Flathead County Transportation Plan – Phase II

Existing Transportation System Technical Memorandum

- Problem Identification
- Crash Analysis
- Intersection and Corridor Capacity Analysis

Prepared For:

Flathead County
Planning and Zoning Office
Kalispell, Montana

Prepared By:

Robert Peccia & Associates
825 Custer Avenue
Helena, Montana
www.rpa-hln.com

June, 2009

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Chapter 2: Existing Transportation System

2.1 INTRODUCTION

In an effort to clearly understand the existing traffic conditions and determine potential problem areas, it was necessary to gather current information about different aspects of the transportation system.

Existing traffic volume data collected by Flathead County and the Montana Department of Transportation was used to determine average daily traffic (ADT) volumes on major road segments within the county. Additional traffic data was collected by RPA during the development of the *Flathead County Transportation Study – Phase 1* and throughout the development of this Plan. The combination of supplied data and collected data was used to determine current operational characteristics, and to identify traffic problems that may exist or are likely to occur within the foreseeable future. Information that was gathered to help evaluate the system includes, but was not limited to, the following:

- Existing functional classifications;
- Existing traffic volumes (ADTs);
- Existing roadway corridor conditions;
- Speed data for select corridors;
- Intersection turning movement counts;
- Current intersection control types;
- Traffic crash records.

2.2 EXISTING FUNCTIONAL CLASSIFICATIONS

One of the initial steps in trying to understand an existing transportation system is to first identify what roadways will be evaluated as part of the larger planning process. A transportation system is made up of a hierarchy of roadways, with each roadway being classified by the character of service they provide. 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, than 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, 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:

http://www.mdt.mt.gov/other/urban_maps/fc_internet/KALISPELLFUNC.PDF (Kalispell Urban Area)

http://www.mdt.mt.gov/other/urban_maps/fc_internet/WHITEFISHFUNC.PDF (Whitefish Urban Area)

http://www.mdt.mt.gov/travinfo/docs/funct-classification.pdf (State Rural Area)

Roadway functional classifications within rural Flathead County include principal arterials, minor arterials, major and minor collector routes, and local/subdivision roads. The urban areas of Flathead County are also served by a similar hierarchy of streets. However, due to their urban nature, the volumes on these streets are generally higher than in rural 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

Photo 1: Highway 35 - Principal Arterial

The purpose of the principal arterial is to serve the major centers of activity, the highest traffic volume corridors, and the longest trip distances. This group of roads carries a high proportion of the total traffic. Most of the vehicles entering and leaving the area, as well as most of the through traffic bypassing a 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. Principal arterials connect only to other principal arterials or to the interstate system and should not allow for direct residential driveway access.

The major purpose of the principal arterial is to provide for the expedient movement of traffic. Service to abutting land is a secondary concern. Principal arterials should be public roads maintained by the MDT. Easement/right-of-way widths for arterials must meet MDT standards. The speed limit on a principal arterial could range from 25 to 70 mph depending on the area setting.

Minor Arterial System

The minor arterial street system interconnects with and works in conjunction with the principal arterial system. It accommodates trips of moderate length at a somewhat lower level of travel mobility than principal arterials, and it distributes travel to smaller geographic areas. With an emphasis on traffic mobility, this network includes all arterials not classified as principal arterials. While minor arterials provide access to adjacent lands, direct residential driveway access should not be allowed.

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

Minor arterials should be public county or state roads. Easement/right-of-way widths for state minor arterials must meet MDT's standards. Easement/right-of-way widths for county minor arterials must meet Flathead County's standards. Posted speed limits on minor arterials would typically range between 25 and 70 mph, depending on the setting.

Photo 2: Whitefish Stage - Minor Arterial

Collector System

Photo 3: West Valley Drive - Major Collector

The collector street network serves a dual 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 access residential neighborhoods. The collector system affords easy access to the arterial system and 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. Posted speed limits on urban collectors typically range between 25 and 45 mph; rural collector speed limits can range from 25 to 70 mph depending on setting and roadway surfacing.

Collectors penetrate but should not have continuity through residential neighborhoods. Direct residential driveway access onto collector streets is typically not allowed. The actual location of collectors should be flexible to best serve developing areas and the public.

Photo 4: Batavia Lane - Minor Collector

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 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 without discontinuities. Collectors are typically dedicated to the public and maintained by the county.

Collectors are divided into two categories: minor and major. ADT determines whether a collector is minor or major; minor collectors generally serve less than 1000 ADT.

Unclassified Roads

Unclassified roads are all facilities not included in one of the higher systems. These roadways may function as minor collectors, local roads or subdivision roads and their classification is determined on a case-by-case basis.

Subdivision Road System

Photo 5: Winchester Street - Local / Subdivision Street

The subdivision road network provides direct access to residential, commercial or industrial lots, or other abutting lands, and connections to higher order systems. These roads typically service subdivisions and through-traffic movement is typically discouraged. Subdivision roads may be internal, located on the perimeter, or external to the subdivision. The minimum easement/right-of-way width for a subdivision road is generally 60 feet. The speed limit on subdivision roads is usually 25 mph or less.

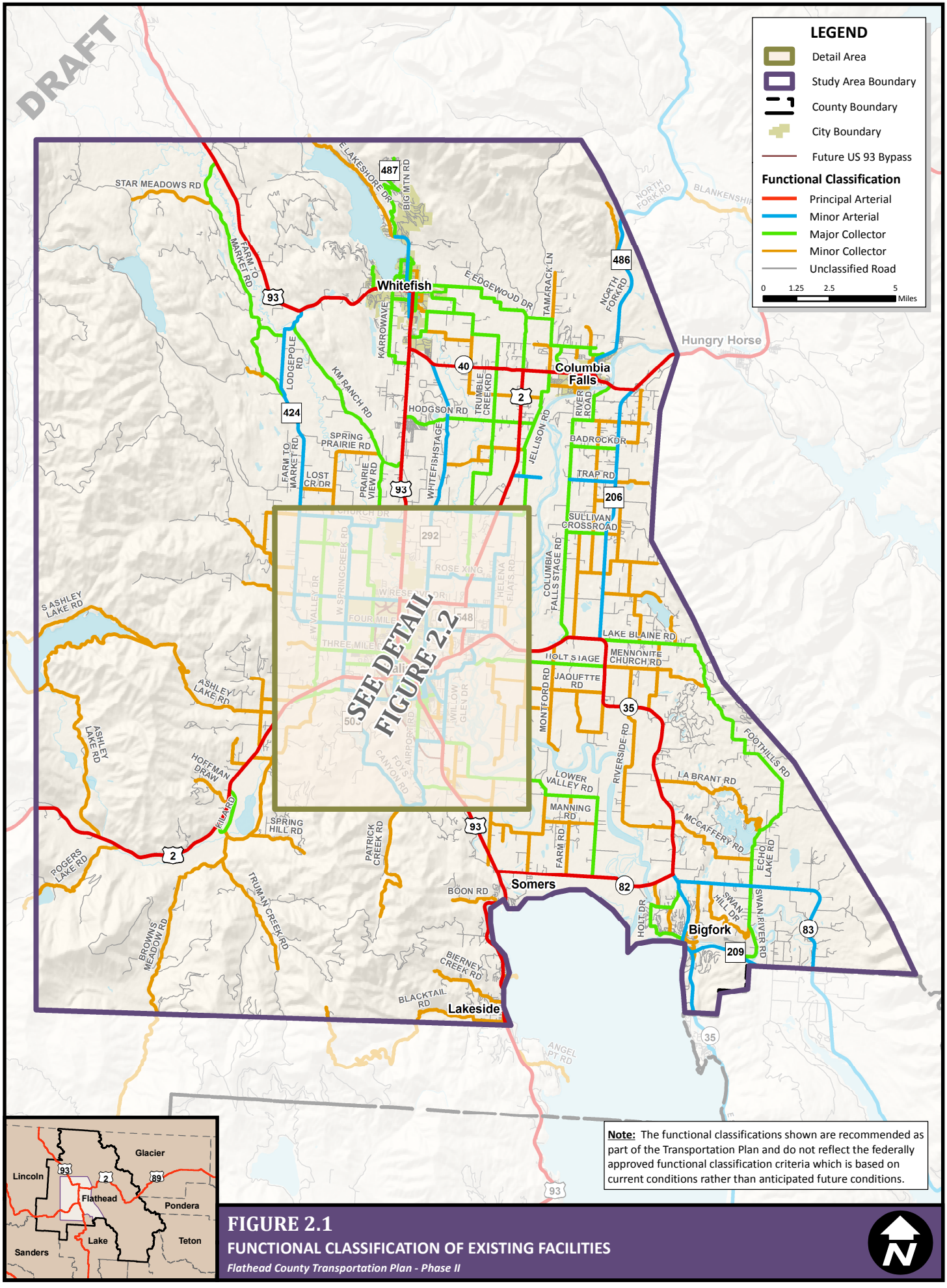


FIGURE 2.1

FUNCTIONAL CLASSIFICATION OF EXISTING FACILITIES

Flathead County Transportation Plan - Phase II

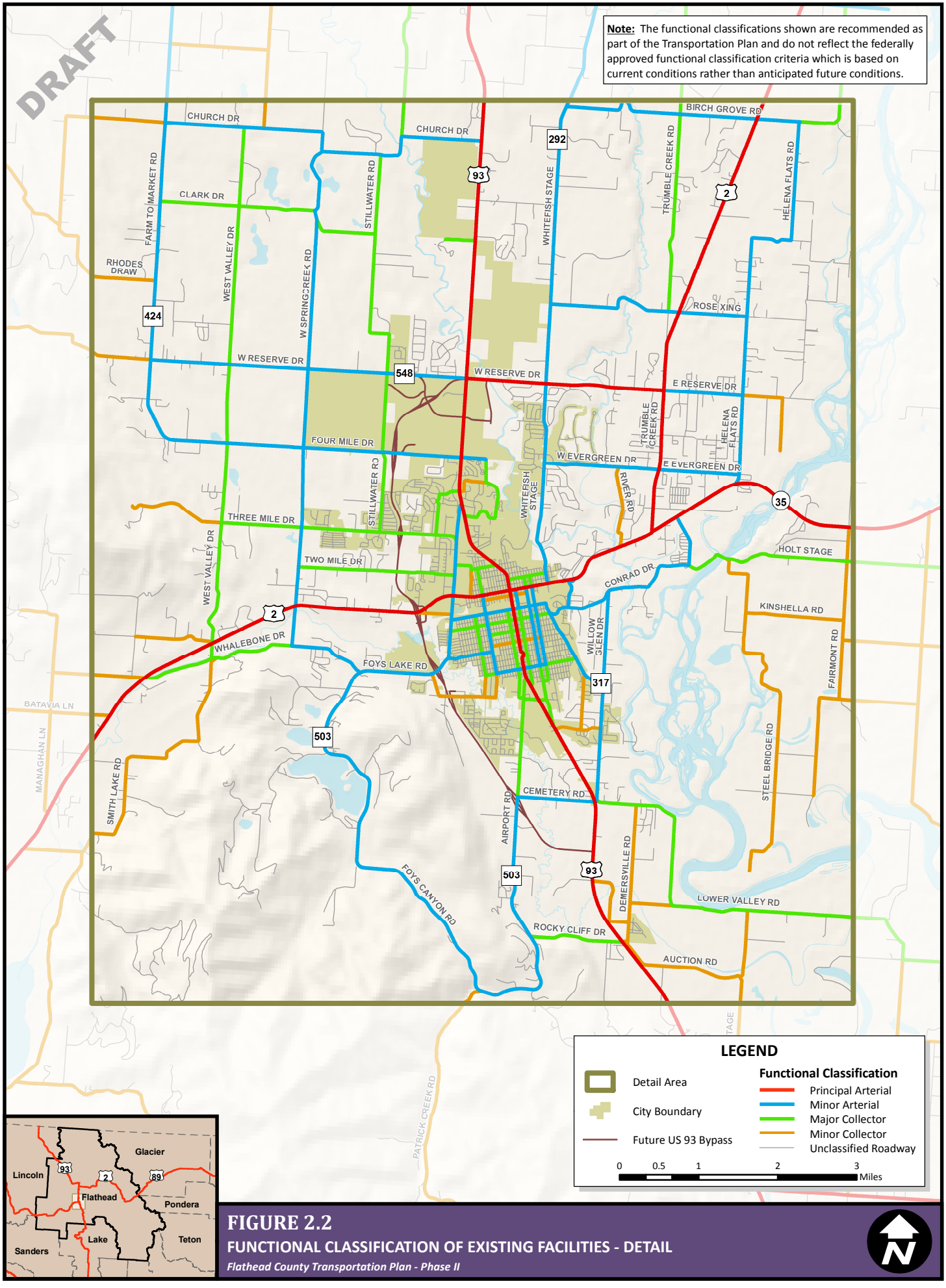


FIGURE 2.2

FUNCTIONAL CLASSIFICATION OF EXISTING FACILITIES - DETAIL

Flathead County Transportation Plan - Phase II

2.3 CORRIDOR VOLUMES, CAPACITY AND LEVELS OF SERVICE

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 MDT, Flathead County, and Robert Peccia and Associates (RPA) were used to determine current traffic conditions, and to provide reliable data on historic traffic volumes. The most recent average daily traffic (ADT) counts available on major road segments within the community were used. This information is shown on **Figure 2.3** and **2.4**. 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 **Figure 2.5** and **2.6**.

The capacity of a roadway is based on a number of features including functional classification, roadway width, number of approaches along the facility, whether the road is urban or rural, speed limit, etc. For planning purposes, all of these variables are taken into account and over time general planning values have been established that approximate the number of vehicles per day that can be accommodated on a given roadway section.

Rural roadway corridors are somewhat unique from their urban counterparts in that oftentimes, excessive traffic volumes are not the primary issue governing travel operations. For the more rural roadways, issues such as sight distance, passing zones and travel speeds usually ride to the forefront. Regarding rural roadways, there are some general planning level guidelines that are often relied upon when comparing the theoretical capacity of a roadway to its existing traffic volumes.

The maximum number of vehicles that could theoretically be accommodated on a roadway is greater than the number typically acceptable in Flathead County. Thus, for the purposes of this Transportation Plan, the concept of "acceptable" capacity has been used as the threshold for defining roadway capacity.

Comparison of the "acceptable" capacity against existing or anticipated future volumes can assist in determining if a roadway is under capacity, at capacity, or over capacity. The general recommended acceptable roadway capacities are shown below in **Table 2.1** and are broken out based on functional classification and roadway type.

Table 2.1: Recommended Acceptable Daily Roadway Capacity

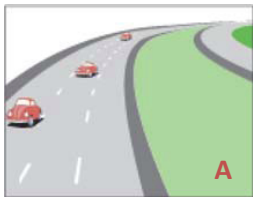
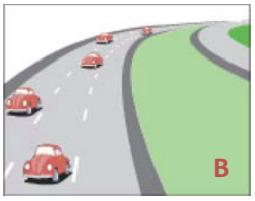
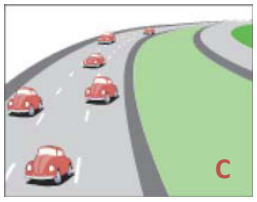
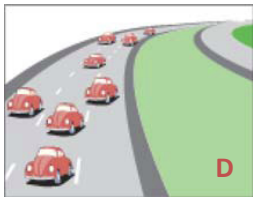
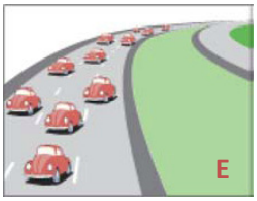
Roadway Type	Capacity (vehicles / day)[1]		
	Rural Collector	Minor Arterial / Urban Collector	Principal Arterial
Two Lane Road	6,000	9,000	12,000
Three Lane Road	9,000	13,500	18,000
Four Lane Road	12,000	18,000	24,000
Five Lane Road	17,500	26,250	35,000

[1]Values represent theoretical planning level capacities developed for this Transportation Plan. Actual capacity can vary greatly depending on access control, cross-street volumes, and peaking characteristics.

Roadway LOS is determined based on a combination of factors all of which play a part in the driver's perception of how the roadway is performing. When drivers experience delays due to reduced travel speeds, lack of passing opportunities, heavy vehicles in the traffic stream, and steep roadway grades, the roadway LOS deteriorates. As was done for roadway capacity, a less complicated look at roadway

LOS can be used for planning purposes. The relationship between the roadway volume and the theoretical capacity of the roadway can be used to determine the corresponding LOS for that corridor. **Table 2.2** below shows these corresponding values.

Table 2.2: Roadway LOS and V/C Ratios

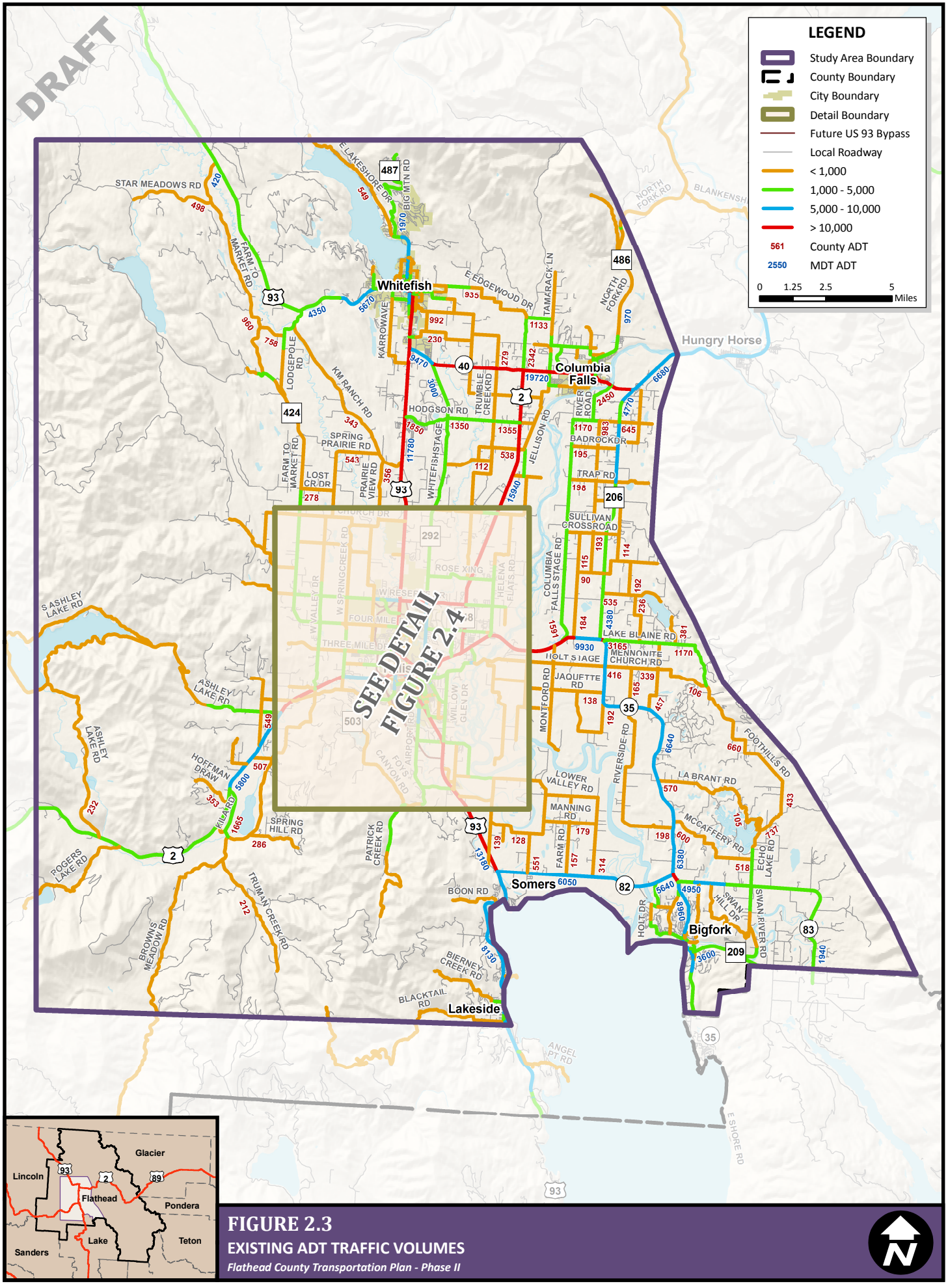
LOS Rank	Description	V/C Ratio
	Represents free-flow conditions. Individual users are virtually unaffected by the presence of others in the traffic stream. Freedom to select speeds and to maneuver within the traffic stream is extremely high. The general level of comfort and convenience provided to drivers is excellent.	< 0.60
	Also allows speeds at or near free-flow speeds, but the presence of other users begins to be noticeable. Freedom to select speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within the traffic stream relative to LOS A.	≥ 0.60 and < 0.70
	Has speeds at or near free-flow speeds, but the freedom to maneuver is noticeably restricted (lane changes require careful attention on the part of the drivers). The general level of comfort and convenience declines significantly at this level. Disruptions in the traffic stream, such as an incident (for example, vehicular crash or disablement), can result in significant queue formation and vehicular delay. In contrast, the effects of incidents at LOS A or LOS B are minimal, with only minor delay in the immediate vicinity of the event.	≥ 0.70 and < 0.80
	Represents the conditions where speeds begin to decline slightly with increasing flow. The freedom to maneuver becomes more restricted, and drivers experience reductions in physical and psychological comfort. Incidents can generate lengthy queues because the higher density associated with the LOS provides little or no space to absorb disruptions in traffic flow.	≥ 0.80 and < 0.90
	Represents operating conditions at or near the roadway's capacity. Even minor disruptions to the traffic stream, such as vehicles entering from a ramp or vehicles changing lanes, can cause delays as other vehicles give way to allow such maneuvers. In general, maneuverability is extremely limited, and drivers experience considerable physical and psychological discomfort.	≥ 0.90 and < 1.00
	Describes a breakdown in vehicular flow. Queues form quickly behind points in the roadway where the arrival flow rate temporarily exceeds the departure rate, as determined by the roadway's capacity. Such points occur at incidents and on- and off-ramps, where incoming traffic results in capacity being exceeded. Vehicles typically operate at low speeds under these conditions and are often required to come to a complete stop, usually in a cyclic fashion. The cyclic formation and dissipation of queues is a key characterization of LOS F.	≥ 1.00

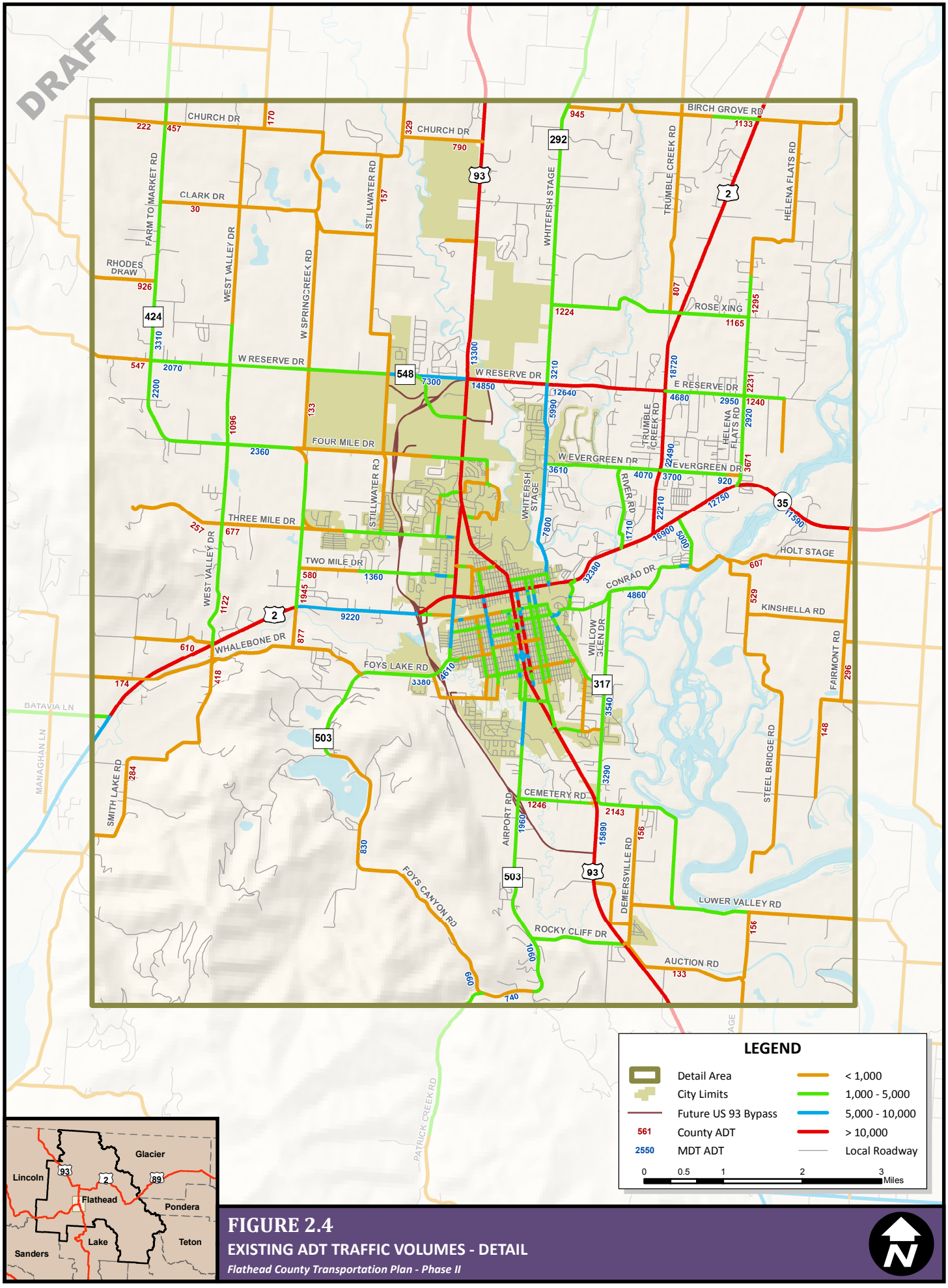
Source: Highway Capacity Manual; Transportation Research Board, 2000

The LOS of a roadway can be improved by either increasing the capacity or decreasing the traffic volume. To increase the capacity, improvements must be made along the roadway to increase its ability

to handle traffic. Reducing traffic volumes is difficult but may be achieved by providing an alternate travel route or by implementing traffic calming techniques.
It should be noted that most Flathead County roads are well under the 6,000 vehicles per day (vpd) threshold previously established for rural collector or arterial roads without left-turn bays and generally function at a LOS of C or better. As future development occurs in the County, traffic volumes will ultimately rise and may approach or exceed these thresholds which will ultimately result in decreased LOS.

As a matter of reference, a residential lot within a new subdivision will generally add approximately 10 vehicle trips per day on the adjacent roadway system. As an example, a 100-lot residential subdivision will generate approximately 1000 vehicles per day on the adjacent roadway. While these trips will distribute themselves on other roadways in the area as they get farther and farther away from the development site, the added trips will have the maximum impacts on the road (or roads) directly adjacent to the development area.


DRAFT
LEGEND
Study Area Boundary
County Boundary
City Boundary
Detail Boundary
Future US 93 Bypass
Local Roadway
< 1,000
1,000 - 5,000
5,000 - 10,000
> 10,000
561 County ADT
2550 MDT ADT
0 1.25 2.5 5 Miles
SEE DETAIL FIGURE 2.4
Whitefish
Columbia Falls
Hungry Horse
Somers
Bigfork
Lakeside
STAR MEADOWS RD
FARM TO MARKET RD
LODGEPOLE RD
KM RANCH RD
SPRING PRAIRIE RD
LOST CR DR
PRAIRIE VIEW RD
WHITEFISH STAGE
HODGSON RD
TRUMBLE CREEK RD
KARROWAVE
E LAKESHORE DR
BIG MTN RD
E EDGEWOOD DR
TAMARACK LN
NORTH FORK RD
RIVER ROAD
BADROCK DR
TRAP RD
JELLISON RD
SULLIVAN CROSSROAD
COLUMBIA FALLS STAGE RD
LAKE BLAINE RD
HOLT STAGE
MENNONITE CHURCH RD
JAQUETTE RD
MONTFORD RD
RIVERSIDE RD
LOWER VALLEY RD
MANNING RD
FARM RD
FOOTHILLS RD
LA BRANT RD
MCCAFFERY RD
ECHO LAKE RD
SWAN HILL DR
SWAN RIVER RD
HOLT DR
BOON RD
BIERNEY CREEK RD
BLACKTAIL RD
PATRICK CREEK RD
TRUMAN CREEK RD
BROWNS MEADOW RD
ROGERS LAKE RD
ASHLEY LAKE RD
S ASHLEY LAKE RD
HOFFMAN DRAW
KILLARD RD
SPRING HILL RD
AIRPORT RD
FOYS CANYON RD
WILLOW GLEN DR
ROSE XING
HELENA FLATS RD
W SPRINGCREEK RD
W VALLEY DR
CHURCH DR
FOUR MILE DR
THREE MILE DR
W RESERVE DR
ANGEL PT RD
E SHORE RD
NORTH FORK RD
BLANKENSH
Glacier
Lincoln
Flathead
Pondera
Lake
Teton
Sanders
FIGURE 2.3
EXISTING ADT TRAFFIC VOLUMES
Flathead County Transportation Plan - Phase II


DRAFT
CHURCH DR
CLARK DR
RHODES DRAW
FARM TO MARKET RD
WEST VALLEY DR
W SPRINGCREEK RD
STILLWATER RD
WHITEFISH STAGE
TRUMBLE CREEK RD
HELENA FLATS RD
BIRCH GROVE RD
ROSE XING
W RESERVE DR
E RESERVE DR
FOUR MILE DR
W EVERGREEN DR
EVERGREEN DR
THREE MILE DR
TWO MILE DR
WHALEBONE DR
FOYS LAKE RD
CONRAD DR
HOLT STAGE
KINSHELLA RD
FAIRMONT RD
WILLOW GLEN DR
RIVER RD
CEMETERY RD
AIRPORT RD
STEEL BRIDGE RD
DEMERSVILLE RD
LOWER VALLEY RD
ROCKY CLIFF DR
AUCTION RD
FOYS CANYON RD
SMITH LAKE RD
MANAGHAN LN
BATAVIA LN
PATRICK CREEK RD
424
548
292
93
2
317
503
35
LEGEND
Detail Area
City Limits
Future US 93 Bypass
561 County ADT
2550 MDT ADT
< 1,000
1,000 - 5,000
5,000 - 10,000
> 10,000
Local Roadway
0 0.5 1 2 3 Miles
Glacier
Lincoln
Flathead
Pondera
Sanders
Lake
Teton
FIGURE 2.4
EXISTING ADT TRAFFIC VOLUMES - DETAIL
Flathead County Transportation Plan - Phase II
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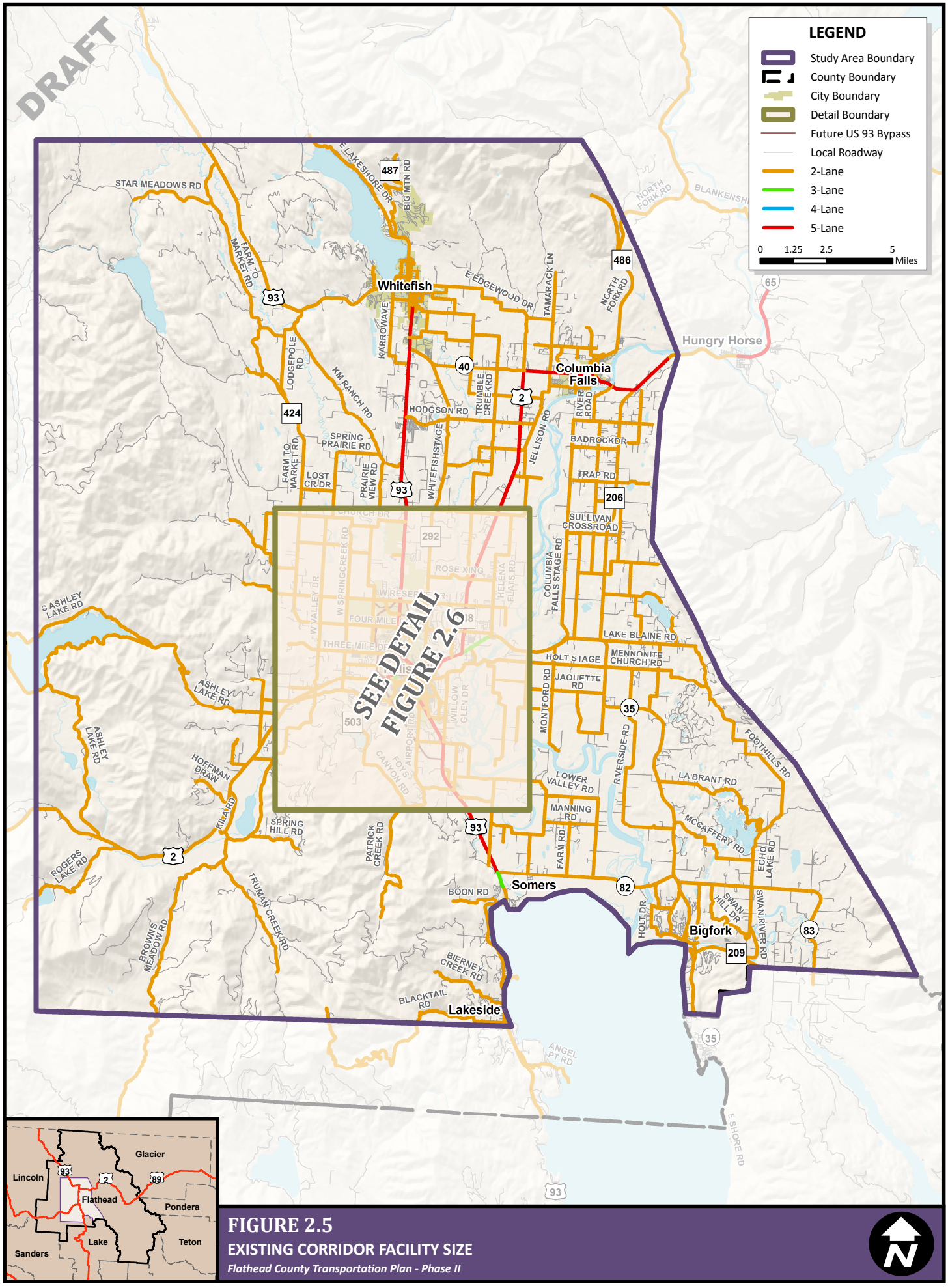
DRAFT
LEGEND
Study Area Boundary
County Boundary
City Boundary
Detail Boundary
Future US 93 Bypass
Local Roadway
2-Lane
3-Lane
4-Lane
5-Lane
0 1.25 2.5 5
Miles
SEE DETAIL FIGURE 2.6
Whitefish
Columbia Falls
Hungry Horse
Somers
Bigfork
Lakeside
STAR MEADOWS RD
E LAKESHORE DR
BIG MTN RD
FARM TO MARKET RD
E EDGEWOOD DR
TAMARACK LN
NORTH FORK RD
KARROWAVE
LODGEPOLE RD
KM RANCH RD
HODGSON RD
TRUMBLE CREEK RD
RIVER ROAD
JELLISON RD
BADROCK DR
SPRING PRAIRIE RD
LOST CR DR
PRAIRIE VIEW RD
WHITEFISH STAGE
TRAP RD
SULLIVAN CROSSROAD
CHURCH DR
ROSE XING
W SPRINGCREEK RD
W VALLEY DR
HELENA FLATS RD
COLUMBIA FALLS STAGE RD
LAKE BLAINE RD
HOLT STAGE
MENNONITE CHURCH RD
JAQUETTE RD
MONTFORD RD
S ASHLEY LAKE RD
ASHLEY LAKE RD
HOFFMAN DRAW
KILLARD RD
SPRING HILL RD
PATRICK CREEK RD
AIRPORT RD
FOYS CANYON RD
WILLOW GLEN DR
RIVERSIDE RD
FOOTHILLS RD
LA BRANT RD
LOWER VALLEY RD
MANNING RD
FARM RD
MCCAFFERY RD
ECHO LAKE RD
ROGERS LAKE RD
TRUMAN CREEK RD
BROWNS MEADOW RD
BOON RD
HOLT DR
SWAN HILL DR
SWAN RIVER RD
BIERNES CREEK RD
BLACKTAIL RD
ANGEL PT RD
E SHORE RD
Glacier
Lincoln
Flathead
Pondera
Lake
Teton
Sanders
FIGURE 2.5
EXISTING CORRIDOR FACILITY SIZE
Flathead County Transportation Plan - Phase II

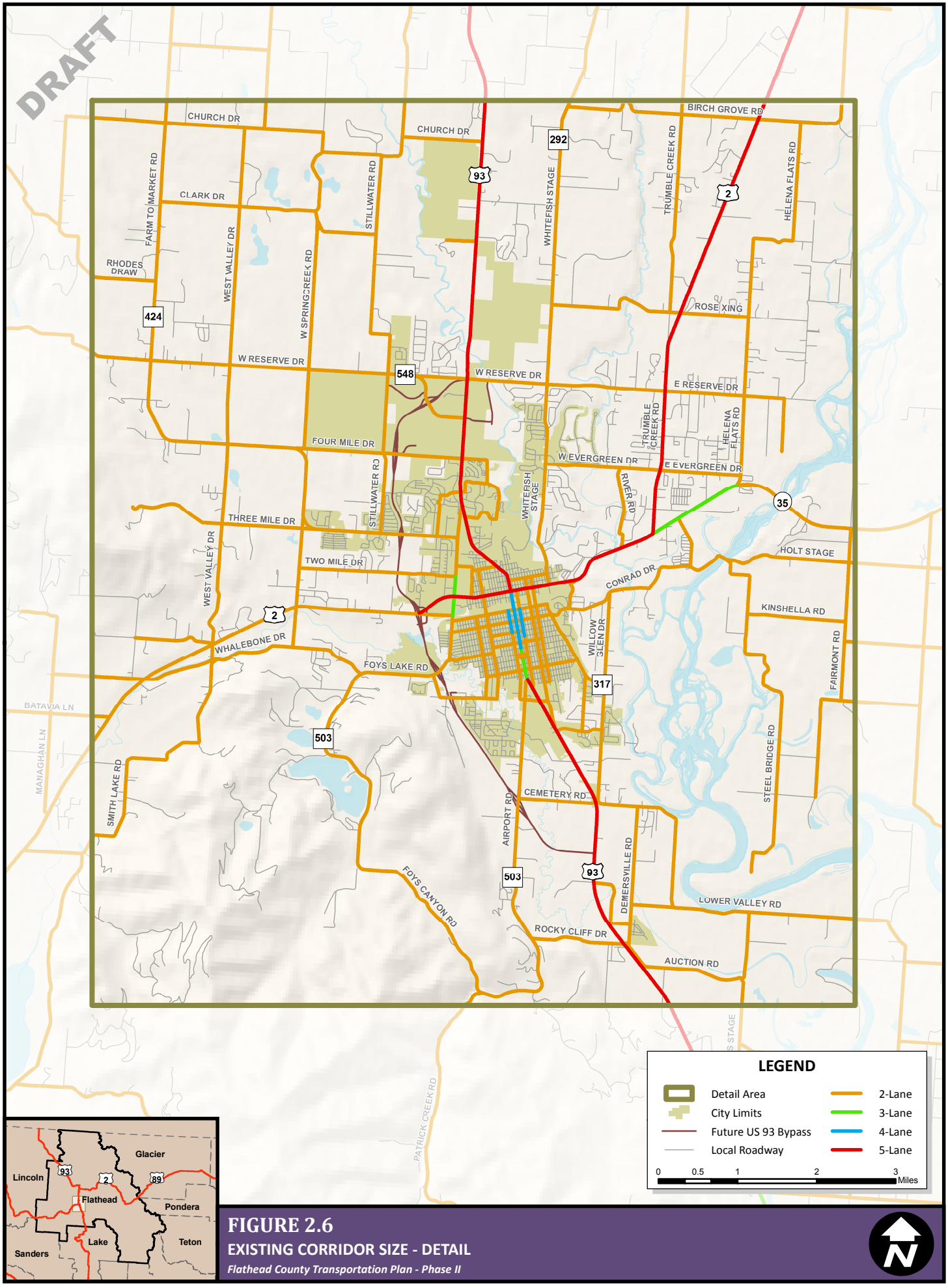

FIGURE 2.6

EXISTING CORRIDOR SIZE - DETAIL

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2.4 EXISTING INTERSECTION LEVELS OF SERVICE

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, which 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.

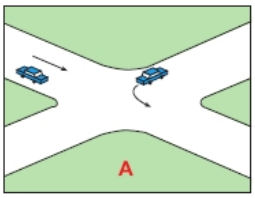
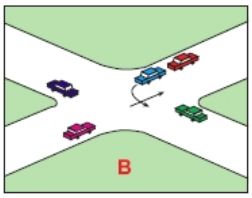
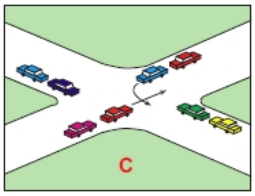
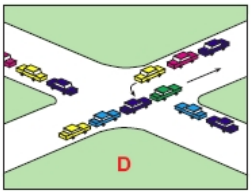
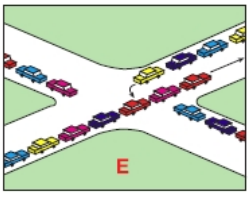
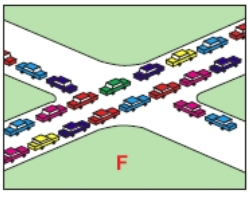
Due to the significant portion of total expense for road construction projects used for project design, construction, mobilization, and adjacent area rehabilitation, a careful analysis must be made of the expected service life from intersection-only improvements. If adequate design life can be achieved 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.

Intersection 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 motorists' perception 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. As was the case with corridor LOS, the scale ranges from "A" which indicates little, if any, vehicle delay, to "F" which indicates significant vehicle delay and traffic congestion. **Table 2.3** on the following page gives a description of each LOS ranking along with delay thresholds for signalized and unsignalized intersections.

Intersection counts were conducted during the fall of 2006 as part of the *Phase 1* LOS analysis. Each intersection was counted between 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM to ensure that the intersection's peak volumes were represented. Based upon this data, the operational characteristics of each intersection were determined. The LOS analysis contained in this section 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 4.1 f.

Table 2.3: Intersection Level of Service Criteria

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

Source: Highway Capacity Manual; Transportation Research Board, 2000

2.4.1 Signalized Intersections

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.

For signalized intersections, recent research has determined that "average control delay" per vehicle is the best available measure of level of service. 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. Control delay takes into account uniform delay, incremental delay, and initial queue delay. The control delay is primarily a function of volume, capacity, cycle length, green ratio, and the pattern of vehicle arrivals. **Table 2.3** defines LOS in terms of average control delay per vehicle.

The intersection of Fairmont Road and MT Highway 35 is the only signalized intersection specifically analyzed as part of this Transportation Plan. This intersection was recently signalized on a temporary basis and the data collection at this location occurred while the intersection was still unsignalized. **Table 2.4** shows the LOS analysis completed for this intersection using an assumed signal timing. Under unsignalized conditions, this intersection had a failing LOS and met signalization warrants. For more information on this intersection and other intersections that were evaluated in detail, see **Section 2.7.2**.

Table 2.4: Existing Level of Service for Signalized Intersections

Signalized Intersection	AM Peak Hour			PM Peak Hour		
	Delay	LOS	V/C	Delay	LOS	V/C
MT Highway 35 / Fairmont Road[1]	**11.10**	**B**	**0.69**	**8.70**	**A**	**0.59**
Eastbound Left / Thru / Right	5.00	A	0.32	8.70	A	0.68
Westbound Left / Thru / Right	12.40	B	0.80	5.20	A	0.36
Northbound Left / Thru / Right	32.00	C	0.21	32.00	C	0.21
Southbound Left / Thru / Right	30.40	C	0.00	30.90	C	0.06

[1]Signal timing was assumed and may not reflect actual signal timing.

2.4.2 Unsignalized Intersections

Unsignalized intersections include two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections. The LOS for an AWSC type intersection is computed in the same way as signalized intersections and is based on the average control delay per vehicle at the intersection. Since there is no major street, the highest delay could be experienced by any of the approaching streets.

TWSC type intersection LOS values are computed in a manner different than signalized and AWSC type intersections. The LOS for a TWSC intersection is generally not defined for the intersection as a whole, but rather is determined by the delay experienced for each individual minor street approach. However, for the purposes of this Plan, and to gauge the overall intersection performance, the LOS for a TWSC was based on the average delay experienced along the minor street approaches. 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 TWSC intersections, through traffic on the major (uncontrolled) street only experiences delay if the lane includes a combined left-turn. If there is a designated left-turn lane along the major street, the through and right-turn movements do not directly experience 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. **Table 2.3** on the previous page shows the criteria used to determine the LOS for both signalized and unsignalized intersections.

Using the guidelines discussed previously, the data collected in the fall of 2006, and calculation techniques for TWSC and AWSC type intersections, the LOS was calculated for fifteen unsignalized intersections. The results of this analysis are shown in **Table 2.5** below. The intersection LOS is also shown graphically in **Figure 2.7** and **2.8**. A more detailed analysis of each of these intersections is given in **Section 2.7.2**.

Table 2.5: Unsignalized Intersection Level of Service (Existing Conditions)[1]

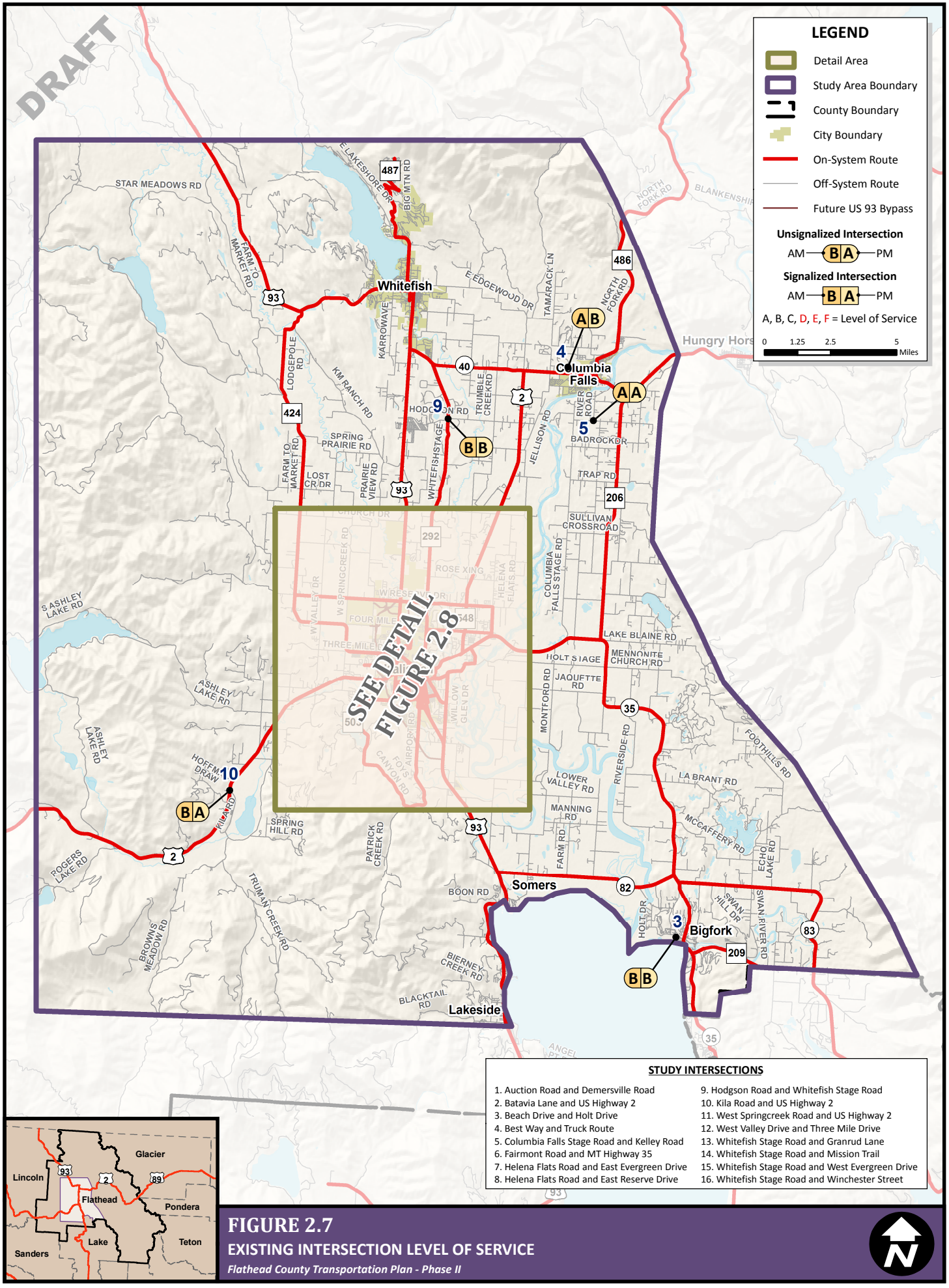
Unsignalized Intersection	AM Peak Hour			PM Peak Hour		
	Delay	LOS	V/C	Delay	LOS	V/C
Auction Road / Demersville Road	**8.7**	**A**	**-**	**8.8**	**A**	**-**
Northbound Left / Thru	7.2	A	0.00	7.3	A	0.01
Eastbound Left / Right	8.7	A	0.03	8.8	A	0.01
Batavia Lane / US Highway 2	**33.9**	**D**	**-**	**17.1**	**C**	**-**
Northbound Left	8.1	A	0.06	8.6	A	0.03
Eastbound Left / Right	33.9	D	0.65	17.1	C	0.34
Beach Drive / Holt Drive	**9.7**	**A**	**-**	**10.7**	**B**	**-**
Eastbound Left / Thru / Right	7.5	A	0.00	7.5	A	0.00
Westbound Left / Thru / Right	7.4	A	0.00	7.6	A	0.01
Northbound Left / Thru	10.2	B	0.00	11.3	B	0.01
Northbound Right	9.0	A	0.01	9.2	A	0.01
Southbound Left / Thru / Right	10.2	B	0.01	11.3	B	0.00
Best Way / Truck Route (AWSC)	**8.05**	**A**	**-**	**7.75**	**A**	**-**
Eastbound Left / Thru / Right	7.39	A	-	7.35	A	-
Westbound Left / Thru / Right	8.42	A	-	8.00	A	-
Northbound Left / Thru / Right	8.04	A	-	7.66	A	-
Southbound Left / Thru / Right	8.16	A	-	8.12	A	-
Columbia Falls Stage / Kelley Road	**9.9**	**A**	**-**	**9.5**	**A**	**-**
Eastbound Left / Thru	7.6	A	0.09	7.4	A	0.05
Southbound Left / Right	9.9	A	0.08	9.5	A	0.11
Helena Flats Road / East Evergreen Drive	**12.2**	**B**	**-**	**11.6**	**B**	**-**
Northbound Left / Thru / Right	7.6	A	0.03	7.7	A	0.02
Southbound Left / Thru / Right	7.6	A	0.00	7.6	A	0.00
Westbound Left / Thru / Right	13.0	B	0.06	11.5	B	0.02
Eastbound Left / Thru / Right	11.4	B	0.12	11.6	B	0.10
Helena Flats Road / East Reserve Drive (AWSC)	**8.44**	**A**	**-**	**9.45**	**A**	**-**
Eastbound Left / Thru / Right	8.03	A	-	9.52	A	-

Unsignalized Intersection	AM Peak Hour			PM Peak Hour		
	Delay	LOS	V/C	Delay	LOS	V/C
Westbound Left / Thru / Right	8.32	A	-	8.68	A	-
Northbound Left / Thru / Right	9.02	A	-	10.00	A	-
Southbound Left / Thru / Right	7.94	A	-	8.58	A	-
Hodgson Road / Whitefish Stage	**10.3**	**B**	**-**	**11.9**	**B**	**-**
Northbound Left / Thru / Right	7.3	A	0.01	7.4	A	0.02
Southbound Left / Thru / Right	7.5	A	0.01	7.5	A	0.02
Westbound Left / Thru / Right	10.1	B	0.09	12.0	B	0.16
Eastbound Left / Thru / Right	10.4	B	0.13	11.7	B	0.16
Kila Road / US Highway 2	**10.7**	**B**	**-**	**9.6**	**A**	**-**
Southbound Left / Thru	8.0	A	0.07	7.9	A	0.10
Westbound Left / Right	10.7	B	0.14	9.6	A	0.07
West Springcreek Road / US Highway 2	**60.5**	**F**	**-**	**24.5**	**C**	**-**
Eastbound Left / Thru / Right	8.0	A	0.08	8.8	A	0.04
Westbound Left / Thru / Right	9.1	A	0.01	7.9	A	0.02
Northbound Left / Thru / Right	26.6	D	0.24	25.3	D	0.18
Southbound Left / Thru / Right	94.4	F	0.90	23.7	C	0.39
West Valley Drive / Three Mile Drive	**9.8**	**A**	**-**	**9.8**	**A**	**-**
Eastbound Left / Thru / Right	7.2	A	0.00	7.3	A	0.00
Westbound Left / Thru / Right	7.3	A	0.01	7.2	A	0.01
Northbound Left / Thru / Right	9.6	A	0.09	9.8	A	0.10
Southbound Left / Thru / Right	10.0	A	0.10	9.8	A	0.10
Whitefish Stage / Granrud Lane	**14.2**	**B**	**-**	**14.1**	**B**	**-**
Northbound Left / Thru	8.2	A	0.00	8.2	A	0.01
Eastbound Left / Right	14.2	B	0.10	14.1	B	0.04
Whitefish Stage / Mission Trail	**16.3**	**C**	**-**	**17.4**	**C**	**-**
Southbound Left / Thru	7.9	A	0.00	8.1	A	0.01
Westbound Left / Right	16.3	C	0.18	17.4	C	0.12
Whitefish Stage / West Evergreen Drive	**15.1**	**C**	**-**	**133.7**	**F**	**-**
Southbound Left / Thru	7.9	A	0.04	9.2	A	0.22
Westbound Left / Right	15.1	C	0.34	133.7	F	1.11
Whitefish Stage / Winchester Street	**19.1**	**C**	**-**	**21.1**	**C**	**-**
Northbound Left / Thru / Right	8.5	A	0.00	8.1	A	0.00
Southbound Left / Thru / Right	8.0	A	0.01	8.5	A	0.01
Westbound Left / Thru / Right	24.2	C	0.35	22.4	C	0.13
Eastbound Left / Thru / Right	14.0	B	0.03	19.8	C	0.30

[1]Intersection LOS for two-way stop-controlled intersections is based on average delay along minor approach legs.

The LOS analyses of the existing conditions for these study intersections reveals that a few unsignalized intersections are currently functioning at LOS D or lower. These intersections are ideal candidates for closer examination and potential intersection improvement measures.

It should be noted that it is not unusual for an unsignalized intersection to experience a poor LOS due to conditions for the minor street left-turn movement. It should be understood that, often this poor LOS is experienced by a small minority of the total number of vehicles at the intersection and that the intersection as a whole may operate acceptably. Therefore, LOS along the minor street approach may be representative of only a small percentage of the total vehicles utilizing the intersection. A more detailed analysis should be completed to determine how the intersection functions as a whole.


DRAFT
LEGEND
Detail Area
Study Area Boundary
County Boundary
City Boundary
On-System Route
Off-System Route
Future US 93 Bypass
Unsignalized Intersection
AM B A PM
Signalized Intersection
AM B A PM
A, B, C, D, E, F = Level of Service
0 1.25 2.5 5 Miles
SEE DETAIL FIGURE 2.8
Whitefish
Columbia Falls
Somers
Bigfork
Lakeside
Hungry Horse
STAR MEADOWS RD
FARM TO MARKET RD
E LAKESHORE DR
BIG MTN RD
E EDGEWOOD DR
TAMARACK LN
NORTH FORK RD
KARROWAVE
LODGEPOLE RD
KM RANCH RD
HODGSON RD
TRUMBLE CREEK RD
RIVER ROAD
BADROCK DR
JELLISON RD
SPRING PRAIRIE RD
LOST CR DR
PRAIRIE VIEW RD
WHITEFISH STAGE
TRAP RD
SULLIVAN CROSSROAD
COLUMBIA FALLS STAGE RD
ROSE XING
HELENA FLATS RD
W SPRINGCREEK DR
W VALLEY DR
FOUR MILE DR
THREE MILE DR
WILLOW GLEN DR
FOXS CANYON RD
AIRPORT RD
S ASHLEY LAKE RD
ASHLEY LAKE RD
HOFFMAN DRAW
KILA RD
SPRING HILL RD
PATRICK CREEK RD
ROGERS LAKE RD
TRUMAN CREEK RD
BROWNS MEADOW RD
BOON RD
BIERNES CREEK RD
BLACKTAIL RD
LAKE BLAINE RD
HOLT STAGE
MENNONITE CHURCH RD
JAQUETTE RD
MONTFORD RD
RIVERSIDE RD
LOWER VALLEY RD
MANNING RD
FARM RD
LA BRANT RD
MCCAFFERY RD
FOOTHILLS RD
ECHO LAKE RD
SWAN HILL DR
SWAN RIVER RD
HOLT DR
487
486
206
424
40
2
93
292
548
35
82
83
209
STUDY INTERSECTIONS
1. Auction Road and Demersville Road
2. Batavia Lane and US Highway 2
3. Beach Drive and Holt Drive
4. Best Way and Truck Route
5. Columbia Falls Stage Road and Kelley Road
6. Fairmont Road and MT Highway 35
7. Helena Flats Road and East Evergreen Drive
8. Helena Flats Road and East Reserve Drive
9. Hodgson Road and Whitefish Stage Road
10. Kila Road and US Highway 2
11. West Springcreek Road and US Highway 2
12. West Valley Drive and Three Mile Drive
13. Whitefish Stage Road and Granrud Lane
14. Whitefish Stage Road and Mission Trail
15. Whitefish Stage Road and West Evergreen Drive
16. Whitefish Stage Road and Winchester Street
Glacier
Lincoln
Flathead
Pondera
Lake
Teton
Sanders
FIGURE 2.7
EXISTING INTERSECTION LEVEL OF SERVICE
Flathead County Transportation Plan - Phase II

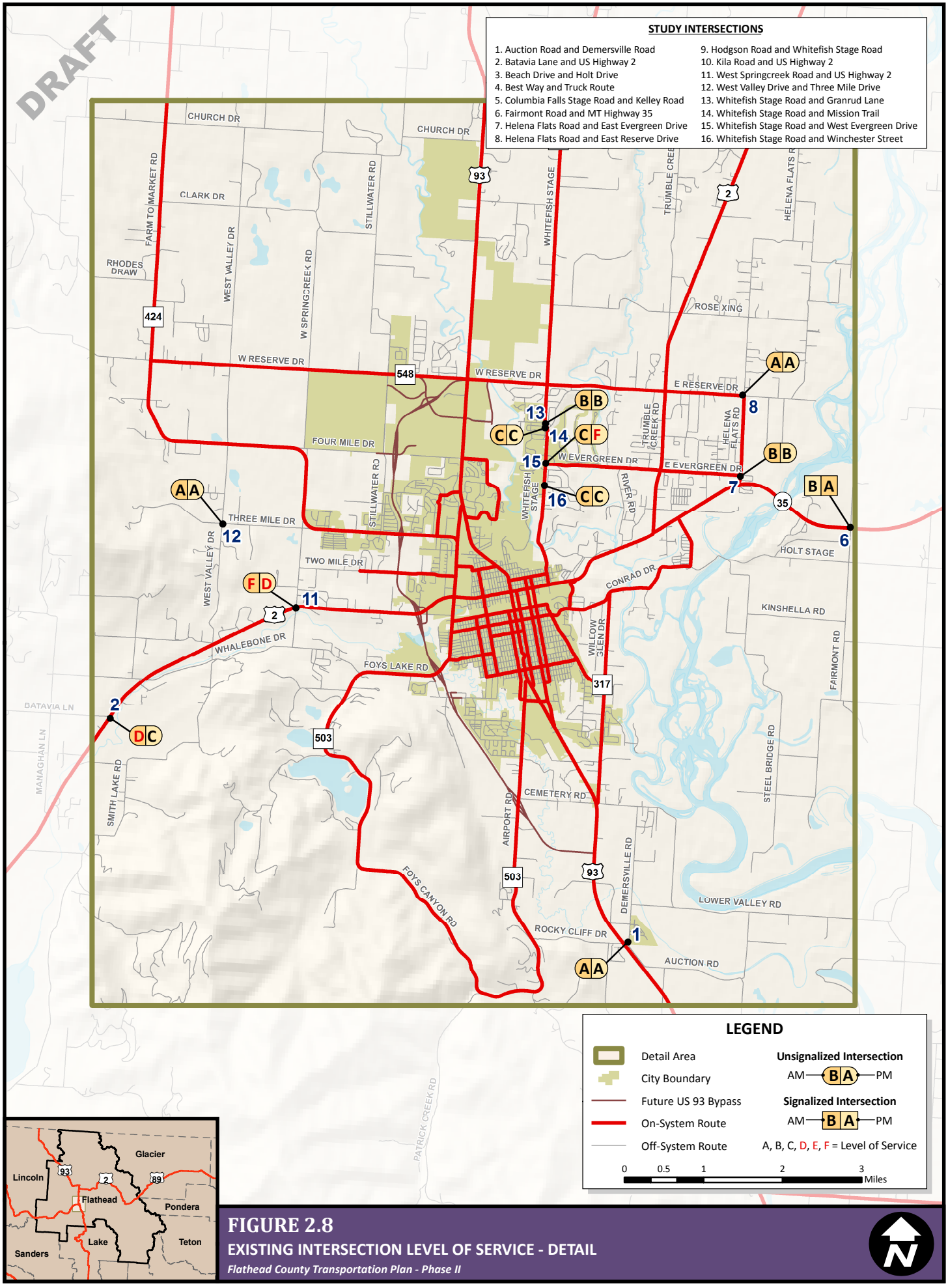


FIGURE 2.8

EXISTING INTERSECTION LEVEL OF SERVICE - DETAIL

Flathead County Transportation Plan - Phase II

2.5 SIGNAL WARRANT ANALYSIS

A signal warrant analysis was conducted to determine if any of the existing unsignalized intersections listed in **Table 2.**5 with levels of service of D or lower met signal warrants. According to the 2003 Edition of the *Manual on Uniform Traffic Control Devices (MUTCD)*, there are eight signal warrants that must be analyzed for the installation of a traffic control signal. The MUTCD states that a traffic signal should not be installed unless one or more warrants are satisfied. The eight signal warrants that must be analyzed are as follows:

1. **Eight-Hour Vehicular Volume** – This warrant is intended for application at locations where a large volume of intersection traffic is the principal reason to consider the installation of a traffic signal (Condition A) or where the traffic volume on the major street is so heavy that traffic on the minor street experiences excessive delay or conflict in entering or crossing the major street (Condition B) during any eight hours of an average day. The criteria for Warrant 1 may be met if either Condition A or Condition B is met. The combination of Condition A and B are not required. *This warrant was not analyzed due to insufficient project data.*

2. **Four-Hour Vehicular Volume** – This warrant is intended for locations where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal. This warrant requires that the combination of the major-street traffic (total of both approaches) and the higher-volume minor-street traffic (one direction only) reach the designated MUTCD volume during any four hours of an average day. This warrant was based upon a combination of AM and PM peak hour volumes to account for the four-hour period. *This warrant was met for two of the intersections analyzed as shown in **Table 2.6**.*

3. **Peak Hour** – This warrant is intended for use at a location where during any one hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street. This warrant also requires that the combination of the major-street traffic (total of both approaches) and the higher-volume minor-street traffic (one direction only) reach the designated MUTCD volume. The peak hour warrant was conducted assuming that this peak hour would fall within the peak periods. *This warrant was met for three of the intersections analyzed as shown in **Table 2.6**.*

4. **Pedestrian Volume** – The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street. *This warrant was not analyzed due to insufficient project data.*

5. **School Crossing** – This warrant addresses the unique characteristics that a nearby school may have on the roadways. It requires that the major roadway be unsafe to cross and that there are no other feasible crossings in the area. *This warrant was not analyzed due to insufficient project data.*

6. **Coordinated Signal System** – Progressive movement in a coordinated signal system sometimes necessitates installing traffic control signals at intersections where they would not otherwise be needed in order to maintain proper platooning of vehicles. *This warrant was not met for any of the intersections under consideration.*

7. **Crash Experience** – The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal. *This warrant was not analyzed due to insufficient project data.*

8. **Roadway Network** – This warrant is intended for locations where the installation of a traffic signal may encourage concentration and organization of traffic flow on a roadway network. *This warrant was not met for any of the intersections under consideration.*

Ideally, before considering a signal for traffic control at an intersection, it is desirable to meet more than one signal warrant. A detailed analysis of an intersection that meets at least one signal warrant should be completed to determine if less restrictive traffic controls, or possible geometric modifications, would benefit the operational characteristics of the intersection. Intersections meeting multiple signal warrants may be candidates for signalization, but must be analyzed carefully to consider the major and minor street traffic movements and volumes. As is shown in **Table 2.6**, all three intersections analyzed appear to meet one or more traffic signal warrants based upon the preliminary warrant analysis and thus could be considered for traffic signal control going forward.

Table 2.6: Signal Warrant Analysis (Existing Unsignalized Intersections)

Intersection	LOS		Signal Warrant			
	AM	PM	#2	#3	#6	#8
Batavia Lane / US Highway 2	D	C	X	X		
West Springcreek Road / US Highway 2	F	D	X	X		
Whitefish Stage / West Evergreen Drive	C	F		X		

Since vehicular delay and the frequency of some types of crashes are sometimes greater under traffic signal control than under STOP sign control, consideration should be given to providing alternatives to traffic control signals, even if one or more of the signal warrants has been satisfied. Some of the available alternatives may include, but are not limited to, the following:

- Installing signs along the major street to warn road users approaching the intersection;
- Relocating the stop line(s) and making other changes to improve the sight distance at the intersection;
- Installing measures designed to reduce speeds on the approaches;
- Installing a flashing beacon at the intersection to supplement STOP sign control;
- Installing flashing beacons on warning signs in advance of a STOP sign controlled intersection on major- and/or minor-street approaches;
- Adding one or more lanes on a minor-street approach to reduce the number of vehicles per lane on the approach;
- Revising the geometrics at the intersection to channelize vehicular movements and reduce the time required for a vehicle to complete a movement, which could also assist pedestrians;
- Installing roadway lighting if a disproportionate number of crashes occur at night;
- Restricting one or more turning movements, perhaps on a time-of-day basis, if alternate routes are available;
- If the warrant is satisfied, installing multi-way STOP sign control;
- Installing a roundabout; and
- Employing other alternatives, depending on conditions at the intersection.

2.6 SAFETY AND CRASH ANALYSIS

The MDT Traffic and Safety Bureau provided crash information and data for use in the *Flathead County Transportation Plan – Phase II*. The crash information was analyzed to identify potential problem areas along corridors and at intersections and was also used to indicate areas that may warrant further study. General crash characteristics and potential roadway deficiencies were determined through the crash analysis. Specific corridors and intersections that have been identified as problem areas during this time period were determined and are evaluated in more detail in **Section 2.7** of this Plan.

The crash information covers a three-year time period from January 1st, 2004 to December 31st, 2006. It should be noted that reconfiguration projects around the County during this time period were not taken into account in this analysis.

2.6.1 CORRIDOR ANALYSIS

Twelve study corridors were evaluated as part of this crash analysis. Problem areas were identified at locations along the corridor that have an unusually high number of crashes in certain locations. **Section 2.7.1** provides more detail about the areas where potential safety problems exist. The following locations along the study corridors appear to have an unusually high number of crashes:

- **Church Drive**
  - Intersection with US Highway 93
  - 90 degree corners along the corridor
- **Columbia Falls Stage / River Road**
  - Intersection of Columbia Falls Stage and River Road
  - Intersection with Hellman Lane
  - Intersection with Kelley Road
- **East Reserve Drive**
  - Between Ash Road and US Highway 2
  - Intersection with US Highway 2
- **Foothills Road**
  - At or near Jewel Basin Road
  - Between Peters Creek Way and Bachelor Grade Road
  - North of Snowberry Trail
- **Helena Flats Road**
  - Intersection with MT Highway 35
- **Hodgson Road**
  - Intersection with US Highway 2
  - Between Hare Trail and Lidstrom Road
  - Intersection with US Highway 2
  - Intersection with Whitefish Stage
- **Kila Road**
  - Intersection with US Highway 2
- **Lower Valley Road**
  - At or near intersection with Foys Bend Lane
  - Along other sharp corners

2.6.2 Intersection Crash Analysis

Sixteen intersections were evaluated as part of this crash analysis. Three analyses were performed to rank these sixteen intersections based on different crash characteristics. These three analysis measures and their results are described in this section.

First, the intersections were ranked by number of crashes. A summary of these intersections, along with the number of crashes at each intersection, is shown in **Table 2.7**. The intersections at which no reported crashes occurred were not analyzed further as part of this crash analysis.

Table 2.7: Number of Crashes at Intersections (Jan 1, 2004 - Dec 31, 2006)

Intersection	Type[1]	Crashes
Hodgson Road / Whitefish Stage	U-2W	6
West Springcreek Road / US Highway 2	U-2W	6
Kila Road / US Highway 2	U-2W	5
Fairmont Road / MT Highway 35[2]	U-2W	4
West Valley Drive / Three Mile Drive	U-2W	3
Whitefish Stage / West Evergreen Drive	U-1W	3
Batavia Lane / US Highway 2	U-2W	2
Helena Flats Road / East Evergreen Drive	U-2W	2
Whitefish Stage / Granrud Lane	U-1W	2
Columbia Falls Stage / Kelley Road	U-2W	1
Auction Road / Demersville Road	U-2W	0
Beach Drive / Holt Drive	U-2W	0
Best Way / Truck Route	U-4W	0
Helena Flats Road / East Reserve Drive	U-2W	0
Whitefish Stage / Mission Trail	U-1W	0
Whitefish Stage / Winchester Street	U-1W	0

[1] "U-1W" = Unsignalized one-way stop control; "U-2W" = Unsignalized two-way stop control; "U-4W" = Unsignalized four-way stop control.
[2] This intersection was signalized after the crash data collection and analysis was completed.

The second crash analysis performed involved a more detailed look at the crashes to determine the MDT "severity index rating". Crashes were broken out into three categories of severity: property damage only (PDO), other injury crash, and fatality or incapacitating injury. Each of these three types is given a different rating: one (1) for a PDO crash; three (3) for a non-incapacitating injury crash; eight (8) for a fatality or incapacitating injury crash. The MDT severity index rating for each intersection in the analysis is shown in **Table 2.8**. The calculation used to arrive at the severity index rating is shown below.

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

Table 2.8: Intersection Crash Analysis - MDT Severity Index Rating

Intersection	PDO	Injury	Fatality / Incap.	Severity Index
Whitefish Stage / Granrud Lane	1	0	1	4.50
Batavia Lane / US Highway 2	0	2	0	3.00
West Springcreek Road / US Highway 2	1	5	0	2.67
West Valley Drive / Three Mile Drive	1	2	0	2.33
Whitefish Stage / West Evergreen Drive	1	2	0	2.33
Kila Road / US Highway 2	2	3	0	2.20
Fairmont Road / MT Highway 35	2	2	0	2.00
Helena Flats Road / East Evergreen Drive	1	1	0	2.00
Hodgson Road / Whitefish Stage	4	2	0	1.67
Columbia Falls Stage / Kelley Road	1	0	0	1.00

The third analysis ranked the number of crashes against the average daily traffic (ADT) 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 is as follows:

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

Table 2.9: Intersection Crash Analysis - Crash Rate

Intersection	Crashes	Volume[1]	Crash Rate
West Valley Drive / Three Mile Drive	3	1,427	1.92
Hodgson Road / Whitefish Stage	6	3,239	1.69
Kila Road / US Highway 2	5	4,778	0.96
West Springcreek Road / US Highway 2	6	8,821	0.62
Columbia Falls Stage / Kelley Road	1	1,667	0.55
Helena Flats Road / East Evergreen Drive	2	3,838	0.48
Fairmont Road / MT Highway 35	4	10,863	0.34
Whitefish Stage / West Evergreen Drive	3	9,949	0.28
Whitefish Stage / Granrud Lane	2	7,000	0.26
Batavia Lane / US Highway 2	2	7,991	0.23

[1] Volume determined using turning movement counts collected for this Plan.

In order to give the intersections included in the crash analysis a comparable rating, a composite rating score was developed based on the three analyses presented previously. The intersections were ranked based on their position on each of the three previous tables, giving each equal weight. For example, the intersection of West Valley Drive and Three Mile Drive was given a ranking of 5 for its position in **Table 2.7**, another ranking of 4 for its position in **Table 2.8**, and a ranking of 1 for its ranking in **Table 2.9**. Thus its composite rating is 10. Refer to **Table 2.10** for the composite rating of each intersection.

Table 2.10: Intersection Crash Analysis Composite Rating

Intersection	Crash	Severity	Crash Rate	Composite
West Springcreek Road / US Highway 2	1	3	4	8
West Valley Drive / Three Mile Drive	5	4	1	10
Hodgson Road / Whitefish Stage	1	9	2	12
Kila Road / US Highway 2	3	6	3	12
Whitefish Stage / Granrud Lane	7	1	9	17
Whitefish Stage / West Evergreen Drive	5	4	8	17
Fairmont Road / MT Highway 35	4	7	7	18
Batavia Lane / US Highway 2	7	2	10	19
Helena Flats Road / East Evergreen Drive	7	7	6	20
Columbia Falls Stage / Kelley Road	10	10	5	25

The top problematic intersections as identified through the composite rating score method may warrant further study and may be in need of mitigation measures to specifically address crash trends. Each of the sixteen intersections studied in this crash analysis were analyzed in more detail in **Section 2.7.2**.

2.7 STUDY CORRIDORS AND INTERSECTIONS

This section provides information about the existing conditions of the twelve corridors and sixteen intersections that were evaluated in detail as part of this *Transportation Plan*. Each study intersection and corridor was analyzed to identify areas where problems currently exist or potentially may exist in the future. The crash analysis, LOS analysis and capacity levels contained in the previous sections were also used to help identify potentially deficient areas.

All of the sixteen study intersections and ten of the twelve study corridors evaluated in this Chapter were also evaluated in the *Flathead County Transportation Study - Phase 1*. **Figure 2.9** shows the location of the study corridors and intersections.

2.7.1 STUDY CORRIDORS

The corridors discussed in this section were evaluated in detail and are shown in **Figure 2.9**. All other roads within the study area were not individually evaluated but rather were analyzed as elements of the transportation system as a whole. These study corridors were chosen based on their importance to the roadway network, known traffic patterns, accessibility, and community desire. Information collected along these corridors includes signage, intersection control, surfacing conditions, drainage, sight distances, crash data, and other factors that may contribute to the performance of the corridor. The following twelve corridors were evaluated:

1. **Ashley Lake Road** – US Highway 2 to North Ashley Lake Road
2. **Church Drive** (not evaluated in *Phase 1*) – US Highway 93 to Bald Rock Road
3. **Columbia Falls Stage / River Road** – MT Highway 35 to US Highway 2
4. **East Reserve Drive** – US Highway 2 to Helena Flats Road
5. **Foothills Road** – Lake Blaine Road to Echo Lake Road
6. **Helena Flats Road** – MT Highway 35 to East Reserve Drive
7. **Hodgson Road** – US Highway 93 to US Highway 2
8. **Holt Stage Road / Mennonite Church Road** – Steel Bridge Road to Mennonite Church Road
9. **Kila Road** – North intersection with US Highway 2 to south intersection with US Highway 2
10. **Lake Blaine Road** – MT Highway 35 to Hemler Creek Drive
11. **Lower Valley Road** (not evaluated in *Phase 1*) – Willow Glen Drive to MT Highway 82
12. **Spring Hill Road** – Smith Lake Road to its end

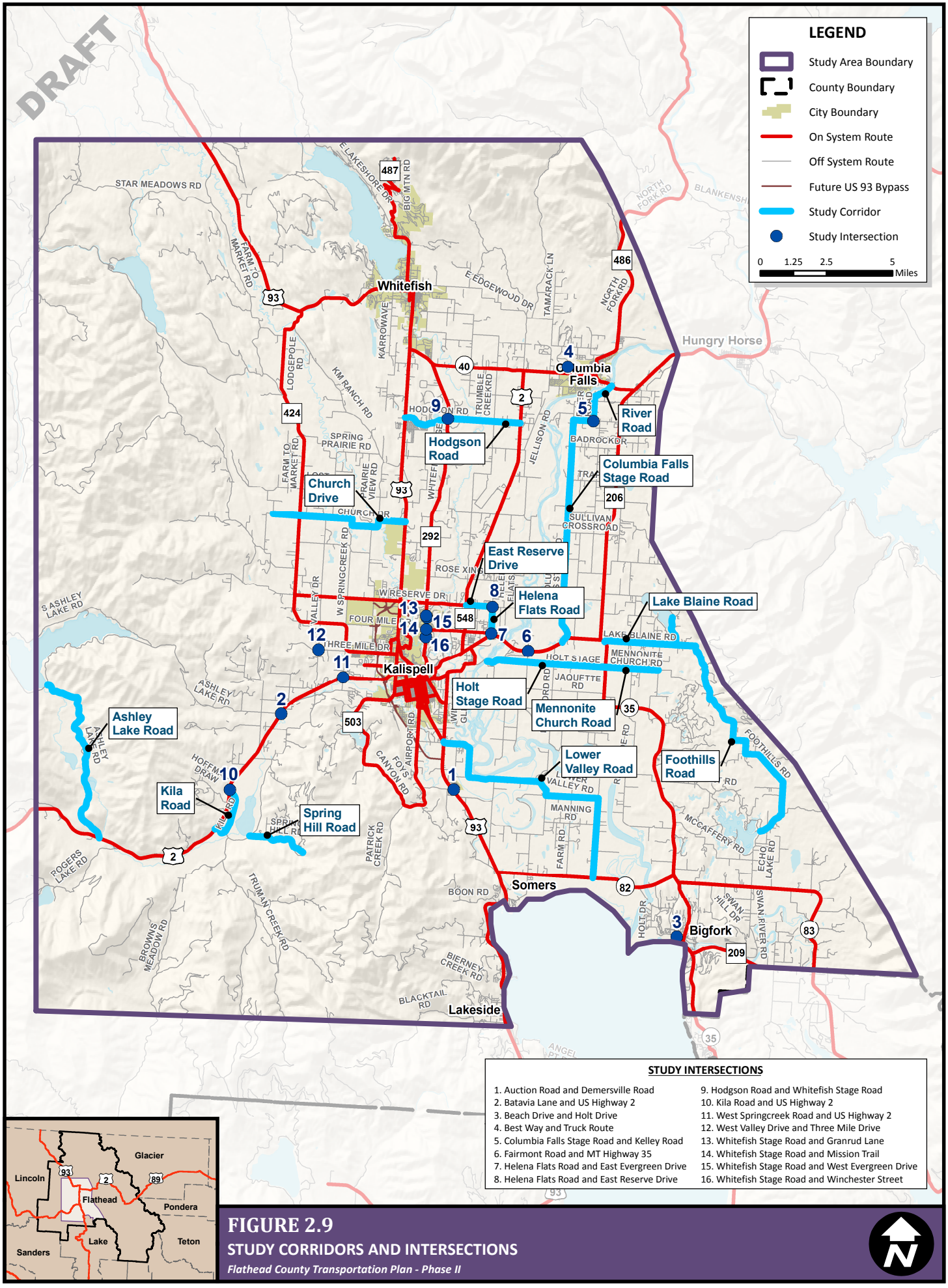


FIGURE 2.9

STUDY CORRIDORS AND INTERSECTIONS

Flathead County Transportation Plan - Phase II

1. Ashley Lake Road

Ashley Lake Road was evaluated from the intersection with US Highway 2 north to the intersection of North Ashley Lake Road and Ashley Lake Road. Ashley Lake Road is a two-lane gravel roadway classified as a minor collector and has little to no shoulder. This roadway is used to access recreational areas around Ashley Lake in addition to serving residential areas along the corridor. The speed limit along Ashley Lake Road is 35 mph.

Photo 6: Ashley Lake Road

A speed study was conducted by RPA along Ashley Lake Road in August 2008, approximately 4.4 miles north of US Highway 2. The speed study showed an average speed of 35.9 mph and an 85th percentile speed of 42.8 mph. As the speed study shows, the average speed is close to the speed limit, while the 85th percentile speed is almost 8 mph higher than the posted speed limit. Generally it is desirable to have an 85th percentile speed within 5 mph of the posted speed limit. The high 85th percentile speed along Ashley Lake Road indicates that there may be a speeding problem at the study location.

Table 2.11 shows various ADT counts conducted along the study corridor by Flathead County, MDT, and RPA. These ADT counts show that current traffic volumes are well under theoretical capacity levels for a two-lane roadway and are also under the suggested roadway paving threshold value of 400 vehicles per day (vpd). As traffic increases in the future, these volumes may reach or exceed this paving trigger.

Table 2.11: Ashley Lake Road ADT

Source	Location	Date	ADT
County	North of US 2	Aug-03	232
MDT	0.5 miles north of US 2	2004	200
RPA[1]	4.4 miles north of US 2	Aug-08	191

[1]Represents single day ADT count; value was not adjusted for seasonal or daily variation.

There were five crashes reported along the study area of Ashley Lake Road between January 1st, 2004 and December 31st, 2006. Four out of the five crashes reported involved only one vehicle, the majority of which occurred along the shoulder of the roadway. No fatalities or injuries were reported as a result of any of the crashes.

In general, Ashley Lake Road has had very few crashes along the study corridor. An analysis of the crash data shows that most of the crashes are likely due to users driving too fast for the conditions and as a result, running off the road. The roadway is gravel and the majority of the crashes were due to drivers overcorrecting and rolling over into the ditch. There appears to be no pattern of where the crashes are taking place. The crash analysis does not identify specific deficient areas that are directly resulting in unsafe conditions along the study corridor.

Identified Issues

- Future ADTs may reach paving threshold
- No shoulders and limited sight distance
- Potential speeding

2. Church Drive

Photo 7: Church Drive

Church Drive was evaluated from the intersection with US Highway 93 west to the intersection with Bald Rock Road. Church Drive is a two-lane paved roadway classified as a minor arterial between US Highway 93 and Secondary 424 and as a minor collector west of Secondary 424. This corridor was not evaluated as part of the *Phase 1* plan.

Church Drive has no shoulder and has a posted speed limit of 35 mph. The corridor provides residential access to the area and also serves to provide connection to US Highway 93 and Secondary 424. The surrounding area generally consists of fields, some of which are expected to see future commercial and/or residential development. As the area grows, it is expected that Church Drive will see a dramatic increase in traffic volumes, particularly east of West Springcreek Road.

Table 2.12 below shows ADT counts conducted by Flathead County along various portions of the study corridor. These ADT counts show that current traffic volumes are well under theoretical capacity levels for a two-lane roadway.

Table 2.12: Church Drive ADT

Source	Location	Date	ADT
County	East of Secondary 424	Sep-07	457
County	East of Stillwater Road	Sep-03	593
County	South of Prairie View Road	May-01	568
County	West of Bald Rock Road	Jun-02	138
County	West of Secondary 424	Sep-07	222
County	West of Stillwater Road	Sep-03	571
County	West of US Highway 93	Jul-06	790

There were sixteen reported crashes along the study area of Church Drive between January 1st, 2004 and December 31st, 2006. Of these sixteen crashes, ten involved only one vehicle, the majority of which occurred along the shoulder of the roadway. Seven of the crashes occurred when the roadway surfacing conditions were dry. Eight crashes resulted in injury, none of which were incapacitating or resulted in fatalities.

Of the sixteen reported crashes, five occurred at the intersection with US Highway 93. At the time of these crashes, this intersection had stop control along Church Drive. This intersection is presently being constructed to incorporate a "junior interchange" along with the reconstruction of US Highway 93 to a 5-lane roadway. It is expected that the safety of this intersection will improve as a result of the intersection being reconstructed.

A number of crashes also occurred at or near one of the 90-degree corners along Church Drive. These sharp corners can be difficult to navigate, especially in adverse weather conditions and may prove to be increasingly dangerous as traffic volumes increase along Church Drive.

The crash analysis completed along Church Drive indicates that there is a general problem regarding the safety of the multiple 90-degree corners present along the corridor. The relatively low traffic volumes that currently exist along Church Drive (particularly along the western section of the corridor) help keep the total number of crashes along the corridor low; however, as development occurs in the area, and as traffic volumes ultimately increase along Church Drive, the corridor may prove to be even less safe than current crash trends currently indicate.

The intersection of Prairie View Drive and Church Drive is of particular concern. This is a standard three-legged intersection with stop-control along the eastern leg of Church Drive. The concern with this intersection is that the majority of the traffic occurs along the southern and eastern Church Drive approach legs. This creates a problem with priority at the intersection due to the current signing and geometric configuration of the intersection. Also, while traveling northbound along Church Drive it is difficult to see this intersection due to the trees and foliage along the southeastern corner. These concerns will become more of an issue as traffic volumes continue to increase as development occurs in the area.

Identified Issues

- Lack of advance warning signing for curves
- Future ADTs may create hazardous conditions along the 90-degree curves
- No shoulders
- Areas with steep side slopes
- Worn pavement markings
- Intersection with Prairie View Drive has inadequate signing and priority

3. Columbia Falls Stage / River Road

This corridor was evaluated from the intersection US Highway 2 south to the intersection with MT Highway 35. River Road runs from the intersection with US Highway 2 southwest approximately 0.75 miles to intersect with Columbia Falls Stage; Columbia Falls Stage runs from the intersection with River Road south to intersect with MT Highway 35. The study corridor is a two-lane paved roadway classified as a major collector and is approximately 10.75 miles long.

Photo 8: Columbia Falls Stage

This corridor mainly serves a variety of residential neighborhoods and provides access to some recreational areas along the Flathead River. The corridor also provides an alternate north/south connection to Secondary 206 between Columbia Falls and Kalispell east of the Flathead River.

The pavement and striping is generally in good condition; however, the lack of shoulders is problematic along areas with steep side slopes. There are also a number of short vertical curves that result in decreased sight distances. The speed limit along Columbia Falls Stage is 45 mph south of Trap Road and 35 mph north of Trap Road. The speed limit of River Road is 35 mph.

A speed study was conducted by RPA along Columbia Falls Stage approximately 0.5 miles north of Sullivan Crossroad in August, 2008. The speed study showed an average speed of 57.0 mph and an 85th percentile speed of 66.8 mph. The average speed is 12 mph higher than the posted speed limit, while the 85th percentile speed is more than 20 mph higher than the posted speed limit. As the speed study indicates, there is excessive speeding occurring along Columbia Falls Stage which can result in unsafe conditions along the corridor.

Table 2.13 shows various ADT counts conducted by Flathead County and RPA along the study corridor. These ADT values are well under theoretical capacity levels for a paved two-lane major collector roadway.

Table 2.13: Columbia Falls Stage ADT

Source	Location	Date	ADT
County	North of Badrock Drive	Jul-01	691
County	North of Gosney Crossroad	Jul-01	792
County	North of Kelley Road	Jul-04	1,919
County	North of MT 35	Oct-07	1,591
County	North of Trap Road	Jul-01	706
County	South of Helman Lane	Jul-04	796
County	West of Kelley Road	Sep-02	1,170
County	East of Columbia Falls Stage	Jul-04	2,395
County	South of US 2	Aug-06	2,450
RPA[1]	0.5 Miles north of Sullivan Crossroad	Aug-08	852

[1]Represents single day ADT count; value was not adjusted for seasonal or daily variation.

There were twenty-seven reported crashes along Columbia Falls Stage between January 1st, 2004 and December 31st, 2006. Sixteen of the twenty-seven crashes reported involved only one vehicle, the majority of which occurred along the shoulder of the roadway. Approximately half of the reported crashes occurred when the roadway surface was dry, while the remaining crashes occurred when the roadway surface conditions were poor (due to snow, ice, mud, or loose gravel). Ten reported crashes resulted in injuries, none of which resulted in fatalities.

Photo 9: Columbia Falls Stage / River Road

There have been three crashes reported at or near the intersection of Columbia Falls Stage and River Road. This intersection creates a sharp curve that requires drivers to slow down substantially. This curve, coupled with the fact that there are a high number of speeding drivers along the corridor, increases the risk of crashes at this location.

The intersections of Columbia Falls Stage with Kelley Road (see **Section 2.7.2** for more detail) and with Hellman Lane are also potentially dangerous intersections. Three crashes were reported at or near the intersection with Hellman Lane while one occurred at the intersection with Kelley Road. Both of these intersections involve 90-degree corners which require the driver to either slow substantially or come to a complete stop.

Overall there are a large number of crashes occurring along the corridor. It is likely that a majority of these crashes are the result of users driving too fast for the conditions as is indicated by the scattering of single vehicle crashes along the corridor. There are also a number of minor approaches that connect to Columbia Falls Stage which may play a part in the number of crashes.

It is expected that the land use along this corridor will see substantial future commercial and residential development. As development pressures are realized along this corridor, new right-of-way should be set aside as part of project approval for a future wider roadway section. It will be highly desirable to provide shoulders along this route in the future as traffic volumes increase.

As developments are planned, traffic impact studies should be required that evaluate what mitigation may be needed, both on-site and off-site, to alleviate potential impacts. Along Columbia Falls Stage, the planning for left-turn bays, and potentially right-turn bays, are likely mitigation techniques that may be warranted as land use changes. In addition to roadway improvements, the intersection of Columbia Falls Stage and MT Highway 35 should continually be evaluated for traffic signal control warrants as land use changes. It is likely that this route will transform from one that serves primarily local traffic, to one that may start to serve regional through traffic as an alternate to US Highway 206.

Identified Issues

- No shoulders
- Steep side slopes
- Excessive speeding
- Substandard vertical curves / limited sight distances
- High density of access roads
- High number of crashes around the intersection of Columbia Falls Stage and River Road
- Sharp curve at the intersection with Hellman Lane; inadequate advance warning signage
- Possible need to signalize the intersection with MT Highway 35
- Alignment of Kelley Road and Columbia Falls Stage (see **Section 2.7.2**)
- Future development may dramatically increase ADT volumes

4. East Reserve Drive

East Reserve Drive was evaluated from the intersection with Helena Flats Road west to the intersection with US Highway 2. East Reserve Drive is a two-lane paved roadway classified as a minor arterial. There is a posted speed limit of 45 mph and little to no shoulder is provided along the corridor.

Photo 10: East Reserve / Helena Flats

This corridor is approximately one mile long and serves multiple residential neighborhoods and businesses in the area. There are also three schools within a one-mile radius of East Reserve Drive. There are currently no sidewalks or bike lanes provided along the study corridor. Potentially hazardous conditions for pedestrians exist due to the high speeds along the corridor and the lack of pedestrian and bicycle facilities.

Table 2.14 below shows various ADT counts conducted along the study corridor by MDT and Flathead County. These ADT counts show that current traffic volumes are under theoretical capacity levels for a paved two-lane facility.

Table 2.14: East Reserve Drive ADT

Source	Location	Date	ADT
County	East of US Highway 2	Apr-99	3,523
County	West of Helena Flats Road	Sep-05	3,439
MDT	East of US Highway 2	2005	4,680
MDT	West of Helena Flats Road	2005	2,950

There have been seventeen crashes reported along the study corridor between January 1st, 2004 and December 31st, 2006. Of these crashes, fourteen involved multiple vehicles. Twelve crashes occurred while pavement conditions were dry. A total of six crashes resulted in injuries, none resulted in fatalities. The most common type of collision was right angle collisions typically occurring at or near access points along the corridor.

There were six reported crashes between Ash Road and US Highway 2, three of which occurred at the Town Pump gas station entrance. It is likely that this concentration of crashes is due to the multiple driveways associated with the commercial development along this stretch and the close proximity to the high volume intersection with US Highway 2. The ten crashes that occurred at the signalized intersection with US Highway 2 involved vehicles either traveling along East Reserve Drive, or turning from US Highway 2 onto East Reserve Drive. In general, it is likely that the majority of crashes along East Reserve Drive are a combination of the high number of access points and the high speeds present along the corridor.

East Reserve Drive is increasingly seeing use as an informal "bypass" for vehicles traveling between US Highway 2 and MT Highway 35. Because of the usage of this route as a "bypass", speeds tend to be faster than expected for this type of facility. As development occurs in the area, and as traffic volumes increase along US Highway 2, it is likely that this corridor will see an increase in "bypass" usage.

Identified Issues

- Limited or no shoulder
- High density of access points
- Concentration of crashes between US Highway 2 and Ash Road
- High speeds near residential neighborhoods and schools
- Increasing use as a "bypass" to connect US Highway 2 and MT Highway 35
- Limited bicycle/pedestrian facilities
- High number of crashes at the intersection with US Highway 2

5. Foothills Road

Foothills Road was evaluated from Lake Blaine Road south to Echo Lake Road. Foothills Road is a two-lane paved roadway with little or no shoulder. This roadway is used to access recreation and residential areas along the corridor. Foothills Road has several sharp curves and is very rural in nature. The study corridor has a posted speed limit of 35 mph and is classified as a major collector.

Table 2.15 below shows various ADT counts completed by Flathead County. These ADT counts show that current traffic volumes are well under theoretical capacity levels for a two-lane paved roadway.

Table 2.15: Foothills Road ADT

Source	Location	Date	ADT
County	East of Echo Lake Road	Nov-07	737
County	North of Jewel Basin Road	Nov-07	433
County	West of Krause Lane	Nov-07	660
County	South of Bachelor Grade	Nov-07	868
County	East of Lake Blaine Road	Nov-07	1,170

There were seventeen reported crashes along the ten-mile stretch of Foothills Road from January 1st, 2004 to December 31st, 2006. Fourteen (or 82%) of the reported crashes involved only one vehicle, the majority of which occurred along the shoulder of the roadway. Nine of the reported crashes occurred when road surface conditions were wet, icy, or covered in snow or slush. Five crashes resulted in injuries, none of which resulted in fatalities. An analysis of the crash info shows a cluster of crashes reported at or near the following three locations:

- **Intersection with Jewel Basin Road –** There were three reported crashes at this location. Jewel Basin Road intersects Foothills Road along a curve. There are sight distance issues, particularly southbound, at this intersection. The approach angle of Jewel Basin Road also adds to the dangerous conditions present at this location.

Photo 11: Foothills Road / Jewel Basin Road

- **North of Snowberry Trail –** There were seven reported crashes along the one-mile stretch of Foothills Road north of Snowberry Trail. The majority of these crashes occurred just south of the last sharp curve along Foothills Road that heads to Lake Blaine Road. This stretch of Foothills Road generally has poor sight distances in addition to multiple sharp curves that lack appropriate signing.

Photo 12: Snowberry Trail / Foothills Road

- **Peters Creek Way to Bachelor Grade Road –** There were four reported crashes along this one-mile stretch of Foothills Road. This stretch has multiple sharp curves with limited sight distance in addition to multiple approaches connecting to the corridor. Currently, a yield sign is provided along Bachelor Grade Road at the intersection with Foothills Road. The yield sign, coupled with the approach angle of Bachelor Grade Road, gives a false sense of priority to drivers accessing Foothills Road at this location.

Photo 13: Bachelor Grade Road / Foothills Road

In general, Foothills Road is windy, has locations of limited sight distance, and has little to no shoulder. These factors contribute to a potentially dangerous roadway. As traffic volumes increase along Foothills Road, issues regarding the safety of the corridor may worsen as the effects of the roadway characteristics become more influential on the corridor traffic.

Identified Issues:

- Multiple sharp horizontal curves and substandard vertical curves that limit sight distance and create safety issues
- Intersections along curves
- Inadequate signing in some locations
- Increasing ADT may decrease roadway safety

6. Helena Flats Road

Photo 14: Helena Flats Road

Helena Flats Road was evaluated from MT Highway 35 north to East Reserve Drive. Helena Flats Road is a two-lane paved roadway with little to no shoulder and is classified as a minor arterial. This corridor serves local residents and connects Highway 35 to Highway 2 via East Reserve Drive. The study corridor has a posted speed limit of 35 mph.

This corridor is increasingly seeing use as an informal "bypass" for vehicles traveling between US Highway 2 and MT Highway 35. This usage is being fueled by those travelers wishing to avoid the intersection and additional trip length by going through the intersection of LaSalle Road and MT Highway 35.

Helena Flats Road is a major corridor used to access the Evergreen Schools (both junior high and elementary). This corridor currently lacks sidewalks and bike lanes. The close proximity to schools in the area increases the likelihood of students being present along the corridor, either walking or biking. Potentially hazardous conditions for pedestrians exist due to the speeds along the corridor and the lack of pedestrian and bicycle facilities.

A speed study was conducted by RPA along Helena Flats Road in August 2008 north of US Highway 2. The speed study showed an average speed of 34.5 mph and an 85th percentile speed of 39.2 mph. The

speed study indicates that the average speed is lower than the posted speed limit of 35 mph, while the 85th percentile speed is within 5 mph of the posted speed limit. These results do not indicate that there is currently a speeding problem along Helena Flats Road at the location observed. The number of access points and the narrow roadway width are likely factors at maintaining relatively low speeds along this corridor.

Table 2.16 below shows various ADT counts conducted along the study corridor by MDT, RPA and Flathead County. These ADT counts show that current traffic volumes are under theoretical capacity levels for a paved two-lane facility.

Table 2.16: Helena Flats Road ADT

Source	Location	Date	ADT
County	North of East Evergreen Drive	Sep-05	3,671
County	South of East Evergreen Drive	Oct-07	3,864
MDT	South of East Reserve Drive	2005	2,920
MDT	North of MT Highway 35	2005	3,410
RPA[1]	North of East Evergreen Drive	Aug-08	3,962

[1]Represents single day ADT count; value was not adjusted for seasonal or daily variation.

There have been sixteen crashes reported along the study corridor between January 1st, 2004 and December 31st, 2006. Of these crashes, fourteen involved multiple vehicles. Seven crashes occurred while pavement conditions were dry while the remaining nine occurred while the pavement was wet or icy. A total of six crashes resulted in injuries, none of which resulted in fatalities. The most common type of collision was right angle collisions typically occurring at access points along the corridor.

There were two reported crashes at the intersection with East Reserve Drive (see **Section 2.7.2** for more detail). Eight crashes occurred at the unsignalized intersection with MT Highway 35. This intersection is very wide and ill-defined. Also, southbound to eastbound drivers have a difficult time entering the traffic stream. This movement volume is increasing due to drivers avoiding LaSalle Road. Potential traffic signal control may be warranted as land use changes are proposed east of the Flathead River.

Photo 15: Helena Flats Road / MT Highway 35

Identified Issues:

- Increasing traffic volumes
- Narrow roadway with no shoulders
- Lack of bicycle and pedestrian facilities
- Potential traffic signal needed at the intersection with MT Highway 35
- Schools in the area increase the potential risk along the corridor

7. Hodgson Road

Photo 16: Hodgson Road / Whitefish Stage

Hodgson Road was evaluated from US Highway 93 to US Highway 2. Hodgson Road is a two-lane paved roadway with little to no shoulder and is classified as a major collector. The corridor serves local traffic and also serves as a connecting route between US Highway 93 and US Highway 2. The speed limit along Hodgson Road is 40 mph.

Hodgson Road between US Highway 2 and Whitefish Stage is generally flat with some locations of steep side slopes. This portion of the study corridor is fairly undeveloped. Hodgson Road between Whitefish Stage and US Highway 93 is generally curvy and has areas with substandard vertical curves. A number of residential developments exist in this area and utilize Hodgson Road.

The adjacent land use along this corridor is ripe for future development. As development pressures are realized along this corridor, new right-of-way should be set aside as part of project approval for a future wider roadway section. It will be highly desirable to provide shoulders along this route in the future. Access control along this roadway should also be considered as development occurs in the area.

As developments are planned, traffic impact studies (TIS's) should be required that evaluate what mitigation may be needed, both on-site and off-site, to alleviate potential impacts. Along Hodgson Road, the planning for left-turn bays, and potentially right-turn bays, are likely mitigation techniques that may be warranted as land use changes.

Table 2.17 below shows various ADT counts conducted along the study corridor by Flathead County. These ADT counts show that current traffic volumes are under theoretical capacity levels for a paved two-lane facility.

Table 2.17: Hodgson Road ADT

Source	Location	Date	ADT
County	East of Trumble Creek Road	Sep-07	1,222
County	East of Whitefish Stage	Sep-07	1,350
County	East of US Highway 93	Oct-07	1,850
County	West of US Highway 2	Sep-07	1,355
County	West of Whitefish Stage	Oct-07	1,388

There have been twenty-five reported crashes along the study corridor between January 1st, 2004 and December 31st, 2006. Of these crashes, fourteen involved multiple vehicles. Thirteen crashes occurred while pavement conditions were dry while the remaining eleven occurred while the pavement was wet, snowy, slushy, or icy. Seven crashes resulted in injuries, one of which resulted in a fatality. The most common type of collision was right angle collisions typically occurring at access points or intersections along the corridor.

An analysis of the crash data shows a cluster of crashes along Hodgson Road at four locations: 1) intersection with US Highway 93; 2) between Hare Trail and Lidstrom Road; 3) intersection with Whitefish Stage (see **Section 2.7.2** for more detail); and 4) intersection with US Highway 2.

- **Hare Trail to Lidstrom Road** – There were ten reported crashes along this ¾ mile section of Hodgson Road. This section of Hodgson Road is narrow and windy and has multiple residential access points and connecting roads, many of which have poor sight distance. The majority of these crashes occurred at intersections or along corners or hills where sight distance is limited. Seven crashes occurred when the roadway was icy or snowy. Three crashes resulted in injuries along this section of Hodgson Road.

Photo 17: Limited sight distances along Hodgson Road

- **Intersection with US Highway 93** – There were three reported crashes at this location, none of which resulted in injuries. This is a three-legged intersection with stop control along Hodgson Road. US Highway 93 has two travel lanes in each direction along with a center raised median. This intersection has some sight distance issues, particularly along the Hodgson Road leg. While traveling west along Hodgson Road, it is difficult to see this intersection due to the vertical curve present near the intersection. There is also no advanced warning sign for this intersection along Hodgson Road.

Photo 18: Hodgson Road / US Highway 93

- **Intersection with US Highway 2 –** There were five crashes reported at this intersection. Of these crashes, all but one involved multiple vehicles. Three crashes resulted in injuries, one of which resulted in a fatality. US Highway 2 is a five-lane roadway consisting of two travel lanes in each direction and a two-way left-turn lane. This intersection does not appear to have sight distance or geometric configuration issues. It is expected that the high number of crashes occurring at this location are largely due to the high volume and large size nature of the intersection.

Photo 19: Hodgson Road / US Highway 2

Hodgson Road between US Highway 93 and Whitefish Stage has experienced a high number of crashes. This portion of Hodgson Road is windy, has locations of limited sight distances, has little to no shoulder, and has multiple access roads and residential roads connecting to it. As development occurs along Hodgson Road and as ADTs continue to rise, the number of crashes will only increase. The current speed limit of 40 mph along Hodgson Road may need to be reanalyzed to determine if changes need to be made to help decrease the rate of crashes long this corridor.

Identified Issues:

- Increasing traffic volumes
- Narrow windy roadway with no shoulders
- Limited sight distances
- High rate of crashes, particularly between Whitefish Stage and US Highway 93

8. Holt Stage Road / Mennonite Church Road

Photo 20: Holt Stage Road

Holt Stage Road / Mennonite Church Road was evaluated from Steel Bridge Road to Creston Hatchery Road. This corridor is a two-lane roadway that is paved along Holt Stage Road and gravel along Mennonite Church Road. This corridor serves local residents and connects the City of Kalispell to MT Highway 35. There is generally no shoulder provided and there are areas with steep side slopes. This corridor is classified as a major collector roadway with a speed limit of 35 mph. The area that the corridor serves is fairly undeveloped and consists mostly of fields and farmland.

The Old Steel Bridge is currently being replaced, and as a result, current traffic volumes may not be representative of typical use. Once the new bridge is in place, travel patterns are likely to change in this area. The lands adjacent to Holt Stage Road will be ripe for development, and as time goes on development pressures will certainly increase.

Table 2.18 below shows various ADT counts conducted along the study corridor by Flathead County. These ADT counts show that current traffic volumes along Holt Stage Road are under theoretical capacity levels for a paved two-lane facility, while current ADT values along Mennonite Church Road are approaching or exceeding the suggested roadway paving trigger value of 400 vpd.

Table 2.18: Holt Stage Road / Mennonite Church Road ADT

Source	Location	Date	ADT
County	East of Steel Bridge Road	Sep-04	607
County	East of Montford Road	Aug-04	248
County	West of MT Highway 35	Sep-06	190
County	East of MT Highway 35	Nov-07	416
County	West of Creston Hatchery Road	Nov-07	339

There have been six reported crashes along the study corridor between January 1st, 2004 and December 31st, 2006. Five out of the six crashes reported involved only one vehicle, all of which occurred at night. Two crashes resulted in injuries, none of which resulted in fatalities.

In general, the study corridor has seen very few crashes over the three year study period. An analysis of the crash data shows that most of the crashes are likely due to users driving too fast for the conditions, especially at night. There appears to be no pattern of where the crashes are taking place. As a result,

there are no identified deficient areas that are directly resulting in unsafe conditions along the study corridor.

Identified Issues:

- Potentially increasing traffic volumes
- Bridge reconstruction may change roadway usage
- Steep sides lack guardrail along the western portion of Holt Stage Road
- Traffic volumes approaching or exceeding the paving trigger along Mennonite Church Road

9. Kila Road

Kila Road was evaluated from the north intersection with US Highway 2 to the south intersection with US Highway 2. Kila Road has little to no shoulder and has multiple sharp curves, especially along the southern portion of the corridor. This is a two-lane paved roadway that serves the residents of Kila and surrounding areas. The roadway is classified as a major collector and has a speed limit of 35 mph.

Photo 21: Kila Road

Kila Road west of Smith Lake Road is windy, steep, has steep slopes, and has areas with very limited sight distances. Both the northern and southern intersections of Kila Road and US Highway 2 are skewed and provide limited sight distances (see **Section 2.3.2** for more detail).

Table 2.19 below shows various ADT counts conducted along the study corridor by Flathead County. These ADT counts show that current traffic volumes are under theoretical capacity levels for a paved two-lane facility. As is indicated by these traffic volumes, the majority of traffic along Kila Road utilizes the northern most intersection with US Highway 2.

Table 2.19: Kila Road ADT

Source	Location	Date	ADT
County	At north intersection with US Highway 2	Sep-05	1,960
County	East of Smith Lake Road	Sep-05	1,665
County	West of Smith Lake Road	Aug-03	166
County	At south intersection with US Highway 2	Aug-03	151

There have been eleven reported crashes along Kila Road between January 1st, 2004 and December 31st, 2006. Nine of the eleven reported crashes involved a single vehicle, most of which occurred along the shoulder of the roadway. Four crashes resulted in injuries, none of which resulted in a fatality. Four crashes occurred while the road was snowy or icy, while the other seven occurred when the road surface was dry. Five of the reported crashes occurred at the northern intersection of Kila Road and US Highway 2 (see **Section 2.7.2** for more detail). The remaining six reported crashes occurred sporadically along Kila Road.

Kila Road generally has seen very few crashes over the three year study period other than those occurring at the intersection with US Highway 2. An analysis of the crash data shows that most of the crashes involved only one vehicle and are likely due to users driving too fast for the conditions, and as a result, running off the road.

Identified Issues:

- Skewed intersections with US Highway 2 with limited sight distance
- Sharp curves, steep slopes, and limited sight distance west of Smith Lake Road
- No advanced warning signs for intersections
- Substandard vertical and horizontal geometrics at southern intersection with US Highway 2

10. Lake Blaine Road

Photo 22: Lake Blaine Road / Foothills Road

Lake Blaine Road was evaluated from MT Highway 35 to the intersection with Hemler Creek Drive. Lake Blaine Road has little to no shoulder and has some sharp curves along its northern end which cause limited sight distance. This is a paved two-lane roadway that serves local residents and allows access to Lake Blaine. The speed limit along Lake Blain Road is 45 mph from MT Highway 35 to Foothills Road, and 25 mph from Foothills Road to its end. Lake Blaine Road is classified as a major collector between MT Highway 35 and Foothills Road and as a minor collector from Foothills Road to its end.

Cayuse Prairie School is located off Lake Blaine Road. Currently there is no designated "school zone" located along the roadway in the vicinity of the school. A lack of signing and pedestrian / bicycle facilities exist near the school and along Lake Blaine Road.

The intersection of Lake Blaine Road and Foothills Road currently has limited sight distance. A yield sign exists along the northern leg of this intersection. This yield sign, coupled with the limited sight distance and skewed southbound approach angle creates a dangerous intersection, especially as traffic volumes continue to increase in the area. Vehicles currently traveling south along Lake Blaine Road wishing to take a right at the intersection may feel a false sense of priority to westbound vehicles based on the current intersection conditions.

A speed study was conducted by RPA along Lake Blaine Road in August 2008, west of Van Sant Road. The speed study showed an average speed of 47.5 mph and an 85th percentile speed of 53.4 mph. The study results showed that the average speed is slightly higher than the posted speed limit of 45 mph, while the 85th percentile speed is more than 8 mph higher than the posted speed limit. These results indicate that there is a potential speeding problem along Lake Blaine Road.

Table 2.20 on the following page shows various ADT counts conducted along the study corridor by Flathead County, MDT, and RPA. These ADT counts show that current traffic volumes are under theoretical capacity levels for a paved two-lane facility.

Table 2.20: Lake Blaine Road ADT

Source	Location	Date	ADT
County	East of MT Highway 35	Nov-07	3165
County	North of Foothills Road	Nov-07	381
MDT	East of MT Highway 35	2005	2600
RPA[1]	West of Van Sant Road	Aug-08	1713

[1]Represents single day ADT count; value was not adjusted for seasonal or daily variation.

There were seventeen reported crashes along Lake Blaine Road between January 1st, 2004 and December 31st, 2006. Of these crashes, eleven involved only one vehicle, most of which occurred along the shoulder of the roadway. Six crashes occurred while the road surface was dry, while the remaining eleven occurred while the road was wet, snowy, slushy, or icy. Of the seventeen reported crashes, eight resulted in injuries, none of which resulted in fatalities.

An analysis of the crash data shows that the majority of the crashes were spread out along Lake Blaine Drive. No apparent cluster of crashes has been identified. In general, the majority of the crashes appear to be the result of users driving too fast for the conditions and, as a result, running off the roadway. This is supported by the speed study that was conducted that indicates a potential problem with speeding vehicles along the study corridor.

Identified Issues:

- Potential speeding problem
- Lack of shoulders and steep side slopes
- Vertical curves limit sight distance
- Multiple access points
- No "School Zone" near Cayuse Prairie School
- Lack of pedestrian and bicycle facilities
- Sight distance and signing issues at the intersection with Foothills Road
- High number of single vehicle crashes

11. Lower Valley Road

Lower Valley Road was evaluated from the intersection with Willow Glen Drive to the intersection with MT Highway 82. Lower Valley Road is a paved two-lane roadway with little to no shoulder and is classified as a minor collector. This corridor was not evaluated as part of the *Phase 1* plan.

Photo 23: Lower Valley Road

This corridor is flat but has multiple sharp horizontal curves, many of which are 90-degree corners. A speed limit of 45 mph exists along Lower Valley Road; however, some of the sharp corners are signed for slower speeds. Farmland generally surrounds the corridor, with some light residential mixed in, mostly along the northern portion.

A speed study was conducted by RPA along Lower Valley Road east of Foys Bend Lane in August 2008. The speed study showed an average speed of 46.5 mph and an 85th percentile speed of 55.7 mph. The speed study indicates that the average speed is slightly higher than the posted speed limit of 45 mph, while the 85th percentile speed is more than 10 mph higher than the posted speed limit. The results of the speed study indicate that there is a potential speeding problem along Lower Valley Road.

Table 2.21 below shows various ADT counts conducted along the study corridor by Flathead County and RPA. These ADT counts show that current traffic volumes are under theoretical capacity levels for a paved two-lane facility.

Table 2.21: Lower Valley Road ADT

Source	Location	Date	ADT
County	East of Willow Glen Drive	Sep-05	2143
County	North of Manning Road	Aug-07	178
County	North of MT Highway 82	Jun-05	314
RPA[1]	East of Foys Bend Lane	Aug-08	1094

[1]Represents single day ADT count; value was not adjusted for seasonal or daily variation.

There were eighteen reported crashes along Lower Valley Road between January 1st, 2004 and December 31st, 2006. Fifteen of these reported crashes involved only one vehicle, the majority of which occurred along the shoulder of the roadway. Thirteen of the eighteen reported crashes occurred while the road surface was dry. Eight crashes resulted in injuries, none of which resulted in fatalities.

An analysis of the crash data shows that nine of the reported crashes (or 50%) occurred at or near the intersection with Foys Bend Lane. This intersection is a 90-degree corner with little signing. The majority of the remaining nine reported crashes occurred near other sharp corners present along Lower Valley Road, although no other clusters of crashes were observed.

In general, the majority of the crashes along Lower Valley Road appear to be the result of users driving too fast around a sharp corner, and as a result, running off the road. This is supported by the speed study that was conducted that points to a potential problem with speeding vehicles along the study corridor.

Identified Issues:

- Potential speeding problem
- Lack of shoulders
- Multiple sharp corners
- Inadequate signing at some locations
- Large number of crashes at or near the intersection with Foys Bend Lane
- Crashes along 90-degree corners

12. Spring Hill Road

Spring Hill Road was evaluated from the intersection with Smith Lake Road to its end. Spring Hill Road is a two-lane gravel roadway with little to no shoulder. The road has several sharp curves and a portion of the roadway is on a steep vertical grade. This roadway serves residents along the corridor and also provides access to recreational areas in the area. The speed limit along Spring Hill Road is 35 mph and it is classified as a minor collector.

Photo 24: Spring Hill Road

Table 2.22 below shows various ADT counts conducted along the study corridor by Flathead County. These ADT counts show that current traffic volumes are well under theoretical capacity levels for a two-lane roadway. Current traffic volumes are also under the suggested roadway paving trigger value of 400 vpd.

Table 2.22: Spring Hill Road ADT

Source	Location	Date	ADT
County	East of Smith Lake Road	Aug-07	286
County	1.1 miles east of Smith Lake Road	Sep-00	100

There was only one reported crash along Spring Hill Road between January 1st, 2004 and December 31st, 2006. The crash occurred near the intersection with Smith Lake Road and was the result of a single vehicle running off of the road due to excessive speed for the conditions.

In general, Spring Hill Road is a steep windy road that is difficult to traverse during times of inclement weather. Chains or studded tires are recommended during the winter. The crash analysis competed for the corridor did not identify any specific problematic areas resulting in crashes. If development occurs in the area, and ADTs increase, this corridor may approach the roadway paving trigger and safety issues may become a greater concern.

Identified Issues:

- Lack of advance warning signs for curves
- Future ADTs may reach paving threshold
- No shoulders
- Sight distance
- Difficult to traverse during inclement weather
- Steep grades

2.7.2 STUDY INTERSECTIONS

This section provides information on the sixteen intersections that were evaluated as part of this *Transportation Plan*. These study intersection were chosen based on their importance to the roadway network, known traffic patterns, community desire, and identified problem areas. Each of the study intersections were also analyzed in the previous *Phase 1* study and include select signalized and unsignalized intersections. The following are the sixteen study intersections evaluated in detail (also shown graphically in **Figure 2.9**):

1. Auction Road and Demersville Road
2. Batavia Lane and US Highway 2
3. Beach Drive and Holt Drive
4. Best Way and Truck Route
5. Columbia Falls Stage and Kelley Road
6. Fairmont Road and MT Highway 35
7. Helena Flats Road and East Evergreen Drive
8. Helena Flats Road and East Reserve Drive
9. Hodgson Road and Whitefish Stage
10. Kila Road and US Highway 2
11. West Springcreek Road and US Highway 2
12. West Valley Drive and Three Mile Drive
13. Whitefish Stage and Granrud Lane
14. Whitefish Stage and Mission Trail
15. Whitefish Stage and West Evergreen Drive
16. Whitefish Stage and Winchester Street

Each study intersection was analyzed in detail using a number of factors. The previous sections of this Chapter provide information for the intersection performance, preliminary signal warrants and crash analysis. This section uses this previous information along with site visit data to look at each study intersection in detail to define the existing conditions and to identify potential problems.

1. Auction Road and Demersville Road

The intersection of Auction Road and Demersville Road is located south of Kalispell just off of US Highway 93. Auction Road is a two-lane paved roadway that runs parallel to US Highway 2. Demersville Road is a two-lane paved roadway that runs north/south. The intersection of Auction Road and Demersville Road is a skewed three-way intersection that has stop control along the western leg of Auction Road.

No reported crashes occurred at this intersection during the three-year crash analysis period. The traffic volumes are currently low at this intersection, which result in a LOS of A for both the morning and evening peak hours. This is currently a very low volume intersection with fairly distributed turning movements.

The development and construction presently occurring along Demersville Road will increase the traffic at this location in the near future. As traffic volumes increase, the skewed and ill-defined nature of this intersection could prove to be problematic. While this intersection currently has low enough traffic volumes to remain safe and effective, it should be analyzed in the future as these volumes increase.

Identified Issues:

- Skewed and ill-defined
- Increasing ADT may create safety concerns

Photo 25: Auction Road / Demersville Road intersection; from top to bottom: Looking north; looking west; looking south.

2. Batavia Lane and US Highway 2

Photo 26: Batavia Lane / US Highway 2 intersection; from top to bottom: looking west; looking north; looking south.

The intersection of Batavia Lane and US Highway 2 is located west of Kalispell. Batavia Lane is a paved two-lane roadway. US Highway 2 is a two-lane highway that serves regional and local traffic. This intersection is a skewed three-way intersection that has stop control along Batavia Lane. A northbound left-turn lane is provided along US Highway 2 at this location. A widened paved shoulder is provided along the southbound lane which serves as a right-turn lane. No striping currently exists designating this as a right-turn lane, however.

A gas station is located at the northwest corner and Smith Valley School is located along the southwest corner of this intersection. Painted crosswalks currently exist across the southern leg of US Highway 2 and across Batavia Lane. Crossing guards are used to help students cross US Highway 2 at this intersection. The speed limit along US Highway 2 is 45 mph in the adjacent school zone.

Two crashes occurred at this location during the three-year study period. Both crashes involved multiple vehicles and each resulted in non-incapacitating injuries. The LOS analysis completed for this intersection indicates a LOS of D for the AM peak hour and a LOS of C for the PM peak hour. It is expected that a large portion of the AM peak hour traffic is directly a result of the school located at this intersection.

The preliminary signal warrant analysis completed in **Section 2.5** indicates that a signal is warranted based on four-hour traffic volumes and peak hour traffic volumes. It should be noted that the school crossing signal warrant (number 5) was not analyzed due to insufficient data. This intersection should be analyzed in more detail to determine if a traffic signal or other traffic control device is appropriate for this location.

Identified Issues:

- Batavia Lane skewed approach alignment
- School along the southwest corner
- Gas station along the northwest corner
- Students crossing US Highway 2
- Failing LOS during AM peak hour
- Preliminary signal warrant analysis indicates a signal may be warranted
- Shoulder along southbound lane is not striped for a right-turn lane

3. Beach Drive and Holt Drive

The intersection of Beach Drive and Holt Drive is located in Bigfork, southeast of Kalispell. Holt Drive is a paved two-lane major collector roadway which connects to MT Highway 35. Beach Drive makes up the southern leg of the intersection and is a local road which provides access to local residents and to Flathead Lake. Ichabod Lane makes up the northern approach leg of the intersection and is a local residential access road.

This intersection is a four-legged intersection with stop control provided along Beach Drive and Ichabod Lane. The approach along Beach Drive is very skewed and steep. A separate right-turn lane is provided along the southern leg of the intersection. A stop sign and curbing divides the right-turn lane and thru/left-turn lane along this leg. The sight distance along the southern leg is limited due to the approach angle and steepness of the roadway.

No reported crashes occurred at this intersection during the three-year analysis period. The LOS analysis shows a LOS of B during the AM and PM peak hours. While there were no reported crashes during the study period and the LOS indicates that the intersection is performing adequately, this is likely the result of the low traffic volumes at this intersection. Overall this is a very awkward intersection that has multiple geometric issues.

Identified Issues:

- Holt Drive is skewed and steep
- Separate right-turn lane divided by stop sign and curbing
- Limited sight distance
- Northern and southern approach alignment is poor

Photo 27: Beach Drive / Holt Drive intersection; from top to bottom: looking west; looking south; looking east; looking north.

4. Best Way and Truck Route

Photo 28: Best Way / Truck Route Intersection; from top to bottom: looking west; looking east; looking north; looking south.

The intersection of Best Way and Truck Route is located along the western portion of Columbia Falls. Best Way and Truck Route are both two-lane paved roadways that mostly serve industrial and commercial businesses in the area. This intersection is a four-way stop-controlled intersection. A substantial number of large trucks utilize this intersection due to its close proximity to a logging mill and other businesses in the area.

No reported crashes occurred at this intersection during the three-year crash analysis period. The traffic volumes are currently low at this intersection, which result in a LOS of A for both the AM and PM peak hours.

This intersection presently functions at an acceptable LOS and does not appear to have safety issues resulting in high crash rates. An analysis of the current traffic volumes utilizing this intersection indicate that the volumes are fairly distributed along all four legs of the intersection. As traffic volumes increase, this intersection should be analyzed in more detail to determine if the stop control currently being provided along all four legs is still necessary, or if other traffic control measures are needed. It should be noted that the four-way stop-controlled intersection is the most restrictive form of intersection traffic control and often results in increased delay and vehicle emissions.

It is uncertain if all four corners of the intersection currently accommodate large trucks. Due to the high percentage of large trucks utilizing this intersection, it is important that the corner radii accommodate a large enough design vehicle.

Identified Issues:

- High volume of large truck traffic
- Four-way stop control
- Small corner radii

5. Columbia Falls Stage and Kelley Road

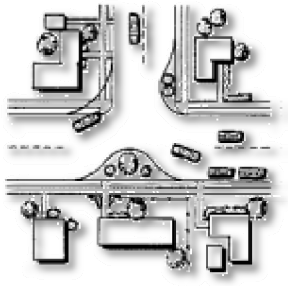
The intersection of Columbia Falls Stage and Kelley Road is located south of Columbia Falls. Columbia Falls Stage is a two-lane paved roadway classified as a major collector. This corridor serves as an alternate route to MT Highway 206 and connects Kalispell to Columbia Falls east of the Flathead River. Kelley Road is a two-lane paved roadway classified as a minor collector. Kelley Road connects Columbia Falls Stage to MT Highway 206 south of Columbia Falls. The intersection of Columbia Falls Stage and Kelley Road is a three-legged intersection with stop control along the northern leg of Columbia Falls Stage.

Photo 29: Columbia Falls Stage / Kelley Road Intersection; from top to bottom: looking west; looking south; looking east.

The crash analysis completed for this intersection shows that one crash occurred during the three-year study period. The crash involved two vehicles but did not result in any reported injuries. The LOS analysis completed shows that this intersection performs at a LOS of A during both the AM and PM peak hours.

An analysis of the traffic distribution at this intersection indicates that the majority of the traffic occurs along Columbia Falls Stage which acts as the mainline corridor. A large portion of the traffic at this intersection travels along the western and southern approach of Columbia Falls Stage. Most of the traffic along the eastern leg of Kelley Road takes a right at the intersection to head north along Columbia Falls Stage.

As development occurs in the area, and as traffic volumes increase, it is expected that this intersection will become more problematic due to the current geometric configuration and traffic control measures. Given the traffic distribution discussed above, it may be desirable to allow free flow traffic along Columbia Falls Stage Road. This could be achieved by realigning this intersection to create a smooth curve along the northwest corner (see illustration). The eastern leg of Kelley Road could then be realigned to connect to the intersection at a 90-degree angle. Stop control would then be provided along Kelley Road. Realigning the intersection in this fashion would allow for unobstructed movements for the majority of traffic. This will become increasingly important as traffic volumes increase at this intersection.



Identified Issues:

- Majority of intersection traffic occurs along Columbia Falls Stage
- Poor geometric configuration
- "T" intersection requires a stop along northern leg
- Increasing traffic volumes may prove to be problematic

6. Fairmont Road and MT Highway 35

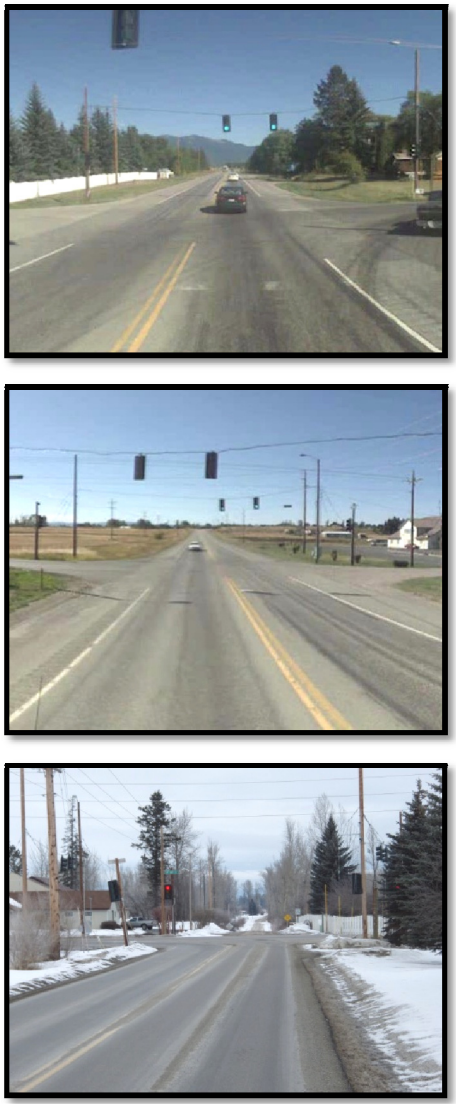


Photo 30: Fairmont Road / MT Highway 35; from top to bottom: looking east; looking west; looking north.

The intersection of MT Highway 35 and Fairmont Road is located east of Kalispell and east of the Flathead River. MT Highway 35 is a two-lane paved highway classified as a principal arterial. Fairmont Road is a two-lane paved minor collector roadway that serves local traffic. The intersection of MT Highway 35 and Fairmont Road is a four-way signalized intersection.

This intersection was recently temporarily signalized and the data collection at this location occurred while the intersection was unsignalized. Assumed signal timing was used for the performance analysis of this intersection and may not reflect actual signal timing. A LOS of B during the AM peak hour and a LOS of A during the PM peak hour resulted from this performance analysis. A previous analysis of this intersection under unsignalized conditions indicates a failing LOS during AM and PM peak hours.

The vast majority of traffic at this intersection occurs along MT Highway 35. Turn-lanes are not currently provided along any of the intersection legs. As traffic volumes increase, turn lanes off of MT Highway 35 may be needed.

There were four crashes at this location during the three-year crash analysis period. The crash analysis period occurred while the intersection was unsignalized. Two of these crashes resulted in injuries. It is unknown how the safety of this intersection has changed since its recent signalization.

MT Highway 35 has a speed limit of 65 mph at this location, which could result in potentially hazardous situations at this location. Advance intersection warning signs may be needed to help identify the traffic signal along this high-speed highway and to increase the safety of the intersection.

Identified Issues:

- High speeds along MT Highway 35
- Vast majority of traffic occurs along MT Highway 35
- Historically high rate of crashes
- Potential for turn lanes along MT Highway 35
- Traffic signal is temporary and should be permanently constructed
- Advance intersection warning signs needed

7. Helena Flats Road and East Evergreen Drive

The intersection of Helena Flats Road and East Evergreen Drive is located in Evergreen, just east of Kalispell. Helena Flats Road is a two-lane paved roadway classified as a minor arterial. Helena Flats Road connects to MT Highway 35 and provides an alternate north/south corridor to LaSalle Road / US Highway 2. East Evergreen Drive is a two-lane paved roadway and is classified as a minor arterial west of the intersection with Helena Flats Road. Evergreen Drive is a major east/west corridor and connects to Whitefish Stage. A bike/ped path exists along the north side of East Evergreen Drive.

The intersection of Helena Flats Road and East Evergreen Drive is a four-legged intersection with stop control along East Evergreen Drive. East Evergreen School is located along East Evergreen Drive near the intersection with Helena Flats Road. A crosswalk is provided across the northern leg of this intersection.

There were two reported crashes at this intersection during the three-year study period. Both crashes involved two vehicles, one of which resulted in a non-incapacitating injury. A LOS analysis completed for this intersection shows that it currently functions at a LOS of B during AM and PM peak hours. The vast majority of traffic occurring at this intersection occurs along Helena Flats Road as straight through movements. One concern regarding this intersection is the amount of vegetation present at the corners of the intersection. Care should be taken to trim vegetation so that sight distance and traffic control signs are not obstructed.

It is expected that this intersection, particularly along Helena Flats Road, will see an increase in traffic volumes due to its use as a "bypass" to LaSalle Road / US Highway 2. At this time, the intersection functions adequately; however, if traffic volumes increase, or traffic patterns change, this intersection should be analyzed in more detail to determine if a change in traffic control devices, or the addition of turn-lanes, may be needed.

Photo 31: Helena Flats Road / East Evergreen Drive Intersection; from top to bottom: looking west; looking south; looking east; looking north.

Identified Issues:

- Majority of intersection traffic occurs along Helena Flats Road
- Vegetation obstructs sight distances and/or traffic signs
- East Evergreen School is located near the intersection
- Increasing use as a "bypass" to LaSalle Road / US Highway 2
- Likely increasing ADT may result in intersection performance issues

8. Helena Flats Road and East Reserve Drive



Photo 32: Helena Flats Road / East Reserve Drive; from top to bottom: looking east; looking west; looking south; looking north.

The intersection of Helena Flats Road and East Reserve Drive is located in Evergreen, northeast of Kalispell. Helena Flats Road is a two-lane paved roadway classified as a minor arterial. Helena Flats Road connects to MT Highway 35 and provides an alternate north/south corridor to LaSalle Road / US Highway 2. East Reserve Drive is a two-lane paved roadway classified as a minor arterial west of Helena Flats Road and as a minor collector east of Helena Flats Road. The intersection of Helena Flats Road and East Reserve Drive is a four-way stop-controlled intersection. It should be noted that the four-way stop-controlled intersection is the most restrictive form of intersection traffic control and often results in increased delay and vehicle emissions.

There were no reported crashes at this intersection during the three-year study period. The LOS analysis performed for this intersection shows that the intersection currently functions at a LOS of A during AM and PM peak hours. The traffic distribution at this intersection shows that the southern leg sees the most use, while the eastern leg experiences the least amount of traffic. In general, the majority of the traffic is traveling south to west through the intersection during the AM peak hour, while during the PM peak hour traffic is fairly well distributed along all legs.

One concern regarding this intersection is that there are some sight distance issues along the northwest corner. There is a large fence along the northwest corner at this location that obstructs the view along the northern and western approach legs. While the crash analysis does not indicate that this has been an issue, as traffic volumes continue to rise, the obstructed sight distance may become problematic.

It is expected that this intersection will experience an increase in traffic volumes as development occurs in the area and as these corridors see an increase in use as a "bypass" to MT Highway 35 and LaSalle Road / US Highway 2. While this intersection presently functions at an acceptable LOS, the performance should be monitored as development pressures are realized and as traffic volumes ultimately grow.

Identified Issues:

- Limited sight distance along northwest corner
- Increasing traffic volumes
- Four-way stop control

9. Hodgson Road and Whitefish Stage

The intersection of Hodgson Road and Whitefish Stage is located between Kalispell and Whitefish. Whitefish Stage is a two-lane paved roadway classified as a minor arterial and serves as an alternate north/south corridor to US Highway 93 which runs between Whitefish and Kalispell. Hodgson Road is a two-lane paved major collector roadway which runs between US Highway 93 and US Highway 2. Hodgson Road generally serves local traffic and residential neighborhoods in addition to providing east/west connection between the two highways.

The intersection of Hodgson Road and Whitefish Stage is a four-legged intersection with stop control along Hodgson Road. Six crashes were reported at this intersection during the three-year study period. Of the six crashes, two resulted in injuries, none of which were incapacitating. The intersection has a crash rate of 1.69 crashes per million entering vehicles. This intersection had the highest number of crashes and the second highest crash rate of the study intersections over the three-year analysis period.

A performance analysis completed for this intersection indicates that the intersection performs at a LOS of B during the AM and PM peak hours. The traffic volumes are fairly evenly distributed along all four intersection legs. No proportionally heavy traffic movements are apparent at this intersection.

The main concern with this intersection is the skewed western approach leg. The geometrics of this leg are awkward and restrict sight distance which results in safety issues. The high number of crashes occurring at this intersection may at least partially be attributed to the poor intersection alignment.

Identified Issues:

- High rate of crashes
- Skewed western approach leg
- Limited sight distance

Photo 33: Hodgson Road / Whitefish Stage; from top to bottom: looking west; looking south; looking east; looking north.

10. Kila Road and US Highway 2

Photo 34: Kila Road / US Highway 2; from top to bottom: looking south; looking west; looking north.

The intersection of Kila Road and US Highway 2 is located in Kila, south of Kalispell. Kila Road is a two-lane paved roadway classified as a major collector. This corridor is used to access the small community of Kila off of US Highway 2. Kila School is also accessed via Kila Road. US Highway 2 is a two-lane paved highway classified as a principal arterial.

The intersection of Kila Road and US Highway 2 is a three-legged intersection with stop control along Kila Road. This intersection is very skewed and as a result has limited sight distance. Five crashes were reported at this location during the three-year analysis period. Of the five crashes, three resulted in injuries, none of which were incapacitating. This intersection had the third highest number of crashes and the third highest crash rate of the study intersections.

A performance analysis of this intersection shows that the intersection functions at a LOS of B during the AM peak hour and at a LOS of A during the PM peak hour. A look at the turning movement counts performed at this intersection shows that almost all of the traffic accessing US Highway 2 at this location is turning right off of Kila Road. The counts also show that almost all of the traffic accessing Kila Road from US Highway 2 at this location is turning left from US Highway 2.

An initial look at the "Volume Guidelines for Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways" contained in MDT's *Traffic Engineering Manual* indicates that a southbound left-turn lane should be considered at this location based on current traffic volumes. Currently, vehicles stopping to turn left onto Kila Road are interrupting US Highway 2 traffic flow.

Identified Issues:

- High rate of crashes
- Skewed eastern approach leg
- Limited sight distances
- Southbound left-turn lane may be needed

11. West Springcreek Road and US Highway 2

The intersection of West Springcreek Road and US Highway 2 is located west of Kalispell. West Springcreek Road is a two-lane paved principal arterial roadway that serves local and regional traffic along the western edge of Kalispell. US Highway 2 is a two-lane paved highway classified as a principal arterial.

The intersection of West Springcreek Road and US Highway 2 is a four-legged intersection with stop control along West Springcreek Road and Dern Road. A flashing signal currently exists at this location which provides a flashing red light for the West Springcreek Road and Dern Road legs and flashes yellow for the US Highway 2 legs. Poor sight distance currently exists at the southwest corner of this intersection. This intersection has a high percentage of truck traffic which utilizes West Sringcreek Road to connect to Reserve Drive and US Highway 93 in order to "bypass" the City of Kalispell.

There were six reported crashes at this intersection during the three-year study period. Of these six crashes, five resulted in injuries, none of which were incapacitating. This intersection had the highest number of crashes, the third highest severity index, and the fourth highest crash rate, which resulted in the highest composite rating of all the study intersections.

The performance analysis conducted for this intersection indicates that it performs at a LOS of F during the AM peak hour and at a LOS of D during the PM peak hour. The poor performance of the intersection can largely be attributed to the inability of traffic along West Springcreek Road and Dern Road to access US Highway 2 due to the high traffic volumes along the highway. A preliminary signal warrant analysis performed for this intersection indicates that signal warrants were met for the 4-hour and peak hour traffic volumes. This intersection should be analyzed in more detail to determine if a traffic signal or other traffic control device is appropriate for this location.

Identified Issues:

- Highest composite crash rating
- Limited sight distance along southwestern corner
- Failing LOS during AM and PM peak hours
- Preliminary signal warrant analysis indicates a signal may be warranted
- High percentage of truck traffic
- Steep grade along Dern Road

Photo 35: West Springcreek Road / US Highway 2; from top to bottom: looking east; looking west; looking south; looking north.

12. West Valley Drive and Three Mile Drive

Photo 36: West Valley Drive / Three Mile Drive; from top to bottom: looking east; looking south; looking north.

The intersection of West Valley Drive and Three Mile Drive is located west of Kalispell. West Valley Drive is a two-lane paved minor collector roadway that serves local traffic in the area. Three Mile Drive is a two-lane paved roadway classified as a minor collector west of West Valley Drive and as a major collector east of West Valley Drive. Three Mile Drive generally serves local traffic in the region.

This intersection is a four-legged intersection with yield signs along West Valley Drive. There have been three reported crashes at this intersection during the three-year analysis period. Two of the crashes resulted in injuries, none of which were incapacitating. This intersection has the highest crash rate and fourth highest severity index, resulting in the second highest composite rating among the study intersections.

The performance analysis conducted for this intersection indicates that it functions at a LOS of A during both the AM and PM peak hours. A look at the traffic patterns indicate that a vast majority of the traffic entering this intersection occurs along West Valley Drive. It would seem better suited to move the traffic control signs from West Valley Drive and place them along the Three Mile Drive approaches.

In general this intersection performs quite well. There is minimal traffic delay and the sight distance seems adequate along all corners. Despite the low traffic volumes and minimal delay, this intersection did have a high crash rate resulting in 1.92 crashes per million entering vehicles. This high crash rate may at least partially be due to the traffic control signs being placed along the higher volume legs of the intersection instead of being placed along the lower volume legs. This may cause confusion amongst users resulting in unsafe conditions.

Identified Issues:

- High rate of crashes
- Yield signs placed along higher volume legs

13. Whitefish Stage and Granrud Lane

The intersection of Whitefish Stage and Granrud Lane is located north of Kalispell. Granrud Lane is a two-lane paved roadway classified as a minor collector and serves local and residential traffic in the area. Whitefish Stage is a two-lane paved roadway and is classified as a minor arterial. Whitefish Stage serves local and regional traffic in the area and also provides an alternate north/south route to US Highway 93 and US Highway 2.

This intersection is a three-legged intersection with stop control along Granrud Lane. There were two reported crashes during the three-year analysis period, one of which resulted in an incapacitating injury. A performance analysis of this intersection indicates that the intersection performs at a LOS of B during the AM and PM peak hours. Granrud Lane has relatively low traffic volumes at the intersection with Whitefish Stage.

Overall, this intersection performs adequately for the amount of traffic that it handles. The relatively limited use along Granrud Lane contributes to the high performance level of the intersection. This intersection is geometrically sound and has good sight distance in all directions. If traffic volumes continue to rise in the future, this intersection should be monitored to determine if turn lanes along Whitefish Stage are justified.

One concern regarding this intersection is the treatment of the shared-use path which crosses the Granrud Lane leg of the intersection. There are no pavement markings or signs indicating that pedestrians and/or bicyclists may be crossing at this location. This could result in potentially hazardous situations.

Photo 37: Whitefish Stage / Granrud Lane; from top to bottom: looking north; looking east; looking south.

Identified Issues:

- One incapacitating injury occurred during the analysis period
- Lack of treatment for the shared-use path crossing
- Turn lanes off of Whitefish Stage may be needed in the future

14. Whitefish Stage and Mission Trail

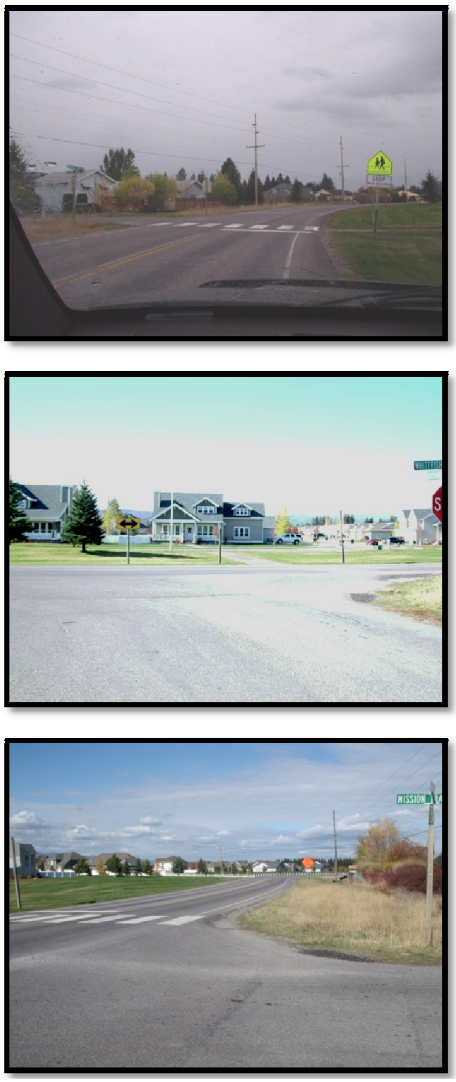


Photo 38: Whitefish Stage / Mission Trail; from top to bottom: looking south; looking west; looking north.

The intersection of Whitefish Stage and Mission Trail is located north of Kalispell. Mission Trail is a two-lane paved roadway and is used primarily for residential access. Whitefish Stage is a two-lane paved roadway and is classified as a minor arterial. Whitefish Stage serves local and regional traffic in the area and also provides an alternate north/south route to US Highway 93 and US Highway 2.

This intersection is a three-legged intersection with stop control along Mission Trail. There were no reported crashes during the three-year analysis period. A performance analysis of this intersection indicates that the intersection performs at a LOS of C during the AM and PM peak hours. The vast majority of the vehicles traveling along Mission Trail are turning left at the intersection to head south towards Kalispell. Similarly, the majority of vehicles turning onto Mission Trail are right-turns off of Whitefish Stage.

Overall, this intersection performs adequately for the amount of traffic that it handles. The relatively limited use along Mission Trail contributes to the high performance level of the intersection. This intersection is geometrically sound and has good sight distance in all directions. If traffic volumes continue to rise in the future, this intersection should be monitored to determine if turn lanes off of Whitefish Stage are justified. In the future, as the LOS decreases, additional traffic control device may be needed.

One concern regarding this intersection is that there is a crosswalk across the northern leg of the intersection which connects to the shared-use path along Whitefish Stage. The crosswalk leads directly to the shoulder and ditch along Mission Trail as there is no sidewalk or trail provided at this location. This could lead to pedestrians and/or bicyclists sharing the narrow roadway along Mission Trail with motorists.

Identified Issues:

- Crosswalk across Whitefish Stage does not connect to a path or sidewalk along Mission Trail
- Monitor to determine if traffic control device and/or turn lanes are needed in the future

15. Whitefish Stage and West Evergreen Drive

The intersection of Whitefish Stage and West Evergreen Drive is located north of Kalispell. West Evergreen Drive is a two-lane paved roadway classified as a minor arterial. West Evergreen Drive serves local and regional traffic in the area. Whitefish Stage is a two-lane paved roadway and is classified as a minor arterial. Whitefish Stage serves local and regional traffic in the area and also provides an alternate north/south route to US Highway 93 and US Highway 2.

This intersection is a three-legged intersection with stop control along West Evergreen Drive. There were three reported crashes at this intersection during the three-year analysis period. Of these crashes, two resulted in injuries, none of which were incapacitating. The Village Plaza Shopping Center is located at the northeast corner of this intersection. Edgerton School is also located nearby.

A performance analysis of this intersection indicates that the intersection performs at a LOS of C during the AM peak hour and at a LOS of F during the PM peak hour. The poor performance of the intersection indicates that some form of traffic control measure may be needed at this intersection. Currently, there are no designated turn-lanes off of Whitefish Stage at this intersection. The high number of turning vehicles and poor LOS may indicate a need to add a right and/or left-turn bay(s) off of Whitefish Stage. A preliminary signal warrant analysis for this intersection indicates that warrants may be met for the peak hour traffic warrant. This intersection should be analyzed in more detail to determine if a traffic signal or other traffic control device is appropriate for this location.

Photo 39: Whitefish Stage / West Evergreen Drive; from top to bottom: looking west; looking south; looking north.

Identified Issues:

- Poor PM peak hour LOS
- High volume of vehicles turning from Whitefish Stage
- Preliminary signal warrant analysis indicates a signal may be warranted
- School and area businesses located nearby

16. Whitefish Stage and Winchester Street

Photo 40: Whitefish Stage / Winchester Street; from top to bottom: looking north; looking west; looking east; looking south.

The intersection of Whitefish Stage and Winchester Street is located north of Kalispell. Winchester Street is a two-lane paved roadway which is primarily used to access residential areas. Whitefish Stage is a two-lane paved roadway and is classified as a minor arterial. Whitefish Stage serves local and regional traffic in the area and also provides an alternate north/south route to US Highway 93 and US Highway 2.

This intersection is a four-legged intersection with the western leg being an access to the Buffalo Hill Golf Club. Stop control is provided along the Golf Club access road and along Winchester Street. There were no reported crashes during the three-year analysis period. A performance analysis of this intersection indicates that the intersection performs at a LOS of C during the AM and PM peak hours.

Overall, this intersection performs adequately for the amount of traffic that it handles. If traffic volumes continue to rise in the future, this intersection should be monitored to determine if turn lanes or other traffic control measures are justified. Another concern regarding this intersection is that there is no signing for the crosswalk across the northern leg of the intersection. This may reduce the visibility of the crosswalk to oncoming motorists.

Identified Issues:

- No signing for the crosswalk across Whitefish Stage
- Increasing traffic volumes may necessitate additional traffic control measures