GALLATIN COUNTY TRANSPORTATION INFRASTRUCTURE ASSESSMENT AND RECOMMENDATIONS

Current and Future Needs

Twenty Year Plan

By

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GLOSSARY OF ABBREVIATIONS

ADT	Average Daily Traffic
EMS	Emergency Medical Services
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
GIS	Geographical Information Systems
HCM	Highway Capacity Manual
HMA	Hot Mix Asphalt
ITE	Institute of Transportation Engineers
LOS	Level of Service
MDT	Montana Department of Transportation
MVMT	Million Vehicle Miles Traveled
NHTSA	National Highway Transportation Safety Administration
PM	Particulate Matter
ROW	Right of Way
VMT	Vehicle Miles Traveled

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EXECUTIVE SUMMARY

Gallatin County Road and Bridge Department is responsible for maintaining about 655 centerline miles of gravel roads, 32 centerline miles of dirt roads and 179 centerline miles of paved roadways. The Department also maintains 199 bridges and culverts. The existence and condition of transportation infrastructure is a critical factor for increasing rural economic growth. In other words, a well-maintained and adequate transportation infrastructure is essential if rural communities are to be linked to employment, markets, and other opportunities found outside the local community and Gallatin County. As growth in the county continues, there are more residential and industrial developments, as well as more residents, all requiring county services. It is imperative to maintain and upgrade bridges and culverts for providing fire and emergency services to an expanding population, to provide access for school buses and to provide for heavy vehicle traffic such as delivery vehicles. Maximizing benefits from public funds to taxpayers is paramount in developing a capital and maintenance program. This can be most successfully achieved through systemwide proactive planning for the future. Every $100 million over a 10-year period (i.e. an average of 10 million per year) invested in highway safety improvements is estimated to result in approximately 145 fewer traffic fatalities over a 10-year period (i.e. an average of 14.5 fatalities per year). Additional benefits include better mobility, timely emergency response, and improved quality of life.

The study presented here is a supplement to the existing Bozeman and Belgrade transportation plans. It provides the basis for developing a countywide transportation plan and identifies a financial plan for immediate and future transportation needs. The transportation infrastructure addressed in this document is limited to unpaved and paved roadways and bridges.

The primary tasks of this planning effort consisted of collecting and integrating all available data on the existing county transportation infrastructure to facilitate informed decision making, evaluating the current condition of the county transportation infrastructure, projecting the condition of the transportation infrastructure in 1, 2, 5 and 10 years from 2004 reflecting forecast changes in land use and traffic volumes in the county, estimating the cost of implementing recommended improvements based on the analysis, recommending potential funding source alternatives, and recommending schedules for implementing the road and bridge improvements.

Based on the existing research on Particulate Matter (PM) emissions from traffic on gravel roads and life-cycle cost analysis of gravel and paved roads, a set of standards for existing gravel and paved roads in the county was established. These standards were then compared with the current traffic demand (e.g. Average Daily Traffic) to identify current traffic needs.

Historical residential well information was used to project the residential demand growth by the year 2025. Traffic demand projections were made based on this projected residential demand growth. The standards for County roadways and bridges established earlier were then compared with this estimated future traffic demand to identify future road and bridge improvement needs. The costs of meeting identified current and future needs were estimated. The current needs are estimated to cost $34.97 million. Since all of the current needs can not be met in one year, this cost was budgeted equally over the next five years (FY 2005-2006 till FY2010-2011). There were no dirt roads that were identified to be improved.

The future needs are estimated to total $26 million. The future needs are divided into immediate future needs (i.e. needs for the time period between year 2010 and 2015) and long term needs (i.e. needs for the time period between year 2015 and 2025). The immediate future needs are estimated to cost about $10 million and long term needs are estimated to cost about $ 16 million. There were no bridges that were identified to be improved in the immediate future needs analysis or the long term future needs. The costs of immediate and long term future needs are equally divided among the years in the respective time periods.

This document also presents a set of federal and state funding sources that may be applicable to the identified improvement projects. The identified current needs are necessary to maintain an acceptable level of mobility and meet the known current traffic demands. To maximize their effectiveness, the identified future needs should be re-evaluated at regular intervals using available land use data at that time.

1. INTRODUCTION

Gallatin County encompasses 2,517 square miles and is currently the fastest growing county in Montana. Its population grew by 41 percent between 1990 and 2002 and by 5 percent between 2000 and 2002 alone. This rapid growth has led to accelerated deterioration of the transportation infrastructure. A well-maintained transportation system is essential for safe and efficient movement of County residents and also for sustaining regional economic growth.

1.1. Economic Importance of Transportation Infrastructure

The existence and condition of transportation infrastructure is a critical factor for increasing rural economic growth. That is, a well-maintained and adequate transportation infrastructure is essential if rural communities are to be linked to employment, markets, and other opportunities found outside the local community and Gallatin County (1). Activities such as building new roads, widening existing roads, and constructing new interchanges or bridges will result in many benefits for rural areas, including improved access to services and jobs for rural residents, improved access to customers for businesses, and reduced transportation costs (2). Other potential benefits include reductions in travel times, reduced vehicle operating costs, improved safety and improved environmental quality, and savings for local consumers as goods and services become more competitively priced. If an improved transportation network leads to economic growth, it will result in increased wages for workers and greater net income for owners of local businesses. Ongoing research is being conducted nationally to establish the relationship between economic growth and transportation infrastructure investments.

As growth in the county continues to increase, there are more buildings and residents requiring county services. It is imperative to maintain and upgrade bridges and culverts for providing fire and emergency services to an expanding population, to provide access for school buses and to provide for heavy vehicle traffic such as delivery vehicles.

1.2. Need for Comprehensive Transportation Infrastructure Plan

The County Road and Bridge Department is responsible for maintaining about 655 center line miles of gravel roads, 32 center line miles of dirt road, and 179 center line miles of paved roadways. The County also maintains 199 bridges and culverts. The County Road and Bridge department is charged with using public funds in the most efficient manner to provide the residents of the county with safe and comfortable roads. Doing so requires assigning levels of priority to candidate projects and making informed decisions to maintain the existing infrastructure and build new infrastructure effectively. Resources available to the County for repair and construction of new facilities are limited; however, rapid growth in the county has resulted in needs for additional transportation infrastructure and the need for increased maintenance of the existing roadways and bridges.

Providing the most benefits from public funds to taxpayers is paramount in developing a capital and maintenance program. This can be most successfully achieved through systemwide proactive planning for the future. In response to continuing rapid growth, the county has developed and is implementing a growth policy that delineates the county's policies on land use (3). This document sets forth a vision for county planning to provide better quality of life in the county. Increased use of the transportation network demands comprehensive planning so that the limited financial resources available to the county can be utilized efficiently and equitably.

1.3. Health Effects of Emissions from Unpaved Roads

Particulate matter (PM) emissions from vehicular travel on unpaved roads are one of the air quality criteria pollutants outlined in the Clean Air Act. PM is one of the criteria pollutants that has been identified as a probable carcinogen and listed as an "air toxic" compound by the U.S. Environmental Protection Agency (EPA).

The Federal Highway Administration (FHWA) has established a PM research program to determine the contribution of mobile sources to PM emissions in non-attainment areas determined by the EPA. These non-attainment areas will have to develop plans for reducing emissions. Though Gallatin County is not in the non – attainment area at present, it is important to reduce these emissions as much as possible.

A large number of individuals have an increased risk of developing health problems from exposure to particulate matter. It is estimated that tens of thousands of elderly people die prematurely each year from ambient levels of fine particles. Breathing fine particles can also adversely affect individuals with heart disease, emphysema, and chronic bronchitis. Children are also susceptible to particulate matter, because their respiratory systems are still developing. Exposure to fine particles is associated with increased frequency of childhood illnesses and increased respiratory symptoms and reduced lung function. Asthmatics are also at risk, because breathing fine particles can aggravate asthma. In summary, older populations and children are the most prone to developing health complication due to PM emissions.

As a result of these conditions, it is sometimes necessary to pave gravel roads that are close to locations such as schools and elderly homes. The county must therefore incorporate these needs into its infrastructure planning process.

1.4. Safety Benefits of Road Improvements

One of the major benefits of roadway improvements is enhanced safety for travelers. More than 42,000 people are killed in highway crashes each year in the U.S., and more than 3.5 million are injured. Studies show that increased investment in road and bridge improvements at the local level saves lives. Making lanes and shoulders wider, adding medians and improving bridges are just a few of the improvements that have been shown to reduce fatalities significantly. FHWA has published information (Table 1-1) on the effectiveness of various road improvements in reducing fatalities. Table 1-1 is based on data obtained by the Road Information Program from the Federal Highway Administration (FHWA) and the National Highway Traffic Safety Administration (NHTSA).

Table 1-1. Safety Benefits from Road Improvements

Improvements	Percentage Reduction in Fatality Rates
Improvements at Intersections	
Turning Lanes and Traffic Channelization	47%
Sight Distance Improvements	56%
New Traffic Signals	53%
Bridge Improvements	
Widening a Bridge	49%
New Bridge	86%
Upgrade Bridge Rail	75%
Roadway Improvements	
Construct Median for Traffic Separation	73%
Widen or Improve Shoulder	22%
Realign Roadway	66%
Groove Pavement for Skid Treatment	33%
Roadside Improvements	
Upgrade Median Barrier	66%
New Median Barrier	63%

Every $100 million over a 10-year period (i.e. about 10 million per year) invested in highway safety improvements is estimated to result in approximately 145 fewer traffic fatalities over a 10-year period (i.e. about 14.5 fatalities per year). Listed in Table 1-1 are key local road and bridge improvements evaluated over a 20-year period by FHWA and the related reduction in fatality rates (4). For example, a new bridge at an identified problem location reduces the fatality rate (i.e. the total number of fatal accidents divided by Million Vehicle Miles Traveled (MVMT)) by 86% on average. These improvements result in expected safety benefits when applied to a road segment identified to be in need of one of the improvements shown in the table through a crash analysis. Crash analysis typically uses the data from all accidents in a jurisdiction of interest and identifies the high crash locations through a statistical analysis. The most common accident types (e.g. head-on collision) at these high crash locations are usually identified and an appropriate improvement for that location is selected. The above table shows the average fatality reductions based on documented safety benefits at different locations all over the nation.

1.5. Project Objectives

The Greater Bozeman Transportation Coordination Committee completed an update of the Greater Bozeman Area Transportation Plan in 2001 (5). This update was the first step towards developing a countywide transportation plan.

This project is a supplement to the existing Bozeman and Belgrade transportation plans. It provides the basis for developing a countywide transportation plan and will identify a financial plan for immediate and future transportation needs. The transportation infrastructure addressed in this document is limited to unpaved and paved roadways and bridges.

The primary tasks of this planning effort were:

1. collect and integrate all available data on the existing county transportation infrastructure to facilitate informed decision making;
2. evaluate the current condition of the county transportation infrastructure;
3. project the condition of the transportation infrastructure in 1, 2, 5 and 10 years from 2004 reflecting forecast changes in land use and traffic volumes in the county;
4. estimate the cost of implementing recommended improvements based on the analysis; and
5. recommend potential funding source alternatives and propose schedules for implementing the recommendations in the final report.

The recommendations from this project will help the county to respond to existing transportation infrastructure deficiencies and to plan for future infrastructure needs. Deliverables include a GIS database integrating and displaying all available information on county roadways, bridges and other information in order to enable the county to effectively allocate their limited resources. The financial plan will evaluate and present various options for generating funds required to implement the recommendations.

1.6. Current Needs

Phase 1 of this project was intended to accomplish the first two of the project objectives. Phase I of this project identified current needs, prioritized these current needs and estimated costs to fulfill the current needs using the infrastructure and traffic conditions in year 2003 as the base. The Emphasis of Phase I was to identify the *non – regular infrastructure maintenance* to meet the current traffic demand.

Transportation Plans typically respond to a backlog of needs. They should also address future conditions and plan for them. Phase II emphasized identifying the *additional capacity needs* (e.g. additional traffic lane, etc.) for years 2010, 2015 and 2025.

In rural areas, simpler approaches can be used to forecast future conditions (6).Phase II of this project was built on Phase I to identify future needs, to estimate costs of remedial infrastructure improvements, and identify alternative funding options for implementing recommendations.

Chapter 2 provides the roadway and bridge standards that were established and it also details how various data on existing roadways and bridges were collected and integrated into GIS. Chapter 3 deals with the methodology of the analysis used for identifying the existing transportation infrastructure needs. Chapter 4 provides a list of ranked improvements needed to meet the demands of the current traffic.

1.7. Future Needs

Gallatin County initiated a planning process in 2002 as the basis for developing a countywide transportation plan and identifying a financial plan for immediate and future transportation needs. The transportation infrastructure addressed in this planning effort is limited to unpaved roadways, paved roadways and bridges maintained by Gallatin County.

Chapter 4 of this report describes the methodology of the analysis used for identifying future transportation infrastructure needs. Chapter 5 provides a list of ranked improvements needed to meet the demands of future traffic in years 2010, 2015 and 2025. Future traffic levels were projected based on the growth history in Gallatin County. Research shows the existing transportation infrastructure influences future growth in part. Residential and industrial growths also influence transportation infrastructure improvements in the future. Chapter 6 provides a cost schedule for the identified current and future needs.

Chapter 7 details various available federal and state funding sources. Chapter 8 describes the maps showing the current future needs while Chapter 9 provides conclusions and recommendations.

Appendix A of this report provides a more detailed description of future residential demand projections.

2. INFRASTRUCTURE STANDARDS

It was determined that a set of standards for transportation infrastructure needed to be established before a systemwide planning was done, as this would ensure uniformity throughout the transportation infrastructure system. This chapter presents the standards that were developed for Gallatin County.

2.1. Summary of Literature on Standards of Transportation Infrastructure

A review of standards developed and followed by different counties across the nation was undertaken as part of this project. Many counties across the country utilize very elaborate standards for the design and construction of roadways and bridges; therefore, replicating such an effort for Gallatin County was deemed unnecessary. Instead, the following standards for Gallatin County were extracted based upon a thorough review of generally accepted nationwide standards.

2.1.1. EPA Standards for Emissions from Unpaved Roads

EPA has established limits on airborne PM so that a minimum air quality standard is maintained at all times in all residential areas. PM has two different standards. There is a “coarse” standard that regulates PM particles 10 microns or smaller, which are referred to as PM_{10}. A “fine” standard regulates particles smaller than 2.5 microns, which are referred to as $PM_{2.5}$. These particles enter the air through a variety of ways including wind blown dust, particles from brake and tire wear, pavement wear, and from other vehicle degenerative processes. Unpaved roads are often the source of PM in the atmosphere generated by traffic and wind from exposed aggregate surface. Dust from unpaved roads is both a health and driving hazard. Unpaved roads are also a source of pollution in water as they contribute to undesirable amounts of sediments, oils, salts, and other hazardous pollutants in waterways.

Some major risks to human health by PM_{10} particles are aggravation of existing respiratory and cardiovascular disease, damage to lung tissue, impaired breathing and respiratory symptoms, and alterations of the body’s immune system defenses against inhaled particles. It is extremely difficult to predict or measure re-entrained dust due to the many factors causing it to become airborne. Factors like traffic volume, chemical composition of the road, humidity and wind patterns all affect re-entrained dust levels.

Table 2-1. PM_{10} Emissions from Paved and Unpaved Roads

Paved Roads	Unpaved Roads	Source
$0.003 \text{ to } 0.039 \frac{lbs\ PM_{10}}{VMT}$	$2.27 \frac{lbs\ PM_{10}}{VMT}$	California Air Resources Board
	$1.01 \frac{lbs\ PM_{10}}{VMT}$	Washington State University

Table 2-1 shows how PM emissions on unpaved roads compare to those on paved roads, normalized with respect to vehicle-miles of travel (VMT) (7, 8). It can be seen that PM_{10} emissions from paved roads are up to 280 times less than the same from unpaved roads. Emissions from paved and unpaved roads vary with the relative humidity, precipitation rates, speed limits and road conditions. Table 2-2 shows how the PM_{10} emissions from unpaved roads vary with the vehicle speeds. Table 2-3 shows standards set by the Federal Highway Administration (FHWA) for allowable PM_{10} and $PM_{2.5}$ emissions from unpaved roads.

Table 2-2. PM_{10} Emissions from Roadways with Speed Limits of 25 and 35 mph

Speed Limit	Emission Rate
25 mph	$0.59 \text{ to } 2.00 \frac{lbs\ PM_{10}}{VMT}$
35 mph	$1.85 \text{ to } 3.04 \frac{lbs\ PM_{10}}{VMT}$
Average between 25 and 35 mph	$1.01 \frac{lbs\ PM_{10}}{VMT}$

Source: California Air resources Board and Washington State University

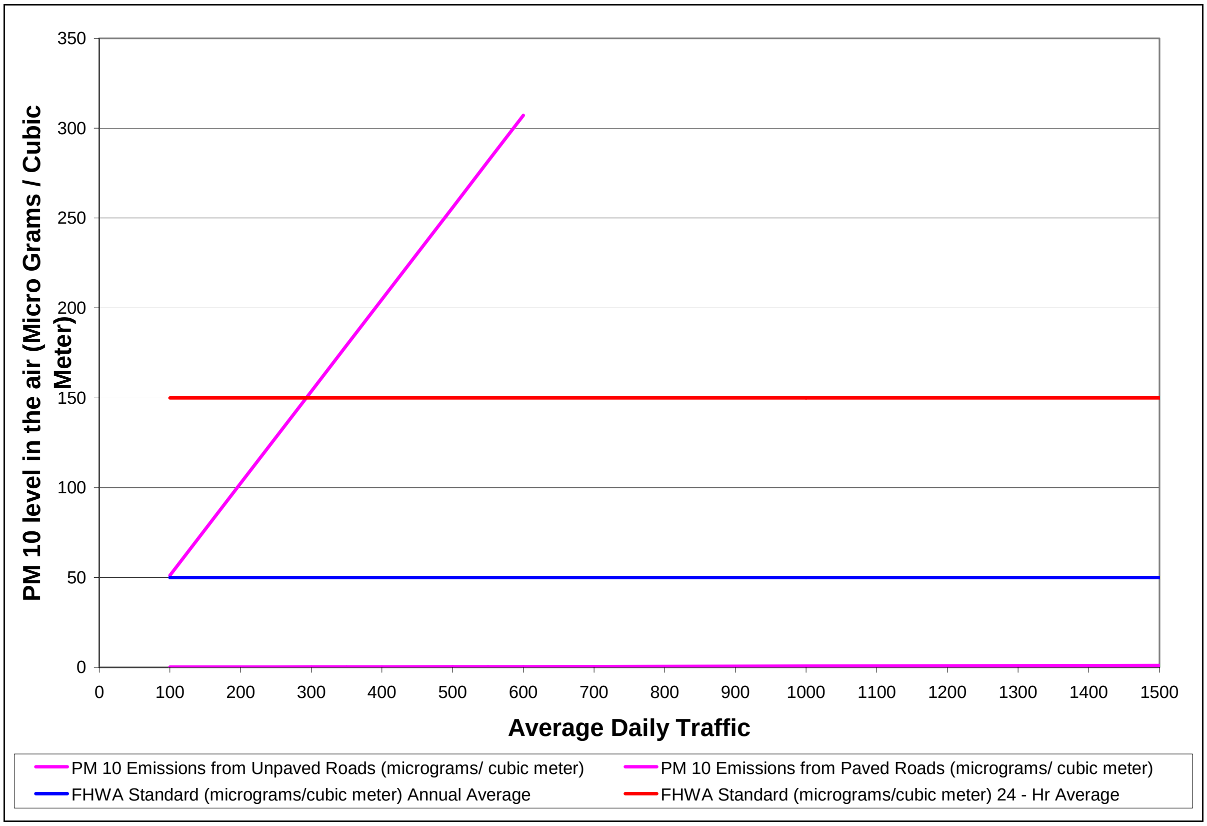
Table 2-3. FHWA Standards for PM Emissions

PM Type	Annual Average	24-Hr Average
PM 10	**Less than 50 $\mu g / m^3$**	**Less than 150 $\mu g / m^3$**
PM 2.5	**Less than 15 $\mu g / m^3$**	**Less than 65 $\mu g / m^3$**

Source: FHWA Particulate Matter (PM) Program (9)

The above emission rates were used to calculate the Average Daily Traffic (ADT) at which the air quality will not meet the standards. It was determined that paving gravel or dirt roads that have an average daily traffic count of more than 150 vehicles per lane (300 average daily traffic (ADT) on typical two lane roads) and are situated close to homes for the elderly and schools, because the elderly and children are the groups most likely to be affected by excessive particulate matter in the air. As shown in Figure 2-1, roads that have more than 300 ADT seem to cause higher PM 10 levels in the air than the FHWA recommended standards.

Figure 2-1. PM_{10} Emissions and FHWA Standards

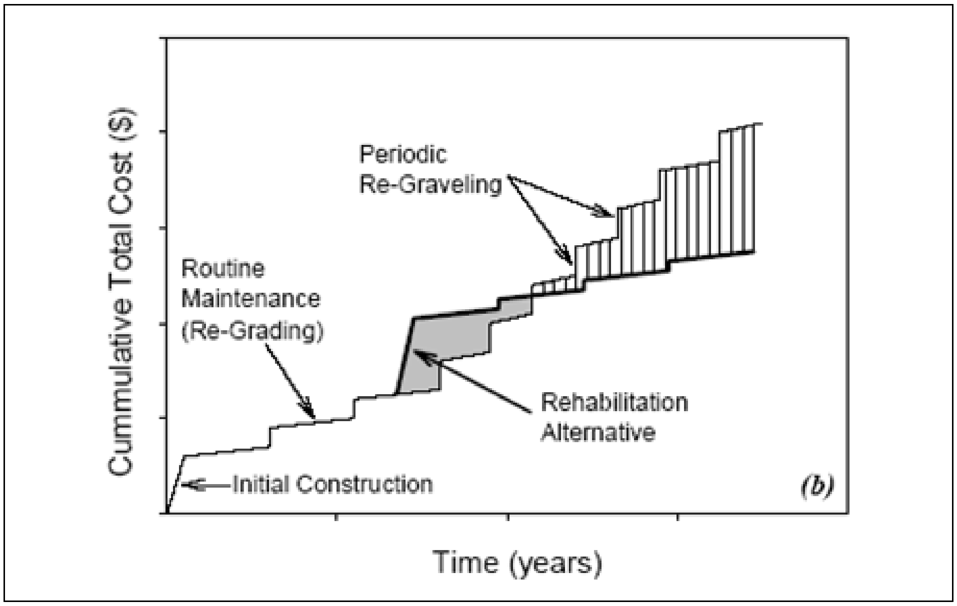


2.1.2. Life Cycle Economics of Paving Gravel and Dirt Roads

Costs to maintain gravel roads increase as they age and carry increased traffic volumes. Figure 2-2 shows a conceptual diagram of how cumulative maintenance costs of gravel and paved roads vary over the age of the roadway. Paving a gravel road may require increased resources; however, it costs less to maintain a paved road. Lower maintenance costs for paved roadways may lead to cost savings over the expected life of the facility.

One vehicle traveling along one mile of gravel road for one year may cause losses of "fines" material of up to one ton. Replacing these fines every year can be very expensive as the number of vehicles on a gravel road increases. It should also be noted that maintaining a proper crown on gravel roads (4 percent or more) is difficult as the average daily traffic (ADT) on gravel roads increases. Based upon this, it is recommended that gravel roads having an ADT of more than 300 vehicles be paved.

Figure 2-2. Cumulative Maintenance Costs vs. Age of a Specific Road



South Dakota's Maintenance and Design Manual for Gravel Roads advocates that the following ten activities occur before the decision is made to pave the roads.

1. Develop a road management program
2. The local agency has a commitment to excellence
3. Traffic volumes demand it
4. Standards have been adopted
5. Safety and design are considered
6. Base and drainage are improved
7. Road preparation costs are determined
8. Pavement life and maintenance costs are compared
9. User costs are compared
10. Weigh public opinion

All the relevant steps were followed in this analysis as necessary.

Table 2-4 and Table 2-5 show a typical maintenance cost scenario for one mile of gravel road and one mile of paved roads. From these tables for an example of an unpaved road, it can be seen that the savings in the maintenance costs from paving this gravel road can be as much as $45,500 over 12 years. A major portion of the paving costs of about $75,000 per mile are recovered as savings in the maintenance cost. These savings do not include the health benefits and benefits from better driving condition of the roadway.

Table 2-4. Maintenance Costs for an Example Gravel Road

	YEAR												
	1	2	3	4	5	6	7	8	9	10	11	12	**TOTALS**
GRADING													
Equipment	$350	$360	$370	$380	$390	$400	$410	$420	$430	$440	$450	$460	$4,860
Labor	$120	$130	$140	$150	$160	$170	$180	$190	$200	$210	$220	$230	$2,100
REGRAVEL													
Materials			$4,200			$4,500			$4,500		$4,700		$17,900
Equipment			$2,500			$2,700			$2,800		$2,900		$10,900
Labor			$2,300			$2,300			$2,300		$2,300		$9,200
STABILIZATION/DUST CONTROL													
Materials	$800	$900	$950	$990	$1,000	$1,000	$1,025	$1,200	$1,400	$1,600	$1,625	$1,650	$14,140
Equipment	$30	$35	$40	$40	$50	$60	$70	$80	$90	$100	$110	$120	$825
Labor	$100	$110	$120	$125	$140	$150	$160	$170	$180	$190	$200	$210	$1,855
Totals	$1,400	$1,535	$10,620	$1,685	$1,740	$11,280	$1,845	$2,060	$11,900	$2,540	$12,505	$2,670	**$61,780**

Table 2-5. Maintenance Costs for an Example Paved Road

	Year												
	1	2	3	4	5	6	7	8	9	10	11	12	TOTALS
PATCHING								$600			$600		**$1,200**
SEALING						$15,000							**$15,000**
Totals													**$16,200**

A study by Iowa State University shows the following differences in maintenance costs of gravel roads with different ADT.

Figure 2-3. Maintenance Cost per Mile for Gravel and Bitumen Roads

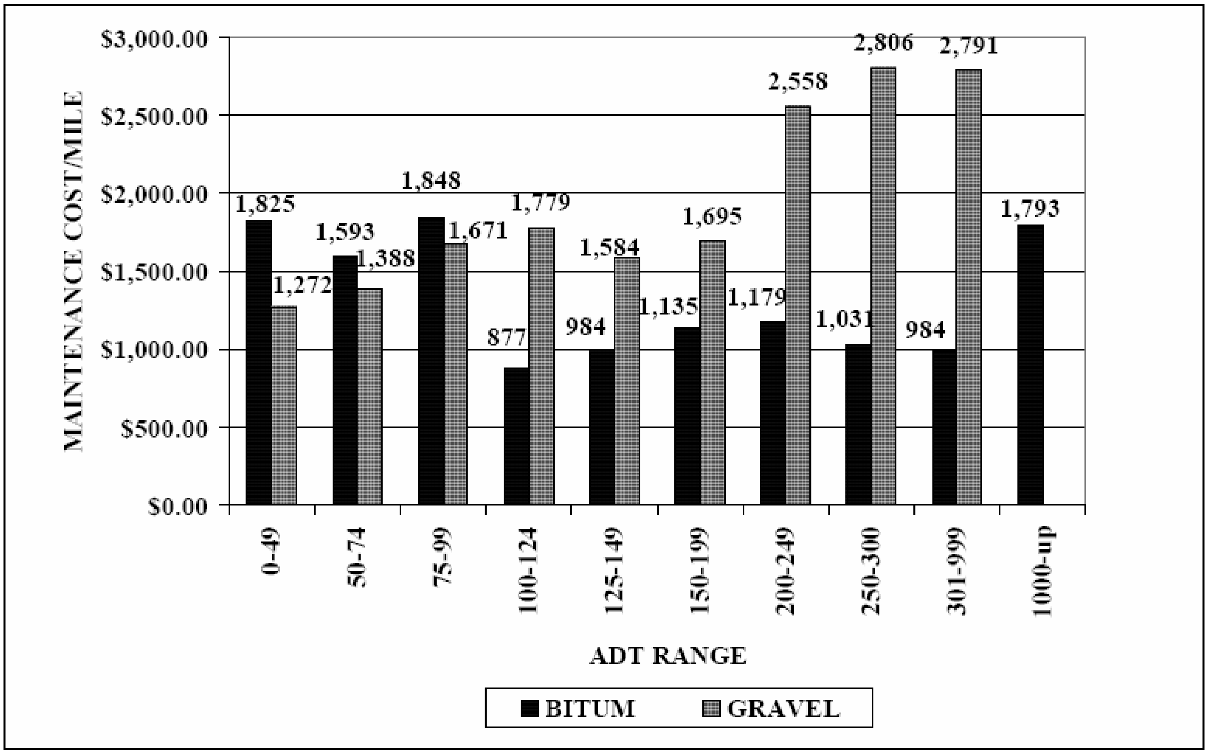


Figure 2-3 is reproduced from the cost comparison study by Iowa State University (10).

2.2. County Roadway Standards

The Gallatin County Road and Bridge Department maintains 867 centerline miles of roadways with varying surface types, as shown in Table 2-6.

Table 2-6. County Centerline Road Miles by Surface Type

Surface Type	Length of Roadway (in centerline miles)
Asphalt	**179**
Dirt	**32**
Gravel	**655**
Total	866

The roadways are also classified into four different functional classifications, as shown in Table 2-7. This distribution is typical of a rural network setting. Principal arterial and minor arterial systems are between 6 and 12 percent of total road length, the collector system is from 20 to 25 percent, and the rest is local road system.

Table 2-7. County Centerline Roadway Miles by Functional Type

Roadway Category	Length (in Center line Miles)
Principal Arterial System	**56**
Minor Arterial System	**430**
Collector System	**275**
Local Road System	**31**
Not Specified	**74**

2.2.1. Gravel and Dirt Roads

The primary concerns with gravel roads are loose gravel, sharp curves, washboard conditions, weather and wildlife. A properly designed and well-maintained gravel road eliminates the necessity of paving the road as long as traffic demands do not exceed the capacity.

Some of the above concerns on gravel roads are addressed through regular maintenance activities by the County Road and Bridge Department. Regular maintenance activities include the following:

1. Regular snow removal in winter
2. Grading and shaping to move water rapidly off the road
3. Compacting the graded surface to prevent fine losses and replacing the surface material when needed
4. Cleaning roadside ditches and reshaping them to maintain the flow capacity
5. Replacing damaged or missing road signs
6. Remove ruts and repair wash boarding

Increasing traffic introduces several concerns on gravel roads. First, the particulate matter (PM_{10}) emissions from unpaved roads increase as the number of vehicles that travel these roads increases. Since there has been substantial increase in the amount of travel in the recent years in the county, the PM_{10} emissions from unpaved roads have been increasing. Second, deterioration of unpaved roads is accelerated due to higher ADT volumes than those for which they were designed. Third, maintenance costs for gravel roads increase with increased number of vehicles on them.

The concerns with dirt roads are the same as those of gravel roads. Therefore, the current needs to improve the gravel and dirt roads were identified using Average Daily Traffic (ADT) per lane of the gravel road, posted speed limit on the gravel road, distance of elderly homes and schools from gravel roads with daily traffic of 300 vehicles per lane or more, fine loss considerations, and the functional type of the road. All the gravel roads that serve an average daily traffic of more than 300 are shown in the County map 1 in Chapter 4. These gravel roads were prioritized based on the functional type of the road, because principal arterials and minor arterials are important for movement across major communities while the collector and local road system are more important for movement within a community. This prioritized list was then filtered based on the growth rate of these areas that the roads serve and the importance of the road for mobility in the County.

2.2.2. Paved Roads

Paved roads should be maintained properly so they serve the traveling public well and last their expected lifetime in good condition. Regular maintenance on paved roads includes the following:

1. Snow removal
2. Patching any present potholes and chip sealing
3. Cleaning roadside ditches and reshaping them to maintain the flow capacity
4. Replacing damaged or missing road signs

The ADTs on paved roads have also been increasing significantly in recent years due to the growth in the region. This results in the need to widen some of the paved roads that are carrying more ADT than they were designed for. Higher ADTs have also led to accelerated deterioration of paved roads. These roads should also be repaved or widened. The needs for widening or re-paving paved roads were identified by using the ADT per lane, existing pavement condition rating (e.g. poor), posted speed limit, the importance for east-west and north-south movement in the county, and the functional type.

2.3. Bridge and Culvert Standards

There are 199 bridges and culverts currently maintained by the Gallatin County Road and Bridge Department. The lengths of these bridges and culverts are shown in Table 2-8.

Table 2-8. Number of Bridges and Culverts, by Length

Type	Number of Bridges and Culverts
Length of 20 ft. or more	**71**
Length less than 20 ft.	**128**
Total	199

Many of the bridges and culverts in Gallatin County carry a higher number of vehicles per day than they were originally designed for due to the rapid growth in the region. The aging of these bridges along with wear and tear leads to reduction in the strength of the bridges. There are also new residential developments near existing bridges that must now carry delivery trucks, school buses and emergency medical services (EMS), which means that vehicles heavier than the design strengths of the bridges will access these new developments. These concerns with existing bridges were addressed by collecting information on the age of the bridge, design strength, posted weight limits, ADT and axle weights of fire trucks.

3. EXISTING NEEDS

The immediate needs that should be addressed in the next two years were identified by comparing the current traffic demands to the capacity and conditions of the existing transportation infrastructure.

3.1. Existing Roadway Needs

All gravel and dirt roads maintained by the Gallatin County Road and Bridge Department were examined using the integrated GIS database. This GIS database contains all available information on the County transportation infrastructure. Gravel and dirt road segments with ADT per lane of 300 or more were identified first, and then they were ordered by the posted speed limit. These road segments were then prioritized based on the functional type, posted speed limit, ADT, existing pavement road condition (e.g. poor), and the importance of these roads to mobility and access. The costs of paving these gravel roads were estimated based on the cost structure in Table 3-1.

Table 3-1. Cost Structure for Paving Gravel Roads

Type of Improvement	Estimated cost per unit
9" Pit Run Gravel in Place/ Compacted with 3" Compacted (3/4)" cushion	**$ 75,000**
3" HMA in place / compacted	**$ 75,000**
Total per mile	$150,000

Some of the roadways have a good subsoil structure to be paved while some of the gravel roads need their subsoil to be prepared before paving them. The estimated cost of paving gravel roads with adequate soil structure and compaction was $75,000, while the estimated cost of paving gravel roads without adequate subsoil structure and compaction was $150,000.

Paving gravel roads was expected to be done by the County Road and Bridge Department and the appropriate cost structure is shown in Table 3-1. An estimate of costs for paving gravel roads by hiring a contractor is expected to be 50 percent more. The total cost for paving all the recommended gravel road segments was estimated to be approximately $18.45 million.

Table 3-2 shows the prioritized list of gravel and dirt roads that need to be paved in the next two years (FY 04-05 and FY 05-06).

Table 3-2. Gravel Roads Needing Pavement

Budget Year	Road Name	Section Start	Section End	Length (in miles)	Cost
1	Stucky	End of Pavement	Gooch Hill	2.5	$375,000
1	Dry Creek	West Dry Creek	End of 1 mile	1	$150,000
1	Madison	Norris	Hwy 205	21	$3,150,000
2	E Patterson	19th	3rd Ave	0.5	$75,000
2	Bear Canyon	Bozeman Rd	End of 3.74 miles	3.74	$561,000
2	Story Mill	Bridger Drive	End of 3/4 Mile	0.76	$114,000
2	Nixon Gulch	Rail Road	Bridger Canyon	2.2	$330,000
2	Rocky Mountain	Spring Hill	Reynolds Rd	4.82	$723,000
2	Cobb Hill	Gallatin Rd	Beatty	1	$150,000
2	Bozeman Trail	Taybeshockup	Ft. Ellis	2.2	$330,000
2	Highline	Cameron Bridge Rd.	Amsterdam	2	$300,000
2	Logan Trident	Frontage Rd.	Clarkston	4.22	$633,000
2	Flanders Mill	Durston	Baxter	1	$150,000
3	Trail Creek	Interstate 90	County Line	6.3	$945,000
3	Monforton School	End of Pavement	Baxter	1.5	$225,000
3	Yadon	Dry Creek	End	1.57	$235,500
3	Penwell Bridge	Walker Rd	Dry Creek Rd	6.5	$975,000
3	Johnson	Fowler	Chapman	2	$300,000
3	Saddle Mountain	Summer Cutoff	Jordon Spur	1	$150,000
3	Baxter	End of Pavement	Jackrabbit	3.14	$471,000
3	Fowler	Johnson Rd	Stucky	3	$450,000
3	Beatty	Cobb Hill	Elk Ln	0.2	$30,000
3	Hulbert West	Jackrabbit Ln	Thorpe	1	$150,000
4	Heeb	Stage Coach Trail	Amsterdam	1.1	$165,000
4	Kyd	Talc	Colter	1.1	$165,000
4	Zachariah	Gallatin Rd	End of Rd	1	$150,000
4	Kelly Canyon	Hwy 205	Bridger Canyon	5.78	$867,000
4	River Rd	End of Pavement	Cameron Bridge	3.3	$495,000
5	Clarkston	Logan Trident	Old Field	13	$1,950,000
5	Durston	End of Pavement	Love Ln	1.5	$225,000
5	Harper Puckett	Baxter Ln	Valley Center	2.72	$408,000
5	W Patterson	Cottonwood	Sir Arthur	1.6	$240,000
5	Cottonwood Canyon	Cottonwood	End of Road	2	$300,000
5	Davis	valley Center	End of 0.5 miles	0.5	$75,000
5	Brackett Creek	Bridger Canyon	County Line	5.1	$765,000
5	Jackson Creek	Unpaved Section N	unpaved Section S	2.79	$418,500
5	Hulbert East	Jackrabbit Ln	Love Ln	1.95	$292,500
5	Hidden Valley	End of Pavement	Harper Puckett	0.59	$88,500
5	Spanish Creek	Gallatin Rd	End of County Line	4.03	$604,500
5	Chapman	Johnson Rd	Gooch Hill	1.8	$270,000
			Total	123.01	$18,451,500

There were no dirt roads identified to be paved in this examination of gravel and dirt roads. All of the paved roads in the county were also examined using the integrated GIS database. Paved road segments with per-lane ADT in excess of 1,200 vehicles were identified as a first step. The Level of Service (LOS) for these paved road segments was calculated according to the Highway Capacity Manual (11). According to HCM 2000, the LOS can be A, B, C, D, E, and F. At LOS A, the vehicles move at the free flow speed while vehicles are barely moving at saturated conditions at LOS F. It is commonly acceptable to operate at LOS of C while a LOS of D or less is commonly unacceptable among practitioners of traffic engineering. For this project road segments with a Level of Service (LOS) of C or poorer were identified from the list of roads with 1,200 vehicles per lane or more. From this list of paved road segments, the priorities of needed improvements were determined using posted speed limit, functional type, importance of the road segment to mobility, and listed road condition.

Table 3-4 presents the prioritized list of paved roads that need to be widened. There were no paved road segments that were identified for repaving in the next two years. The costs to widen these roadway segments were estimated based on the cost structure shown in Table 3-3. The costs for widening these roadway segments also included the cost of acquiring the right way of way. The new required right of way to add one lane was estimated to be 12 feet.

Table 3-3. Cost Structure for One Additional Paved Lane

Description	Estimated Cost per mile
Acquiring Right of way of 12 ft. for one mile	**$100,000**
9” Pit Run Gravel in Place/ Compacted with 3” Compacted (3/4)” cushion	**$ 75,000**
3” HMA in place / compacted	**$ 75,000**
Total per mile	$250,000

Since the newly acquired right of way can not be expected to be immediately ready for paving, the costs of preparing the soil structure, compacting the soil and applying gravel were included. It is recommended that an additional 12 feet of right of way be acquired during the initial expansion because acquiring right of way as the developments grow around the roadways becomes increasingly difficult and expensive. Acquiring additional right of way becomes especially important for areas in which there has been significant growth close to the roadway in the past five years. However, the cost of acquiring this additional right of way (beyond 12 ft. required for recommended expansion) is not included in the estimated costs shown in Table 3-4.

Table 3-4. Paved Roads That Need to Be Widened or Repaved

Budget Year	Road Name	Section Start	Section End	Improve ment	Length (in miles)	Cost
1	19th	Stucky	Nash	Widen	3.5	$875,000
2	Amsterdam	Interstate 90	Stage Coach Trail	Widen	3.5	$875,000
2	Sourdough	Kagy	Goldenstein	Widen	1.6	$400,000
3	Valley Center	Love Lane	Jackrabbit	Widen	3	$750,000
3	Cottonwood	Huffine	19th Street	Re - Pave	6	$900,000
3	Sypes Canyon			Widen	1.4	$350,000
4	Goldenstein	19th	Sourdough	Widen	2	$500,000
5	Airport Rd	Frontage Rd	Spring Hill Rd	Widen	4.12	$1,030,000
5	Mill Rd	Gallatin Rd	Gateway Rd	Re- Pave	0.5	$125,000
5	Buffalo Jump	Frontage Rd	Madison	Re - Pave	2	$300,000
5	Stage Coach	Churchill Rd	End of Pavement	Re - Pave	2.5	$375,000
5	Dyk	Stage Coach	Amsterdam	Re - Pave	2	$300,000
3	Valley Center	I-90 Underpass	Love Ln.	Re-Pave	1.65	To be paved by MDT in 2007
			Total		33.77	6780000

The benefits of widening these roads within the next five years are that these roads will make the movement in and out of major communities more efficient, resulting in reduced delays and improved level of service. These roads, as shown in the attached maps in Chapter 5, can be seen to be close to the existing communities that are well-populated. This is in accordance with the growth policy adopted by the county, which strives to allow growth in compact communities.

3.2. Existing Bridge and Culvert Needs

All of the bridges and culverts maintained by the county were examined using the integrated GIS database. Rapid growth has led to new developments around existing bridges that were designed for lower traffic volumes and fewer heavy vehicles. Bridges and culverts with repair or replacement needs were identified based on the ADT, posted weight limits, critical axle weights of fire trucks, and listed bridge condition. The critical axle weight of fire trucks was determined to be 36,000 pounds; therefore, the first step was to identify bridges that are not designed to take the 36,000-lb axle load. These bridges were then ordered based on their proximity to residential and industrial communities, and were further prioritized according to the listed condition, ADT, and the functional type of the roadway on which the bridge is located. Table 3-5 shows the prioritized list of bridges and culverts that need to be replaced or repaired in the next two years.

The costs for replacing or repairing these bridges were estimated based on the costs from past bridge improvements in Gallatin County. The benefits of replacing these recommended bridges may include reduced emergency response time as the first EMS vehicles need not take a longer route to avoid a bridge or culvert that can not support the vehicle's weight. Delivery trucks and other farm equipment will also be able to cross these bridges safely after these improvements. The total cost for recommended bridge improvements was estimated to be $9.78 million.

Table 3-5. Bridges to Be Replaced or Repaired in the Next Two Years

Budget Year	Rank	Cost	Bridge_Num	Road Name
Bridges in POOR Condition and do not meet fire truck weight requirements				
1	**1**	$ 75,000	393	Camp Creek Rd
1	**2**	$ 60,000	024	Griffin Rd
1	**3**	$ 60,000	170	Bozeman Trail Rd
1	**4**	$ 35,000	514	Madison Rd
1	**5**	$ 75,000	362	Camp Creek Rd
1	**6**	$ 40,000	513	Cooper Rd
1	**7**	$ 50,000	244	Law Rd
1	**8**	$ 50,000	037	Beatty Rd
1	**9**	$1,000,000	040	Swamp Rd
1	**10**	$ 75,000	101	Dry Creek Rd
1	**11**	$ 65,000	103	Dry Creek Rd
1	**12**	$ 60,000	071	Prairie Rd
2	**12**	$1,000,000	014	Axtell-Anceney Rd
2	**14**	$ 50,000	123	Hamilton Rd
2	**15**	$ 75,000	204	High-Flat Rd
Bridges that are in NOT POOR Condition but DO NOT MEET the fire truck weight requirements				
2	**16**	$1,000,000	003	Old Town Rd
3	**17**	$1,000,000	007	Nixon Gulch Rd
3	**18**	$1,000,000	001	Williams Bridge Rd
4	**19**	$1,000,000	002	Old Town Rd
4	**20**	$ 80,000	202	Gateway Foothills Rd
5	**21**	$1,000,000	273	Meridian Cemetary Rd
5	**22**	$ 65,000	009	Story Hill Rd
5	**23**	$ 50,000	578	Rocky Mountain Rd
5	**24**	$ 65,000	155	Maiden Rock Rd
5	**25**	$ 750,000	042	Hamilton Rd
5	**26**	$1,000,000	017	West Williams Rd
	Total	$9,780,000		

The total cost of both road and bridge improvements in the next five years are $34.97 million. Chapter 6 presents a cost schedule and funding options to meet the costs of these improvements.

4. FUTURE NEEDS IDENTIFICATION

Design standards for transportation infrastructure in Gallatin County were established as explained in Chapter 2 (Phase I) before a systemwide planning effort to identify the current transportation infrastructure was done. These standards were developed to ensure uniformity throughout the analysis of transportation infrastructure system. The same standards were used in Phase II to identify the future infrastructure improvements. This chapter describes the analytical procedures and how these standards were used in Phase II.

There are numerous methods to estimate travel demand within the rural transportation planning context. They range from simple techniques such as historical trend analysis to variants of more complex computer models that require large databases of demographic and socioeconomic information to forecast travel demand. Simplified demand estimation techniques and analysis are appropriate in most rural planning situations.

Historical trend analysis, which estimates transportation demand by plotting historical demand levels over time and extrapolating the trend into the future, is a starting point for demand estimation in rural transportation planning areas. However, there are drawbacks that need to be kept in mind as these numbers are developed.

First of the assumptions under this method is that the trends in all factors and relationships affecting demand (such as trends and shifts in demographic shifts, inflation, fluctuation trends in the price of fuel, etc.) are assumed to remain constant over time. This means that the change/ trend in these factors remain relatively constant over the time period of this analysis. *If one or more of these factors change, there could be a shift in demand*.

In addition to the historical trend analysis method, there are simplified versions of more complex techniques, which tend to focus on the impacts of a number of key factors influencing transportation demand. Some of these simplified techniques are being used by transportation planners and consultants. One approach is to take population and economic forecasts for the County and use their relationship between these corridors and travel demand to generate growth factors (12).

Based on the availability of historical data and the available resources for this planning effort, the research team chose to use the residential well density in the County as an indicator of the residential demand in the County.

4.1. Residential Demand Projections

It is vital to plan for the future transportation demands because the County must be responsive to traffic growth. It was decided that analysis of needs would be performed for years 2010, 2015 and 2025. The first step in planning for future transportation demand is to project residential growth and the spatial distribution of this growth. Projecting future growth is usually done using historical information on residential demand as mentioned earlier. The research team chose to use historical information on spatial distribution of wells (i.e. well density) as an indicator of residential demand, to forecast future growth in the County. Historical information on distribution of residences throughout the County is not available in a usable format.

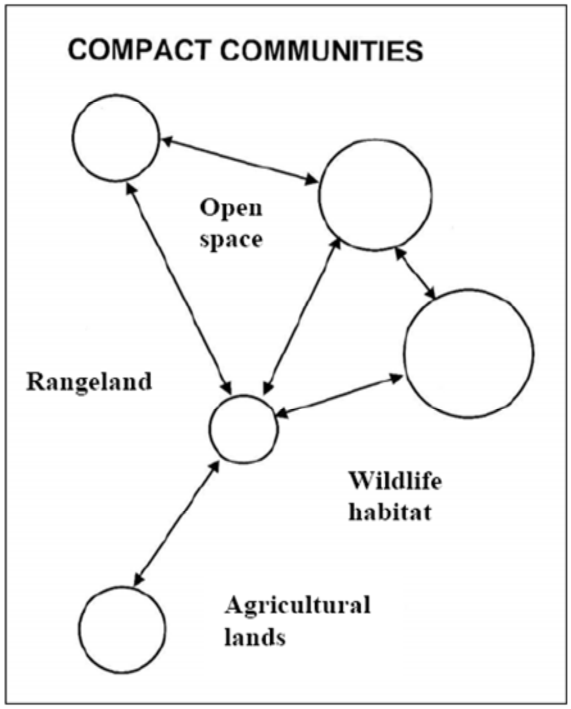
The historical data on well density for the County was obtained from U.S. Department of Agriculture. A detailed description of the model developed to project future residential demand growth in the County is presented in Appendix A. The results of this effort were the projected number of new wells in each quarter square mile section of the County for the years 2010, 2015 and 2025. Gallatin County Growth policy adopted in April 2003 specifies that the County Planning Department aims at creating compact communities (13). Based on this planning policy, the research group identified the top five growth areas in the County on which to focus the Phase II planning effort. These areas are described as shown in Table 4-1. These five growth areas are also shown in the map in Appendix A.

Table 4-1. Top Five Growth Areas in Gallatin County

Growth Area Number	Description of Growth Area
Area 1	Bozeman Exurbs and Suburbs
Area 2	Belgrade Exurbs and Suburbs
Area 3	Manhattan (Off City Limits)
Area 4	Three Forks (Off City Limits)
Area 5	Four Corners Area and South of Bozeman

The County Growth Policy adopted in April 2003 recommends that the growth be directed to build compact communities that are interconnected well. This concept is shown in Figure 4-1. In accordance with this recommendation, the identified top five growth areas were the focus of the analysis for future needs. The interconnecting roads to these five top growth areas were also identified and analyzed for needs to be improved.

Figure 4-1. County Growth Policy Recommendations



Source: County Growth Policy

4.2. Traffic Demand Projections

The most common type of residential development in Gallatin County outside the city limits is single–family detached homes. Ground count data collected in a study by Virginia Transportation Research Council (VTRC) for a set of seven neighborhoods of single–family detached homes produced a mean trip generation rate of 10.81 (with a range of 9.4 to 12.2 vehicle trips per dwelling unit) at the 95 percent confidence level.

The Institute of Transportation Engineers' (ITE) mean rate based on 348 neighborhoods was 9.57 vehicle trips per dwelling unit. As the number of neighborhoods increases, the confidence interval for this mean rate will decrease (14). The top five growth areas in Gallatin County are similar to the neighborhoods used in the ITE mean rate estimation.

The variations between these different rates are within the range for the 95 percent confidence interval. Therefore, the standard ITE mean rate of 9.57 vehicle trips per dwelling units was used to calculate the number of *new* trips out of every quarter square mile section in the top five growth areas as shown in Table 4-1. These trips were aggregated to project the Average Daily Traffic (ADT) on the County roadways in each of these growth areas.

The research team also identified a set of interconnecting roads among the five growth areas with the help of the County Road Superintendent. A total number of trips in and out of these growth areas were also calculated. The trips were then distributed among the interconnecting roads according to the known trip attractions. Area 1 (Bozeman Area) had the highest attraction followed by Belgrade, Four Corners, Manhattan and Three Forks in that order.

4.3. Needs Analysis

The standards established in Phase I for Gravel Roads and Paved Roads were again used in the needs analysis for Phase II. A summary of these standards is shown in Table 4-2. The same set of methodologies described in Chapter 2 was used in Phase II also. These standards were applied to examine the capacity of the roads to meet the projected traffic demands (i.e. the projected ADTs in year 2010, 2015 and 2025).

Table 4-2. Summary of Infrastructure Standards

Type of Improvement	**Standards to Warrant Improvement**
Pave Gravel Road	Average Daily Traffic (ADT) ≥ 300 Trips
Pave Gravel Road	Current Condition is POOR **AND** ADT ≥ 100 Trips
Repave Paved Road	Current Condition is "POOR" **AND** ADT ≥ 300 Trips
Widen Paved Road	Level of Service (LOS) worse than "C"
Safety Improvements	Anecdotal Evidence of Higher Number of Crashes (No accident data used in this study)
Replace Bridge	Current Condition "POOR" **OR** ADT > Design ADT **OR** Design Strength of the Bridge Structure < Emergency Vehicle Wheel Load

4.4. Needs Prioritization

The same sets of factors described in Chapter 2 were used in prioritizing the needs identified in Phase II. A summary of the factors for prioritizing gravel road, paved road and bridge improvements is shown in Table 4-3. Because the needs identified in Phase I are the *current* needs they have higher priority than the road and bridge improvement needs that arise out of future growth projections. Chapter 3 included a schedule for the current needs identified in Phase I. All the needs are expected to be met in the next five Fiscal Years (FY06 to FY10). The future needs identified in Phase II, as prioritized in the next section, are anticipated to be completed subsequent to meeting the current needs.

Table 4-3. Factors for Road and Bridge Improvement Prioritization

Improvement Project Type	Factors for Prioritization
Gravel Roads to be paved	1. Functional Type, 2. Average Daily Traffic (ADT), 3. Recorded Current Condition, 4. Growth Rate of the Neighborhood and 5. Importance of the Roadway as a Link
Paved Roads to be widened	1. Functional Type, 2. Average Daily Traffic (ADT), 3. Level of Service (LOS), 4. Recorded Current Condition, 5. Growth Rate of the Neighborhood and 6. Importance of the Roadway as a Link
Bridges to be replaced	1. Recorded Current Condition, 2. Average Daily Traffic (ADT), 3. Importance as a Link and 4.Weight Deficiency to Carry Emergency Vehicles

5. FUTURE NEEDS

Transportation infrastructure improvement needs were identified based on the future traffic demand. Future traffic demand projections were made for Years 2010, 2015 and 2025. The primary focus of this effort was to identify where *additional transportation capacity* (e.g. additional lanes) is required and when capacity improvements should be made. These capacity improvements are in three different categories. The first is paving existing gravel roads to meet future increased traffic demand. The second category of improvements is widening existing paved roads by adding one or more new traffic lanes; this may include obtaining additional Right of Way (ROW). The third category is replacement of bridges on the road sections that need to be widened.

5.1. Future Gravel Road Improvement Needs

The future gravel roads needs were prioritized using the factors shown in Chapter 4. Prioritized gravel road improvements are presented in Table 5-1. The estimated costs of these improvements are also shown in this Table.

Table 5-1. Future Gravel Road Improvement Needs (Phase II)

Budget Year	Rank	Road Name	Section Start	Section End	Length (in Miles)	Cost
2010	1	River	Norris Hwy	1.2 Miles South	1.2	$180,000
2010	2	Thorpe	Cameron Br. Rd.	Hulbert	2	$300,000
2010	3	Linney	Cameron Br. Rd.	Lee	1	$150,000
2010	4	Veltkamp	Highline	Linney	1.4	$210,000
2010	5	Blackwood	Fowler	0.5 Mile West of Beatty	4.25	$637,500
2010	6	Lee	Highline	River	1.9	$285,000
2010	7	Bitterroot	River Rd.	1.3 miles West	1.3	$195,000
2010	8	Stagecoach Trail	Wooden Shoe	Amsterdam	3.9	$585,000
2010	9	Bolinger	Weaver	Frontage Rd	1.9	$285,000
2010	10	Weaver	Frontage Rd.	Dry Creek Rd.	4.2	$630,000
2010	11	Richman	Thorpe	End of Road	1.3	$195,000
2010	12	Hillside	Story Mill	End of Road	0.7	$105,000
2010	13	McIlhattan	Augusta	Manley	1	$150,000
2010	14	L	Bohart	Story Mill	0.3	$45,000
2010	15	Fish Hatchery	Bridger Canyon	End of Road	0.7	$105,000
2010	16	Toohey	Spring Hill	Walker	1.8	$270,000
2010	17	Taybeshockup	Bozeman Trail	Triple Tree	2	$300,000
2010	18	Mount Ellis	Bozeman Trail	Nickols Peak	0.5	$75,000
2010	19	Alaska	Cameron Br. Rd.	End of Road	1.5	$225,000
2010	20	Harper Puckett	Cameron Br. Rd.	Valley Center	0.6	$90,000
2010	21	Wes Davis	Hamilton	Penwell Bridge Rd.	2.5	$375,000
2010	22	Hamilton	Dry Creek	Wes Davis	3	$450,000
2010	23	Old Town	Frontage Rd.	County Boundary	1	$150,000
2010	24	Reese Creek	Dry Creek	Springhill	4.2	$630,000
2010	25	Spain Bridge	Penwell Bridge	Airport	2	$300,000
2010	26	Beatty	Blackwood	Cobb Hill	1.3	$195,000
2010	27	Maiden Rock	Bridger Canyon	Access Rd.	0.6	$90,000
2015	28	Gravel Pit	Kuipers	Wooden Shoe	1.2	$180,000
2015	29	Manhattan Frontage	Frontage	Churchill	2.9	$435,000
2025	30	Wooden Shoe	Manhattan Frontage	Stagecoach Trail	4.6	$690,000
2025	31	Bench	Old Yellowstone	Beacon	4.8	$720,000
				Total	68.95	$9,232,500

5.2. Future Paved Road Needs

Paved roads in the County were examined for insufficient capacity to meet traffic demands in Years 2015 and 2025. A set of paved roads were identified to be in need of widening to meet future traffic demands. The projected traffic demands in Years 2010, 2015 and 2025 were used in this analysis. These paved roads are presented in Table 5-2. The cost of widening these roads were also estimated and shown in Table 5-2.

Table 5-2. Future Paved Road Needs (Phase II)

Budget Year	Rank	Road Name	Section Start	Section End	Length (Miles)	Cost
2015	1	19 TH	Nash Rd	Cottonwood Rd.	3	$750,000
2015	2	River	Norris Hwy.	Bitterroot	3	$750,000
2015	3	Sourdough	Goldenstein	Nash	2	$500,000
2025	4	Amsterdam	Churchill	Stagecoach Trail	2.9	$725,000
2025	5	Cameron Bridge rd.	Jackrabbit	Churchill	4.6	$1,150,000
2025	6	Nelson	Airport	Frontage	3.1	$775,000
2025	7	Thorpe	Cameron Bride rd.	Interstate 90	7.5	$1,875,000
2025	8	Linney	Amsterdam	Cameron Bridge	2.1	$525,000
2025	9	Frank	Jackrabbit	End of Pavement	2	$500,000
2025	10	Cottonwood	Huffine	19th	6	$1,500,000
2025	11	3 RD	Goldenstein	Nash	2.2	$550,000
2025	12	Royal	Thorpe	Amsterdam	1	$250,000
2025	13	Gooch Hill	Huffine	Chapman	2.2	$550,000
2025	14	Patterson	Cottonwood	3rd	2.5	$625,000
2025	15	Collins	Weaver	Frontage	1.4	$350,000
2025	**16**	**Baseline**	**Lagoon**	End of Pavement	**2.1**	**$808,500**
2025	17	Tubb	Baseline	Airport	1.3	$325,000
2025	18	Story Mill	City Limit	Deer Creek	0.8	$200,000
2025	19	Bozeman Trail	Haggerty	Academy	3.3	$825,000
2025	20	Alaska	Alaska Frontage	Cameron Bridge	1.2	$300,000
2025	21	Love	Valley Center	Huffine	4	$1,000,000
2025	22	Fort Ellis	Frontage Rd.	Bozeman Trail	0.9	$225,000
2025	23	Blackwood	Gallatin Rd	1.5 Miles to the east	1.5	$375,000
2025	24	Cobb Hill	Huffine	Gallatin	1.8	$450,000
2025	25	Monforton School	Baxter	Huffine	2	$500,000
2025	26	Durston	Love Lane	Bozeman City Boundary	1.4	$350,000
				Total	65.80	$16,733,500

* Baseline Rd. should be paved before widened

5.3. Bridge Improvement Needs

Phase I identified bridges that could not carry fire trucks and heavy delivery vehicles and listed prioritized bridges that need to be replaced. In Phase II, the research team examined whether there were bridges on the road sections that need to be widened. *There were no bridges or culverts on the road sections that are listed to be widened*. Bridges that are in poor condition and the bridges that do not have the standard design load carrying capacity have already been identified and listed in Phase I.

5.4. Needs Identified in City Transportation Plans

Bozeman and Belgrade have developed transportation plans. These plans were reviewed to determine County road and bridge improvements needed to support the improvements proposed in these plans. Table 5-3 lists the improvements the County will need to consider from the Bozeman and Belgrade plans because these improvements involve County maintained road segments. Many of the improvements suggested by the city plans will have to be further examined in detail before implementation. Most of these improvements will also have to be performed in close cooperation with other entities such as Montana Department of Transportation (MDT) and the cities of Bozeman, Belgrade, Manhattan, etc.

Table 5-3. Proposed Improvements by City Transportation Plans

Description of Improvement	Proposing Entity	Source
Thorpe Road Interchange	City of Belgrade	Belgrade Transp. Plan
Eastside By-Pass	City of Belgrade	Belgrade Transp. Plan
Interstate Underpass at Madison	City of Belgrade	Belgrade Transp. Plan
Airport Interchange	City of Belgrade	Belgrade Transp. Plan
New Signal at Amsterdam and River Rock Roads	City of Belgrade	Belgrade Transp. Plan
Widen Amsterdam: Off- Ramp – West	City of Belgrade	Belgrade Transp. Plan
Pedestrian/Bicycle Path Belgrade to Bozeman	City of Belgrade	Belgrade Transp. Plan
Place Signal at Amsterdam and Thorpe	City of Belgrade	Belgrade Transp. Plan
Cottonwood – Stucky to Valley Center, Construct 3-lane urban arterial	City of Bozeman	Bozeman Transp. Plan
Fowler/Davis – Stucky to Valley Center, construct 2-lane urban arterial	City of Bozeman	Bozeman Transp. Plan
Bozeman Trail – Highland to I-90, upgrade to 2-lane rural arterial and realign	City of Bozeman	Bozeman Transp. Plan
Create an Airport Interchange and connect to Frontage Roads with 2-lane rural arterial	City of Bozeman	Bozeman Transp. Plan
Jackrabbit Lane – Gallatin Gateway to Four Corners, widen to 3-lane rural arterial	City of Bozeman	Bozeman Transp. Plan
Jackrabbit Lane – Four Corners to I-90, widen to 3-lane rural arterial, with right turn lanes at major intersections	City of Bozeman	Bozeman Transp. Plan
Reconstruct Bridger Creek Bridge	City of Bozeman	Bozeman Transp. Plan

Source: (15,16)

6. COST SCHEDULE

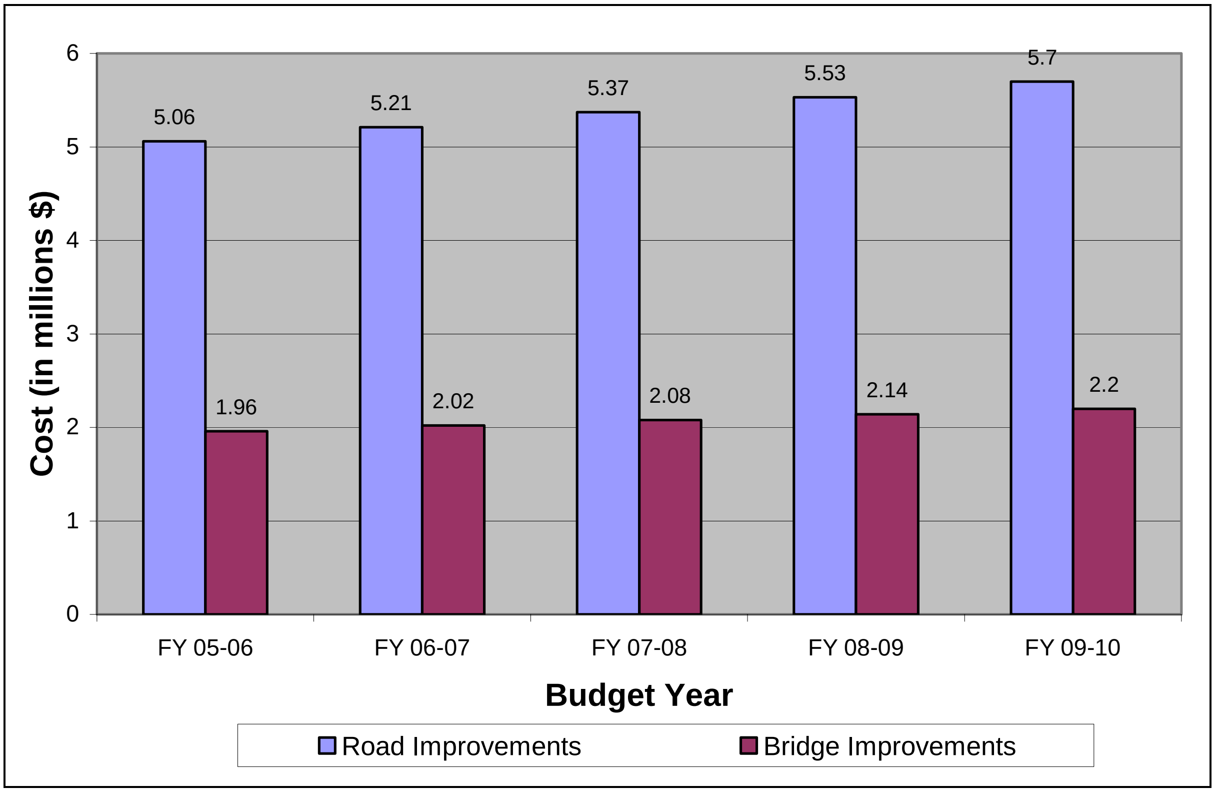
The cost of meeting the identified needs was estimated using the cost details in the earlier chapters. The cost of meeting the current needs was estimated and divided over the next five years (FY 05-FY10). The cost of future needs was also estimated and divided over fifteen years from 2010 (FY11-FY25).

6.1. Costs to Meet Current Needs

The total cost of the identified current road and bridge improvements is estimated to be $34.97 million in the next five years. These are needs to be implemented to accommodate the growth that has taken place in the past decade while the Phase II of this project identified the future needs based on projected traffic demands and land use changes.

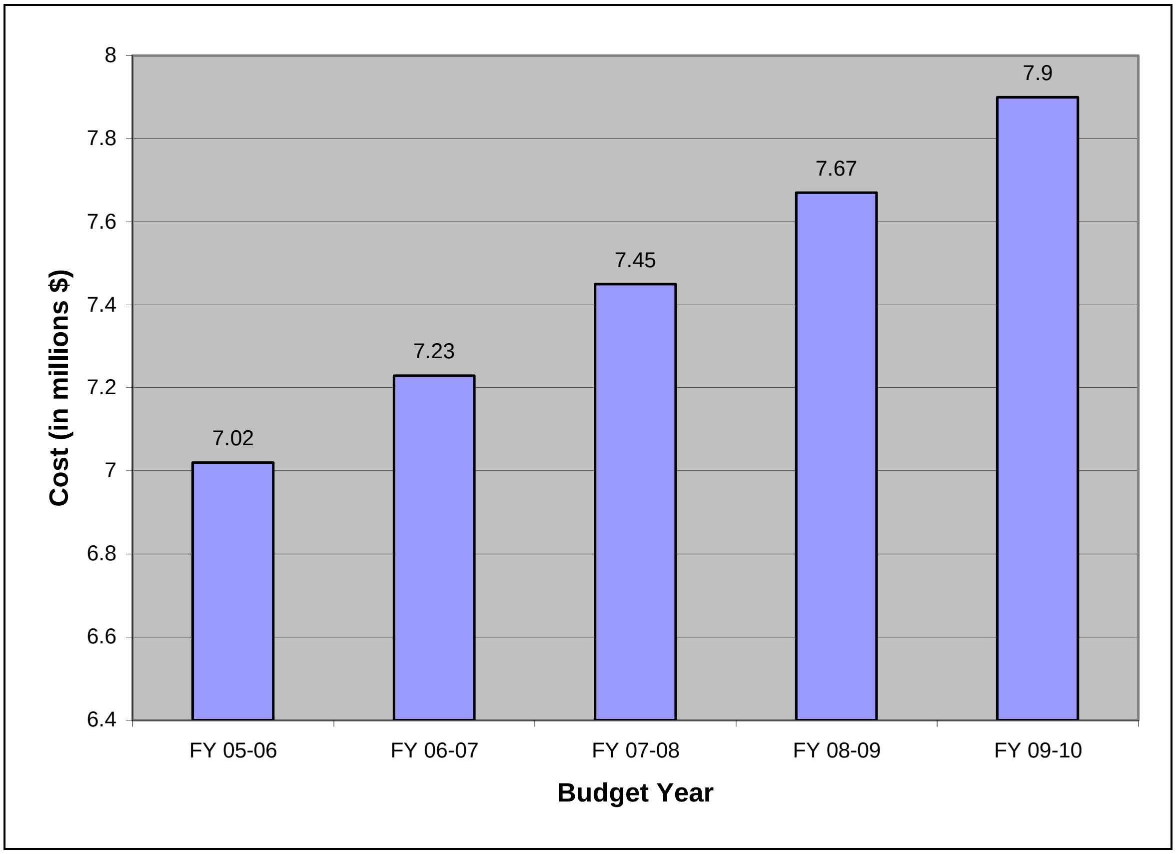
All the current needs can not be met in the next one or two years. So, a five year cost schedule for meeting the current needs is provided here. The total cost can be split equally among the next five years as the estimated cost of improvements is not expected to escalate more than three percent in the next five years. This presents a budget requirement of $6.99 million per year for the next five years for both road and bridge improvements. This will provide $1.96 million per year for the next five years for bridge improvements, about $3.68 million per year for the next five years for paving gravel roads and about another $1.36 million per year for the next five years for widening or re-paving paved roads.

Figure 6-1. Cost Schedule to Meet Current Needs



For the cost schedule presented in Figure 6-1, the prioritized road and bridge needs have been grouped into improvements for each of the next five budget years. The budget years in which improvements are recommended to be implemented are also indicated in Table 3-2, Table 3-4, and Table 3-5. FY 05-06 is referred to as budget year 1. Budget years 2, 3, 4 and 5 are subsequent financial years. The groups of road and bridge improvements for the next five budget years are indicated in the attached maps in a different color for each year. Figure 6-2 shows the combined costs (i.e. road and bridge needs together) of meeting the current needs.

Figure 6-2. Combined Cost Schedule to Meet Current Needs



6.2. Costs to Meet Future Needs

Future needs presented in Chapter 5 were then analyzed for estimating costs to implement. A summary of the cost of all these improvements is shown in Table 6-1. Current needs identified in Phase I of this project are scheduled to be completed by FY 10-11. The total cost of future needs (both gravel and paved roads) until Year 2015 is $10 million. These improvements are scheduled to be completed by FY 2015-2016. The total cost of identified future needs from Year 2015 through Year 2025 is $16 million. Improvements are scheduled to be implemented between FY2016-2017 and FY2025-2026. The unit costs used for estimating the costs of these improvements were the same as those used in Phase I. Paving one mile of existing gravel road is expected to cost $ 150,000 while the cost of widening one mile of an existing paved road is expected to be $250,000 including the cost of acquiring the right of way (ROW).

Table 6-1. Total Cost of Identified Future Improvements

	2010	2015	2025
Gravel Improvements	$7,207,500	$615,000	$1,410,000
Paved Improvements		$2,000,000	$14,733,500
Total	$7,207,500	$2,615,000	$16,143,500

The $10 million required to meet the road improvement needs for Year 2015 have been equally divided among the five Fiscal Years between 2010 and 2015. The cost schedule for the improvements until Year 2015 is shown in Figure 6-3. The $16 million required to meet the road improvement needs for Year 2025 can also be divided among the ten Fiscal Years between 2015 and 2025. A cost schedule for these improvements is shown in Figure 6-4. An inflation rate of three percent per annum (3%) was used to develop this cost schedule.

Figure 6-3. Cost Schedule for Improvements until Year 2015

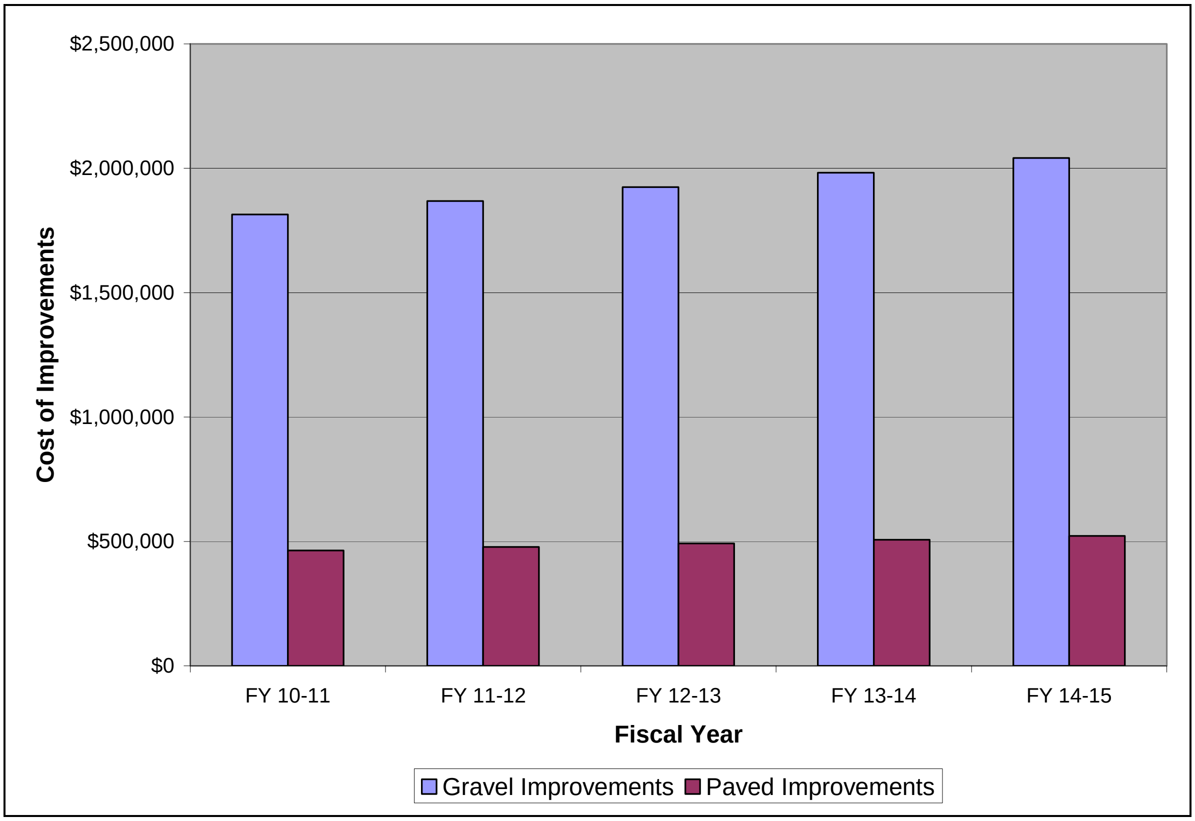


Figure 6-4. Cost Schedule for Future Improvements until Year 2025

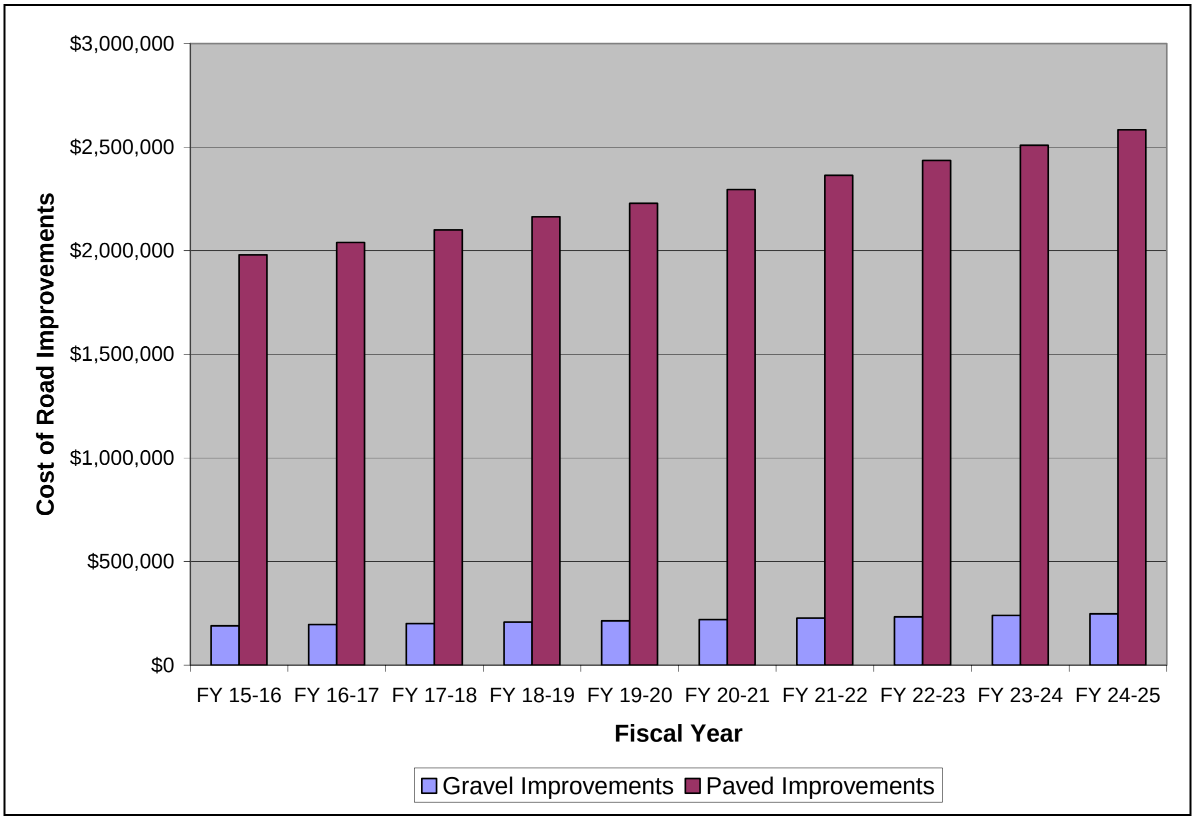
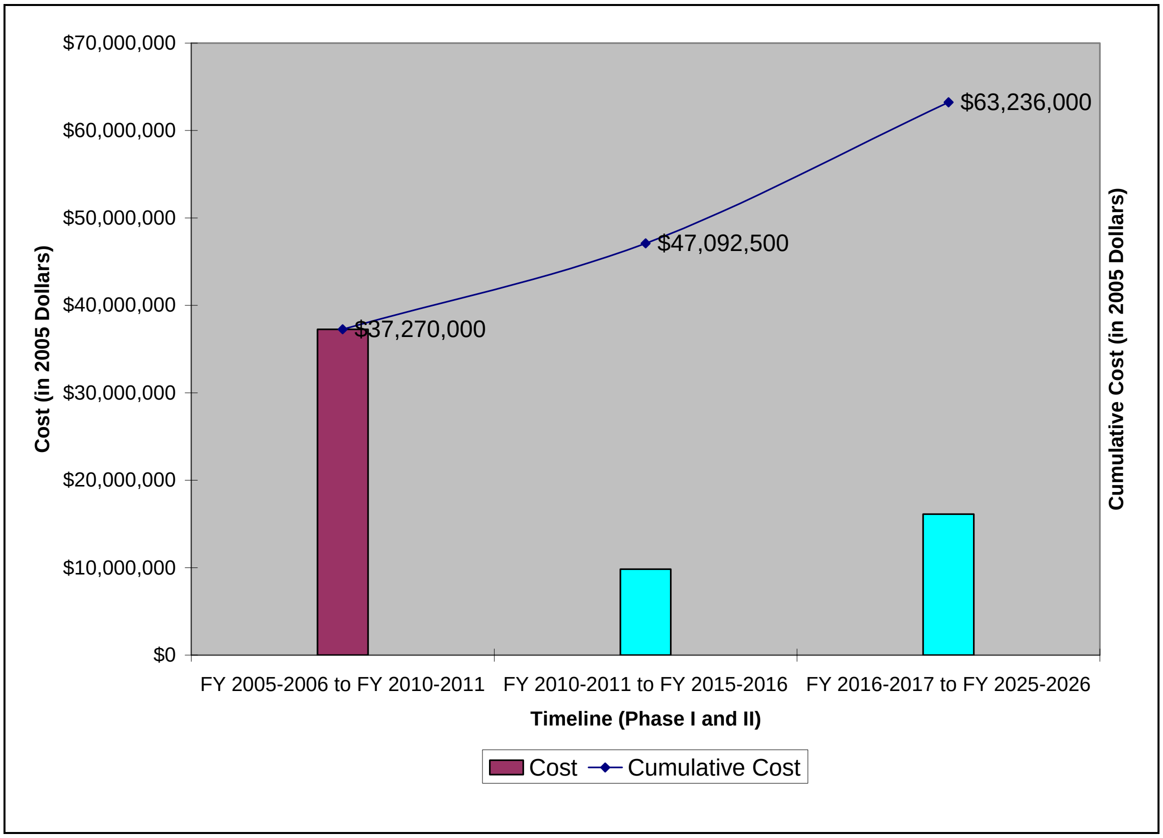


Figure 6-5 shows the overall cost and a distribution of this overall cost for the twenty year period of this plan (i.e. FY 2005-2006 till FY2025-2026).

Figure 6-5. Overall Cost Schedule for the Twenty Year Plan



7. FUNDING SOURCES

The recommended improvements can be implemented using various sources of funds available to the County from State and federal Governments apart from the local funds.

7.1. Federal and State Funding Sources

The following State and Federal funding sources can be further explored for use by the county.

1. CTEP – Community Transportation Enhancement Program
2. STPS – Surface Transportation Program – Secondary
3. STPHS – Surface Transportation Program - Hazard Elimination
4. CMAQ – Congestion Mitigation & Air Quality Improvement Program
5. STPRP – Rail/Highway Crossing Protective Devices Program
6. STPRR – Rail/Highway Crossing Elimination of Hazard Program
7. HBRRP – Highway Bridge Replacement and Rehabilitation Program
   - A. Off-System Bridge Replacement and Rehabilitation Program
8. SFC – State Funded Construction
9. State Fuel Tax – City and County
10. Revenue Aligned Budget Authority (RABA)
11. Federal Lands Highway Program (FLHP)
    - A. Public Lands Highways (PLH)
      - 1) Discretionary
      - 2) Forest Highway
    - B. Parkways and Park Roads
12. Minimum Guarantee
13. Transit Funding
    - A. Section 5310 - Service for the Elderly and Persons with Disabilities
    - B. Section 5311 - Rural General Public Transit Service

Short descriptions of these funding sources, including information on source of revenue, required match, intended purpose of funds, how the funds are distributed, and the agency responsible for establishing the priorities for the use of these funds, can be found in Appendix B, which includes relevant parts from a document developed by the planning division of the Montana Department of Transportation (MDT).

7.2. Local Funding Sources

In addition to the many Federal and State funding sources listed above, there are a number of local funding options that can be used for transportation improvements.

7.2.1. General Obligation Funding Sources

If approved by the county's registered electors, general obligation bonds can be sold, with the proceeds being expended on transportation system improvements. The law limits the total bonding capacity of counties like Gallatin County. Since these funds are the most general (i.e. can be spent on the widest range of projects and needs of the community), use of the County's bonding capacity for transportation improvements must be carefully weighed against those other, diverse community needs that may arise from time to time.

7.2.2. County Road Maintenance Districts

Gallatin County can create road maintenance districts to fund maintenance of road improvements through an annual assessment against properties within the district. Maintenance may include operation, maintenance and repair of traffic signal systems, repair of traffic signs, and placement and maintenance of pavement markings.

7.2.3. Rural Improvement Districts

An improvement district made up of properties specially benefited by an improvement can be created and bonds sold to fund design and construction of the improvement projects. These funds are often used to leverage State and federal funds to make improvements that not only benefit the district properties, but the community at large.

7.2.4. County Road Impact Fees

Gallatin County currently collects impact fees on a per-lot basis as a requirement for subdivision approval. These fees can be used for projects expanding capacity on the County road network. When appropriate, an eligible project that benefits the general public can be constructed with the costs of construction being credited against fees owed.

7.2.5. Transportation Districts

Creation of transportation districts will enable the County to recommend up to 12 mill levies for district expenses, exclusive of bond repayment. The maximum amount of bonded indebtedness outstanding at any time cannot exceed 28 percent of the taxable value of the properties within the district.

8. MAPS OF CURRENT AND FUTURE NEEDS

Map 1 presents all the prioritized road improvements that have been recommended to be completed in the next two years and Map 2 presents all the prioritized bridge improvements that have been recommended to be completed in the next two years. Map 3 shows all the prioritized road improvements that have been recommended to be completed in the time period between FY2010 –2011 and FY 2025-2026. Map 1, Map 2 and Map 3 are provided as Appendix C.

9. CONCLUSIONS AND RECOMMENDATIONS

Phase II improvement recommendations cost approximately $ 2 millions per year over the fifteen years between Year 2010 and Year 2025 in terms of new construction beyond an approximate cost of $7 to $8 millions per year over the next five years to meet the current needs identified in Phase 1. It should be noted that the cost of regular maintenance activities listed in Chapter 2 (e.g. snow removal, grading, sanding, etc.) is not included in this cost estimate of needs.

The road and bridge needs identified in Phase 1 are the improvements that should be currently in place to meet the traffic demands. It is very critical to meet these needs. The road improvements identified in Phase 2 are based on the growth projections in the County. It is apparent that a minimum of the level of funding indicated in this report is necessary to improve the capacity to meet the future traffic demand.

There are critical current needs for road and bridge improvements. It is essential that these needs are met to maintain an acceptable level of mobility and to facilitate safe traffic in the County. The current needs that should already be in place to meet the current traffic demands are scheduled to be improved by FY 2010 - FY 2011. The current rate of growth is expected to continue in the future and this growth will create significant amount of demand for additional capacity of roads and bridges. These needs have been identified and presented in Chapter 5. These needs will have to be revisited in five years and updated based on available information at that time, because the future growth may vary based on other factors external to the ones used for the growth projections in this project.

Future land use growth of the whole County was modeled based on past land use growth, employment growth, demographic changes, and county growth policy. Based on these projections, a set of corridors (road network) will be established that will facilitate the movement of County residents among the major population centers of the County including Bozeman, Belgrade, Manhattan, Three Forks, Four Corners and Amsterdam. This identified network will help improve travel east-west and north-south in the County.

9.1. Recommendations

This twenty year plan identified the needs to be met to maintain an acceptable level of mobility and safety within Gallatin County. The future needs were identified in accordance with the recommendations of the County Growth Policy. The residential demand projections were based on a few simplifying assumptions and may be calibrated at regular intervals in the future with available data. The current needs identified in this document were identified as needs to meet the *current traffic conditions that are known*. It is recommended that the identified current needs in this plan are met in the next five years

The future needs were identified to meet the *estimated traffic conditions based on residential growth projections.* These estimated traffic conditions based on residential growth projections may vary depending on other factors such as changes in economic and population growth rates. Therefore, this infrastructure improvement should be updated on a biennial basis to account for the changes in every two years.

APPENDIX A: RESIDENTIAL DEMAND GROWTH PROJECTIONS

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Land Resources and Environmental Sciences Department, Montana State University

The Gallatin County suburban and exurban growth forecast model developed for this project utilized the change in geo-referenced well data from 1979 to 2003 in 2 year increments to predict future well densities on a one quarter square mile section grid (160 acres). The assumption was that one well in a rural area was indication of a single dwelling (home) as it is mostly the case in the exurban and suburban areas.

There were two components to this growth scenario: 1) population growth in quarter sections that already were occupied with wells, and 2) growth where an unoccupied quarter section is developed and indicated by one or more wells. The first component utilized the quarter section well densities from 1979 to 2003 to calculate an observed well density growth rate (δwells / δt). Density growth rate was calculated by dividing the change in number of wells in a given number of years (δwells) by the number of years (δt). Multiple regression analysis was then used to determine the relationship between observed well growth rates and well densities in adjacent quarter sections (neighborhood) (Figure A-9-1) nearby community attraction values, where attraction values were population of a community divided by distance from the quarter section to the center of the community, and distance from the quarter section to a paved road. The assumption was that the size of the community and the existence of paved roads close by influenced the growth rate of a given quarter square mile section. It is generally true that larger communities represent a stronger attraction for rural growth and that growth is most likely to occur along existing paved roads.

The communities with highest attraction were determined to be Bozeman, Belgrade, Manhattan, Three Forks, and West Yellowstone. All of the communities showed a consistent influence on the well growth rates in the suburban and exurban areas. Livingston area outside of Gallatin County was also included in the modeling as it generates a significant number of trips to and from Gallatin County

The growth rate function for any given quarter square mile section was:

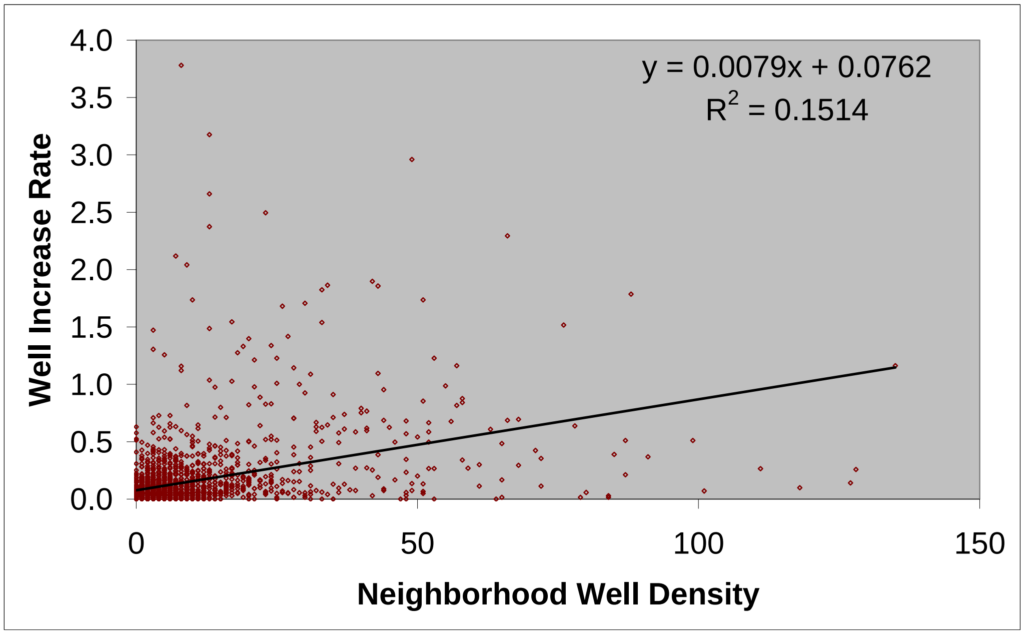
δwells / δt = 0.1443 + 0.0024 * Neighbors - 0.1798 * West Yellowstone - 0.001 * Bozeman + 0.0471 * Livingston - 0.0578 * Three Forks + 0.0014 * Belgrade - 0.0491 * Manhattan - 0.0335 * log(distance to paved roads)

The name of the city represents the community attraction value. The regression parameter value (e.g. -0.001 for Bozeman) in front of each community name indicated the reciprocal of the strength of the attraction.

The well densities for future years (e.g. 2010) were calculated by adding the projected growth rate (δwells/δt) multiplied by the number of years into future (δt) to a previous year's well density in each quarter square mile section.

When the well growth rate function was applied to years prior to 2003 to predict 2003 well densities Figure A-9-1, the model tended to over predict at the lower growth rates and somewhat under predict at the higher growth rates.

Figure A-9-1. Well Growth Rate vs. Neighborhood Well Density



The second component of the growth scenario (from unoccupied to occupied quarter sections) was treated as a probability influenced by the same factors as in growth scenario one.

In this case, observed quarter sections that became occupied in the years from 1979 to 2003 were used as the dependent variable in a logistic regression. The resultant equation was

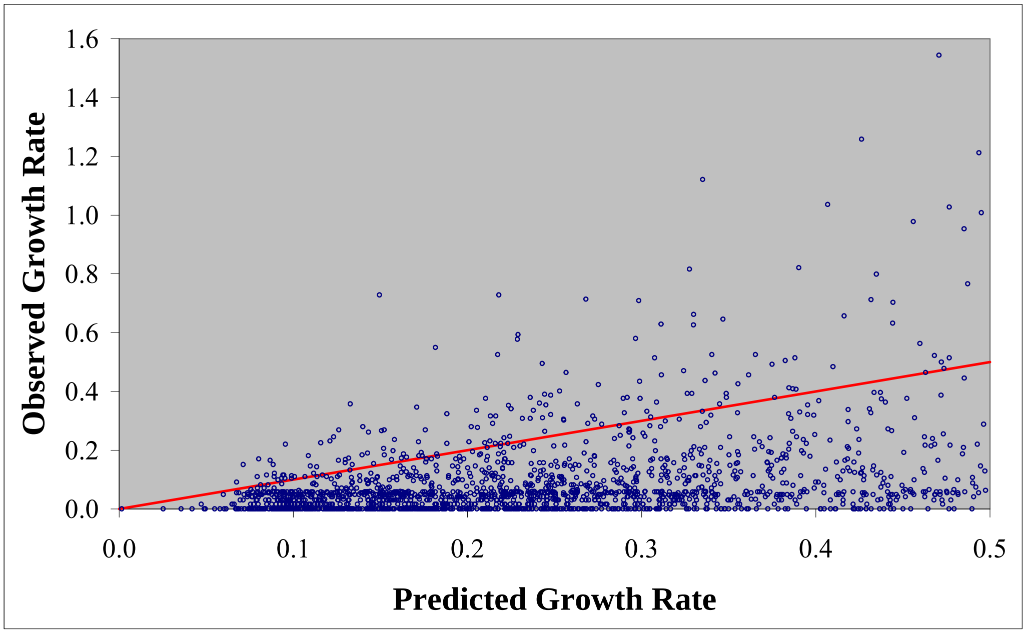
p = (Exp(-4.26 + 0.313 * Neighbors - 1.763 * West Yellowstone - 0.003 * Bozeman + 4.023 * Livingston - 0.896 * Three Forks + 0.154 * Belgrade + 0.674 * Manhattan - 0.292 * log(distance to paved roads))) / (1 + Exp(-4.26 + 0.313 * Neighbors - 1.763 * West Yellowstone - 0.003 * Bozeman + 4.023 * Livingston - 0.896 * Three Forks + 0.154 * Belgrade + 0.674 * Manhattan- 0.292 * log(distance to paved roads)))

p is the probability of an unoccupied quarter section becoming occupied by one well. The model allows only one well to be entered in a previously unoccupied quarter section depending on the probability of a new well. Thus, the well growth rate (δwells / δt) for these newly occupied quarter sections will always be 1.0.

New wells were assigned to each quarter section of the map for each iteration of the map, regardless of zoning restrictions or conservation easements and according to the parameters outlined in the two model components. The resulting map was then fed back into the model for each iteration of the model, producing subsequent years' growth demand forecasts.

The output for any given future year is a scenario map that shows the magnitude and spatial pattern of residential development pressure. The forecasts are spatially explicit in demonstrating the distribution of residential development demands in relation to transportation infrastructure and proximity to urban areas and previously developed exurban areas. The output is not intended to precisely predict the development of any particular single quarter section. Rather, the output represents the spatial pattern of development as a whole, and some positive or negative variation in the forecast for a particular quarter section must be considered.

Figure A-9-2. Observed vs. Predicted Well Densities for Year 2003



The output from this model was compared with another population growth estimate for Gallatin County. Using the Gallatin County Needs Assessment produced by Gallatin Development Corporation, we used their values of 3% annual growth rate which was based on U.S. Census data and continued that out to the year 2025. Also, information found in that report showed that human population living outside incorporated towns has increased from 54% to 59% in Gallatin County. We projected an unincorporated population growth to the year 2025. For the Montana State University (MSU) model, our numbers are based on geo-referenced well numbers and their change over time since 1979. The output from the MSU model was multiplied by the average number of people per well which was calculated by dividing the population in unincorporated areas in Gallatin County (using the Gallatin County Needs Assessment values) by the number of wells in the unincorporated areas (the GIS well data). A comparison of the growth projections are demonstrated in Figure A-9-3.

The Gallatin County Growth Policy and the MATR projection lines are considerably lower than the MSU model output because they are based solely on demographic trends and do not account for such spatial factors as transportation infrastructure, and proximity to growth centers and pre-existing residential development that influence the growth.

To examine the relationship between town centers, residential development demand, and transportation infrastructure, five areas were created and looked at very closely. Four of the areas centered on the town centers in the Gallatin Valley. The fifth area focused on an area southwest of Bozeman that was forecasted to experience high growth. Each area was divided along cardinal axis creating four subunits for which the number of new wells per quarter square mile section was generated and used for the traffic demand projection as described in Chapter 4 of this document.

Figure A-9-3. Gallatin County Exurban and Suburban Residential Growth Forecasts

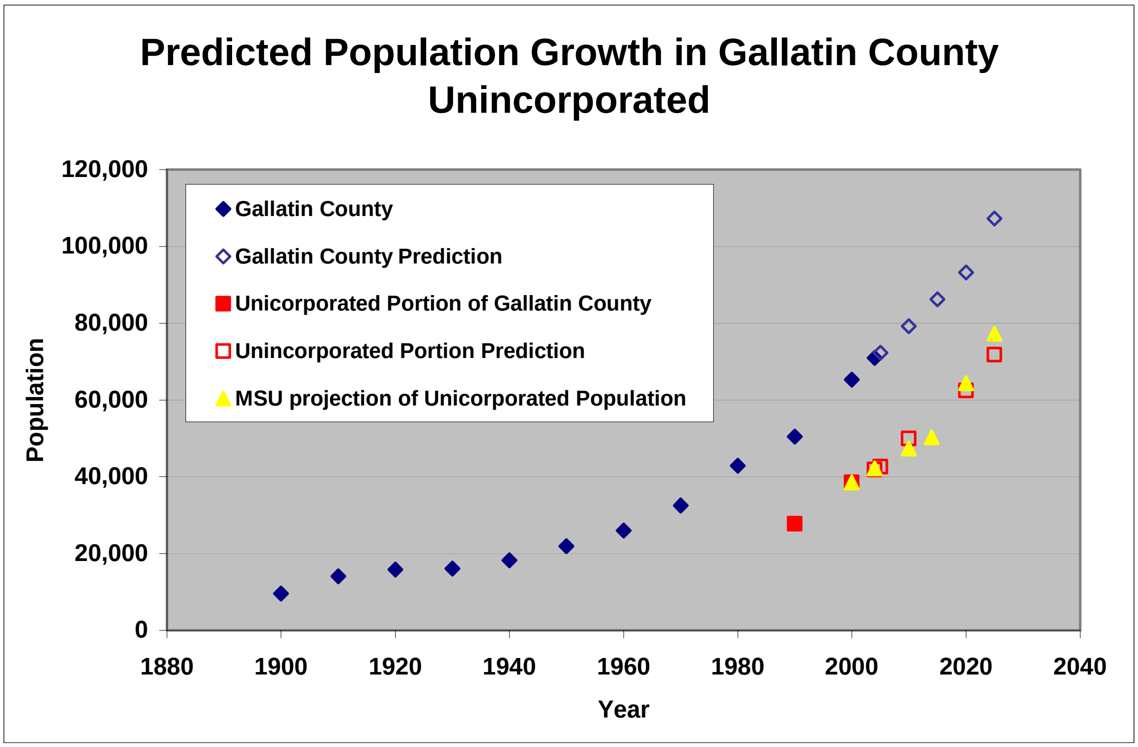
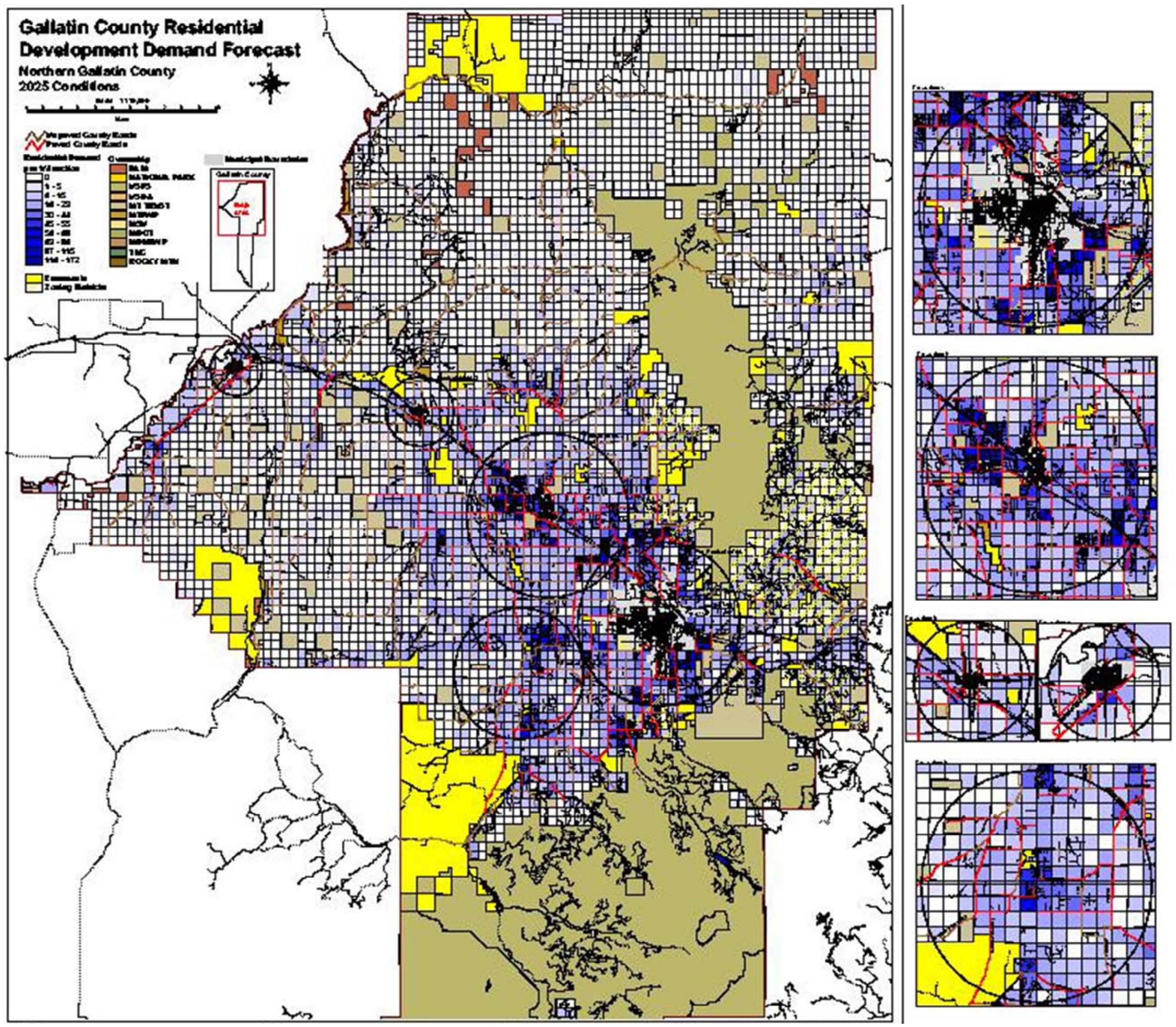


Figure A-9-4. Gallatin County Growth Projections and Top Five Growth Areas



APPENDIX B: TRANSPORTATION FUNDING CATEGORIES

Prepared by Rail, Transit, and Planning Division, Montana Department of Transportation

September 2002

1. **CTEP** - Community Transportation Enhancement Program

Federal funds available under this unique Montana program are used to finance transportation projects that enhance the present surface transportation system in accordance with the Federal requirement that 10% of the STP funds each state receives must be spent on projects in the following categories:

- Pedestrian and Bicycle facilities
- Acquisition of scenic easements and historic or scenic sites
- Scenic or historic highway programs
- Landscaping and other scenic beautification
- Rehabilitation and operation of historic transportation buildings, structures or facilities (including railroads)
- Historic preservation
- Archaeological planning and research
- Mitigation of water pollution due to highway runoff
- Preservation of abandoned railway corridors (including the conversion and use for pedestrian or bicycle trails)
- Control and removal of outdoor advertising
- Safety education activities for pedestrians and bicyclists
- Establishment of transportation museums
- Projects that reduce vehicle-caused wildlife mortality

The Federal share for CTEP projects/activities is 86.58% with a required local match of 13.42%. Eligible local and tribal governments select the projects.

2. **STPS** - Surface Transportation Program – Secondary

Federal and State funds available under this program are used to finance transportation projects on the state-designated Secondary Highway System. Of the total, 86.58% is Federal and 13.42% is State funds from the State Special Revenue Account for highway projects.

The Transportation Commission (MCA 60-2-110 (1), (3)) distributes Secondary funds each fiscal year to the five financial districts. Distribution is based on the following:

1. 30% in the ratio of land area in each district to the total land area in the state.

2. 35% in the ratio of the rural population in each district to the total rural population in the state.

3. 30% in the ratio of rural road mileage in each district to the total rural road mileage in the state.

4. 5% in the ratio of the rural bridge square footage in each district to the total rural bridge square footage in the state.

MDT and county commissions determine Secondary priorities cooperatively for each district.

Eligible activities for the use of Secondary funds fall under three major types of improvements: Reconstruction, Rehabilitation, and Pavement Preservation. The Reconstruction and Rehabilitation categories are allocated 65% of the program funds with the remaining 35% dedicated to Pavement Preservation. Secondary funds can also be used for any project that is eligible for STP under Title 23, U.S.C.

3. **STPHS** - Surface Transportation Program - Hazard Elimination

The purpose of the Federal Hazard Elimination Program is to identify hazardous locations throughout the states highway system, assign benefit/cost ratio priorities for the correction of these hazards, and implement a schedule of projects for their improvements. Hazard Elimination projects are funded with 90% Federal funds and 10% State funds.

Projects eligible for funding under the Hazard Elimination Program include any safety improvement project on any public road; any public surface transportation facility or any publicly owned bicycle or pedestrian pathway or trail; or any traffic calming measure. MDT's Traffic & Safety Bureau selects the projects by identifying high hazard sites through the analysis of law enforcement accident reports. Sites with a cluster of accidents over time are field reviewed and an appropriate type of corrective action is determined. The cost of the proposed Hazard Elimination project is compared to the potential benefit of the action. Once the benefit/cost ratio is calculated for all high hazard sites statewide, the projects are prioritized from highest to lowest and the projects are funded in this order until the yearly funds are exhausted.

4. **CMAQ** – Congestion Mitigation & Air Quality Improvement Program

Federal funds available under this program are used to finance transportation projects and programs to help meet the requirements of the Clean Air Act. Eligible activities include transit improvements, traffic signal synchronization, bike/ped projects, intersection improvements, travel demand management strategies, traffic flow improvements, and public fleet conversions to cleaner fuels. At the project level, the use of CMAQ funds is not constrained to a particular system (i.e. Primary, Urban, and NHS). Of the total received, 86.58% is Federal and 13.42% is non-federal match. A requirement for the use of these funds is the estimation of the reduction in pollutants resulting from implementing the program/project. These estimates are reported yearly to FHWA.

TEA-21 provided states significantly more flexibility in the use of CMAQ funds. Prior to TEA-21, almost all CMAQ funds had to be used in Missoula, Montana's only moderate carbon monoxide (CO) non - attainment area. Although Missoula continues to receive the CMAQ funds that come to Montana by virtue of the Federal formula, MDT has directed approximately 90% of Montana's CMAQ apportionment to several new State programs.

A) Montana Air & Congestion Initiative (MACI) – Discretionary Program

The MACI – Discretionary Program provides funding for projects in areas of the state that are designated non-attainment or recognized as being "high-risk" for becoming non-attainment. District Administrators and local governments nominate projects cooperatively. Projects are prioritized and selected based on air quality benefits and other factors.

5. **STPRP** - Rail/Highway Crossing Protective Devices Program

The purpose of the Federal Rail/Highway Crossing – Protective Devices Program is to identify high hazard rail crossing sites and install new rail crossing signals.

MDT's Rail - Highway Safety manager is responsible for surveying, identifying and prioritizing those railroad crossings that require new protective devices or upgrading of existing devices. The funds are distributed on a statewide basis determined by a priority list ranked by a hazard index. The Federal/State ratio is 90% Federal and 10% State.

6. **STPRR** - Rail/Highway Crossing Elimination of Hazard Program

The purpose of the Federal Rail/Highway Crossing – Elimination of Hazard Program is to identify high hazard rail crossing sites and construct new rail/highway grade crossings. The program also uses funds to rehabilitate existing grade separations.

Eligible expenditures include the separation or protection at grade crossings, reconstruction of existing crossings and relocation of highways to eliminate crossings.

Projects for this program are selected by identifying those sites where only a grade separation will eliminate an identified hazard or where an existing grade separation exists but needs rehabilitation or replacement. Since funding for this program is limited, STPRR funds are often used in combination with other Federal funding sources to fund costly grade separation projects.

Grade separation projects are funded with 90% Federal funds and 10% State funds.

7. **HBRRP** - Highway Bridge Replacement and Rehabilitation Program

This program provides funding for the rehabilitation and replacement of deficient bridges. The funding, eligibility requirements and project selection for this program is divided into two categories, depending upon whether the bridge is located "on-system" or "off-system".

A) Off-System Bridge Replacement and Rehabilitation Program

The Off-System Bridge Program receives funding through the Federal Highway Bridge Replacement and Rehabilitation Program. As stated above, the On-System Bridge program receives 65 percent of the HBRRP funds. The remaining 35 percent are allocated to the Off-System Bridge Program. Off-System Bridge projects are funded with 80 percent Federal funds and 20 percent State funds.

Projects eligible for funding under the Off-System Bridge Program include all bridges not "on-system," at least 20 feet long in length, and have a sufficiency rating of less than 80.

Procedures for selecting bridges for inclusion into this program are based on a ranking system that weighs various elements of a structures condition and considers county priorities. MDT Bridge Bureau personnel conduct a field inventory of off-system bridges on a two-year cycle. The field inventory provides information used to calculate the Sufficiency Rating (SR).

8. <u>**SFC** – State Funded Construction</u>

The Pavement Preservation Program funds construction projects with State funds. Projects not eligible for Federal funding participation are funded with these funds. The program funds projects on the Primary and Secondary Highway Systems to preserve the condition and extend the service life of the pavement. The type of work consists entirely of overlays and/or seal and covers. Eligibility requirements are that the highway be maintained by the State. The Transportation Commission establishes the priorities for the program. This program is totally State funded, requiring no match. MDT staff nominates the projects based on pavement preservation needs.

9. <u>State Fuel Tax - City and County</u>

Montana assesses a tax of $.27 per gallon on gasoline and diesel fuel used for transportation purposes. Each incorporated city and town receives a portion of the total tax funds allocated to cities and towns based on:

1) The ratio of the population within each city and town to the total population in all cities and towns in the State;

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

Each county receives a percentage of the total tax funds allocated to counties based on:

1) The ratio of the rural population of each county to the total rural population in the State, excluding the population of all incorporated cities or towns within the county and State;

2) The ratio of the rural road mileage in each county to the total rural road mileage in the State, less the certified mileage of all cities or towns within the county and State; and

3) The ratio of the land area in each county to the total land area of the state.

All fuel tax funds allocated to the city and county governments must be used for the construction, reconstruction, maintenance, and repair of rural roads or city streets and alleys. The funds may also be used for the share that the city or county might otherwise expend for proportionate matching of Federal funds allocated for the construction of roads or streets on the Primary, Secondary, or Urban Systems.

Priorities for the use of these funds are established by the cities and counties receiving them.

10. Revenue Aligned Budget Authority (RABA)

RABA is a very important provision of TEA-21 that guarantees all trust fund revenues into the highway account are available for the program the following year. These funds are distributed between the states according to overall program share (minimum guarantee) and proportionately distributed into the underlying programs in the states.

11. Federal Lands Highway Program (FLHP)

FLHP is a coordinated Federal program that includes four separate programs.

A) Public Lands Highways (PLH)

1. Discretionary

The PLH Discretionary Program provides funding for projects on highways that are within, adjacent to, or provide access to public lands. In Montana, project prioritization for nominations for PLH Discretionary funds is based on Transportation Commission policy with project selection by the Secretary of Transportation. However, this program has been heavily earmarked by Congress under TEA-21.

2. Forest Highway

The Forest Highway Program provides funding to projects on routes that have been officially designated as Forest Highways. Projects are selected through a cooperative process involving FHWA, the US Forest Service, and MDT and projects are developed by FHWA's Western Federal Lands Office.

B) Parkways and Park Roads

Parkways and Park Roads funding is for National Park transportation planning activities and projects involving highways under the jurisdiction of the National Park Service. Projects are prioritized by the National Park Service and approved and developed by FHWA.

12. Minimum Guarantee

The minimum guarantee Federal funding adjustment that provides the difference between funding received from the formula programs including high priority projects and the percentage of program share negotiated for each State in TEA-21. About half of the minimum guarantee funds go proportionately into the basic program categories and the rest is mostly directed into

Montana's STP (Primary, Secondary, Urban, and Safety enhancements) in order to make this funding category whole after its funding losses of TEA-21. Minimum Guarantee funds are treated like regular program funds when expended.

13. Transit Funding

Several Federal Transit Administration funding programs provide funding for Montana transit providers. With the exception of the Section 5303 and Section 5307 Urbanized Area (Missoula, Great Falls, Billings) programs, the FTA programs are administered by MDT. The two primary programs are the Section 5310 and Section 5311 programs.

A) Section 5310 Service for the Elderly and Persons with Disabilities

These funds are available through an application process to non-profit groups and public bodies for capital assistance. The funding requires a 20% local match.

B) Section 5311 Rural General Public Transit Service

Section 5311 funds are available through an application process for capital and operating assistance to eligible providers of transit services to the general public outside of urbanized areas. Local match requirements are 50% for operating and 20% for capital. Federal law also requires each State to direct 15% of its Section 5311 funds to intercity bus-related projects.

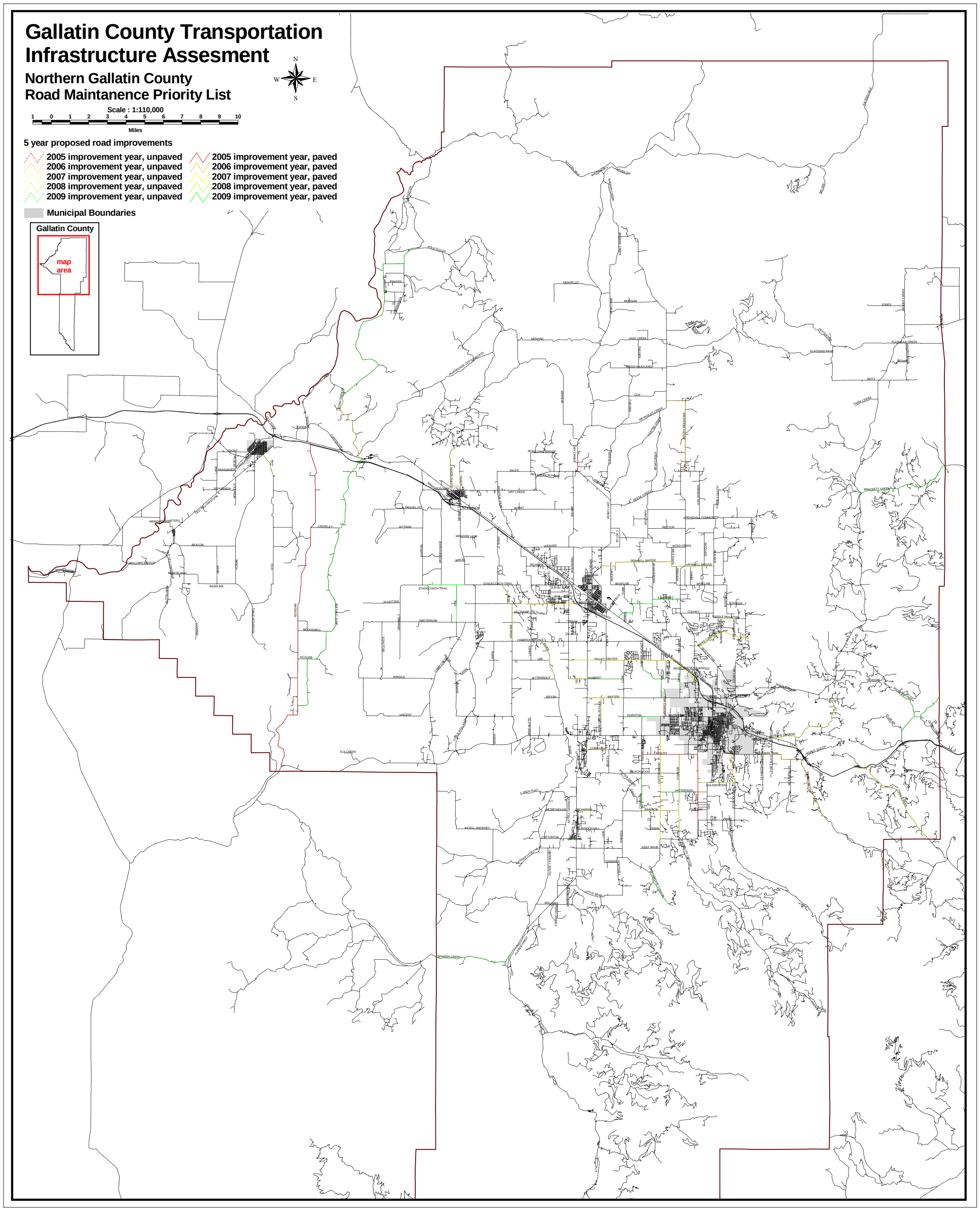
APPENDIX C: MAPS OF NEEDS

Map 1: Prioritized Current Road Improvement Needs (Phase I)

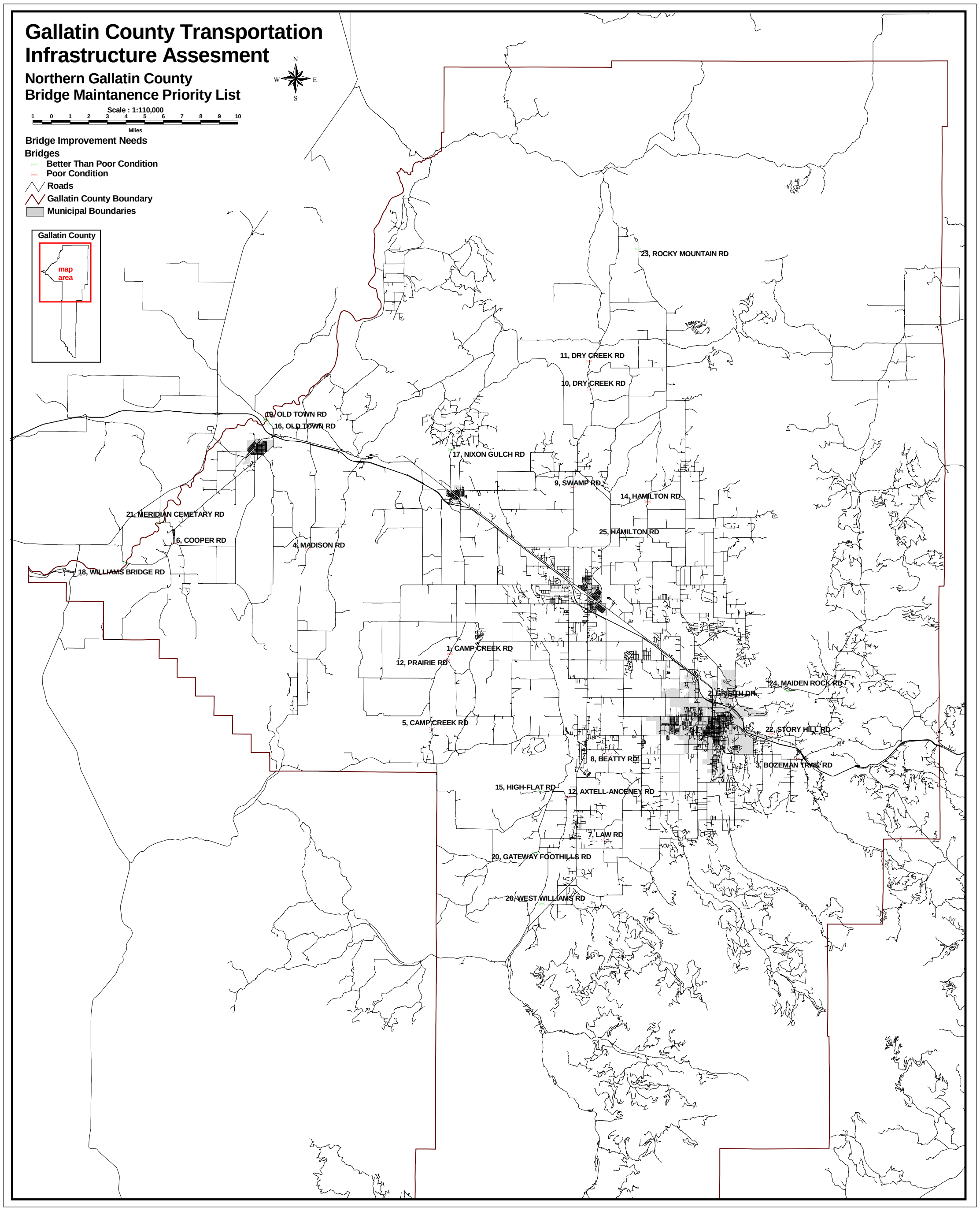
Map 2: Prioritized Current Bridge Improvement Needs (Phase I)

Map 3: Prioritized Future Road Improvement Needs (Phase II)

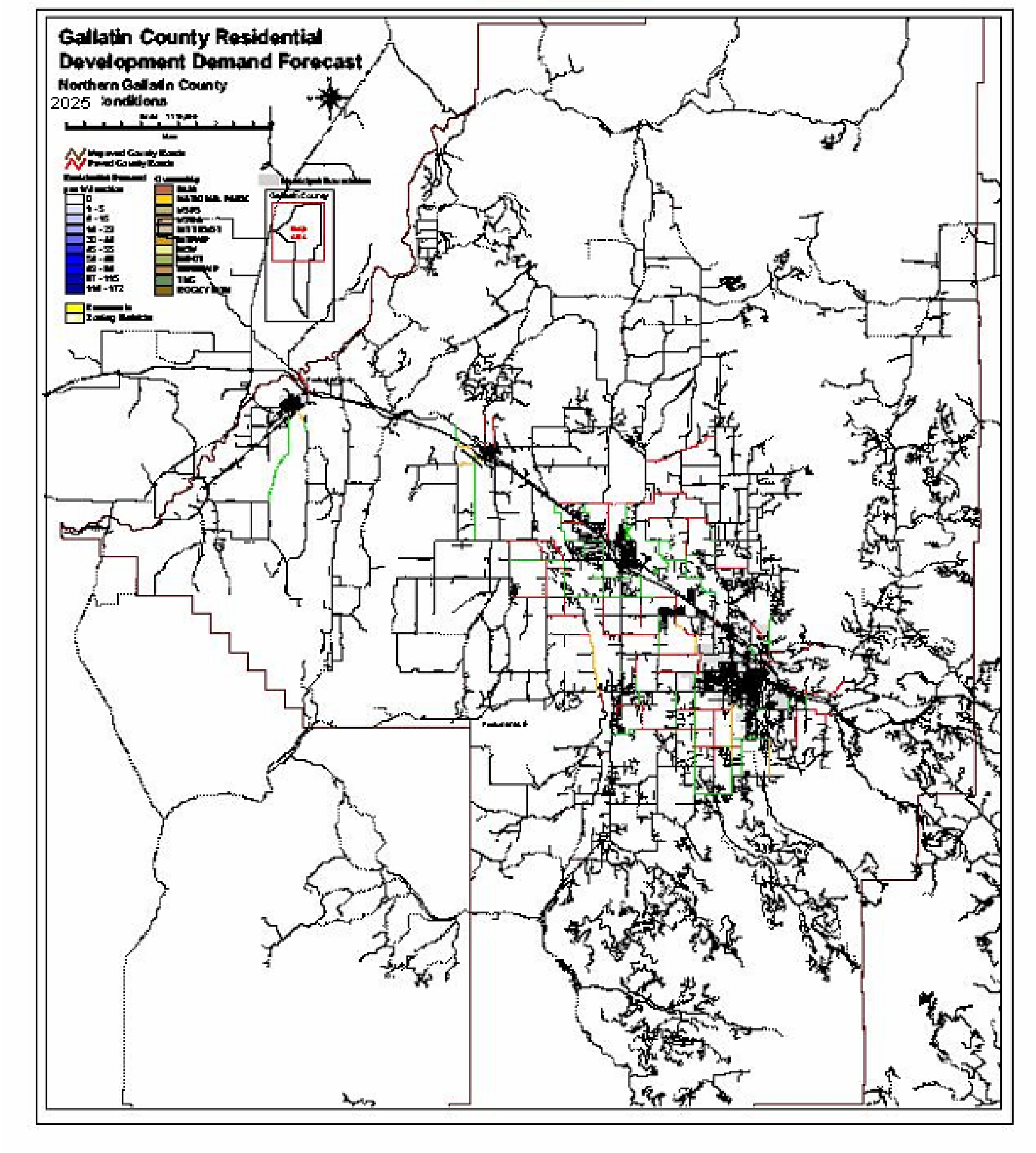
Map 1: Prioritized Current Road Improvement Needs



Map 2: Prioritized Current Bridge Improvement Needs



Map 3: Prioritized Future Road Improvement Needs



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