with 42 - 47 crashes		
I-90 & 7th Avenue*	S	43
Huffine Lane & Jackrabbit Lane	S	42
Intersections with 30 - 35 crashes		
Main Street & 19th Avenue	S	34
Intersections with 24 - 29 crashes		
7th Avenue & Oak Street	S	28
19th Avenue & Oak Street	S	27
19th Avenue & College Street	S	25
Intersections with 18 – 23 crashes		
Main Street & 7th Avenue	S	23
Main Street & 11th Avenue	S	23
I-90 & 19th Avenue*	S	19
19th Avenue & Baxter Lane	S	18
Intersections with 12 - 17 crashes		
Main Street & Babcock Street	S	17
Main Street & College Street	S	17
7th Avenue & Koch Street*	U-2W	16
19th Avenue & Durston Road	S	16
Huffine Lane & Shedhorn Lane*	U-2W	16
Huffine Lane & Ferguson	S	15
Jackrabbit Lane & Valley Center Road	U-2W	15
Main Street & 15th Avenue	S	15
19th Avenue & Tschache Lane	S	14
19th Avenue & Valley Center Road	S	14
Huffine Lane & Fowler Avenue	S	13
Main Street & 3rd Avenue*	S	13
Main Street & 5th Avenue	S	13
Willson Avenue & Babcock Street	S	13

* Intersections not identified in the Greater Bozeman Area Transportation Plan – 2007 Update
** "S" = Signalized intersection, "U-2W" = Unsignalized two-way stop controlled, "U-3W" = Unsignalized three-way stop controlled, "U-4W" = Unsignalized four-way stop controlled.

Note that there are some intersections listed in **Table 2-7** that are not specifically being studied as part of the *Greater Bozeman Area Transportation Plan – 2007 Update*. The intersections at I-90 & 7th Avenue and I-90 & 19th Avenue included above are the on and off-ramps on Interstate 90 and were not studied as part of this *Plan* due to budget limitations as defined in the project scoping plans.

Table 2-8
Intersection Crash Analysis - MDT Severity Index Rating

Intersection		PDO	Injury	Fatality/ Incapacitating Injury	Severity Index
Intersections with 2.75 – 2.50 Severity Index					
Jackrabbit Lane & Valley Center Road	U-2w	8	5	2	2.6
Intersections with 2.49 – 2.25 Severity Index					
Huffine Lane & Ferguson	S	8	6	1	2.27
Intersections with 1.99 – 1.75 Severity Index					
Main Street & 15th Avenue	S	11	3	1	1.87
19th Avenue & Baxter Lane	S	13	4	1	1.83
19th Avenue & Durston Road	S	12	3	1	1.81
Huffine Lane & Fowler Road	S	8	5	0	1.77
Intersections with 1.74 – 1.50 Severity Index					
Main Street & 7th Avenue	U-2W	15	8	0	1.7
19th Avenue & Oak Street	S	18	9	0	1.67
19th Avenue & College Street	S	17	8	0	1.64
7th Avenue & Oak Street	S	23	4	1	1.54
Main Street & 19th Avenue	S	25	9	0	1.53
Intersections with 1.49 – 1.25 Severity Index					
Main Street & Babcock Street	S	13	4	0	1.47
Main Street & 11th Avenue	S	18	5	0	1.43
19th Avenue & Tschache Lane	S	11	3	0	1.43
19th Avenue & Valley Center Road	S	11	3	0	1.43
Huffine Lane & Jackrabbit Lane	S	36	5	1	1.4
Main Street & 5th Avenue	S	11	2	0	1.31
Intersections with 1.24 – 1.00 Severity Index					
Willson Avenue & Babcock Street	S	12	1	0	1.15
Main Street & College Street	S	16	1	0	1.12

** "S" = Signalized intersection, "U-2W" = Unsignalized two-way stop controlled, "U-3W" = Unsignalized three-way stop controlled, "U-4W" = Unsignalized four-way stop controlled.

Table 2-9
Intersection Crash Analysis Crash Rate

Intersection		Number of Crashes	Volume	Rate
Intersections with 2.0 – 1.50 Crash Rate				
Huffine Lane & Jackrabbit Lane	S	42	21,124	1.82
Intersections with 1.49 – 1.0 Crash Rate				
19th Avenue & College Street	S	25	18,488	1.23
Jackrabbit Lane & Valley Center Road	U-2W	15	12,256	1.12
7th Avenue & Oak Street	S	28	24,281	1.05
19th Avenue & Oak Street	S	27	24,545	1
Intersections with 0.99 – 0.50 Crash Rate				
Main Street & 7th Avenue	S	23	21,306*	0.99
Main Street & 15th Avenue	S	15	14,231	0.96
Main Street & 19th Avenue	S	34	33,347	0.93
Willson Avenue & Babcock Street	S	13	13,818*	0.86
Main Street & College Street	S	17	18,107	0.86
Main Street & 5th Avenue	S	13	14,124*	0.84
Main Street & 11th Avenue	S	23	26,331*	0.8
19th Avenue & Baxter Lane	S	18	21,322	0.77
19th Avenue & Valley Center Road	S	14	18,190	0.7
19th Avenue & Tschache Lane	S	14	19,107	0.67
19th Avenue & Durston	S	16	23,421	0.62
Main Street & Babcock Street	S	17	24,950*	0.62
Huffine Lane & Fowler Lane	S	13	19,083	0.62
Huffine Lane & Ferguson	S	15	22,264	0.62

*Volume determined using Greater Bozeman Area Transportation Plan 2001 turning movement counts

** "S" = Signalized intersection, "U-2W" = Unsignalized two-way stop controlled, "U-3W" = Unsignalized three-way stop controlled, "U-4W" = Unsignalized four-way stop controlled.

In order to give the intersections included in the crash analysis an even rating, a composite rating score was developed based on the three analyses presented above. This composite rating score has the following criteria: First, the intersection had to have a minimum crash rate of 1.0 crash per million entering vehicles (MEV). Second it had to have 12 or more crashes in the three years combined. Third, it had to rate in the top 10 of one of the three previous categories. Using these criteria, the intersections were then rated based on their position on each of the three previous tables, giving each equal weight. For example, the intersection of Huffine Lane and Jackrabbit Lane was given a ranking of 2 for its position in **Table 2-7**, another ranking of 16 for its position in **Table 2-8**, and a ranking of 1 for its location in **Table 2-9**. Thus its composite rating is 19. Refer to **Table 2-10** for the composite rating of each intersection.

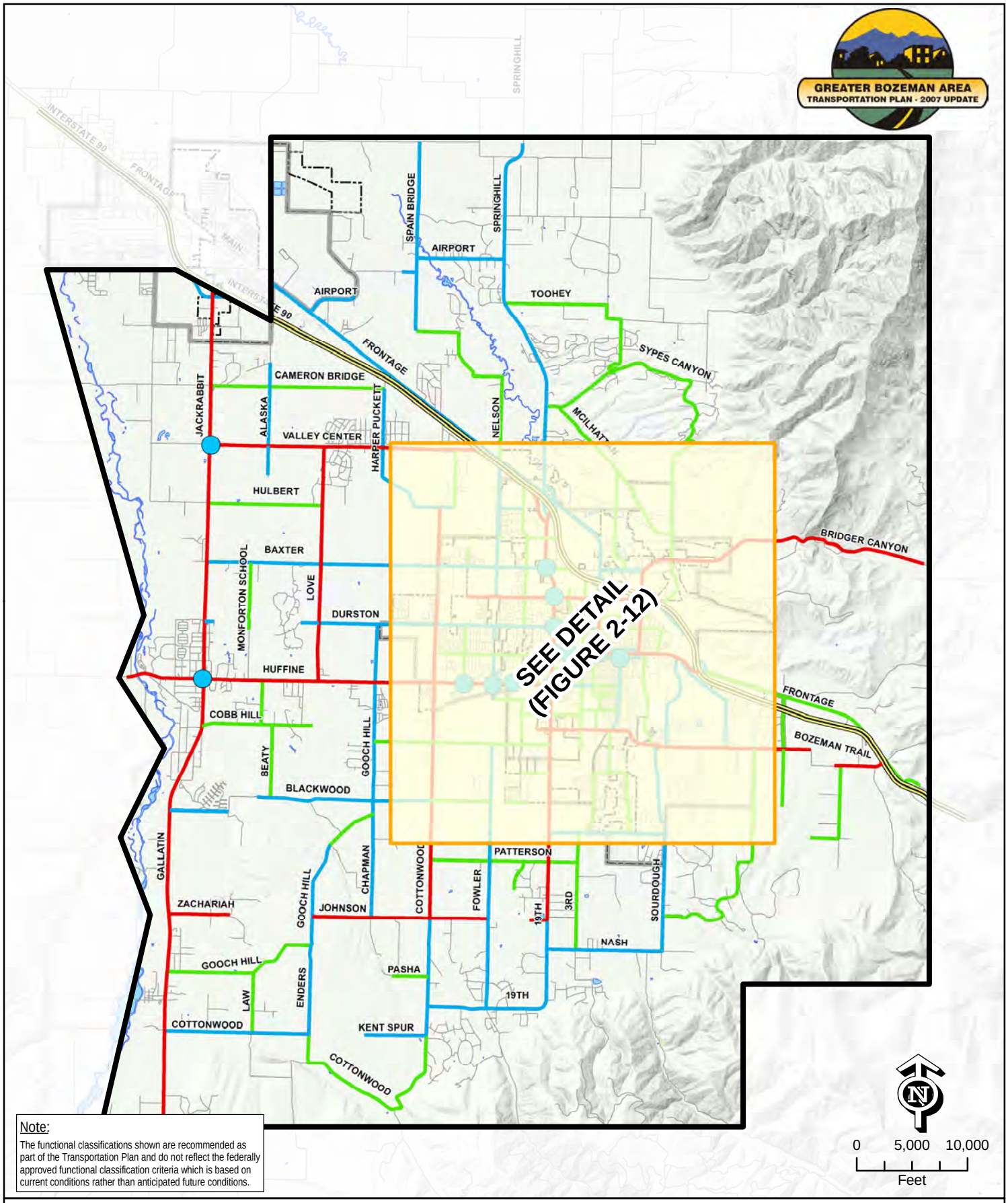
Table 2-10
Intersection Crash Analysis Composite Rating

Intersection	Crash no.	Severity No.	Rate No.	Composite Rating
Jackrabbit Lane & Valley Center Road	12	1	3	16
19th Avenue & College Street	5	9	2	16
19th Avenue & Oak Street	4	8	5	17
7th Avenue & Oak Street	3	10	4	17
Huffine Lane & Jackrabbit Lane	1	16	1	18
Main Street & 7th Avenue	7	7	6	20
Main Street & 19th Avenue	2	11	8	21
Main Street & 15th Avenue	14	3	7	24
19th Avenue & Baxter Lane	8	4	13	25
Main Street & 11th Avenue	6	13	12	31
19th Avenue & Durston Road	11	5	16	32
Huffine Lane & Ferguson	13	2	19	34
Main Street & College Street	9	19	10	38
Main Street & Babcock Street	10	12	17	39
Huffine Lane & Fowler	18	6	18	42
19th Avenue & Tschache Lane	15	14	15	44
Willson Avenue & Babcock Street	17	18	9	44
19th Avenue & Valley Center Road	16	15	14	45
Main Street & 5th Avenue	19	17	11	47

Intersections that were identified through the composite rating score method, as described previously, which warrant further study and may be in need of mitigation to specifically address crash trends are listed below. The locations of these intersections are shown on **Figure 2-11** and **Figure 2-12**. Note that the fourteen intersections listed below are in alphabetical order, and there is no significance to the order of their listing.

- 7th Avenue & Oak Street
- 19th Avenue & Baxter Lane
- 19th Avenue & College Street
- 19th Avenue & Durston Road
- 19th Avenue & Oak Street
- Huffine Lane & Ferguson Road
- Huffine Lane & Fowler Road
- Huffine Lane & Jackrabbit Lane
- Jackrabbit Lane & Valley Center Road
- Main Street & 7th Avenue
- Main Street & 15th Avenue
- Main Street & 19th Avenue
- Main Street & College Street
- Willson Avenue & Babcock Street

The identified intersections will be evaluated further to determine what type of mitigation measures may be possible to reduce specific crash trends (if any) and/or severity. These mitigation measures will be evaluated in the overall context of recommended improvements being evaluated via the *Greater Bozeman Area Transportation Plan – 2007 Update* development. It should be noted that several of the intersections have undergone significant reconstruction during the analysis period of January 1, 2004 to December 31, 2006 including the intersections of 7th Avenue & Oak Street, 19th Avenue & Baxter Lane, 19th Avenue & Durston Road, 19th Avenue & Oak Street, Huffine Lane & Ferguson Road, and Huffine Lane & Fowler Road that are listed earlier.



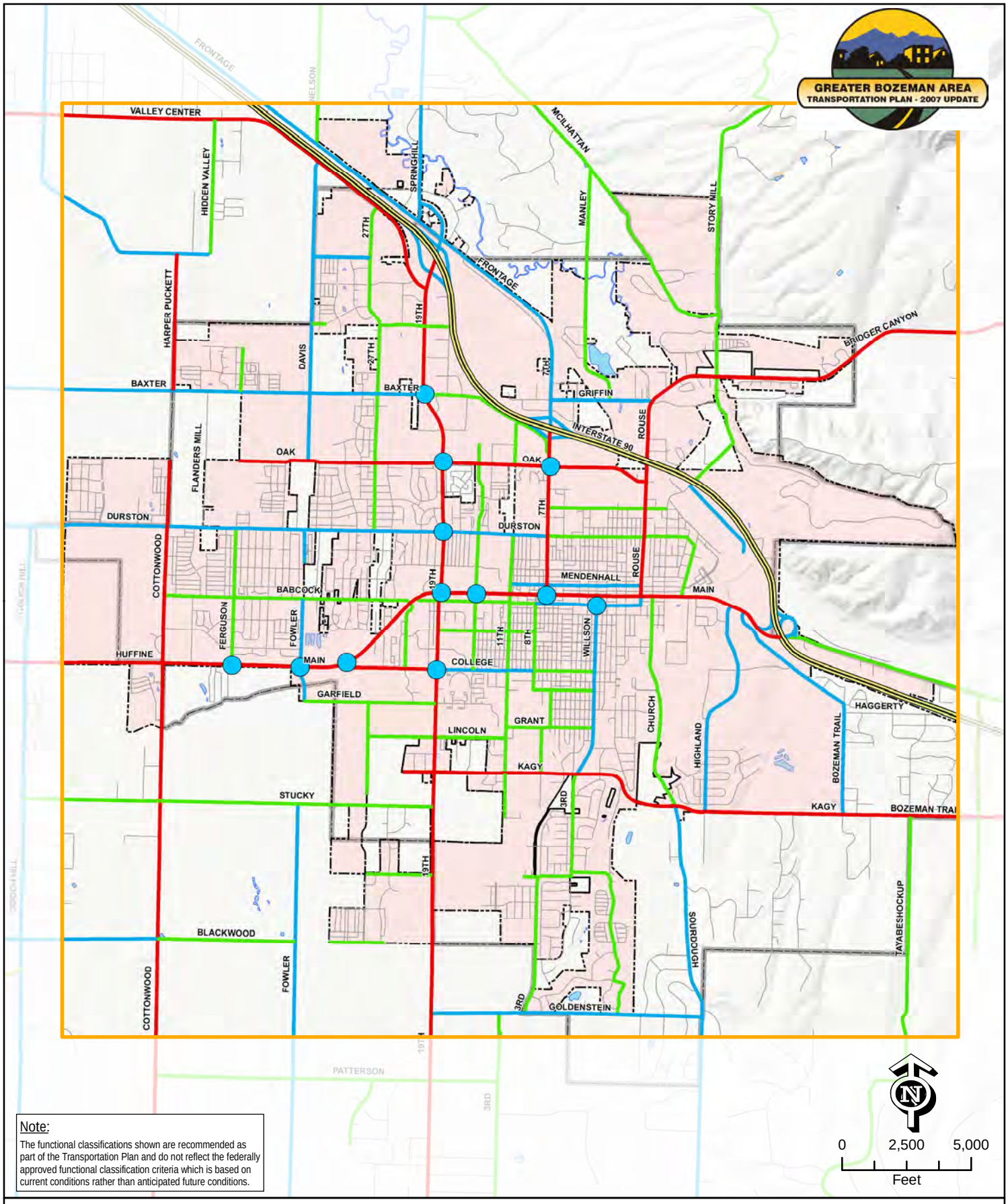
Note:
The functional classifications shown are recommended as part of the Transportation Plan and do not reflect the federally approved functional classification criteria which is based on current conditions rather than anticipated future conditions.

Legend

- Interstate
- Principal Arterial
- Minor Arterial
- Collector
- Local
- Study Area Boundary
- Detail Area
- City Boundary
- Urban Boundary
- Crash Location

Greater Bozeman Area Transportation Plan (2007 Update)

Crash Locations
Figure 2-11



Note:

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Legend

- Interstate
- Principal Arterial
- Minor Arterial
- Collector
- Local
- Detail Area
- City Boundary
- Urban Boundary
- Crash Location

Greater Bozeman Area Transportation Plan (2007 Update)

Crash Locations
Figure 2-12

2.3 NON-MOTORIZED

2.3.1 Overview of Bozeman Demographics

The residents of the Bozeman area are by nature active and sturdy individuals who take year-round advantage of the area's natural beauty and nearly limitless outdoor recreational opportunities. Even on some of the coldest days in the winter the sidewalks will still be filled with pedestrians, and bicyclists can still be seen riding in the snow. Because the Bozeman area's relatively level topography and generally good weather, walking and bicycling play a significant role in the Bozeman area's transportation system and have sizable upward potential. This chapter of the Plan provides an analysis of the Bozeman area's existing conditions for pedestrian and bicycle policy, infrastructure, and programs. This analysis was performed using field work, information gathered though the public involvement process, and technical data provided by the City of Bozeman, Gallatin County and MDT.

Local data sources related to walking and bicycling within the study area are limited. Intersection counts done as part of the Transportation Plan to create a snapshot can be misleading, as many pedestrians and bicyclists prefer less-congested minor roads. The mood of Bozeman residents can perhaps be summarized by the 2007 National Citizen Survey commissioned by the City of Bozeman, which received 500 responses. Overall, residents seemed happy with the quality of life (83 percent) and amenities; however a serious concern about future growth and its potential to change quality of life was apparent. These concerns of residents included 82 percent feeling that the rate of growth in the area was "too fast" and that 48 percent listed concerns that the greatest challenge to the area was "growth, planning, and sprawl" as the biggest worry. As the Bozeman area grows, traffic congestion will likely worsen, and the area's roadway capacity may not be able to keep pace. Mode choice in the region's transportation system and the provision of safe and plentiful facilities for walking and bicycling will become more important as residents seek alternatives for some of their trips.

The results from the walking and bicycling survey as part of this Plan show that the primary reason given for not biking are the lack of bike lanes or paths. The lack of sidewalks or paths was also listed as the third most common reason for not walking. Other relevant data that supports this finding and illustrates the upward potential of walking and bicycling if improved facilities are provided includes the "2005-2006 West Babcock Street Pedestrian and Bicyclist Monitoring Project", which found a 256 percent increase in bicycling and walking along the corridor after the addition of sidewalks and bike lanes.

Photo 1: Sidewalks and bike lanes installed on West Babcock Street have resulted in more than three times as much bicycle and pedestrian traffic.

Despite it being over seven years since the last census, the 2000 US Census Journey to Work data provides the best dataset to compare Bozeman to the state of Montana and to the nation as a whole. Data for Gallatin County would not be meaningful because the study area composes only a fraction of the County. The census shows that the City of Bozeman had a walking mode share of 10.7 percent, while traveling by 'other means', which includes bicycling, composed 4.7 percent of all trips. The statewide mode share for walking was 5.5 percent while 'other means' was 1.7 percent. Nationally, the walking mode share was 2.9 percent with 'other means' combining to 1.2 percent. From this data it is apparent that Bozeman has a much higher mode share of walking and bicycling than both the state and national averages. This data only covers 'journey to work' data and does not include information on other utility or recreational trips. The U.S. Census Bureau estimates the 2007 population of Bozeman to be just under 38,000 people. Based on the data provided by the 2000 census, the transient student population of over 12,000 is somewhat, but not fully accounted for, in the total population estimate meaning that the overall population within the City limits is likely higher. Also important is the daytime population of Bozeman, which can swell to upwards of 50,000 people due to Bozeman's status as a regional employment center and shopping destination.

2.3.2 Study Area Land Use

Development patterns within the Study Area consist of low to medium suburban density in the communities of Bozeman, Four Corners, and Gallatin Gateway, surrounded by low-density rural development and agriculture. The study area has experienced a period of rapid growth in recent years with Bozeman in the process of rapid expansion with numerous annexations composing new residential and commercial development opportunities. Concurrently, Bozeman is enjoying some success with urban infill development adding higher densities and mixed-use projects in some of the older areas of the City. Most commercial and industrial areas line the major transportation corridors within the Study Area such as Huffine Lane, Gallatin Road (Hwy 191), Jackrabbit Lane, (Hwy 85), 19th Avenue, N. 7th Avenue, and Main Street. Parks are scattered throughout the city of Bozeman with substantial surrounding open space composed of private, State and Federal lands.

The City of Bozeman has all lands within the City Limits subject to zoning. Bozeman has undertaken the 2020 Community Plan, which develops land-use strategies to accommodate an expected population of 46,600 by 2020, a 45 percent increase with a 64 percent increase in employment. This underscores Bozeman's position as a regional employer within the Gallatin Valley and stresses the need for a balanced and efficient transportation system. The 2020 Community Plan outlines a future land-use scenario that encourages and supports compact development patterns and infill development, enhances community vitality and increases transportation choices for residents.

The majority of private lands within Gallatin County are unzoned. In 2003 the County adopted a Growth Policy in a comprehensive plan, which established goals and objectives for handling future growth in the County. Supplementing the Growth Policy, there are numerous zoning districts that establish guidelines for development within their boundaries. These zoning districts apply specific restrictions on uses and new development. The subdivision regulations within the Growth Policy and existing zoning districts are a major tool for regulating land use. With these, the County can require infrastructure improvements as a condition of new development.

2.3.3 Major Activity Generators and Attractors

Educational Facilities – From higher education facilities, such as Montana State University, to the elementary schools located throughout the county, providing safe facilities for students and staff to bike and walk is important.

Montana State University has an enrollment of approximately 12,000 and employs almost 3,500 people. The university has a sizable impact on local transportation and serves as one of the major destinations for area cyclists. With a dispersed student population and limited parking on campus, transportation to the campus is a major issue in Bozeman.

There are 30 public and private K – 12 schools within the project study area, 20 of which are in Bozeman. Each of these schools is a nexus of transportation activity concentrated during commute hours. A comprehensive bicycle and pedestrian network that connects the schools and neighborhoods provides alternative transportation options for students and teachers.

Schools can account for one quarter of morning vehicular traffic. Providing safe routes for students and staff to get to school has not only physical activity benefits, but can have a tangible effect on traffic.

Bozeman Deaconess Hospital – Bozeman Deaconess Hospital employs approximately 800 people and is a large generator of trips both local and throughout the Gallatin Valley and beyond. The Hospital is located on the East side of Bozeman off Highland Blvd and is well connected by popular trails via Burke Park and shared-use paths.

Downtown Bozeman – Downtown Bozeman serves as the cultural and entertainment heart of the region. The streets are busy day and night due to the complementary mix of businesses, restaurants, and bars. Scarcity of convenient vehicle parking, combined with the human scale streetscape, draws many pedestrian and bicycle trips. There are no dedicated bike lanes on Main Street, Mendenhall or East Babcock Ave, but bicycle racks are provided on the street frontage. Bicycles and skateboards are prohibited from downtown sidewalks. In the summer of 2007, Main St. underwent a refurbishment process that saw the addition of new streetlights with pedestrian countdown timers, new red concrete crosswalks and fully compliant ADA sidewalk ramps.

Photo 2: Bicyclists are often seen traveling along Main Street in downtown Bozeman.

Government/Civic – All of the public administration in the Gallatin Valley occurs within downtown Bozeman. Together the City and County employ approximately 700 people. A new public library was built in 2006.

Commercial Corridors – The study area has many commercial corridors with concentrated activity. The areas of Four Corners, the I-90 Frontage Road near Gallatin Field, and the North 19th, North 7th and Main Street/Huffine corridors all generate many automobile, walking, and bicycling trips. It is important that these corridors all be accessible by a variety of modes of transportation including bicycling.

Parks – The Bozeman Area has a large number and variety of neighborhood parks with varying facilities. Tennis courts, basketball courts, sports fields, winter ice skating rinks, skate parks, and dog parks can all be found sprinkled around the Study Area. Other public amenities include the Lindley center and Bogert pavilion. All recreational areas generate a significant amount of travel, and given the outdoor nature of this activity, a large percentage of that travel could be non-motorized if the proper facilities are provided. A new regional

park is being developed at the intersection of Davis Lane and W. Oak Street. This will be a heavily used hub of activity in the future.

Photo 3: Newly reconstructed sidewalks in downtown Bozeman have ADA-compliant ramps.

2.3.4 Existing Policies and Goals

This section summarizes past planning efforts and establishes a policy framework to guide future transportation decisions and capital improvement programming for both unincorporated Gallatin County and the City of Bozeman. This undertaking is intended to promote regional planning, offer opportunities to coordinate infrastructure improvements and to incorporate past planning efforts into the current Plan. It is recommended that Gallatin County and the City of Bozeman adopt the recommended policies in this Plan to ensure their effective and consistent implementation throughout the greater Bozeman area.

Bozeman 2020 Community Plan (2001) – Adopted in 2001, the Bozeman Community Plan is a comprehensive planning document setting goals and policies for all aspects of community life, including transportation, housing, land use, and the environment. Chapters 9 (Parks and Open Spaces) and 10 (Transportation) contain specific policies relevant to walkers and cyclists.

- **Chapter 9: Parks, Recreation, Pathways, and Open Space** – The Community Plan incorporates a previously-adopted PROST (Parks, Recreation, Open Space and Trails) plan from 1997 that inventories existing parks; discusses the maintenance of existing parks; discusses future park, trail, and open space needs; provides park development

and land acquisition recommendations; and provides a synopsis of responsible parties and a timeline. Parks form an important destination for walking and bicycling, while linear parks and pathways are essential facilities used by walkers and bicyclists. Chapter 9 defines a network of parks facilities including linear parks and pathways, defines trail facility types, and discusses strategies for trails acquisition, development and maintenance, and risk management.

Chapter 9 sets forth objectives and supporting implementation policies, including the explicit provision that the City "provide for pedestrian and bicycle networks, and related improvements such as bridges and crosswalks, to connect employment centers; public spaces and services, such as parks, schools, libraries; and other destinations." The Plan also recommends an update of the Parks, Recreation, Open Space, and Trails Plan.

- **Chapter 10: Transportation –** Chapter 10 contains policies to create a "true multi-modal and cost-effective transportation system." One sub-chapter covers basic definitions of "pathways," including bike lanes, bike routes, bike and pedestrian paths, and sidewalks. The entire chapter envisions a connected street network and a multimodal system, paired with transportation demand management programs.

  Notable objectives and policies related to bicycling and walking include:

  - Provide for pedestrian and bicycle networks, and related improvements such as bridges and crosswalks, to connect employment centers; public spaces and services, such as parks, schools, libraries; and other destinations.
  - Ensure that a variety of travel options exist which allow safe, logical, and balanced transportation choices.
  - For the purposes of transportation and land use planning and development, non-motorized travel options and networks shall be of equal importance and consideration as motorized travel options.
  - Develop and implement reliable and adequate funding mechanisms for the acquisition, development, and maintenance of urban parks, recreation trails, and public open spaces, including, but not limited to, a park maintenance district, general funds, and parkland dedications.
  - Provide for non-motorized transportation facility maintenance through the City's normal budgeting and programming for transportation system maintenance.
  - Continue the existing sidewalk and curb ramp installation, repair, and replacement program.
  - Develop City-sponsored trail maps and information, and provide signage for trail parking and trail facilities to encourage trail usage.
  - Reduce the impact of the automobile by supporting land use decisions that can decrease trip length of automobile travel and encourage trip consolidation.
  - Promote pedestrian and bicyclist safety.

- Encourage transportation options that reduce resource consumption, increase social interaction, support safe neighborhoods, and increase the ability of the existing transportation facilities to accommodate a growing city.
- Create and maintain an interconnected and convenient pedestrian and bicycle network for commuting and recreation as discussed and described in the transportation facility plan and in coordination with the design standards of the transportation facility plan and the Parks, Recreation, Open Space, and Trails Plan.
- Prepare and adopt clear criteria to determine when pedestrian and bicycle facilities are transportation improvements or recreational facilities.
- Prepare and adopt design, construction, and maintenance standards for pedestrian and bicycle transportation improvements versus recreational facilities.
- Work with neighboring jurisdictions to create and connect trails and corridors.
- Review, revise, and update trail/pathway standards to reflect the various types and uses of trails and other non-motorized travel ways.

Greater Bozeman Area Transportation Plan Update (2001) – The Transportation Plan Update (TPU), adopted in 2001, recommends a street network and street design standards for current and future conditions in Bozeman, and sets priorities and funding needs for projects to expand the street network. Chapter 6 analyzes bicycle and pedestrian facilities and needs, and includes an inventory of existing sidewalks, ADA curb ramps, and bikeways on major streets. The TPU includes bicycle and pedestrian facilities in street design guidelines, but did not make specific cross-section recommendations for primary bicycle corridors.

The TPU also discusses traffic calming measures and recommends a process for citizen request of traffic calming. The implementation plan focuses primarily on street widening projects, which typically have bicycle and pedestrian accommodation when adhering to the design standards.

Gallatin County Trails Report and Plan (2001) – This adopted report defines a trail network that connects residential neighborhoods with schools, parks, shopping and longer distance commuter trails in Gallatin County. High priority trails corridors include:

- Belgrade to Bozeman
- Valley Center Drive
- Bozeman to "M" Trailhead
- Springhill to Bozeman
- Four Corners to Bozeman
- Four Corners to Gallatin Gateway
- Three Forks to Trident.

While no enforceable language has been included, the Report does specify that "those who regulate development in Gallatin County should incorporate non-motorized commuter corridors whenever open lands are first developed." In addition to defining a network, the

Report includes information on trail development and sighting guidelines, as well as potential trail funding sources.

Gallatin County Growth Policy (2003) – The Gallatin County Growth Policy, adopted in 2003, contains a number of goals and policies related to managing growth in Gallatin County, focusing in part on limiting residential development in rural areas and encouraging new development in existing developed areas. Managed growth is known to create safer, more convenient, more appealing environments for walking and bicycling, so the Growth Policy generally supports walking and bicycling. Specific policies related to walking and bicycling includes:

- Requirements that subdivision review include analysis of the location and provision of multi-modal transportation facilities; including pedestrian and bicycle safety measures, and interconnectivity.
- Encouragement of compact development patterns that allow the "good accessibility to basic activities (neighbors, schools, activity centers) allowing use of alternative transportation forms (walking, bike) to satisfy needs."
- Promotion of multi-modal transportation opportunities.
- Encouragement that development be consistent with countywide trails plan.

Gallatin County/Bozeman Area Plan (2005) – The Bozeman Area Plan is a refinement of the Gallatin County Growth Policy specific to the Bozeman Area. It is organized around the same Goals as the Gallatin County Growth Policy, and like that policy, its fundamental goals of managing growth, maintaining compact development, and discouraging development in rural and agricultural areas will contribute to the creation of walking- and biking-friendly communities if implemented. The bulk of the policy language is identical to that of the Gallatin County Growth Policy. It explicitly states that "through the subdivision review process require development to comply with adopted plans for parks, recreation (including biking), open space, and trails.

US Mayors' Climate Protection Agreement (endorsed 2006) – This national resolution, endorsed by the City Commission in 2006, includes the following policy commitments to improve bicycling and walking conditions:

- Adopt and enforce land-use policies that reduce sprawl, preserve open space, and create compact, walkable urban communities;
- Promote transportation options such as bicycle trails, commute trip reduction programs, incentives for car pooling and public transit.

Design and Connectivity Plan for North 7th Avenue Corridor – The purpose of this plan was to provide a design framework plan for improvement projects along the corridor that will enhance connectivity for the pedestrian, bicyclist and automobile, to illustrate the vision for the plan, and to provide implementation strategies and funding mechanisms. This plan provides recommendations for enhancements along the corridor in addition to suggesting various implementation methods.

Revised Draft Bozeman Environmental Action Plan (2007) – The Draft Bozeman Environmental Action Plan expands on the goals set forward in the US Mayors' Climate Protection Agreement. Those specific to walking and bicycling are below:

- Adopt and enforce land-use policies that reduce sprawl, preserve open space, and create compact, walkable urban communities.
  - During the 2020 Community Growth Plan Update, consider any objectives and policies not already in place that would help reduce carbon emissions as the community grows;
  - Promote mixed use.

- Promote transportation options such as bicycle trails, commute trip reduction programs, incentives for car pooling and public transit.
  - During the Transportation Plan Update, consider any objectives not already in place to help reduce carbon emissions as the community grows;
  - Continue improving walkability and bikeability of community through completing networks of walking and biking lanes/routes/paths, completing safe routes for children to walk and bike to all schools, and improve intersection and arterial crossing safety for pedestrians;
  - Ask Bike Board, Pedestrian Traffic Safety Committee, Transportation Coordinating Committee, and interested community groups to participate in developing recommendations.

PROST (Parks, Recreation, Open Space, and Trails) Plan (2007) – The PROST Plan proposes a plan to improve and build a system of parks, recreation facilities, open space, and trails in the City of Bozeman. It includes policy, a prioritized project list, a planning framework, and likely funding sources. Where the 2020 Plan provides the overarching goals and vision for parks, recreation, open space and trails, the PROST Plan provides the detailed background information, inventories, analysis and recommendations to support that vision.

The trails element of this plan is most relevant to walking and bicycling conditions in the community, though parks remain a popular walking and bicycling destination. In the PROST Plan, development is seen as the primary source of trail funding and implementation, while maintenance is a City-funded activity. Chapter 8 sets policies for Shared Use Paths, while Chapter 10 includes specific recommendations for trail acquisition, development, and maintenance. The PROST Plan includes a current and planned trails map, but the recommendations made in the current Transportation Plan Update shall take precedence once this plan is adopted. The PROST Plan was adopted in 2007.

2.3.5 Existing Bicycle Facilities and Programs

Definition of Bikeways

There are five basic types of bikeways:

1. **Shared Use Path –** Sometimes called a "bike path," a shared use path provides bicycle travel on a paved right-of-way completely separated from any street or highway.

2. **Wide Unpaved Trails –** In Bozeman, there are a number of unpaved linear trails that are long, wide and smooth enough to serve longer bicycle trips.

3. **Bike Lane –** A bike lane provides a striped and stenciled lane for one-way travel on a street or highway.

4. **Signed bike routes –** Signed bike routes, also known as shared roadways, provide for shared use with motor vehicle traffic and are usually identified only by signing.

5. **Shoulder Bikeways** – Typically found in rural areas, shoulder bikeways are paved roadways with striped shoulders wide enough for bicycle travel. Shoulder bikeways often include signage alerting motorists to expect bicycle travel along the roadway. If a rumble strip is present or found to be necessary it should be as close to the white line as possible with ample room for bicyclists to the right, and have regular breaks to facilitate bicycle entry and exit to the shoulder.

Photo 4: The popular Galligator Trail is a wide unpaved trail that serves many bicycle and pedestrian trips each day.

It is important to note that bicycles are permitted on all public roads in the State of Montana and in Gallatin County and the City of Bozeman. As such, the Bozeman area's 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 roadway signage 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 network of bike lane and shared roadway on-street bikeways recognizes that certain roadways are optimal bicycle routes, for reasons such as directness or access to significant destinations, and allows the City of Bozeman and Gallatin County to then focus resources on building out this primary network.

Shared use paths are an important type of facility in any bikeway network provided they are located and designed properly. Nationally, there is some difference of opinion between those who feel paved shared use paths, separated from roadways, should be constructed wherever physically possible, versus those who feel more comfortable riding on streets on lanes or routes. This preference is usually based on "personal feelings" regarding comfort and safety.

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. Although sometimes referred to as "bike paths," shared use facilities are multi-use facilities that will likely see use by a wide mix of non-motorized uses, including pedestrians, joggers, rollerbladers, dog walkers, wheelchairs, and other personal mobility devices. Given this 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.

Photo 5: This cyclist chooses to ride along the shoulder of Highland Blvd. rather than on the adjacent shared use path.

Shared use facilities located immediately adjacent to roadways are often referred to as "sidepaths". Sidepaths are sometimes less desirable due to the numerous potential conflicts with motor vehicles turning on or off of side streets and driveways, and due to the fact that they act as two-way facilities that are typically situated on only one side of a roadway. Due to their linear off-street nature, opportunities for developing shared use paths in an urban setting are typically much more limited. As such, shared use paths will normally comprise a much smaller fraction of the total designated bikeway network than on-street bike lanes and routes.

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. Part of the goal of this Plan is to encourage new riders, and providing marked facilities such as bike lanes is one way of helping to persuade residents to give bicycling a try.

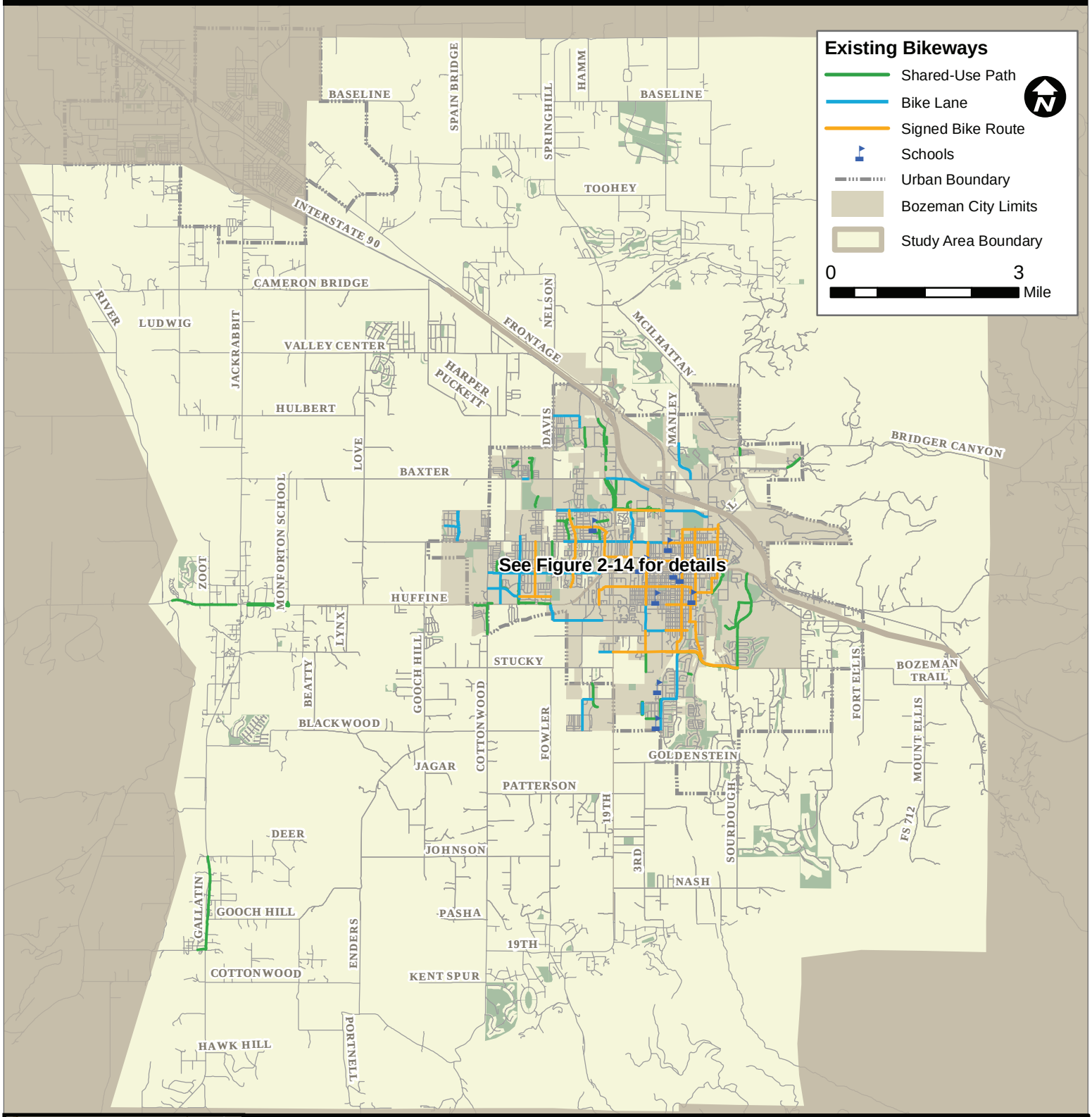
This Plan takes the approach that a connected, comprehensive network of shared-use paths, bike lanes, and shared roadways is the best approach to increasing bicycle use.

Bike lanes help to 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. In addition to the considerable benefits to bicyclists, bike lanes have some important safety benefits to vehicles. Bike lanes create a visibly narrower roadway for drivers (even though the driving lane width is standard) creating a traffic calming effect by causing slower average speeds. One key consideration in designing bike lanes in an urban setting is to ensure that bike lane and adjacent parking lane are wide enough so that cyclists have enough room to avoid a suddenly opened vehicle door.

On streets with low traffic volumes and speeds (usually defined as under 5,000 vehicles per day and under 30 mph vehicle speeds), striped bike lanes may not be needed at all 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. Signed bike routes may also be desirable on certain commute routes where installing bike lanes is not possible, provided that appropriate signage is installed to alert motorists to the presence of bicycles on the roadway. Bike route signing should also include "Share the Road" signs.

There are no designated shoulder bikeways in the City of Bozeman or Gallatin County at the time of writing. However, there are roads in the City of Bozeman and Gallatin County that do have shoulders wide enough for bicycle travel. These facilities are typically inconsistent in width, can have rumble strips that render them ineffective, and can become mired in road debris. Because of this, many cyclists prefer to travel in the vehicle lane.

Existing Study Area Bicycle Network



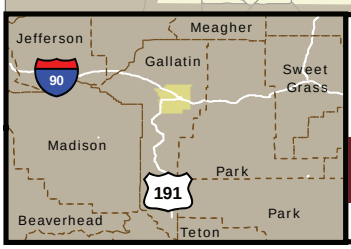
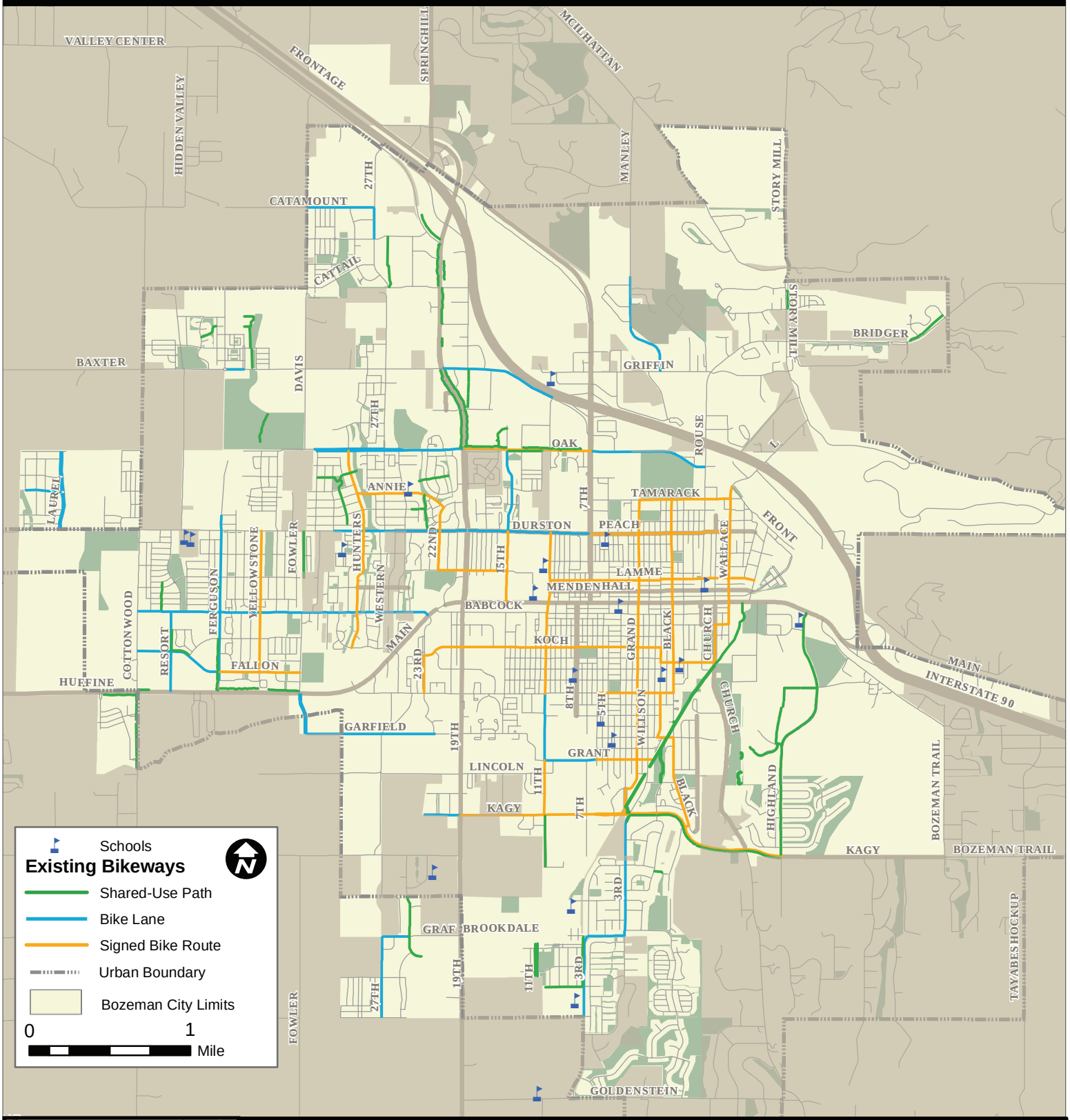


FIGURE 2-13
Existing Study Area Bicycle Network
January 2009
Data Provided by: City of Bozeman, Alta Planning & Design
Map Prepared by: Alta Planning+Design January, 2009

Greater Bozeman Area Transportation Plan

alta PLANNING + DESIGN

Existing Bozeman City Bicycle Network



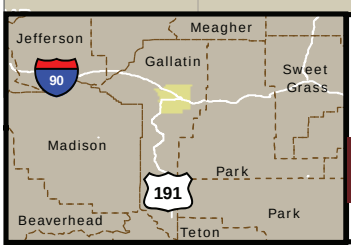


FIGURE 2-14
Existing Bozeman City Bicycle Network
January 2009
Data Provided by: City of Bozeman, Alta Planning & Design
Map Prepared by: Alta Planning+Design January, 2009

Greater Bozeman Area Transportation Plan

alta PLANNING + DESIGN

2.3.6 Existing Bicycle Facilities

As shown in **Figure 2-13**, Bozeman's existing on-street bikeway network is composed of a mix of on-street bike lanes (15.6 total miles) and signed bike routes (20.9 total miles). A number of shared use paths (8.3 total miles) also complement the on-street facilities. **Tables 2-11**, **2-12**, and **2-13** show the limits and lengths of existing bike lanes, signed bike routes, and shared use paths, respectively.

In addition to the total mileage of a bikeway system, it is important to consider the *quality* and *completeness* of the system. A high-quality bicycle facility provides treatments that result in a comfortable, welcoming experience for users.

Bike lane quality includes factors such as lane width, number of adjacent vehicle lanes, speed and volume of vehicular traffic, number of turning conflicts with driveways and parking, completeness of the system (few or no gaps), maintenance (pavement quality, sweeping, etc.) and signal detection that senses bicycles. Signed bike route quality includes factors such as wayfinding signs and markings, maintenance (pavement quality, sweeping, etc), traffic calming measures, crossing treatments at higher-order streets, speed and volume of vehicular traffic, and completeness of the system (few or no gaps).

Photo 6: Opportunities exist for new bicycle facilities through roadway reconstruction such as Durston Road where a new bike lane and bike pocket were built at the intersection with South 19th Avenue.

It should be noted that in Bozeman, two-way shared-use paths have largely been constructed parallel to major roadways in lieu of sidewalks and bike lanes. In some places the path is on one side of the street only. There are some safety concerns related to replacing sidewalks and bike lanes with two-way parallel paths due to conflicts caused by limited visibility and unexpected vehicle patterns at driveways and intersections. These shared-use paths have also been constructed in many cases when the adjacent property develops instead of when the roadway is constructed or reconstructed, leading to a fragmented network that can be difficult for users.

There are no bike lanes or signed bike routes in the rural study area (beyond the Bozeman city limits). There are shoulder bikeways on some rural arterials and collectors and some shared use paths, primarily near schools in Gallatin Gateway and Four Corners (see **Figure 2-13**).

Table 2-11

Existing Bicycle Facilities: Bike Lanes[1]

Street	From	To	Length
Annie Street	Saxon Way	Laurel Parkway	0.2 mi
Baxter Lane	N 19th Avenue	East of Sacco	0.4 mi
Catamount Street	Davis Lane	N. 27th Avenue	0.4 mi
Durston Road	Springbrook Avenue	N. 7th Avenue	1.6 mi
E Baxter Lane	Ferguson Avenue	Gallatin Green Road	0.1 mi
Fallon Street	Cottonwood Road	Ferguson Avenue	0.5 mi
Ferguson Avenue	Diamond Street	Valley Commons Drive	1.0 mi
Fowler Avenue	W Main Street	W Garfield Street	0.3 mi
Kagy Road	Eastern city boundary	S 19th Avenue	0.2 mi
Laurel Parkway	W Oak Street	Durston Road	0.3 mi
Manley Road	North of Gallatin Park	Griffin Drive	0.7 mi
N 15th Avenue	W Oak Street	Durston Road	0.5 mi
N 27th Avenue	Catmount Street	Catron Street	0.2 mi
Oak Street	New Holland Drive	N. 19th Avenue	0.9 mi
Oak Street	N 7th Avenue	N Rouse Avenue	0.7 mi
Resort Drive	W Babcock Street	Huffine Lane	0.5 mi
S 11th Avenue	W College Street	W Grant Street	0.4 mi
S 11th Avenue	North of Brookdale Drive	South of Alder Creek Drive	0.2 mi
S 3rd Avenue	Kagy Boulevard	W Graf Street	0.8 mi
S 3rd Avenue	W Graf Street	Dartmouth Drive	0.5 mi
W Babcock Street	Cottonwood Road	W Main Street	1.3 mi
W Garfield Street	Fowler Avenue	Research Drive	0.8 mi
W Graf Street	Westridge Drive	S 3rd Avenue	0.2 mi
W Grant Street	S 11th Avenue	S 6th Avenue	0.4 mi

[1]Source: City of Bozeman 2007 GIS data

Table 2-12
Existing Bicycle Facilities: Signed Bike Routes[2]

Street	From	To	Length
Annie Street	N Hunters Way	N 22nd Avenue	0.6 mi
Black Avenue	E Tamarack Street	E College Street	1.2 mi
Carol Place	S Black Avenue	E Kagy Road	0.03 mi
College Street	S 6th Avenue	S Black Avenue	0.5 mi
E Garfield Street	S Tracy Avenue	S Black Avenue	0.1 mi
E Olive Street	S Church Avenue	S Wallace Avenue	0.1 mi
E Story Street	S Tracy Avenue	S Church Avenue	0.3 mi
Fallon Street	Ferguson Avenue	Fowler Avenue	0.5 mi
Grand Avenue	W Tamarack Street	S 3rd Avenue	1.8 mi
Grant Street	S 6th Avenue	Galligator Trail	0.3 mi
Kagy Road	S 19th Avenue	Highland Road	2.1 mi
Koch Street	S 23rd Avenue	S Tracy Avenue	1.5 mi
Lamme Street	N 11th Avenue	N Broadway Avenue	1.3 mi
N 11th Avenue	Durston Road	W College Street	1.0 mi
N 15th Avenue	Durston Road	W Main Street	0.4 mi
N 22nd Avenue	Annie Street	W Beall Street	0.4 mi
N Hunters Way	W Oak Street	W Babcock Street	1.0 mi
N Yellowstone Avenue	Durston Road	Fallon Street	0.9 mi
Peach Street	N 7th Avenue	N Wallace Avenue	0.9 mi
S 11th Avenue	W Grant Street	W Kagy Road	0.3 mi
S 23rd Avenue	W Koch Street	W College Avenue	0.2 mi
S 3rdAvenue	S Grand Avenue	W Kagy Road	0.1 mi
S Black Avenue	E Garfield Street	Carol Place	0.6 mi
S Church Avenue	E Olive Street	E Story Avenue	0.2 mi
S Tracy Avenue	E Koch Street	E Story Street	0.1 mi
S Tracy Avenue	E College Street	E Garfield Avenue	0.3 mi
Virginia Way	W Babcock Street	Donna Avenue	0.2 mi
W Beall Street	N 22nd Avenue	N 15th Avenue	0.4 mi
W Oak Street	N 19th Avenue	N 7th Avenue	0.8 mi
W Tamarack Street	N Grand Avenue	N Wallace Avenue	0.6 mi
Wallace Avenue	Front Street	E Olive Street	0.9 mi

[2]Source: City of Bozeman 2007 GIS data

Table 2-13
Existing Bicycle Facilities: Shared Use Paths[3]

Street/trail name	From	To	Length	Notes
Cambridge Drive	West of Hidden Springs	S 3rd Avenue	0.2 mi	South side of street only
E Kagy Road	S 3rd Avenue	Highland Road	1.0 mi	On sidewalk; south side of street only
Ellis Street	Highland Road	Old Highland	0.2 mi	South side of street only
Ferguson Avenue	Ravalli Street	Huffine Lane	0.3 mi	West side of street only
Galligator Trail	Corner of Church & Story	Graf Street	2.0 mi	Trail is treated as shared-use because of its characteristics and transportation value.
Highland Road	E Main Street	E Kagy Road	1.5 mi	West side of street only
Huffine Lane	Fowler Avenue		0.2 mi	Extends west from Fowler to mid-block
Main Street to the Mountains – Library Extension	E Main Street	Corner of Church & Story	0.4 mi	Paved shared-use path, currently under construction. Not in roadway right of way.
N 19th Avenue	E Valley Center Road	W Oak Street	1.5 mi	Fragmented construction
Oak Street	N 19th Avenue	N 7th Avenue	0.7 mi	Fragmented construction
Old Highland Road	Ellis Street	Burke Park	0.5 mi	One side of street only; switches sides
S 11th Avenue	Kagy Road	Opportunity Way	0.3 mi	East side of street only
S 11th Avenue	North of Brookdale	South of Alder Creek	0.2 mi	Both sides of street
S 3rd Avenue	Graf Street	Cambridge Drive	0.3 mi	West side of street only
Simmental	Baxter Lane	Tschache	0.2 mi	
Unnamed trail			0.1 mi	Northeast from intersection of 27th & Cattail
Unnamed trail	Equestrian Lane	E Baxter Lane	0.1 mi	Mid-block greenway trail between Gallatin Green and Vaquero

[3]Source: City of Bozeman 2007 GIS data

2.3.7 Bikeway Signage

Well-designed roads usually require very little signing, because they are built so all users understand how to proceed. Conversely, an overabundance of warning and regulatory signs may indicate a failure to have addressed problems. The attention of drivers, bicyclists and pedestrians should be on the road and other users, not on signs along the side of the road.

Photo 7: Example of a bike route sign installed in Bozeman in 2002

Over-signing of roadways is ineffective and can degrade their usefulness to users. Too many signs are distracting and a visual blight, they create a cluttered effect and waste resources.

Photo 8: Main Street to the Mountains Trail Sign

The message conveyed by the sign should be easily understandable by all roadway users. The use of symbols is preferred over the use of text.

Bikeway signage includes wayfinding signs (e.g. trailhead signage or bike route numbering), facility type signs (e.g. "Bike Lane" signs posted along a roadway with a bike lane), regulatory signs (e.g. "Bike Xing" warning signs or bicycle-sized "Stop" signs), or etiquette signs (such as trail signs). All traffic control signage and markings should conform to the Manual of Uniform Traffic Control Devices (MUTCD Part 9 – Traffic Controls for Bicycle Facilities).

Photo 9: Share the Road signs have been installed in Bozeman on streets like W. College Street

The City of Bozeman has experienced a dramatic increase in bicycle-related signage in recent years. In 2002 a project funded through the Bozeman City Commission provided unique signs to designate a City-wide network of bike routes. Complementing the bicycle route signs are an expanding network of bike lanes stemming both from new development and reconstruction of some of Bozeman's major arterials such as Durston Road, West Babcock, and Baxter Lane. All of these new bike lanes use the MUTCD standard signage and markings. In addition to bike lanes and bike routes the City has provided "Share the Road" signs in some areas where space is limited along popular cycling routes such as W. College Street, S. Church Avenue, and N. 7th Avenue. Shared-use paths in both the City and County typically lack signage such as stop signs for cyclists or warning signs for motorists. Some of the newer shared-use paths being constructed, such as the path along Bridger Drive, do offer basic signage.

Photo 10: Bike Lane Sign

The trail network in and surrounding Bozeman has flourished with assistance from the Gallatin Valley Land Trust, and much of this system has wayfinding signage and trail kiosks.

Outside the Bozeman City limits, bicycle facilities and accompanying signage are scarcer. The County has installed Caution signs on some of its roadways such as Sourdough Road and Bridger Drive. The County currently has no designated bicycle routes or bike lanes, however there are shared use paths along the east side of Highway 191 from Gallatin Gateway north, the south side of Norris Rd (Hwy 84) from the Gallatin river to Four Corners, and from Four Corners towards Bozeman on Huffine Lane (see **Figure 2-13**).

Photo 12: Rural roads in the Bozeman area frequently have no bicycle facilities.

2.3.8 Bicycle Detection at Intersections

Traffic signal actuation in Bozeman involves a variety of technologies and is changing rapidly. Older signalized intersections in and around Bozeman rely on timers that allow cyclists the same opportunities for crossing as vehicles. While there is no priority or detection given to cyclists, delay is not usually long as the light will change according to its timing.

The majority of signals in the study area use embedded inductive loops to detect vehicles. Loops can be sensitive enough to detect bicycles provided they are located and calibrated properly. Detection performance also depends on the material composition of the bicycle. If a bicycle is not detected by the embedded loop, the cyclists can still press the crosswalk button if one is available. If the cyclist is not detected by the signal and there are no pedestrian

crossings, cyclists are forced to either make an unsafe movement through the intersection, or wait for a vehicle to trigger the signal.

Newer signals recently installed in the City, such as some on N. 19th Avenue, W. Main Street and Durston Road, have video detection technology that is sensitive enough to detect a bicycle waiting by itself at an intersection. This method of actuation is the most reliable and user-friendly for bicyclists.

2.3.9 Bicycle Parking

Bicycle parking is an important component in planning bicycle facilities and encouraging people to use their bicycles for everyday transportation. Bicycles are one of the top stolen items in most communities, with components often being stolen even when the bicycle frame is securely locked to a rack. Because today's bicycles are often high-cost and valuable items, many people will not use a bicycle for transportation unless they are sure that there is secure parking available at their destinations.

Cyclists' needs for bicycle parking range from simply a convenient piece of street furniture, to storage in a bicycle locker that affords weather, theft and vandalism protection, gear storage space, and 24-hour personal access. Where a cyclist's need falls on this spectrum is determined by several factors:

- Type of trip being made: whether or not the bicycle will be left unattended all day or just for a few minutes.
- Weather conditions: covered bicycle parking is apt to be of greater importance during the wetter months.
- Value of the bicycle: the more a cyclist has invested in a bicycle, the more concern she or he will show for theft protection. Most new bicycles cost $400-500, and often considerably more.

Bicycle parking can be broadly defined as either short-term or long-term parking:

- **Short-term parking**: Bicycle parking meant to accommodate visitors, customers, messengers and others expected to depart within two hours; requires approved standard rack, and appropriate location and placement. Racks are relatively low-cost devices that typically hold between two and eight bicycles, allow bicyclists to securely lock their frames and wheels, are secured to the ground, and are located in highly visible areas. Racks should not be designed to damage the wheels by causing them to bend. Bike racks should be located at schools, commercial locations, and activity centers such as parks, libraries, retail locations, post offices, churches, and civic centers, or anywhere personal or professional business takes place.

- **Long-term parking**: Bicycle parking meant to accommodate employees, students, residents, commuters, and others expected to park more than two hours. This parking is to be provided in a secure, weather-protected manner and location.

(a)  (b) 

Photo 13: (a) Short-term bicycle parking – "Inverted-U". (b) Long-term bicycle parking.

Bozeman Unified Development Ordinances related to bicycle parking

Ordinance 18.46.040.E
Bicycle Racks Required. All site development, exclusive of those qualifying for sketch plan review per Chapter 18.34, BMC, shall provide adequate bicycle parking facilities to accommodate bicycle-riding residents and/or employees and customers of the proposed development. Bicycle parking facilities will be in conformance with standards recommended by the Bozeman Area Bicycle Advisory Board.

Ordinance 18.19.070.E.3
In Urban Mixed Use Zoning Districts, covered bicycle parking shall be provided. The covered spaces shall be at least one-half of the total minimum bicycle parking. The minimum number of covered spaces shall be the greater of either 10 bicycle parking spaces or 5 percent of motor vehicle parking provided on-site.

Existing Bicycle Parking Facilities

Currently there are bike racks provided in downtown, on the MSU campus, at Bozeman area schools, at grocery stores, commercial centers, and at parks and community centers. However, many of the racks are outdated designs such as "wheelbender" racks and comb racks that only allow a wheel, not the bicycle frame, to be locked. The main rack at the MSU campus appears to be the "coat hanger" rack made by Cora. For a bicycle rack to be the most functional it should require low maintenance, meet the bicycle parking requirements of it, it should complement its surroundings, and support the frame of the bicycle and not just the wheel.

In general, the quantity of bike racks is usually adequate, but some of the outdated designs provide a lower quality of experience compared to modern racks (making them harder to use and less secure).

Photo 14: Bike racks are provided along Main Street, but the presence of bikes locked to street trees and railings may indicate that additional bike racks are needed.

Photo 15: These outdated "comb" type bike racks at a local restaurant are considered a less desirable rack design because it is difficult to lock the frame to the rack.

Recent suburban commercial development has been providing bicycle parking as required by City ordinance. Bozeman also has many examples of temporary bicycle parking of the "comb" variety that have been sponsored by and contain advertising for local bicycle shops. Racks such as these can be found chained near many businesses in downtown Bozeman. On Main Street and at the recently-completed Bozeman Public Library, the number of bikes often exceeds the number of racks, indicating a need for more racks.

No bike parking, short- or long-term, was observed in the study area outside of the city of Bozeman. No long-term bike parking facilities were observed in the Bozeman area.

2.3.10 Bikeway Maintenance

Currently, the City of Bozeman includes bikeway maintenance such as sweeping, striping, vegetation trimming, and snow removal in routine street maintenance, as well as providing residents with opportunities to request service through the pothole hotline and the City Shop phone number, which is publicized in water bills, online, and through the Bike Board. Vegetation trimming and snow removal on sidewalks fronting residences is the homeowner's responsibility. See **Table 2-14** for a list of maintenance activities and their frequency.

Gallatin County does not have any on-street bikeways at this time, so maintenance is not directly relevant. However, it should be noted that the County does not own a sweeper

truck, but does attempt to coordinate with the City for sweeping services as possible. Local cyclists note that riding in the spring can be rough going until rains and traffic begin to naturally clear the roads and shoulders. It is worth noting that the FY '09 budget includes money for a street sweeper and employee time specifically to sweep bike lanes.

Table 2-14
Bikeway Maintenance Activities & Frequency[4]

Activity	Bikeway type	Frequency	Agency
Sweeping	City bike lanes	Weekly as weather permits; focus on bike lanes	City of Bozeman
Sweeping	City bike route streets	At least twice yearly during Fall and Spring Clean-up; more as weather and staffing permit	City of Bozeman
Sweeping	On-demand; any city street	Per citizen request via call to City Shop	City of Bozeman
Sweeping	County facilities	N/A (no County bike facilities; County does not own sweeper truck)	Gallatin County
Striping	City bike lanes	Annually for painted lanes and markings; as needed/requested for thermoplastic lanes and markings	City of Bozeman
Pothole patching	Any city street	As requested through City's pothole hotline; response time is within 7 days	City of Bozeman
Vegetation trimming	Any city street	If sight triangle is blocked, City Forester will trim. Other streets are per citizen complaint; City will fix these as staffing permits and/or send letter to homeowner explaining their responsibility.	City of Bozeman
Snow removal	City bike lanes and bike routes	City removes snow from curb to curb (working around parked cars as possible). Removal starts on collectors when 2" of snow has accumulated, and after 4" on residential streets.	City of Bozeman
Snow removal	County facilities	N/A (no County bike facilities)	Gallatin County

[4]Source: Conversation with John Van Delinder (Bozeman Street Superintendent, on 9-25-07)

2.3.11 System Deficiencies

Bicyclists face various issues, including:

Maintenance Issues – Gravel, glass and other debris are routinely present on the bikeway system. This typically occurs when passing motor vehicles blow debris into the adjacent bicycle lane or shoulder. Gravel from snow removal on shoulders and in bike lanes is common during the winter and spring months.

Lack of Signage – Bozeman's bikeway system lacks wayfinding signage and other tools to orient riders and direct them to and through major bicycling destinations like MSU and downtown.

Photo 16: Some bike facilities have yet to be completed and present gaps in the bikeway network.

Conflicts Between Cyclists and Other Transportation Users – Cyclist safety and comfort issues arise on higher volume roadways lacking dedicated bicycle facilities or traffic-calming treatments. These roadways are most commonly high-volume 5- to 7-lane suburban arterials with frequent driveway access. For example, Huffine Lane and 7th Avenue are major north-south thoroughfares that connect to major commercial districts as well as schools and parks. However, these high-volume, high-speed streets lack bike lanes and have a relatively high number of driveways associated with commercial development, creating an uncomfortable bicycling environment. While S. 19th Avenue currently lacks bike lanes, a contract to reconstruct the roadway with full-fledged bicycle facilities has been awarded and will be constructed beginning summer 2009.

Photo 17: Bridger Drive has a variable shoulder along much of its length.

Main Street is also a major destination for all residents, including bicyclists, but a lack of bike lanes on this street forces bicyclists to share the lane with high volumes of motor vehicles (or, in most cases, ride on the sidewalk despite a sidewalk riding prohibition). Similarly, the one-way couplet of Mendenhall Street and Babcock Street also lack bicycle facilities.

Bozeman's historic downtown street grid provides numerous lower-volume street and crossing choices for bicyclists. Lower-density, less-connective street patterns in newer areas of the city force cyclists onto higher-order streets. When these streets do not have bicycle facilities, it discourages bicycle use.

Rural roads in the greater Bozeman area are generally low-volume, high-speed facilities with no shoulder bikeways and in some cases rumble strips. Bicyclists have nowhere to go when cars approach from behind, creating a facility where cyclists feel both uncomfortable and unsafe. Examples of uncomfortable rural facilities include Valley Center Drive and Sourdough Road and Bridger Drive.

Photo 18: Opportunities exist to make Kagy Boulevard, a designated bike route, a more comfortable bicycling environment.

Difficult Intersections – When signed bike routes or shared-use paths cross a major roadway with

no crossing accommodation, it makes crossing difficult, especially for less-confident users, or especially during peak vehicle traffic periods. These major roadways then act as barriers to bicycle travel for many users. For example, it can be very difficult for bicyclists using Lamme Street (a signed bicycle route) to cross N. 7th Avenue. Likewise, users of the new Main Street to the Mountains shared-use path near the library may find it difficult to cross Main Street.

Cyclist Behavior – Local bicyclists were observed riding in an unsafe manner throughout the study area. Such behavior includes riding on sidewalks, riding against traffic, running red lights and stop signs, and riding without lights at night. This behavior may indicate the need for education efforts concerning safe bicycling techniques.

2.3.12 Encouragement and Education Programs

Bicycle Encouragement and Education programs in the Gallatin Valley are mainly organized at the grassroots level by local bicycle and health related groups. Momentum in this area is growing with more community involvement and interest. As part of National Bike Month, Bike to Work/School week during the third week of May is the region's signature event. Bike to Work/School week is sponsored each year by the Bozeman Bicycle Advisory Board. 2007 Activities included a free breakfast at a different location each day of the week, a bicycle repair clinic and a bike rodeo at Bozeman Deaconess Hospital. The rodeo, organized by the Bozeman Police Department, included helmet fits, free helmets to needy individuals and safety lessons.

The Bozeman Area Bicycle Advisory Board has published a bicycle map for the City of Bozeman. The first version was published in 2005 with a second printing with updated facilities in 2007.

In 2007, a newly organized Safe Routes to School task force was developed. The new National Safe Routes to School program provided funding through the State program administered by MDT for educational and encouragement materials for Emily Dickinson School. The program also funds educational and encouragement materials, and the purchase of several radar equipped speed signs adjacent to the school. This group also publicized National Walk to School Day in October.

In addition to the Bike to Work/School rodeo at Deaconess Hospital, the Bozeman Police Department organizes 3-4 bicycle safety events (by request) at Bozeman elementary and middle schools. These rodeos are voluntary in attendance and typically occur after school hours. These events teach safe riding through obstacle courses, stopping drills, helmet safety, and visibility awareness. Children are also quizzed on road signs and rules of the road. These events typically draw over 200 children and can last up to four hours.

The Bozeman Police Department also acknowledges the need for better bicyclist and driver education and participates in periodic local radio and television talk shows to discuss road safety as well as contributes editorials to the Bozeman Daily Chronicle. Representatives from the Police Department also serve on the Pedestrian Safety Committee and the Safe Routes to School Taskforce.

2.3.13 Bicycles and Transit

Linking bicycles with Streamline mass transit effectively increases the distance cyclists can travel, provides options in the event of a bicycle breakdown, and gives cyclists alternatives to riding at night or in hot, cold or rainy weather. In August of 2006 Streamline began serving the Gallatin Valley with free service over four lines that serve Belgrade, Four Corners and Bozeman.

Photo 19: New Streamline buses can carry three bicycles.

In August of 2007 Streamline unveiled its new fleet of 23 passenger yellow 'bustle-back' buses, which closely resemble older Yellowstone National Park tour buses. Each of the 6 buses has a rack that can hold up to three bicycles on the front of the vehicle. The system is still quite new and supporting infrastructure such as bus pullouts and shelters are following slowly. Bozeman is in the process of building a new parking garage and intermodal facility on Mendenhall Avenue between Black Avenue and Tracy Avenue. This facility will serve as a formalized transfer point with a protected bus pullout. Bicycle parking will be installed within the parking garage and at street frontage.

2.3.14 Bicycle Collision History

Crash data was analyzed from January 2002 through June 2007 and was provided by Gallatin County 911 and the Bozeman Police Department (see **Figure 2-15** and **Figure 2-16**). Gallatin County 911 codes bicycle accidents as 'bicycle/motorcycle' thus reported accidents outside the Bozeman city limits may not in fact involve a bicycle. Despite this concern, these crashes were treated as bicycle accidents as no determination could be made. City of Bozeman accident data does specify data as bicycles only.

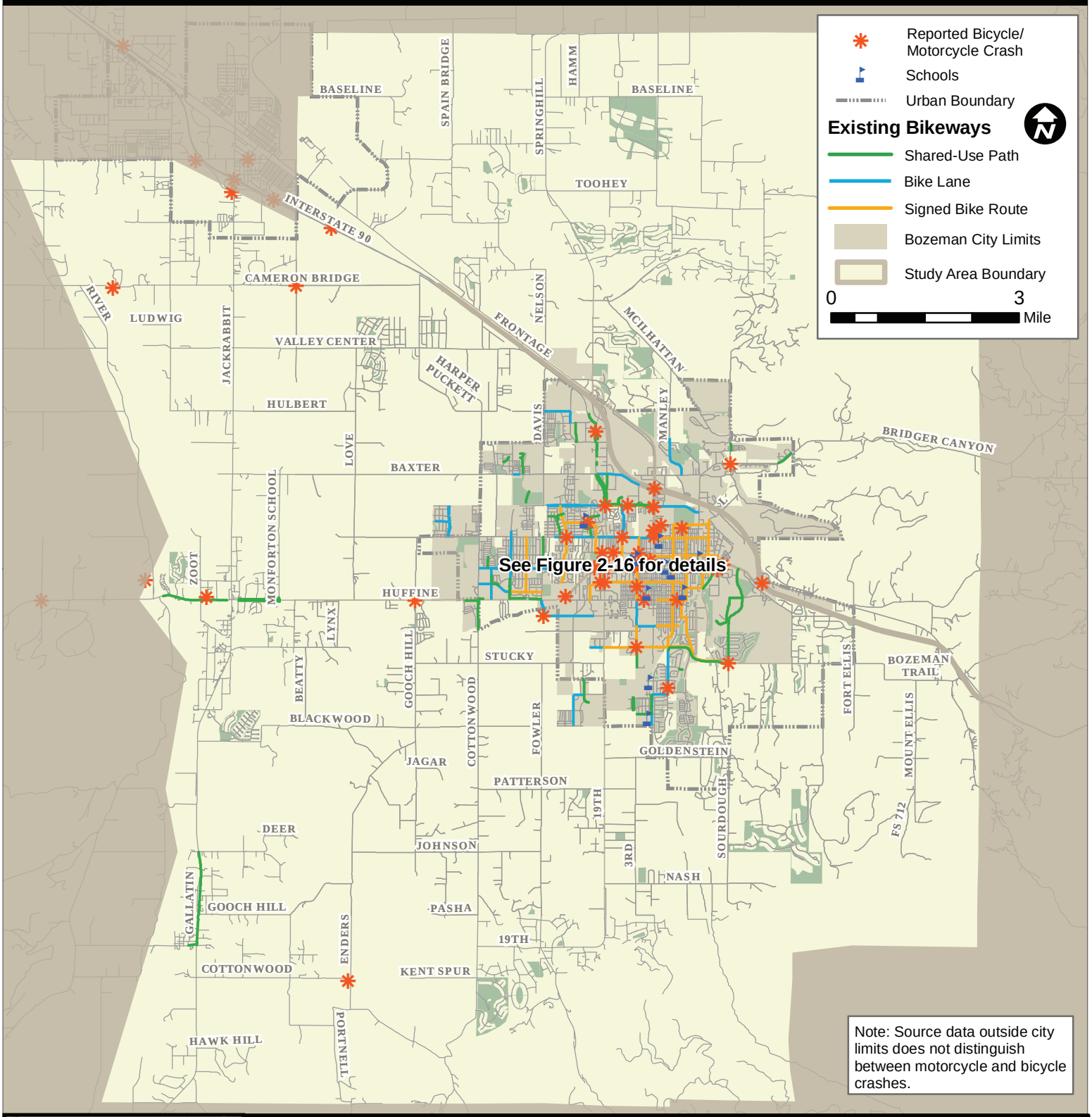
Since 2002, 83 bicycle/vehicle or bicycle/pedestrian accidents were reported in the greater Bozeman study area with 69 occurring within the Bozeman City limits. This number is likely lower than the actual number of collisions that have occurred, as many may have not been reported. In addition, the Police Department reports that accident tracking methods have improved in the last few years causing the years 2002-2005 likely being under represented in the number of collisions. Due to these factors trends between years cannot be ascertained. Data collected from the Bozeman Police Department does show that of the 69 recorded incidents 43 percent of the collisions were the fault of the bicycle, 14 percent were the fault of the vehicle and 42 percent undetermined.

Main reasons for bicycle rider fault involved riding on sidewalk or riding the wrong direction against traffic. Several accidents at night involved no lights or reflectors and in several cases the bicyclist lost control while braking. There were several instances where the bicycle rider ignored stop signs or red signals and swerving into or through traffic. A few cases involved intoxicated bicycle riders.

With vehicles at fault, there were several cases of opening doors on a rider and several cases of not yielding to the bicycle when turning or in a crosswalk.

Generally, rural crashes are concentrated on higher-order streets such as Huffine Lane and Cameron Bridge Road. Within Bozeman, crashes are likewise clustered along high-volume corridors such as 7th Avenue, 19th Avenue, and Main Street, but a smaller number of crashes were reported on lower-volume streets as well, including College Street, Garfield Street, and 11th Avenue. One thing nearly all the crash locations have in common are that they are principal arterials and collectors – almost none had dedicated bicycle facilities.

Study Area Reported Bicycle/ Motorcycle Collisions, 2002-2007



Note: Source data outside city limits does not distinguish between motorcycle and bicycle crashes.

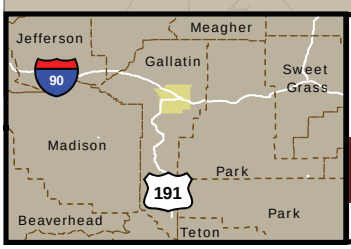


FIGURE 2-15
Study Area Reported Bicycle/Motorcycle Collisions,2002-2007
January 2009
Data Provided by: City of Bozeman, Alta Planning & Design
Map Prepared by: Alta Planning+Design January, 2009

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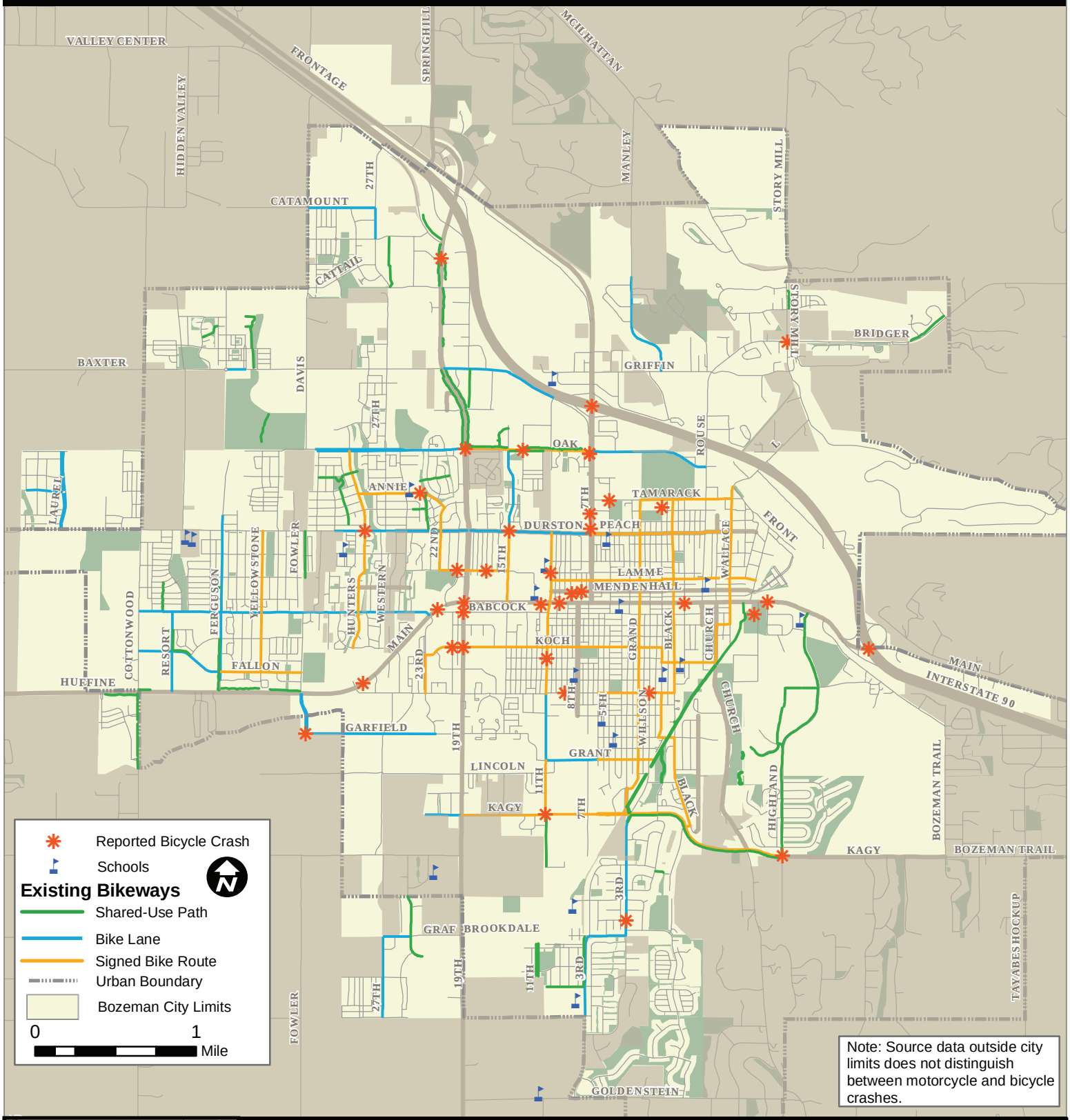
Bozeman Reported Bicycle/ Motorcycle Collisions, 2002-2007



Note: Source data outside city limits does not distinguish between motorcycle and bicycle crashes.

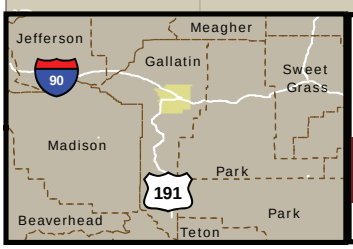


FIGURE 2-16
Bozeman Reported Bicycle Collisions, 2007-2007
January 2009
Data Provided by: City of Bozeman, Alta Planning & Design
Map Prepared by: Alta Planning+Design January, 2009

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2.3.15 Existing Pedestrian Facilities and Programs

Overview of Pedestrian Facilities

Photo 20: A shared-use path has been installed on Oak Street.

The most basic elements of the pedestrian network are sidewalks, pathways, crosswalks, and curb ramps. Sidewalks provide a space for pedestrian activity completely separated from motor vehicle traffic. Pathways (most commonly shared-use paths) also provide a separation from motor vehicle traffic, although pedestrians may have to share pathways with bicyclists and other non-motorized users. Crosswalks provide a legal extension of the sidewalk across a roadway, and curb ramps provide a transition between the raised sidewalk and the crosswalk for persons using mobility assistance devices. These elements should form a connected network to be functional, safe, and encourage people to walk.

2.3.16 Existing Pedestrian Gaps in Arterials and Major Collectors

The City of Bozeman requires that as development occurs, sidewalks be provided on both sides of public streets frontages. This requirement has resulted in a city that is generally very well equipped with sidewalk facilities. Areas still lacking pedestrian facilities include older arterials that have not undergone refurbishment, and some subdivisions constructed in the 1970s (some of which were originally part of the County).

The City has been reconstructing many of its older roadways such as Durston Road, and West Babcock Street. The results have been popular with residents and the "2005-2006 West Babcock Street Pedestrian and Bicyclist Monitoring Project" found a 256 percent increase in bicycling and walking along the corridor with the addition of sidewalks and bike lanes. **Figure 2-18** details arterials and collectors in the City of Bozeman with no sidewalk facilities.

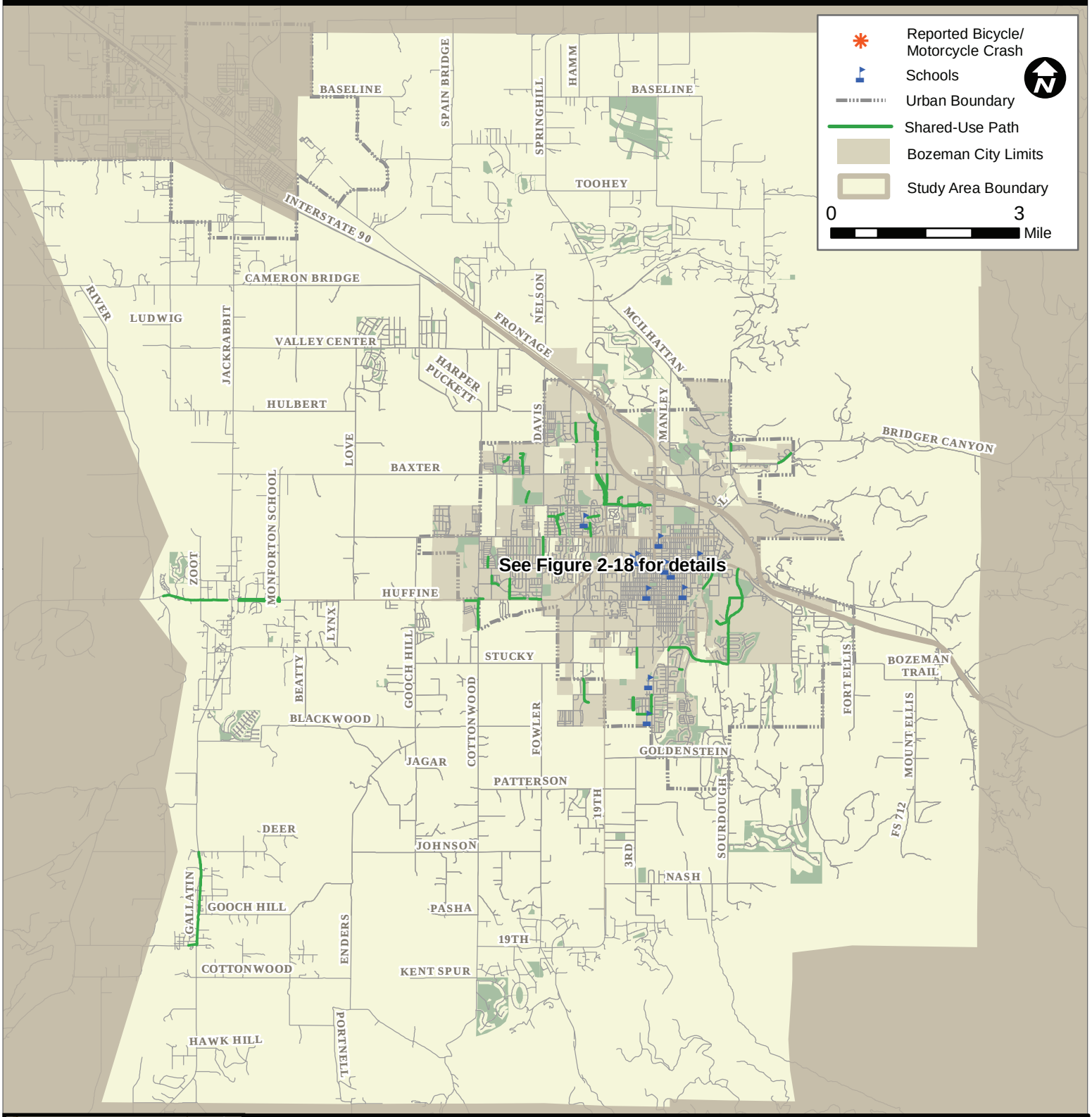
Main Street has also been reconstructed recently, and has wide, smooth sidewalks with fully ADA-accessible curb ramps and attractive street furniture, such as bike racks and street trees.

Gallatin County experiences a more spread out and less dense development pattern than the City of Bozeman. Distances are typically greater and the availability of adequate pedestrian facilities is sparse. Along major roadways within the study area, Gallatin County has few dedicated pedestrian facilities with the exception of a few short sidewalks in Four Corners and some shared use paths in Gallatin Gateway and Four Corners. Currently, the County addresses the issue of sidewalks and other pedestrian circulation facilities on a subdivision by subdivision basis. County planners have been working to improve opportunities for

inter-modal transportation within subdivisions by encouraging the County Commission to require trail systems, sidewalks, and bike lanes where appropriate. **Figure 2-17** details the existing pedestrian network within the unincorporated study area.

Photo 21: Main Street's wide sidewalks with features such as trees, awnings, decorative lampposts, and benches are comfortable and welcoming to pedestrians.

Existing Study Area Pedestrian Facilities



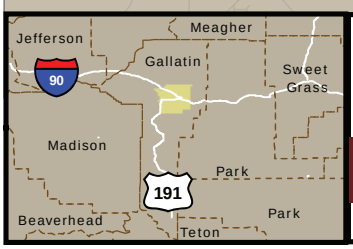


FIGURE 2-17
Existing Study Area Pedestrian Facilities
January 2009
Data Provided by: City of Bozeman, Alta Planning & Design
Map Prepared by: Alta Planning+Design January, 2009

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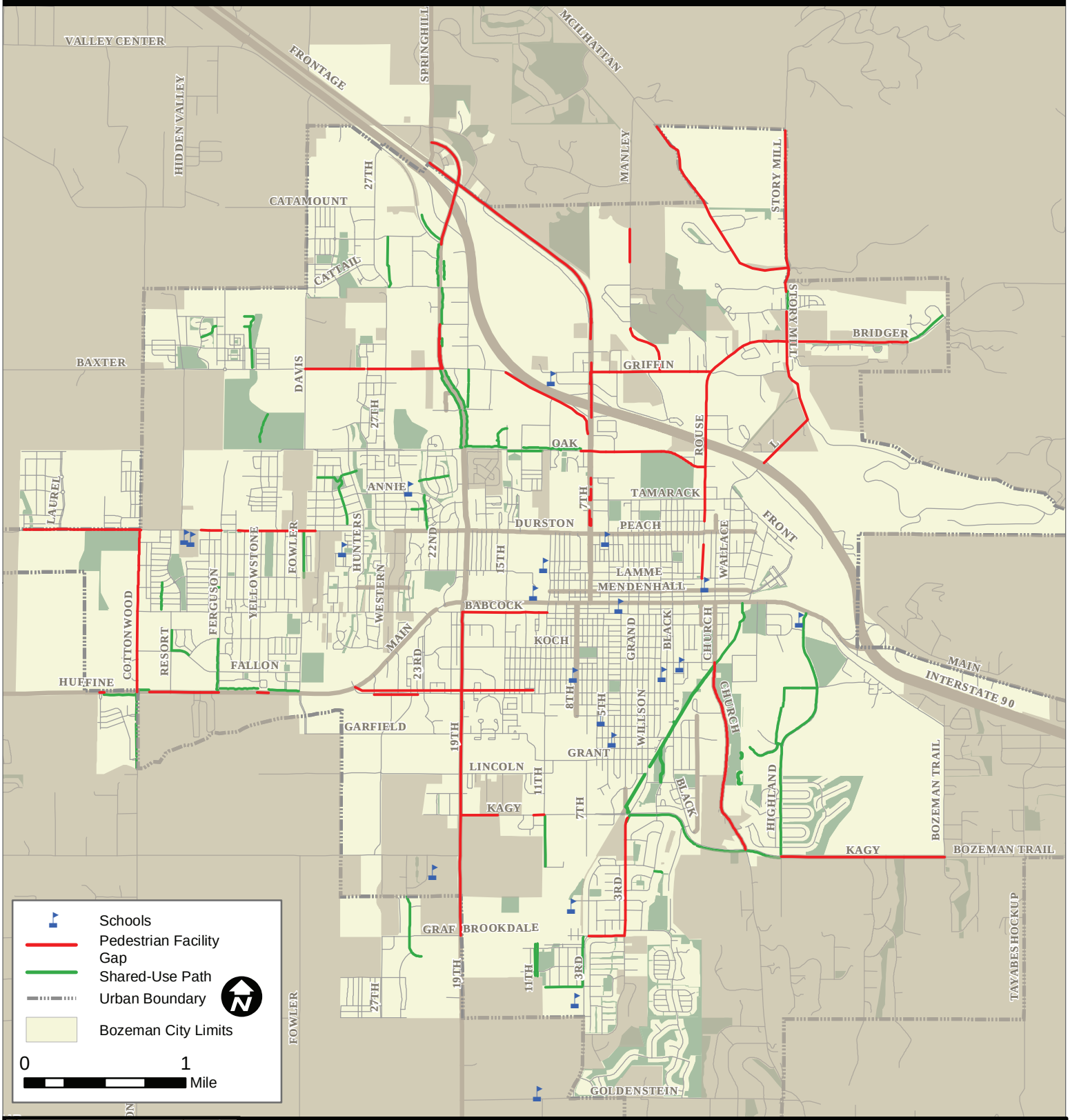
Existing Bozeman Arterial Pedestrian Gaps



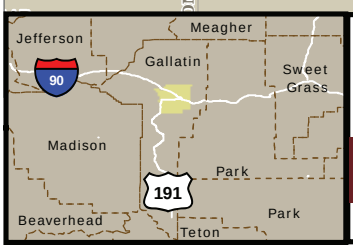


FIGURE 2-18
Existing Bozeman Arterial Pedestrian Gaps
January 2009
Data Provided by: City of Bozeman, Alta Planning & Design
Map Prepared by: Alta Planning+Design January, 2009

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2.3.17 Pedestrian Collision History

Crash data from January 2002 through June 2007 provided by the Bozeman Police Department were analyzed (see **Figure 2-19** and **Figure 2-20**). Fifteen crashes involving a pedestrian were reported in the greater Bozeman study area since 2002, all of which were within the Bozeman city limits. Seven of these crashes were on Main Street, two were on 7th Avenue, two were on Durston/Peach, and others were distributed throughout the city. These numbers, like the bicycle collision data, are likely underreported. The Bozeman Police Department reported that about half of the time the pedestrian was at fault, crossing mid block (jaywalking), or crossing against the signal. There were also several instances of riding on cars or jumping out into traffic.

2.3.18 Pedestrian Facility Maintenance

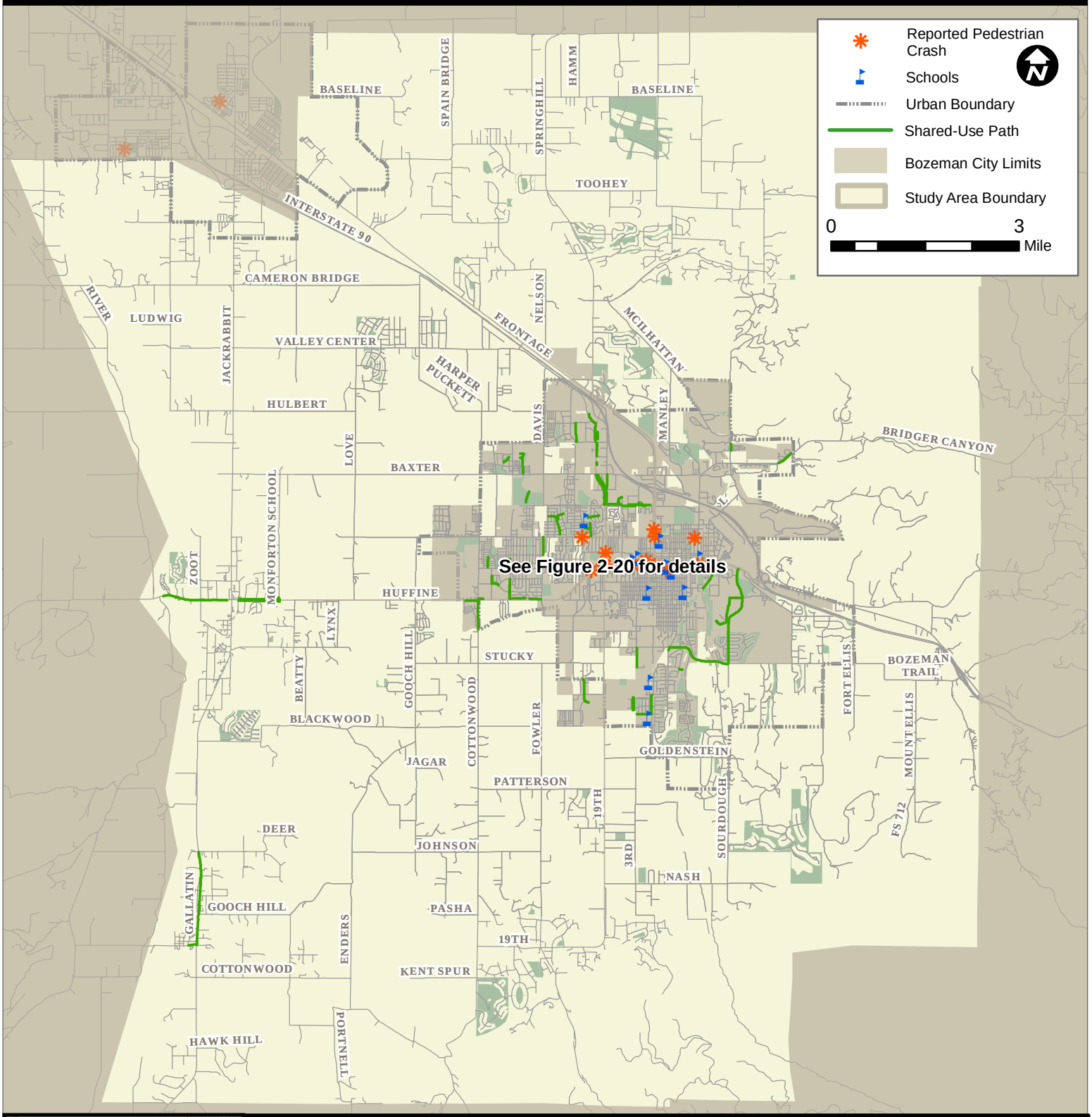
The City of Bozeman assumes maintenance responsibilities for sidewalks that run adjacent to parks that are adjacent to arterials in residential areas, and where residential lots are double fronted. Currently, all sidewalk maintenance in the City of Bozeman for sidewalks fronting residences is the responsibility of the homeowner. However, the City seeks to provide some level of maintenance support, in large part because there are few contractors willing to take on small concrete jobs, so residents are often unable to find a professional to undertake patching. **Table 2-15** lists pedestrian facility maintenance activities and their frequency. Gallatin County does not have any sidewalks at this time, so maintenance is not directly relevant.

Table 2-15
Pedestrian Maintenance Activities & Frequency[5]

Activity	Frequency	Agency
Sidewalk patching/ root removal	Is homeowner responsibility but City will patch as staffing permits and/or send letter to homeowner explaining their responsibility	City of Bozeman
Vegetation trimming	If sight triangle is blocked, City Forester will trim. Other streets are per citizen complaint; City will fix these as staffing permits and/or send letter to homeowner explaining their responsibility.	City of Bozeman
Snow removal	Is property owner responsibility; City removes snow on sidewalks in front of City facilities, along arterials, and in residential areas with double fronted lots.	City of Bozeman

[5]Source: conversation with John Van Delinder, Bozeman Street Superintendent, on 9-25-07

Study Area Reported Pedestrian Collisions, 2002-2007



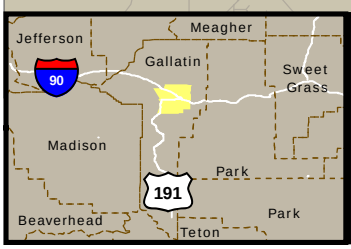


FIGURE 2-19
Study Area Reported Pedestrian Collisions, 2002-2007
January 2009
Data Provided by: City of Bozeman, Alta Planning & Design
Map Prepared by: Alta Planning+Design January, 2009

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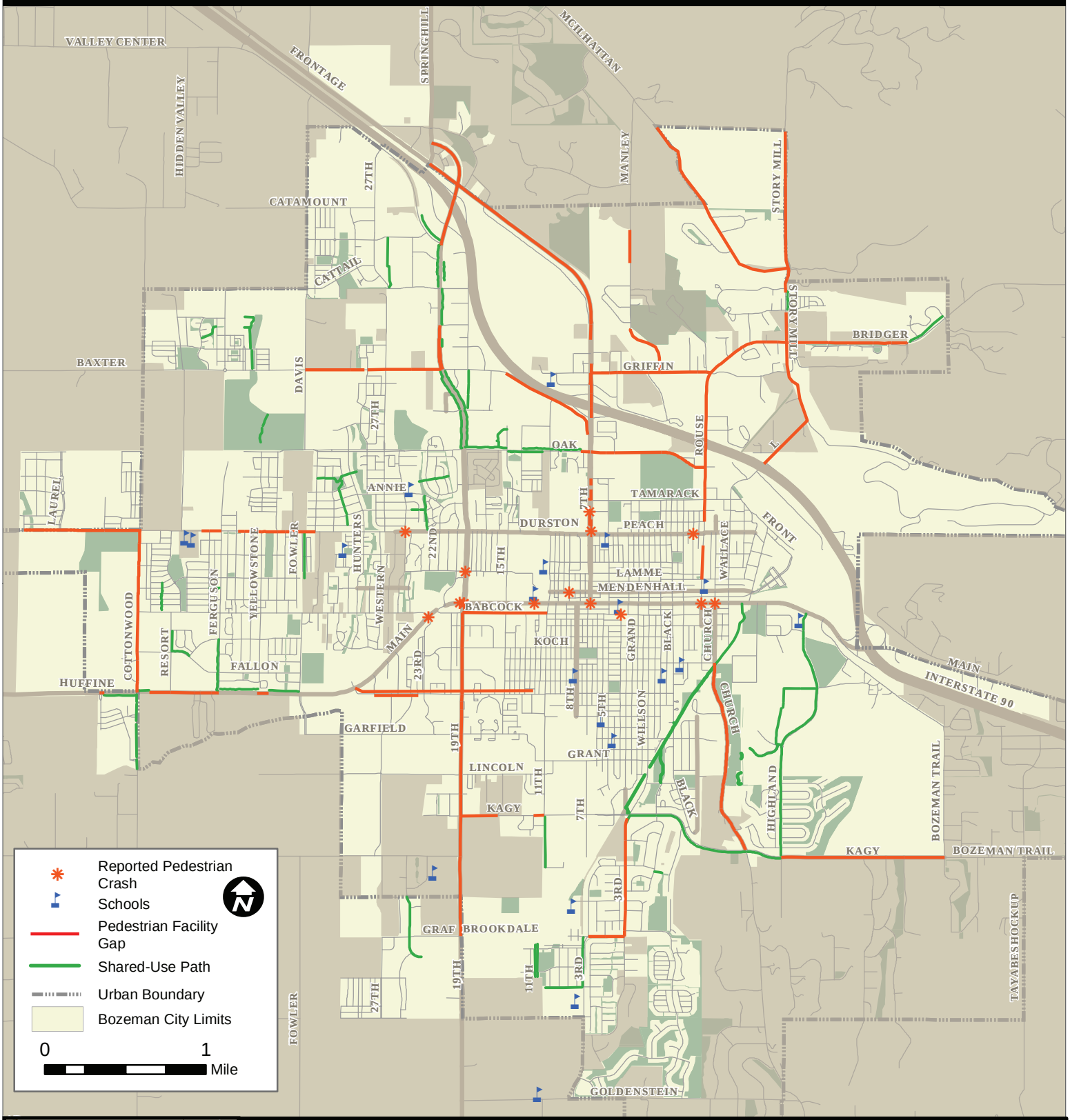
Bozeman Reported Pedestrian Collisions, 2002-2007



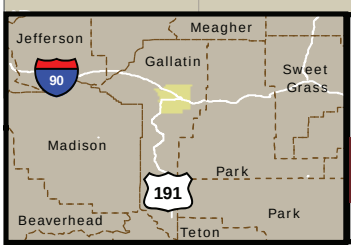


FIGURE 2-20
Bozeman Reported Pedestrian Collisions, 2002-2007.
January 2009
Data Provided by: City of Bozeman, Alta Planning & Design
Map Prepared by: Alta Planning+Design January, 2009

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2.3.19 System Deficiencies

Pedestrians face daily obstacles in Bozeman, as described below.

Maintenance Issues

Existing sidewalks in many parts of Bozeman (e.g., older portions of N. 7th Avenue) suffer from cracking or heaving. Additionally, overgrown vegetation obstructs the sidewalk in some places, forcing pedestrians to walk in the adjacent boulevard strip (if one exists) or road. Construction gravel and debris is not always removed from sidewalks promptly, and during the winter, not all residents remove snow as well as the law requires.

Photo 22: Opportunities exist to improve the conditions of older sidewalks such as this located along Main Street.

Lack of Transit Stop Amenities

The Streamline transit system is relatively new, and designated stops lack shelters, benches, and posted schedules. Walkways providing access to some stops are also in substandard condition.

Lack of Signage

Bozeman's pedestrian system would benefit from signage and other wayfinding tools to orient pedestrians and direct them to and through major destinations like MSU and downtown.

Fragmented Sidewalk Network

Although a relatively complete sidewalk network exists in downtown Bozeman and adjacent neighborhoods, the system is fragmented in other areas. Several major streets (e.g., Huffine Lane and S. 19th Avenue) lack sidewalks altogether while others (e.g. Rouse Avenue and N. 7th Avenue) have partial sidewalks.

While a complete sidewalk inventory was not performed on non-arterial streets, multiple field visits, resident comments in surveys, public meetings, and stakeholder interviews indicated that the residential sidewalk network has numerous gaps and fragments. Sidewalk installation is required on a lot-by-lot basis when the lot is developed, as opposed to when a subdivision is developed; if a lot remains undeveloped for any length of time, the sidewalk system remains incomplete. The City of Bozeman ordinance 18.74.030 addresses this issue by requiring the developer to construct unfinished sidewalks regardless of any other improvements to the lot on the 3rd anniversary of plat recordation.

Rural roadways in the greater Bozeman area generally lack any pedestrian accommodation (though some sidewalks were observed near Four Corners). Some unpaved trails have been provided as development occurs.

Photo 23: Sidewalk gaps in new development areas can exist for up to 3 years. At the end of 3 years the developer is required to finish any undeveloped sidewalk sections.

Photo 24: West Babcock Street (S. 19th to S. 11th Ave) acts as a major pedestrian corridor. Opportunities exist for expanded pedestrian facilities.

Difficult Crossings

Pedestrians face a variety of difficult street crossing conditions:

- Crossing Main Street west of 7th Avenue is challenging due to the street width (5 lanes) and due to relatively long distances between signalized intersections and marked crossings. This discourages pedestrians from walking to services along the roadway. Many chose to dart across the roadway to reach their desired destinations. Many pedestrians are students and families trying to cross between residential neighborhoods south of Main Street and Bozeman High School to the north of Main Street. Likewise, crossing Main Street east of downtown is challenging due to higher vehicle speeds and a lack of crossing treatments.

- Similarly, major arterials throughout the city can be difficult to cross (including 7th Avenue, 19th Avenue, Rouse Avenue, and Kagy Boulevard), with minimal or no crossing treatments. For example, pedestrians encounter relatively high vehicle traffic volumes when crossing Rouse Avenue from Hawthorne School to the north. Additional treatments beyond an existing crosswalk may be necessary to facilitate safe and convenient crossings.

- Pedestrians with disabilities experience crossing difficulties in Bozeman. Main Street has been retrofitted with an accessible sidewalk including curb ramps at every intersection, but curb ramps at intersections in other parts of the city are in poor condition or disrepair, while some intersections lack curb ramps altogether. This can

make traveling by wheelchair or motorized mobility device challenging, if not impossible. Visually and mobility impaired pedestrians experience difficulty navigating through intersections with curb ramps oriented diagonally toward the intersection's center rather than perpendicular toward a crosswalk. Signalized intersections also lack audible pedestrian signals to facilitate safe crossings for the visually impaired.

Photo 25 and 26: This intersection along Main Street has a recently installed crosswalk to accommodate crossing pedestrians. The above photos show a before and after of the intersection.

2.3.20 Bicycle and Pedestrian Enforcement

The Bozeman Police Department does enforce vehicle code by stopping and citing pedestrians, bicycles and the vehicles that endanger them. It is typically more difficult to enforce the laws to pedestrians and bicyclists without foot and bicycle units on the streets. The Police Department is frequently understaffed and unable to commit such resources. Generally, enforcement is left to officer discretion. If not responding to a call, officers are encouraged to patrol school zones during student arrival or departure times, stopping vehicles that speed or behave dangerously. Typically citations are made about half the time when a vehicle is stopped; officers also use these stops as an opportunity for driver education. Pedestrian infractions are also enforced, although these rarely end up as citations. The Police Department does also engage in periodic focused enforcement in certain areas. For example, between 50 and 60 citations were issued to drivers and pedestrians in Downtown Bozeman crosswalks over a two-day operation in 2006. In addition, parking officers are encouraged to stop people to correct behavior even though they have no authority to cite.

2.3.21 Public Involvement

The Gallatin Valley and its proximity to a wealth of outdoor activity has in all regards created an active resident base. Trails, bicycle facilities and sidewalks are not typically considered as fringe amenities, but essential components of the lifestyles of area residents. As such, analysis done on the bicycle and pedestrian network within the study area should

include the input of stakeholder groups as well as members of the general public. The information collected through the following activities has been included in this analysis of the existing conditions.

Stakeholder Interviews – Five stakeholder groups were interviewed in June of 2007. The groups were selected based on their influence and proximity to local bicycle and pedestrian issues. The meetings gave the stakeholder groups an in-depth opportunity to share their concerns, plans, questions, and hopes for the bicycle/pedestrian element of the transportation planning process. The stakeholder groups included:

- Montana State University
- The Pedestrian and Traffic Safety Committee
- The Bozeman Area Bicycle Advisory Board
- The Safe Trails Coalition
- The Gallatin Valley Land Trust

Each stakeholder group provided the project team with a history of their organization, goals for the bicycle and pedestrian element of the transportation plan, perceived problems and problem areas. A detailed summary of these stakeholder group interviews can be found in the Appendix.

Public Workshop #1 – The first of three public workshops was held on June 27th, 2007 at Bozeman High. This workshop drew over 60 members of the public and was held as part of the Transportation Plan update. After a primer, attendees were allowed to participate in smaller workshop groups. The non-motorized workshop was focused on bicycle and pedestrian issues within the study area. The workshop gave attendees the opportunity to provide open-ended input about problem areas, gaps in the network, or ideas for new facilities. Blank large format maps and comment sheets were provided for attendees to mark up.

Greater Bozeman Area Bicycling and Walking Survey – The public involvement process was expanded further with the launching of the Greater Bozeman Area Bicycling and Walking Survey in August of 2007. The survey was created for online participation with supplemental paper versions being made available at various places around Bozeman including the Senior Center and Library. In addition, the survey was sent out via hard copy to 9,000 households with the September 2007 City of Bozeman water bill. The response to the survey was tremendous, with over 3,200 responses received. Of these responses approximately 1,700 responses were submitted electronically with minimal advertising. Of the 9,000 paper copies distributed though the water bills, 1,581 were returned for a 17.6 percent response rate.

Because of the large response brought by the City of Bozeman water bills the number of responses by location within the Study Area cannot be considered representative, however the responses of certain groups have been analyzed separately where needed.

- **Question 1 – Where do you live?**

Of the participants, 89 percent lived within the City of Bozeman, 8 percent lived in unincorporated Gallatin County, 1.5 percent lived in Four Corners and 1 percent lived in Gallatin Gateway.

- **Question 2 – What age group do you belong to?**

Of the survey respondents, 6 percent were under 25 years old, 7 percent were over 70 and 86 percent fell into the 26-69 age group. Of the aged responses, 4.5 percent of respondents were a student of some kind and 4.8 percent were retired.

- **Question 3 – Do you have children under 16 at home?**

This question helps to identify trends and views of parents with children in school. Of the total responses, nearly 28 percent could be classified as 'parents'.

Questions about walking

- **Question 4 – How often do you walk (transportation or recreation)?**

This question shows that the vast majority of respondents are pedestrians and do use pedestrian facilities very frequently. Fully 84 percent of respondents walked at least weekly with almost 60 percent walking daily or almost daily.

- **Question 5 – If you walk, why do you walk?**

This question distinguishes motives for walking. From a utility point of view, almost 47 percent of respondents walk for errands or other transportation. 32 percent of respondents walk as a means of commuting to work or school. Recreationally, 79 percent of respondents walk for exercise or fitness, of these 62 percent walk for fun. Pets and children had a very large impact on walking with over 55 percent of respondents stating this as a reason for walking – more than for errands or transportation.

- **Question 6 – What are the reasons you don't walk or don't walk more frequently?**

Eleven choices greeted respondents in this question. Of these the top five reasons were distance, the need to carry items, lack of sidewalks or paths, lack of time, and perceived danger from the number and speed of vehicles. The third most stated response (33 percent of respondents) was the lack of sidewalks or paths.

Questions about bicycling

- **Question 7 – How often do you ride a bicycle?**

While nearly all the respondents are pedestrians, fewer rode bicycles frequently. Fully 52 percent of respondents road a bicycle at least weekly with 67 percent several times a month. Of these respondents 30 percent or almost 900 ride a bicycle daily or almost daily. This figure alone means there are a significant amount of bicycles on the roads each day. 17 percent of respondents rode a bicycle rarely, with the final 15 percent not riding a bicycle at all.

- **Question 8 – If you ride a bike, why do you ride?**

This question distinguishes motives for bicycling. From a utility point of view, 57 percent of respondents ride a bike for errands or other transportation with 53 percent riding as a means for commuting to work or to school. Unlike walking, cyclists do not seem to make a distinction between exercise/fitness and recreation or fun. Both choices were even at almost 77 percent. People view riding bikes for fitness as fun.

- **Question 9 – What are the reasons you don't ride a bike or don't ride more frequently?**

The two primary concerns respondents had with cycling were the lack of facilities (bike lanes or paths) (57 percent) and the number of cars/motorists and speed of traffic on the roads (53 percent). These reasons were given almost twice as often as the need to carry things (33 percent), far away destinations (30 percent), poor conditions of existing bicycle facilities (26 percent) and the weather (26 percent).

- **Question 10 – Where would you like to walk and/or bicycle from your home?**

Responses for each of the categories given were high. Transportation related destinations such as neighborhood stores (70 percent), place of work (61 percent) and shopping centers (52 percent) all rated high. Recreational destinations also ranked very high. Parks, swimming pools and recreation areas were cited by 55 percent of respondents while off-road paths garnered the most responses of all destinations with 71 percent. Of interest here is that survey respondents regarded good off-road paths as being not only a facility to make it easier to get places, but they view these facilities as destinations in their own right.

- **Question 11 – Please rate the following potential projects for improving walking and/or biking according to their priority to you.**

This question was the most extensive and perhaps the most important of the survey. Respondents were asked to rate types of projects by importance ranging from high, moderate, neutral, low priority, and an oppose option. Respondents were also given the opportunity to provide their own projects and 558 chose to participate.

Because of the large amount of data generated though this question a system was developed to weight each type of response to produce a score out of a possible 150 points. Positive feedback contributed to this score while negative feedback detracted from it. **Table 2-16** on the following page summarizes the information from this question.

Table 2-16
Potential Project Ranking From Question 11

Ranking	Score/150	Projects
1	117	On-road bike lanes or paved shoulders
2	109	New/improved unpaved trails
3	104	New/improved paved shared-use paths
4	102	Safe Routes to School programs and improvements
5	102	Increased maintenance (sweeping/plowing of bike lanes, sidewalks, and trails, hedge trimming, etc.)
6	101	Increased enforcement for traffic violations (e.g. speeding, red light running, parking violations)
7	99	Traffic calming projects to slow/reduce vehicles
8	96	Education or promotional programs for children
9	94	Signed on-road bike routes
10	92	Intersection/crossing improvements
11	91	Improved pedestrian/bicycle connection to MSU
12	87	New/improved marked crosswalks
13	86	Education or promotional programs for cyclists
14	86	Improve sidewalks for disability access
15	82	Education or promotional programs for drivers
16	77	New/improved sidewalks
17	69	Access to transit (bike racks on buses, sidewalks leading to stops, etc.)
18	66	More/better bicycle parking

From the above analysis it is apparent that new on and off-street bicycle facilities ranked consistently the highest in desire by survey respondents. Safe Routes to School related programs and improvements ranked fourth among respondents. Also of high importance was increased maintenance and enforcement of bicycle and pedestrian facilities. Educational programs received a moderate amount of importance and surprisingly, bicycle parking ranked lowest. This may indicate that finding a place to park a bicycle is not a significant deterrent to bicycling in the Bozeman Area and that for the most part bicycle parking is adequate.

- **Question 12 – Please provide the specific locations and a description of up to three high-priority projects identified in question 11.**

Responses related to bicycling had high instances of new bike lane projects around problem streets. The most numerous responses, based on the response of 2005 separate written comments, were received and included the following:

- Connections to Belgrade and Four Corners
- More trails and shared-use paths
- Better connections to many local trailheads
  - "M" Trail
  - Bozeman Creek Trail
  - Sourdough Trail

- Bike Lanes
  - Main Street
  - Willson Street
  - Babcock Street
  - Durston Road
  - Rouse Avenue
  - Mendenhall Street
  - Sourdough Road
  - 19th Street – Access to shopping
  - Kagy Boulevard
  - College Street
  - 11th Avenue
  - N. 7th Ave
  - S. 8th Ave
  - Highland Boulevard
  - Garfield Street
  - Bridger Drive
- More bike racks on Main Street (and downtown) and at the Library
- Shoulders on rural roadways
  - Goldstein Lane
  - Bridger Drive
  - Sourdough Road
  - Frontage Roads
  - Church Street
- High Speeds of cars
- Red light enforcement
- Driver awareness

Responses related to pedestrian conditions focused primarily on the following areas:

- Winter snow removal
- Sidewalk maintenance (including vegetation)
- New sidewalks where there aren't any currently
- Disability access
- Difficult crossings – new crosswalks
- High speeds of cars
- Driver awareness
- Red light enforcement
- More trails that connect to places

Additional areas that exhibited high instances of responses were calls for traffic calming on residential streets that have high speeds.

- **Question 13 – Is there anything else you'd like to tell us about walking and/or bicycling in the Bozeman area?**

This question produced 1,647 almost totally unique responses. The responses were reviewed, however many of the conclusions that can be made mirror those from question 12.

- **Question 14 – Would you like to receive information about future public meeting for the Transportation Plan?**

This question provided the project team with 1,043 new email addresses for project related newsletter and information distribution.

2.3.22 Equestrian Issues

There are no public trail systems in the City of Bozeman that allow for equine travel. Historically, equestrians have used the rural road network of unpaved roads to travel between the many equestrian facilities within the planning boundary, as well as to MSU and the Fairgrounds. As Bozeman grows, it is becoming increasingly difficult for them to access these sites.

Photo 27: A group of equestrians traveling along a rural roadway in Gallatin County.