GRAYLING AREA TRANSPORTATION STUDY

CRAWFORD & ROSCOMMON COUNTIES, MICHIGAN

Prepared For:

NORTHEAST MICHIGAN COUNCIL OF GOVERNMENTS

Prepared By:

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September 2008

ACKNOWLEDGEMENTS

The successful completion of the Grayling Area Transportation Study was only possible through the collaborative planning, review, and participation of many dedicated people. On behalf of the Study Team, we would like to express our sincere appreciation and gratitude to the members of the Technical Steering Committee and the following participants who made the study a success.

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Executive Summary

E 1.0 Study Purpose

Over the past 24 months, the Northeast Michigan Council of Governments (NEMCOG) has conducted the Grayling Area Transportation Study with input and review from the Technical Steering Committee. Together the team has developed recommendations to improve Grayling and the surrounding areas. The study was conducted with the following purpose:

> "Develop a set of feasible alternatives that improve access between I-75 and the Grayling area that reduce travel time, reduce complexity of wayfinding, and promote economic vitality."

The team was directed to assess existing conditions within the study area, examine future land use and operations based on growth and future development, and provide conceptual geometric alternatives and road improvements within the study area. The team worked with a Technical Steering Committee of local citizens representing various economic, governmental and transportation interests within the Grayling region. The committee provided guidance to the team regarding the areas of concern, key goals for the region's transportation system, and general direction.

E 1.1 Study Goals and Objectives

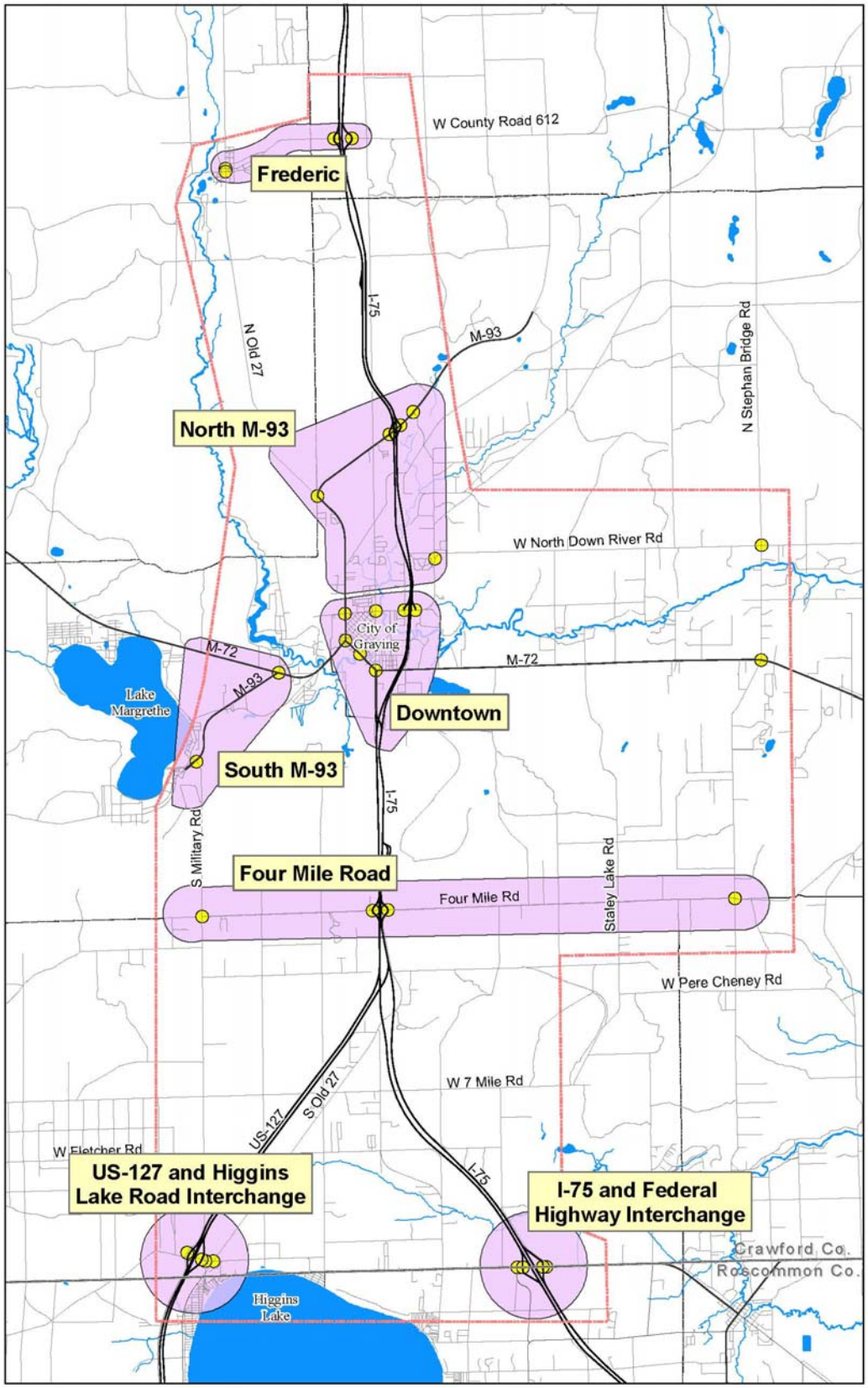
The development of goals and objectives was an important first step in the preparation of the Transportation Study. These served as a guide to help the team determine short and long-term management and infrastructure improvements. The Technical Steering Committee assisted in developing the goals and objectives necessary to meet the forecasted transportation needs for the year 2027. The Steering Committee consists of representatives from the City of Grayling, Crawford County Board of Commissioners, Crawford County Road Commission, Michigan Department of Transportation, Camp Grayling, Grayling Township, Beaver Creek Township, South Branch Township and the Crawford County Economic Development Partnership. The study team used the following guiding principles to develop recommendations to address existing and future transportation issues:

- Regional Access
- Local/Arterial Streets
- Vehicular Safety
- Wayfinding
- Socioeconomic/Land Use
- Environmental
- Other

E 1.2 Study Contents

This study summarizes the assessment of existing conditions in the study area. The existing conditions section includes a description of the major roadways in the study area; information on traffic volumes at key intersections; accidents, and level of service (LOS). See Figure E 1-1 for the project study limits. The impact of expected developments and other projects in the study area are assessed in the Future Conditions section. The recommendations developed in this study are presented in section six and eight, consisting of alternatives and recommendations for short and long term solutions.

FIGURE E 1-1
PROJECT STUDY LIMITS



E 2.0 Existing Conditions (2007)

The study area includes portions of Crawford and Roscommon Counties, all of the City of Grayling, and portions of Beaver Creek, Frederic, Grayling and Maple Forest Townships, in Crawford County, and Gerrish and Lyon Townships in Roscommon County. The study team conducted an extensive data collection effort to gain an understanding of existing conditions in the study area. The first part of this phase was to collect traffic data for the peak traffic hours. Existing traffic data that had been collected within the past five years by NEMCOG, MDOT, the City of Grayling and the Crawford County Road Commission was provided to the team for review. This data was supplemented with additional traffic counts conducted at thirty-four intersections to assure a thorough evaluation in the study area and to determine any different turning patterns. In addition to the turning movement counts, 24-hour ADT (Average Daily Traffic) counts were conducted.

Existing signal timing and phasing data, including cycle lengths, splits and offsets, were obtained from the Michigan Department of Transportation, the City of Grayling and the Crawford County Road Commission. The information for the existing signal timings was used to develop the existing traffic models.

The existing (2007) winter and summer peak-hour Levels-of-Service at the key intersections were calculated using the methods of the 2000 Highway Capacity Manual and the Synchro software package. Levels-of-Service range from "A" to "F", similar to an alphabetic grading system, with each level describing a different set of operational characteristics. LOS "A" describes operational performance under light traffic volumes (on freeway segments and freeway/ramp junctions) or with minimal delay (at signalized and unsignalized intersections). LOS "F" describes a high density of freeway and ramp congestion or intersection failure with extensive delays and long vehicular queues. LOS "C" or "D" is considered acceptable for peak-hour traffic operation of freeway segments, freeway/ramp junctions, and at signalized intersections in urbanized areas according to AASHTO. Levels of service are further explained in Section 3.3 of the report.

E 2.1 Summary of Existing (2007) Traffic Operations

In general, existing traffic conditions (2007) during the morning and afternoon peak-hours during both the summer and winter months operate at acceptable levels-of-service. It should be noted that the levels-of-service are based on the average stopped delay for vehicles making all moves (left, through, and right) from each approach.

For all the roadway segments, the travel time and delay data shows a fairly consistent trend throughout the course of the day and season (winter and summer). Based on observations and traffic analyses, the afternoon peak-hour resulted in longer queues and more delay than the morning peak-hour for a few intersections. This is a result of the intersections having to accommodate vehicles traveling to and from the various retail generators in the area as well as the usual afternoon peak-hour commuter traffic. In contrast, many of the retail stores along the corridors do not open until after the morning commuter peak-hour which results in shorter queues and delays.

E 3.0 Future Traffic Data & Conditions (2027) No-Build Capacity Analysis

To assess the effectiveness of the roadway network, the future conditions of 2027 model year was evaluated. Traffic forecasts for 2027 were developed using regional background growth factors and vehicle trip generation estimates for development anticipated within the study area. A future development that is expected in the Grayling area is the Mainstreet America Theme Park. This theme park is proposed to be a four season destination, located at the northeast quadrant of the I-75 and Four Mile Interchange. The theme park trip generation and distribution were estimated based on the traffic impact study report "Main Street America Theme Park Traffic Impact Study" dated in April 16, 2007.

Traffic growth is expected to occur between existing conditions and any given future year due to overall growth and development within the region. This growth is typically termed as "background growth" and must be accounted for as part of the future volumes. The Michigan statewide travel demand forecasting model was used to estimate the overall

background traffic growth in the region. Based on the travel demand model forecasts a 1.1 percent average annual growth rate was applied to the existing traffic volumes to develop future year 2027 No-Build peak-hour traffic volumes for each of the key intersections.

The future (2027) No-Build analysis consists of applying the 1.1 percent growth rate to the 2007 traffic volumes and adding the trips generated by the Mainstreet America Theme Park. These resulting volumes were added to the existing street network without any modifications to the geometry of the roadways. However, upgrades to the traffic signal systems, recommendations for signal coordination and already proposed MDOT project geometric improvements are included and the impacts of these enhancements reviewed. The resulting traffic volumes for future (2027) No-Build, winter and summer peak-hours at the key intersections in the study area are shown in Appendix D.

E 3.1 Summary of Future (2027) No-Build Traffic Operations

The key intersections within the study area were analyzed with the traffic volumes for 2027. Congestion and delays in 2027 were quantified with traffic from the anticipated developments to understand the relative impact of local growth. The future "No-Build" analysis would not make any significant capacity revisions to the existing roadway system that were not already programmed projects. MDOT is currently in the process of creating design plans for the reconstruction of I-75BL in Grayling in 2009. The reconstruction of I-75BL from M-72 East to Charles Street will be expanded from a four lane cross section to five lanes and then transitioned back to four lanes from Charles Street to the AuSable River. This project will also include converting the existing four lane cross-section to three lanes north of the AuSable River to M-72 West. This reconstruction will occur in 2009. This alternative does include traffic signal optimization measures that provide some benefit to improve travel time on the roadway network and reduce congestion. The results of this analysis clearly indicate that the roadway system is expected to experience an increase in delay and congestion due to growth in traffic volumes and the limited capacity of the intersections to accommodate the high-demand turning movements. The following intersections are projected to experience the greatest impacts, assuming no changes to the existing street network:

- *N. Down River/Roberts*/Michigan Ave.
- *I-75BL/M-72 West*
- *I-75BL/Michigan Av.* (existing signalized intersection)
- *M-72 East/I-75BL* (existing signalized intersection)
- *NB I-75 Ramp/Four Mile Road*
- *SB I-75 Ramp/Four Mile Road*

With the increase in traffic volumes it is not surprising that travel times will increase by 2027 without any major improvements. The downtown business loop routes within the study area are expected to experience the greatest increases in travel times.

Additional operational improvements can be achieved with the following traffic signal enhancements:

- Update all existing traffic signal locations along the I-75 Business loop to actuated controller, requiring the installation of vehicle detection. These timings will require pedestrian push-buttons for crossing I-75 BL at M-72 East and at Michigan Av. As pedestrian clearance times are based on estimated crossing distance, additional locations may require push-buttons if the 'flash don't walk' time exceeds the limit of vehicular splits.
- Actuated permissive-protected left turn phases, dog-house type of signal heads or 4-section heads with flashing yellow arrow would be necessary.
- All three existing signalized business loop intersections running actuated with coordination.

E 4.0 Summary of Alternatives and Recommendations

A large number of conceptual alternatives for improving I-75 access were initially considered and presented to the Steering Committee. Upon confirming one or more major design deficiencies from a geometric, real estate or public comment standpoint several alternatives were eliminated. Therefore only the following interchange alternatives were carried forward for future (2027) operational analysis:

- Providing full access at the I-75/North Down River Road interchange (Figure E 4-1– Alternative 1)
- Providing full access at the I-75/I-75 Business Loop interchange (Figure E 4-2 – Alternative 2)
- Reconfigure the I-75/Four Mile Road interchange with full access (Operational analysis for future conditions included in Mainstreet America Theme Park Traffic Impact Study and the Future (2027) No-Build analysis) (Figure E 4-3 – Alternative 1)

The future (2027) build morning and afternoon peak-hour turning movement volumes for each of the intersections in the winter and summer seasons, are presented in Appendix D. The figures in the appendix only show the key intersections which were identified to be impacted by each of the interchange build scenarios.

E 4.1 I-75 / North Down River Road Full Access Interchange & Upgrade of North Down River Road

The first alternative that was examined was the I-75/North Down River Road Interchange. Currently, the North Down River Road Interchange is a partial interchange on I-75, providing an entrance ramp for northbound (NB) I-75 traffic and an exit ramp for southbound (SB) I-75 traffic. The main focus of the improvements at the North Down River Road Interchange was to provide full access to I-75. This alternative adds a NB I-75 exit ramp and a SB I-75 entrance ramp and provides access to the City of Grayling via North Down River Road to Michigan Avenue. The future build peak-hour traffic volumes were developed by adjusting the future No-Build peak-hour traffic volumes with diverted trips caused by the introduction of a full access interchange at North Down River Road. Diverted trips were estimated based on the ratio of intersection turning movement volumes, logical diversion routes for the new access, and the statewide travel demand model. These traffic projections include the 1.1% growth rate to 2007 traffic volumes, and the additional future build-out trips generated by the Mainstreet America Theme Park. The resulting traffic volumes for future (2027) winter and summer peak-hours at the key intersections in the study area are shown in Appendix D.

The future (2027) winter and summer peak-hour levels-of-service for the morning and afternoon peak-hours at the key intersections are displayed within the study. With the potential of a full access interchange located at North Down River and I-75, the corridor of North Down River would become a main arterial to the City of Grayling. The additional traffic created by the development of a full access interchange would require improvements/expansion to the existing corridor from M-93 to just east of the freeway interchange. Additional operational improvements that are recommended for this alternative along the North Down River Corridor and included with the traffic model are as follows:

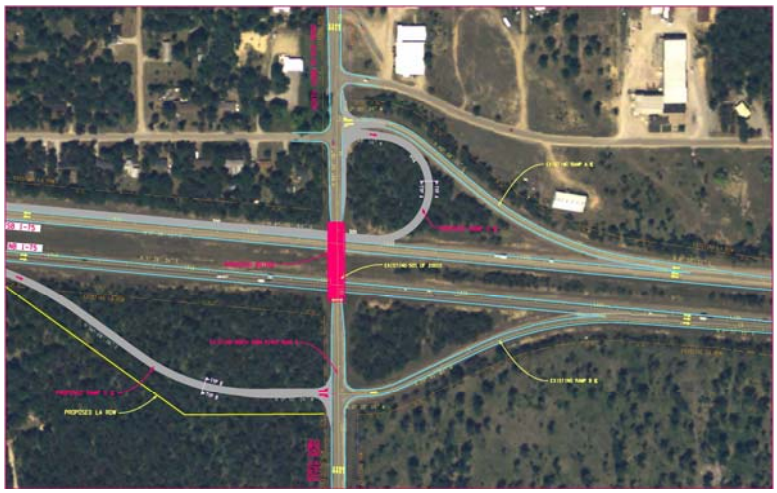


Figure E 4-1: Alternative 1 I-75 & North Down River Road Interchange

- Reconstruction of North Down River pavement. The reconstruction of this roadway would include full removal of the existing roadbed, new subbase, aggregate base and pavement, and placement of a three lane cross-section along this section.
- Reconstruct the bridge over the Au Sable River. This bridge should be constructed wide enough for a three lane cross-section (36 feet) with adequate space for a 12 foot shoulder/non-motorized traffic lane and a positive barrier separation between vehicular traffic and multimodal traffic.
- Reconstruct a center left turn lane along North Down River.
- Construct wider shoulders (8 foot paved) to provide adequate room for vehicles that breakdown and non-motorized vehicles.
- Install a traffic signal at the intersection of North Down River Road and M-93 to accommodate the additional westbound left-turning traffic originating from the freeway with destinations on the west side of Grayling.

With the upgraded ramp configurations, a new bridge consisting of three 12 foot lanes and two eight foot shoulders will have to be reconstructed to provide adequate width across the bridge as well as additional length (totaling approximately 260 feet) across I-75 for the new SB I-75 acceleration lane. If desired, an additional 12 foot width could be added, with additional costs, for non-motorized traffic. The new ramp lanes and shoulders have been designed to meet current MDOT standards. The ramp geometrics have been designed to meet MDOT standards (GEO-101, VII-131, and GEO-370). These new improvements at the interchange, including proposed Right-of-Way (ROW) will cost approximately $4,769,000 for this alternative. The additional cost associated with reconstructing the North Down River Road Corridor is approximately $1,644,000.

E 4.2 I-75 / I-75 Grayling Business Loop Full Access Interchange

The second alternative that was examined for providing full access at the I-75 Business Loop Interchange is a directional interchange. This method provides fully directional, free flow ramps. This interchange shifts NB I-75 to the west, thus creating a narrower median with SB I-75 and requires reconstructing NB I-75. The NB shift provides additional real estate within the existing ROW footprint to allow for a standard "right on/right off" ramp configuration that meets driver expectations.

The future build peak-hour traffic volumes were developed by adjusting the future No-Build peak-hour traffic volumes with diverted trips caused by the introduction of a full access interchange at the south limits of the City of Grayling and the I-75BL. This interchange will offer full NB and SB access to the I-75 freeway, through free flowing directional ramps. Diverted trips were estimated based on the ratio of intersection turning movement volumes, logical diversion routes for the new access, and the statewide travel demand model. These traffic projections include the 1.1% growth rate to 2007 traffic volumes, and the additional future build-out trips generated by the Mainstreet America Theme Park. The resulting traffic volumes for future (2027) winter and summer peak-hours at the key intersections in the study area are shown in Appendix D.

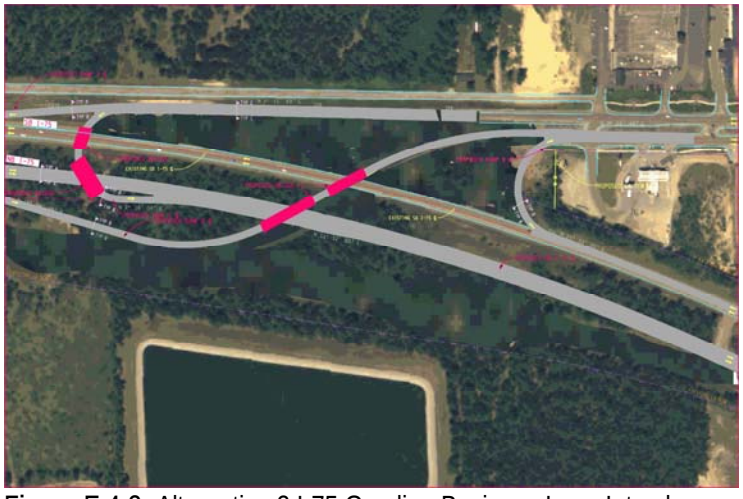


Figure E 4-2: Alternative 2 I-75 Grayling Business Loop Interchange

The future (2027) winter and summer peak-hour levels-of-service for the morning and afternoon peak-hours at the key intersections are displayed in Table 5-5 and Table 5-6 in the report. Additional operational improvements

that are recommended for this alternative along the I-75BL and included with the traffic model include:

- A new traffic signal at I-75BL/M-93/North Down River Road.
- Modifications to the traffic signal cycle lengths for the three traffic signals along I-75BL from 90 seconds during the AM peak-hour to 80 seconds during the PM peak-hour.

The realignment of NB I-75 provides adequate real estate for this interchange within the existing ROW. A small portion of ROW (approximately 0.63 acres) will be required for the SB exit ramp. The cost for this portion of ROW and construction for this alternative is approximately $9,895,000.

E 4.3 Four Mile Road Interchange

The Four Mile Road interchange is currently a full-access interchange located south of Grayling. Four Mile Road is a two-lane, two-way road that crosses I-75. With the addition of the Mainstreet America Theme Park, the Four Mile Road interchange will incur a significant amount of additional traffic. The proposed alternatives were developed in coordination with the options presented by the Mainstreet America Theme Park Traffic Impact Study and to help increase the traffic capacity of the interchange while maintaining acceptable levels-of-service.

Figure E 4-3: Alternative 1 I-75 & 4 Mile Road Interchange

The first alternative for the Four Mile Road interchange is to increase terminal capacity and add additional turn lanes along Four Mile Road without changing the vertical and horizontal alignment or configuration of the interchange. This alternative is consistent with the first phase of recommendations presented in the Mainstreet America Theme Park Traffic Impact Study, see Figure 4-3.

A two-way center left turn lane is proposed through both ramp terminal intersections along with a 330 foot east bound (EB) right turn lane off Four Mile Road onto the SB I-75 entrance ramp and a right turn lane continued from the five lane cross-section east of I-75 that terminates at the NB I-75 entrance ramp. Each terminal intersection will be controlled by a traffic signal. The SB I-75 exit ramp terminal has an added 250 foot turn bay to allow both right and left turning movements, as well as, turn storage. The proposed NB I-75 exit ramp has been realigned to become a two lane exit ramp. It also develops a third lane at the terminal to service dual right turns, as well as, a single left turn. In order to accept the dual right turns from the NB I-75 exit, Four Mile Road must be widened to a five lane cross-section including two EB through lanes, a two-way center turn lane, a WB through lane, and a WB right turn lane onto the NB I-75 entrance ramp. The costs associated with the development of this five lane cross-section are not included with this alternative but will be included with the development of the Mainstreet America Theme Park. In this alternative, the existing Four Mile Road Bridge over I-75 is left in place. This bridge restricts the width of the roadway to only one lane in each direction and limits the vertical sight distance at the terminals. These restrictions control the storage lengths of the turn lanes which prohibits expansion over this structure.

Additional operational improvements that are recommended for this alternative along Four Mile Road and included with the traffic model are as follows:

- The Mainstreet Theme Park has proposed a five lane cross-section from the limits of theme park entrances westerly to the Four Mile Road and I-75 Interchange.
- In addition improvements should be made along Four Mile Road from I-75 westerly to Military Road including widening the shoulders to 8 feet to provide adequate room for pedestrians and non-motorized development.
- With the additional traffic, the existing pavement structure of Four Mile Road should be rehabilitated.

This alternative will require additional ROW along Four Mile Road for the widening of the corridor and is further expanded on in the discussion of the Four Mile Road corridor. The cost for the proposed construction at the interchange is approximately $1,446,000. The reconstruction cost of the two lane roadway with widened shoulders including ROW along the Four Mile Road corridor is approximately $2,263,000.

E 5.0 RECOMMENDATIONS

The Grayling Area Transportation Study was focused on enhancing the existing transportation system to improve and diversify access to I-75 from the Grayling area. The primary needs for the interstate access improvements are as follows:

- Reduce Congestion within the Study Area
- Reduce Complexity of Wayfinding
- Promote Economic Vitality

The following recommendations were developed with the goal of meeting the above needs, while minimizing environmental impacts, reducing accidents, adding/enhancing non-motorized connectivity, and maintaining the recommended interchange spacing:

- Construct a full access interchange at I-75 and North Down River Road, widening North Down River Road to three lanes from the interchange to M-93/I-75BL, and the addition of a new traffic signal at I-75BL/M-93 and North Down River Road. These improvements significantly reduce the congestion along the I-75BL from M-72 East to M-72 West, by removing non-destination traffic along this section of highway. While numerous intersections within the downtown area experience failing levels-of-service for the future (2027) No-Build scenario, only two intersections are failing during the summer with the addition of a full access interchange at I-75 and North Down River Road. Only one location may be upgraded to a full access interchange within the study area without violating the minimum rural interchange spacing of 3 miles as recommended in "A Policy On Design Standards Interstate System." This recommendation is described in detail in Sections 5.1, 5.2 and Section 6.1 of the study.

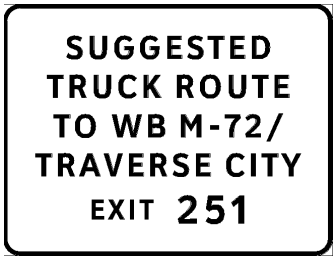


Figure E 5-1: Potential Truck Route Sign

- Improvements to the North Down River Road, M-72 East, I-75 Business Loop and Four Mile Road Corridors could alleviate congestion and improve the overall level of service. This would be accomplished by changing the curve radii, lane widths, shoulder widths, eliminating drives through access management, separating turning movements from the through lane to help maintain traffic flow along the corridor and adjusting the signal timing at each intersection. The corridor improvements are further discussed in detail in Section 5.2 of the study.
- Installation of signing for a by-pass for an optional truck route along Four Mile Road or Military Road. See Figures E 5.1 and E 5.2.The diversion of these trips (commercial vehicles) from the I-75BL through Grayling will increase the capacity of this roadway. For further detail see Section 5.3 and Section 6.2 of the study.
- The existing M-93 Overpass at I-75 is a major crossing for the Hartwick Pines Trail. To

Figure E 5-2: Potential By-Pass Sign

make this crossing, non-motorized vehicles need to share the roadway with motorized vehicles. To eliminate this potential conflict, it is recommended that the existing M-93 structure be widened to accommodate this crossing. This recommendation is described in detail in Section 5.6 of the study and illustrated in Figure E 5-3.

- Review & upgrade deer crossing warning signs, thereby, potentially reducing the numerous single vehicle/animal accidents within the study area. For further detail see Section 3.5 of the study.

Figure E 5-3: M-93 Overpass at I-75 with Widening for Non-Motorized Trail

1.0 INTRODUCTION

1.1 Background

The community of Grayling is located in Crawford County in the center of Northern Michigan's Lower Peninsula, approximately 85 miles south of the Mackinac Bridge. Located just north of the confluence of I-75 and US-127, at the junction of I-75, a major north south interstate freeway, and M-72, an east-west state trunkline route, Grayling is the gateway to beautiful Northern Michigan. The City of Grayling and the project study area are detailed further in Figure 1-1.

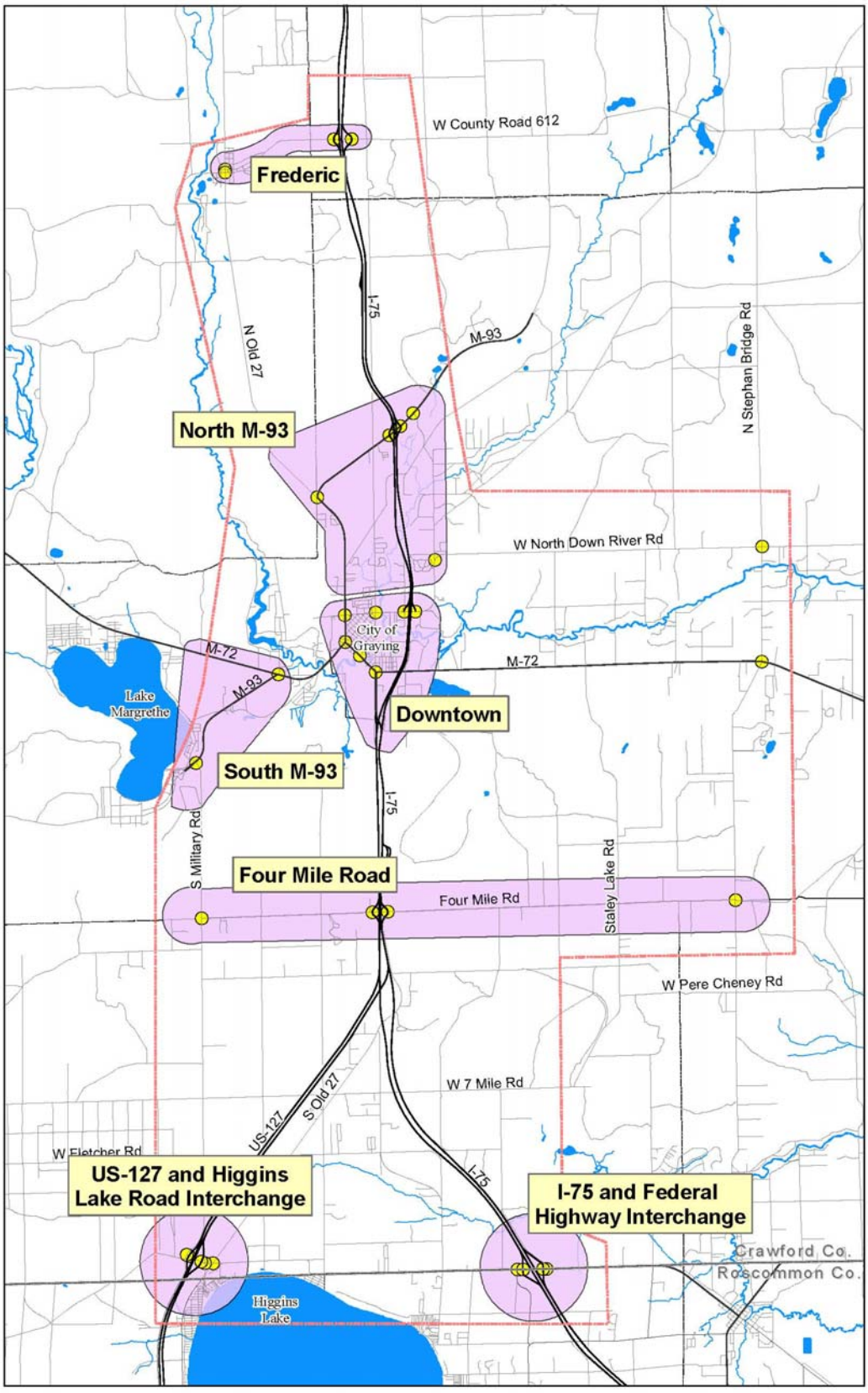
Surrounded by state land and majestic natural resources, Grayling residents and visitors enjoy vast expanses of recreational lands and waters. Particularly notable are two pristine rivers, the middle branch of the Au Sable River flowing easterly through Grayling toward Lake Huron and the Manistee River running to the south and west toward Lake Michigan. The recreational opportunities that abound this area are centered on these rivers and the other natural features that exemplify the area. There are a number of canoe liveries that operate on the local rivers which have caused some to call Grayling the "Canoe Capital of the World". Every year, the Au Sable River Canoe Marathon is held in Grayling during the City's Riverfest. The race is considered the world's longest, toughest non-stop competitive canoeing event. The Grayling area continues to be a year-around tourist and recreational destination and serves a growing tourism industry in Northern Michigan for its fishing, hiking, canoeing, snowmobiling, skiing and hunting.

However, a unique and often challenging geographical feature of this area is that much of the surrounding land is owned by the State of Michigan's Department of Natural Resources and the Federal government. Hartwick Pines State Park, located north of the City, is the fifth largest state park in the state of Michigan and offers visitors numerous trails for hiking and biking as well as various historical attractions. And while tourism is a significant contributor to the local economy, the role of the Federal Government and Camp Grayling relative to local growth and development also have a significant impact on the economy. Camp Grayling is a U.S. Military base located in Grayling Township, west of the City, which houses the largest National Guard joint training site. Year-round training is conducted on its 147,000 acres by the National Guard, as well as active military troops and reserves from the Army, Navy, Marines, Air Force and Coast Guard. These activities provide year-round employment and require year-round resources from the surrounding community to support the operation.

Another large employment opportunity and traffic generator for the City of Grayling is Mercy Hospital's medical complex, located in the northeast portion of the City at the intersection of North Down River Road and Michigan Avenue. This complex employs a vast number of people from the City of Grayling and surrounding townships. This medical facility serves a seven county area, and is actively expanding its services and operations.

While the surrounding areas continue to grow and develop, the existing local roads, highways and access have not been improved or expanded to meet the new demands associated with the growing vehicular, non-motorized, or military needs. Any improvements to provide increased capacity and access will need to balance the needs of the local community and the need to efficiently address regional transportation demand.

FIGURE 1-1
PROJECT STUDY LIMITS



1.2 Study Purpose

During the past five years, the Northeast Michigan Council of Governments (NEMCOG), along with other project stakeholders, sought to formally revisit the accessibility of the Grayling area. In 2006, NEMCOG initiated this study with the goal of addressing numerous long-term transportation issues in the Grayling area. The study team was directed to assess existing conditions within the study area, examine future land use and operations based on growth and future development, and provide conceptual geometric alternatives and road improvements within the study area. The team worked with the Technical Steering Committee, a group composed of local citizens representing various economic, governmental and transportation interests within the Grayling region. Together with representatives of the Michigan Department of Transportation (MDOT), the committee provided daily guidance to the team regarding the areas of concern, key goals for the region's transportation system, and general direction.

1.3 Study Goals and Objectives

The development of goals and objectives was an important first step in the preparation of the Transportation Study. These guidelines served as a roadmap to help the team determine short and long-term management and infrastructure improvements. The Technical Steering Committee assisted in developing the goals and objectives necessary to meet the forecasted transportation needs for the year 2027. The Steering Committee consisted of representatives from the City of Grayling, Crawford County Board of Commissioners, Crawford County Road Commission, Michigan Department of Transportation, Camp Grayling, Grayling Township, Beaver Creek Township, South Branch Township and the Crawford County Economic Development Partnership. The study team used the following guiding principles to develop recommendations to address existing and future transportation issues:

<u>Regional Access</u>

- Improve safety and capacity for traffic movements to/from I-75 into the City of Grayling
- Determine feasibility of improved access to I-75 in the vicinity of I-75 BL and Four Mile Road
- Improve safety and capacity for traffic movements on I-75 BL, M-72 and M-93

<u>Local/Arterial Streets</u>

- Reduce peak-hour delays on key arterial streets
- Identify alternative truck routes that will reduce traffic volumes along the corridors
- Implement access management techniques to improve roadway efficiency
- Improve safety
- Prioritize alternative roadway improvements based on cost, travel time savings and safety

<u>Vehicular Safety</u>

- Identify high crash rates within the study area and evaluate design improvements
- Improve signal timing that facilitates traffic and allows for safe turning movements
- Traffic Calming for lower-speed local roads
- Geometric roadway review

<u>Wayfinding</u>

- Improve wayfinding particularly for the truck route and by-pass through a comprehensive signage plan
- Help to reinforce a positive image of Grayling as a destination through improved aesthetics of the signage plan

<u>Socioeconomic/Land Use</u>

- Plan for adequate roadway improvements with the least disruption on existing and planned land uses
- Ensure road improvements will not detract from the economic viability of Grayling businesses
- Prioritize projects that improve overall public safety

- Prioritize transportation improvements which will meet the future needs of residents and businesses
- Support new economic development

Environmental

- Minimize impacts to natural features including woodlands and regulated wetlands along corridors
- Minimize or avoid impacts to cultural and historic resources that impact properties along corridors
- Develop a transportation system that complements the natural and cultural environment within the area

Other

- Identify transportation system improvements to:
    1. Enhance accessibility within the surrounding areas
    2. Support City, neighborhood and businesses
- Improve Bicycle and Pedestrian Circulation and Safety

The study team's objective was to improve traffic and pedestrian safety; minimize traffic impacts to the surrounding residential streets; improve bicycle and pedestrian facilities; examine existing and future transportation conditions and determine infrastructure improvements and alternatives to reduce traffic congestion especially during peak-hour traffic periods. Summarized as follows:

> *"Develop a set of feasible alternatives that improve access between I-75 and the Grayling area that reduces travel time, reduce complexity of wayfinding, and promote economic vitality."*

To achieve these objectives, the study team needed to examine the existing conditions of the interchanges along I-75, and the state and local roads within the project limits. The study team then developed various improvements needed for the I-75 interchanges, state, and local roads to accommodate the growth of the local community (residential, commercial, industrial, and recreational) and changes occurring within Camp Grayling that achieved these goals and objectives. These alternatives and the final recommendations were created with the objective of developing consensus within the community, which is a critical component to a successful study. The study team ensured that stakeholders were involved, including city leaders, county officials, township officials, Camp Grayling, Crawford County Economic Development Partnership (CCEDP), business owners, concerned residents, and the Michigan Department of Transportation (MDOT). A myriad of different viewpoints and concerns have been coordinated in order to develop workable solutions. Use of keypad voting technology allowed anonymous and instant input from stakeholders and the public, and also allowed for statistical analysis linking demographics to opinions. Throughout the process, several Steering Committee meetings were held to coordinate with stakeholders and to present preliminary design and results of analyses. Minutes from these meetings and input received at public meetings can be found in Appendix A.

1.4 Public Involvement

Historically, projects which initiate a bottom-up approach become the most successful. Getting the citizens involved directly from the beginning helps guide the decision process through the design phase. The Grayling Area Transportation Study incorporated several techniques for acquiring residents' thoughts and opinions. Methods utilized to gather citizen participation include: gallery walks; audience participation technology that utilizes the questions and answer format, as well, as a visual preference survey; and individual interviews.

Gallery Walk

At the Grayling Township Hall, interested citizens were shown aerial photography and land use maps to gather their opinions regarding Grayling's existing transportation system. Through one-on-one conversations with community members, primary concerns such as the current accessibility to the freeway at I-75 and M-72 affecting business possibilities for Grayling and the rumored Mainstreet America Theme Park near 4 Mile Road and I-75 affecting through access in the Grayling area were both gathered and utilized to assist in the decision making process within this study.

Audience Participation Technology and Public Interviews

The Audience Participation Technology and Public Interviews both utilized a questionnaire and set of graphics to gather demographic information and individual opinions and preferences regarding Grayling's existing and possible future transportation network.

A formal presentation to the public at the Grayling Public Library was given to clarify the scope of the project, define the transportation and land use planning process, and gather public input through multiple choice and visual preference survey questions. Attendees expressed their opinions anonymously through the use of keypad polling. Opinions which were shared by the majority of the residents included: concerns regarding interstate access to the downtown business district, reservations pertaining to the use of roundabouts or traffic circles as an alternative to traffic signals in Grayling, support for a local road by-pass routing around Grayling for both truck and through traffic, and support for new sidewalks, bike paths, or bike lanes in the Grayling area.

Public interviews were initiated first by mailing out survey forms with a follow up phone call to setup an appointment, if possible. The interviews began with emphasis placed on the survey questions for guidance to obtain relevant information for the transportation and land use planning study. The feedback regarding the survey questions obtained at the interviews have been incorporated into the results identified in the formal presentation paragraph above. Following feedback regarding the survey questions, open ended questions were asked such as, "With regards to traffic and transportation in the Grayling area, what changes would you make?". Without prompting, opinions which were shared by the majority of the interviewees included concerns regarding traffic in the downtown area such as, truck and through traffic, and the lack of access to downtown from the freeway (easy on/easy off).

1.5 Study Organization

This report is organized into the following sections:

2.0 *Demographics and Land Use* – This section provides an analysis of the current population and employment demographics as well as growth in the areas and current travel patterns.

3.0 *Existing (2007) Conditions and Traffic Analysis* – This section provides an evaluation of existing traffic operations within the study area, as well as an analysis of historic crash data.

4.0 *Future (2027) Conditions and Traffic Analysis* – This section provides an evaluation of projected traffic operations within the study area.

5.0 *Alternatives and Road Improvements* – This section provides a description of the various alternatives developed through public input and stakeholder collaboration, and a comparative evaluation of the recommended alternatives. Evaluations were based on traffic operations, safety, and construction cost.

6.0 *Alternative Combination Evaluations* – This section provides logical complimentary combinations of alternatives that are recommended for the study area.

7.0 *Public Involvement* – This section provides a description of the coordination and involvement that was conducted with members of the public, business interests and government agencies throughout the study period.

8.0 *Recommendations* – This section provides a summary of the recommendations resulting from this study. Also included are recommendations regarding non-motorized paths and transit alternatives.

2.0 DEMOGRAPHICS AND LAND USE

2.1 Population and Employment

This section reviews the existing and future population and employment numbers in the study area. As changes in land use occur, so will changes in local demographics. This section discusses the change in population in the last twenty years, as well, as the projected future population in the study area. Existing and projected employment figures are also discussed.

2.1.1 Existing Population and Employment

To understand the potential traffic in the study area, one must analyze trends in population. Increases in traffic generally accompany increases in population and this section discusses what population growth should be expected in the Grayling area.

Table 2-1 shows the population of each community in the study area, along with the overall population in the Counties of Crawford and Roscommon counties. While only portions of some communities are located within the study area, the area that influences the Grayling area transportation system is much larger.

TABLE 2-1
2000 POPULATION

Community	Population			Change	
	1980	1990	2000	1980 – 1990	1990 – 2000
City of Grayling	1,792	1,944	1,952	8.5%	0.4%
Grayling Township	4,019	5,647	6,516	40.5%	15.4%
Frederic Township	1,142	1,287	1,401	12.7%	8.9%
Maple Forest Township	355	407	498	14.6%	22.4%
Beaver Creek Township	745	1,175	1,486	57.7%	26.5%
Crawford County	9,465	12,260	14,273	29.5%	16.4%
Gerrish Township	1,629	2,421	3,072	48.6%	26.9%
Lyon Township	992	1,234	1,351	24.4%	9.5%
Roscommon County	16,374	19,776	25,469	20.8%	28.8%

Source: U.S. Census, 2000

The study area experienced more significant growth between 1980 and 1990. As shown, most communities in the area contain a relatively low population, which accounts for the high rates of change for Maple Forest and Beaver Creek Townships. However, communities like Grayling Township and Gerrish Township both experienced a higher increase in the actual number of residents. This indicates that growth is occurring at a fast pace in the area and should be reviewed regularly to ensure the local transportation system is adequate to accommodate this growth.

Population by Age

As shown in Table 2-2, the largest segment of the study area population is between the ages of 40 to 49. Although there is a fairly even distribution of population among all age groups, this information is relevant when anticipating additional traffic. Those residents ages 10 to 19 represent new or soon-to-be-new drivers within the system. Conversely, those residents over the age of 80 could be expected to stop driving in favor of more public transit options.

TABLE 2-2
2000 PERCENT OF POPULATION BY AGE

Community	Age Group								
	0 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 +
City of Grayling	14%	15%	10%	11%	14%	8%	9%	10%	8%
Grayling Township	12%	16%	9%	15%	16%	13%	10%	6%	3%
Frederic Township	13%	15%	8%	14%	14%	16%	11%	7%	3%
Maple Forest Township	8%	14%	7%	15%	17%	14%	13%	7%	3%
Beaver Creek Township	13%	12%	9%	14%	17%	14%	13%	8%	2%
Gerrish Township	9%	13%	5%	10%	16%	15%	15%	13%	4%
Lyon Township	8%	10%	5%	9%	15%	15%	18%	14%	5%
All Communities	11%	14%	8%	13%	15%	13%	12%	9%	4%

Source: U.S. Census, 2000

Employment

Employment in the study area communities is primarily distributed among the management/professional, service and sales/office categories. Table 2-3 below shows Grayling Township residents lead the study area in most jobs held in each category. This can be attributed to the Township's population, size and location relative to the City of Grayling. Overall, most residents within the study area are occupied in management or professional jobs, followed closely by sales and office jobs, which represent a quarter of all jobs held by residents within the study area communities.

TABLE 2-3
2000 RESIDENT EMPLOYMENT

Community	Percent of Jobs in Each Community							
	Management/ Professional	Service	Sales/ Office	Farming/ Fishing/ For-estry	Construction/ Extraction	Installation/ Maintenance	Production	Transport
City of Grayling	10%	16%	13%	8%	8%	7%	11%	12%
Grayling Township	39%	41%	41%	58%	39%	42%	41%	41%
Frederic Township	6%	9%	8%	17%	9%	10%	10%	11%
Maple Forest Town-ship	3%	4%	4%	4%	5%	7%	4%	3%
Beaver Creek Town-ship	9%	10%	10%	9%	13%	11%	12%	12%
Gerrish Township	24%	12%	17%	0%	13%	15%	15%	10%
Lyon Township	9%	7%	8%	4%	13%	8%	7%	11%
Percent of Total Employment	27%	21%	25%	1%	6%	5%	9%	7%

Source: U.S. Census, 2000

Table 2-4 shows the number of establishments and associated jobs in both Crawford and Roscommon County, by industry. While some of the employment data was not available for review, this table is still relevant to understand which industries are the largest in each county. As shown, retail trade is the largest industry in both Crawford and

Roscommon Counties. This is not surprising given the location of Grayling, one of the larger commercial centers, in Crawford County, and the presence of the I-75 and US-127 highways that traverse both. While the retail trade industry includes the largest number of establishments, and employs the largest number of employees in Roscommon County, it is interesting to note that, in Crawford County, the Health Care and Social Assistance industry employs the greatest number of employees. Jobs in this industry represent 22% of the total jobs in Roscommon and Crawford Counties. Health care and social assistance jobs dominate the mix in Crawford County, likely due to the recent expansion of the Mercy Hospital in Grayling.

TABLE 2-4
2000 EMPLOYMENT BY INDUSTRY*

Industry	Establishments						Employees					
	Crawford County		Roscommon County		Total		Crawford County		Roscommon County		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
Manufacturing	18	7%	NA	NA	18	2%	641	20%	NA	NA	641	10%
Wholesale trade	7	3%	11	2%	18	2%	42	1%	25 (b)	1%	67	1%
Retail trade	81	30%	145	31%	226	30%	691	22%	1369	39%	2060	31%
Information	7	3%	13	3%	20	3%	18	1%	70	2%	88	1%
Real estate, rental & leasing	13	5%	27	6%	40	5%	25 (b)	1%	25 (b)	1%	49	1%
Professional, scientific, & technical services	19	7%	29	6%	48	6%	83	3%	25 (b)	1%	108	2%
Administrative, waste management & remediation service	13	5%	20	4%	33	4%	175 (c)	6%	42	1%	217	3%
Educational Services	NA	NA	4	1%	4	1%	NA	NA	10 (a)	0%	10	0%
Health care & social assistance	30	11%	52	11%	82	11%	772	24%	715	20%	1487	22%
Arts, entertainment, & recreation	7	3%	17	4%	24	3%	25 (b)	1%	26	1%	51	1%
Accommodation & food services	50	19%	91	19%	141	19%	598	19%	998	28%	1596	24%
Other services (except public administration)	23	9%	66	14%	89	12%	87	3%	207	6%	294	4%
	268	100%	475	100%	743	100%	3,156	100 %	3,510	100 %	6,666	100 %

Source: U.S. Census, 2000

* Various employment data was not reported by the U.S. Census for privacy reasons.

(a) As reported by the census, this industry employed zero to 19 employees. For reporting here, an average was used.

(b) As reported by the census, this industry employed 20 to 29 employees. For reporting here, an average was used.

(c) As reported by the census, this industry employed 100 to 249 employees. For reporting here, an average was used.

2.1.2 Population and Employment Growth

Population estimates prepared by the Michigan State Office of the Demographer indicates both Crawford and Roscommon Counties should anticipate a reasonable amount of population growth into the year 2020. These projections prepared in 1996, do not consider the recent decline in the Michigan economy, which has slowed population growth since 2005 (see Table 2-5). By the year 2020, Crawford County is expected to increase in population by over 46% (to 20,900) from 2000, and Roscommon County is projected to increase by over 30% (to 33,200). These residential increases will likely lead to general economic growth as local and regional business develop to serve the additional population. Alongside this growth will be additional employment opportunities, and in general, as the Crawford/Roscommon regional population grows, so will the economy.

TABLE 2-5
POPULATIONS PROJECTIONS
CRAWFORD AND ROSCOMMON COUNTY

	2000 Actual	Projected					% Change 10-20	% Change 00-20
		2000	2005	2010	2015	2020		
Crawford	14,273	14,900	16,300	17,700	19,300	20,900	22.4%	46.4%
Roscommon	25,469	24,600	26,500	28,600	30,800	33,200	18.1%	30.4%

Source: Office of the State Demographer, Michigan, 1996

Recently, a large theme park development has been proposed near the I-75 exit at 4 Mile Road. Grayling Township has approved the conceptual plan for the development, which is expected to encompass several hundred acres of resort recreation, commercial, multiple-family, industrial and open space uses. The project was in its development stages during the course of this transportation study, but was included in the study due to its sheer size and potential to significantly increase traffic along local roads and state highways.

According to the State of Michigan's Department of Labor and Economic Growth, employment in the coming years is expected to decline compared to the economic growth experienced during the 1990's, especially in the manufacturing industries. However, increasing employment is expected in the service industries, which include the top ten occupations expected to experience the largest state-wide growth, as listed below:

1. Retail Sales
2. Registered Nurses
3. Customer Service Representatives
4. Waiters and Waitresses
5. Food Preparation and Service
6. Janitors, Maids and Housekeepers
7. Business Operations Specialists
8. Truck Drivers
9. Home Health Aides
10. Nursing Aides, Orderlies and Assistants

Roscommon County still maintains a strong manufacturing job base, and may be susceptible to the declining economy. Some medical-related businesses are emerging in the area, but these jobs still only represent a small percentage of total jobs in the County.

Crawford County stands to gain from the new service-related job growth, as many of the County's top employers are in the health and education industries. The Grayling area has benefited from recent service expansions at the Grayling Mercy Hospital, and should be compounded through local zoning changes expected to encourage development of supplementary health-related businesses nearby. Still, a large portion of current jobs in Crawford County are provided in the manufacturing and assembly industries; this is expected to shift to these service-related jobs in the near future.

2.1.3 Existing Land Use

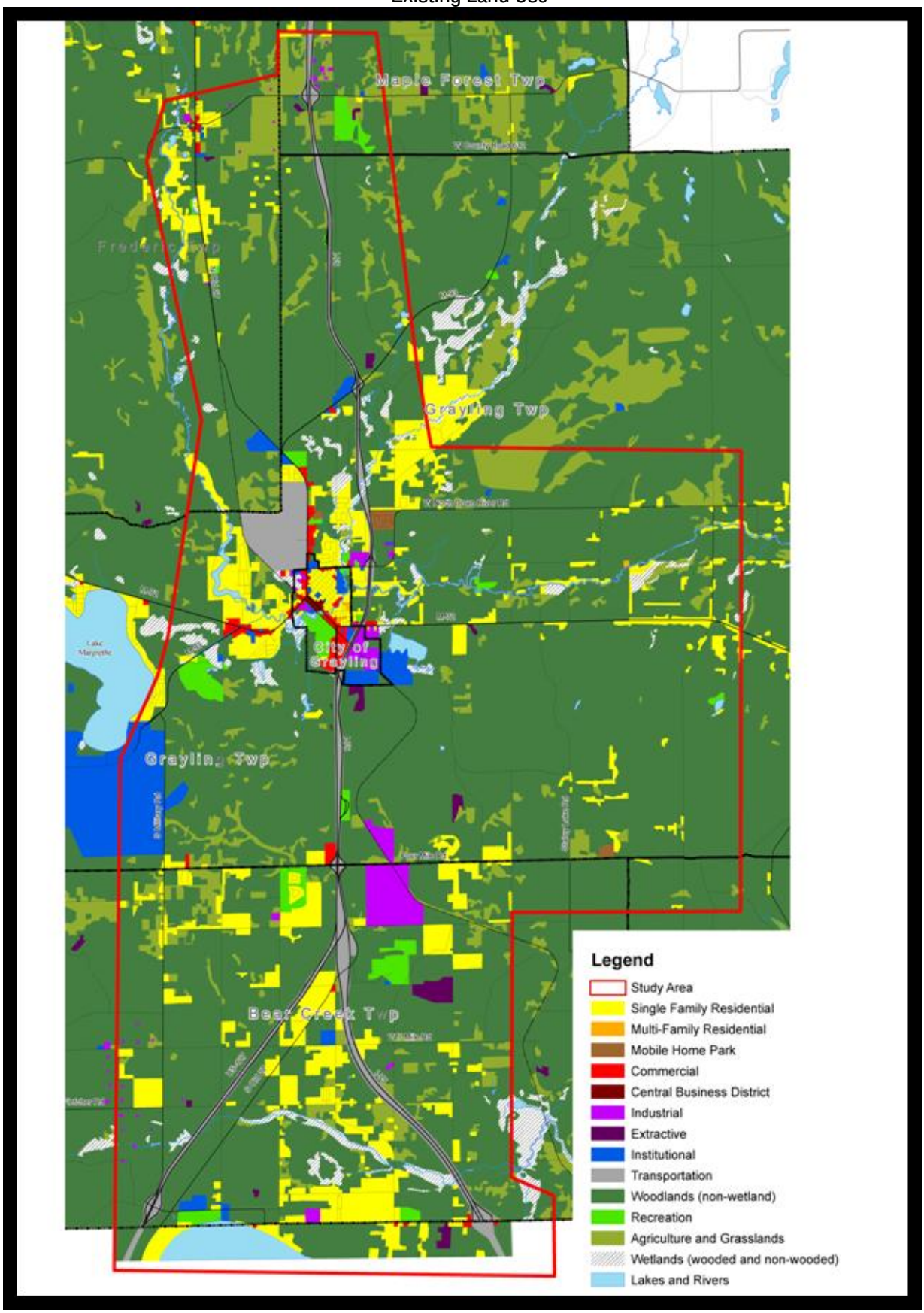
Land use in the area consists of a mixture of State-owned forest land, suburban-style residential and commercial uses. A large component of traffic is generated by tourist activity drawn to the area for its prized recreational opportunities. In the heart of the study area is the City of Grayling, which is the most developed area that contains general commercial, residential and industrial land. West of the city is Camp Grayling, a large military complex that has been increasing in activity. Related to Camp Grayling is their airport facility located north of the city, which is currently being expanded. When complete, the expanded airport will include alternate runways that will provide an air travel service comparable to that provided at the Cherry Capital Airport in Traverse City. By 2011, it is expected the Grayling airport will be able to serve all military aircraft currently owned by the armed services, regardless of weight or size, and will also provide some civilian services as well. This will be made possible through a donation of approximately 40 acres to Crawford County for this purpose.

The communities within the study area are characterized by small hamlets of development located at major crossroads, surrounded by picturesque landscape, rolling hills and scenic natural features. These features, along with the recreational opportunities that accompany them, have drawn residents to the area. However, with limited development opportunities, the patterns of development are somewhat scattered. This has resulted in a low-density residential pattern of development, except within the City of Grayling, which maintains a more urban setting. Likewise, commercial development has followed the residential patterns, resulting in small areas of local commercial development rather than larger regional commercial areas. On a regional basis, the communities of Grayling, Gaylord and Roscommon provide the more intense retail and service uses.

The existing land use pattern in the study area is largely due to the presence of State and Federally-owned forest land. Public lands dominate the landscape, which has created a natural setting that is desirable to new residents. Pockets of development are scattered throughout the study area, where privately-owned land still remains. Only rarely does the State or Federal government sell public land for private development. Therefore, much of the land uses seen today are likely to remain for the long-term.

There are seven local municipalities located within the study area: the City of Grayling, Grayling Township, Frederic Township, Maple Forest Township, Beaver Creek Township, Lyon Township and Gerrish Township. Commercial and industrial development in the study area generally follows the main road corridors, or is located at major crossroads while residential development surrounds the natural river corridors and local bodies of water. Concentrations of residential are found near Higgins Lake in Bear Creek Township, and along the various branches of the AuSable River in Grayling and Frederic Townships. While the City remains the core of the study area, other centers of local development have emerged at the intersection of County Road 612 and N. Old 27 in Frederic Township, and along the M-72 corridor at M-93 in Grayling Township. Other areas predominantly associated with the I-75 expressway are still emerging as centers of activity, including the areas at the 4 Mile and Higgins Lake Drive interchanges. Figure 2-1 shows the existing land use within the study area.

Figure 2-1
Existing Land Use



3.0 EXISTING (2007) CONDITIONS AND TRAFFIC ANALYSIS

All analyses documented in this report were performed in accordance with MDOT, FHWA, and AASHTO practices, guidelines, policies, and standards, including the 2000 Highway Capacity Manual (HCM), A Policy on Geometric Design of Highways and Streets (AASHTO, 2004) and the Michigan Manual of Uniform Traffic Control Devices (MMUTCD, 2003).

3.1 Roadway Network

The existing project roadway network includes roadways in portions of Crawford and Roscommon Counties, the City of Grayling, and portions of Beaver Creek, Frederic, Grayling and Maple Forest Townships, in Crawford County, and Gerrish and Lyon Townships in Roscommon County. The study area outlined in red with an aerial background is shown in Figure 3-1, while Figure 3-2 depicts the areas existing bicycle and pedestrian trail system. There are thousands of acres of state land and miles of groomed trails surrounding the Grayling Area in addition to the through-town trail connecting the areas north and south of Grayling. Following is a summary of major roadways, freeways and trails in the study area:

US-127 is a major four-lane north-south interstate freeway through the study area. US-127 merges with I-75 north of Higgins Lake. The speed limit of US-127 is 70 mph.

I-75 is a major four-lane north-south interstate freeway that passes through the study area, just east of the City of Grayling. The speed limit of I-75 is 70 mph. I-75 is a primary commercial route, carrying approximately 10 percent commercial traffic through Crawford County and is a major carrier of tourist traffic to the area.

I-75 BL is a business loop route running through Grayling that follows a former routing of US-27. The speed limit of the I-75 BL is 40 mph at the City's south end, and slows to 30 mph as it enters the City's downtown shopping district.

M-72 passes through the City of Grayling and is one of three state trunkline routes that run east-west across the entire Lower Peninsula. M-72 is a regional corridor that primarily carries traffic west to Kalkaska and Traverse City and east to Mio. M-72 is a two-lane, state highway with periodic passing lanes. M-72 to the west of Grayling has a four-lane cross-section, and has a speed limit of 35 mph within the City limits. The speed limit increases to 45 mph through the intersection of M-93 South. M-72 east of the City departs Grayling with four lanes and a speed limit of 35 mph within the City limits. Beyond the City limits, M-72 East maintains a speed limit of 55 mph and contains two lanes.

County Road 612 is an east-west, two-lane, local road with a 55-mph speed limit. To the west of I-75, County Road 612 passes through the community of Frederic. The I-75 exit ramp terminal intersects with County Road 612 and operates under stop control.

M-93 is a designated state trunkline route. It links both Camp Grayling and Hartwick Pines State Park with I-75. M-93 originates and terminates at locations, rather than junctions with another road. M-93 starts at the main gate of Camp Grayling. From there it runs north along Sharon Road to a junction with M-72 where it shares the road as it enters the City of Grayling from the west. In Grayling M-93 turns north at the intersection with the former route of US-27, which is now the I-75 BL. M-93 ends at Hartwick Pines Park's main gate. M-93 runs northeast-southwest, and is a two-lane, state highway with a 55-mph speed limit. A full interchange exists where M-93 crosses I-75 north of the City, and the exit ramps intersecting with M-93 operate under stop control.

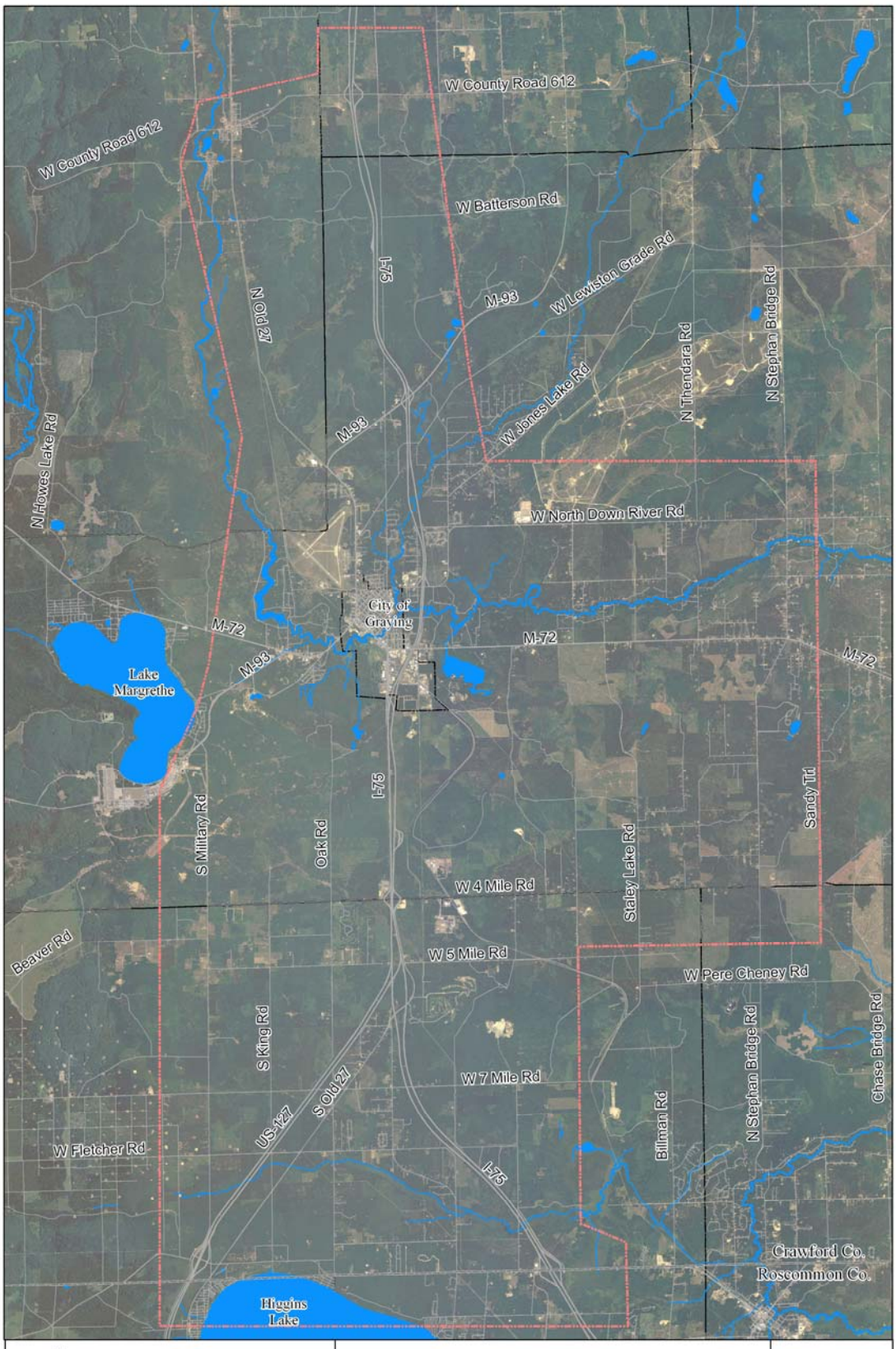
North Down River Road is a primarily east-west, two-lane, local road with a 55-mph speed limit. Slower speeds are posted west of I-75 as it enters the City of Grayling. A partial diamond interchange with I-75 exists, with stop control at the southbound exit ramp at North Down River Road.

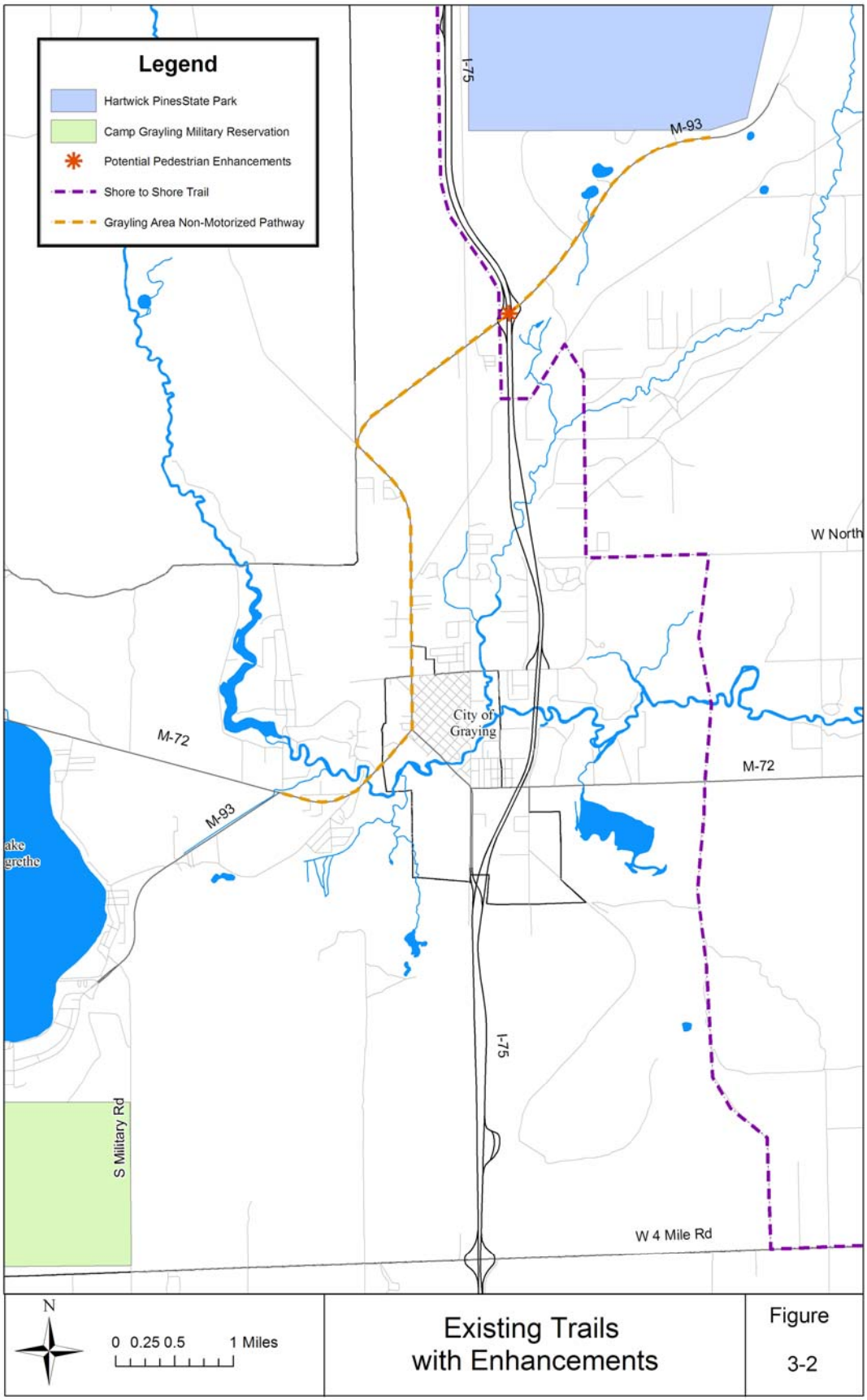
Four Mile Road is a primarily east-west, two-lane, local road with a 55-mph speed limit. Four Mile Road has a full-access interchange with I-75 which is located south of Grayling. The Mainstreet America Theme Parks' main entrance is slated to be off Four Mile Road.

Military Road is a primarily north-south, two-lane, local road with a 55-mph speed limit. Military Road services much of the military traffic generated by Camp Grayling via either the Four Mile Road/I-75 Interchange or the US-127/Military Road Interchange.

Hanson Hills Bike Trail located off M-93 near Lake Margrethe begins at the Cross Country Ski Lodge in the Hanson Hills Recreation Area. This trail has a four mile loop and a one mile loop which is an excellent trail system for the intermediate to expert riders.

Hartwick Pines State Park Trails are three, five and seven and half miles in length through the Hartwick Pines State Park just off of M-93. The natural beauty of the forest makes it one of the nicest trail systems in the state.


W County Road 612
W County Road 612
W Batterson Rd
W Lewiston Grade Rd
N Old 27
I-75
M-93
N Stephan Bridge Rd
N Thendara Rd
W Jones Lake Rd
M-93
N Howes Lake Rd
W North Down River Rd
City of Graying
M-72
M-72
M-72
M-93
Lake Margrethe
I-75
S Military Rd
Oak Rd
Staley Lake Rd
Sandy Trl
W 4 Mile Rd
Beaver Rd
W 5 Mile Rd
W Pere Cheney Rd
S King Rd
W 7 Mile Rd
US-127
S Old 27
Billman Rd
N Stephan Bridge Rd
Chase Bridge Rd
W Fletcher Rd
I-75
Crawford Co.
Roscommon Co.
Higgins Lake
N
0 0.5 1 2 Miles
Basemap
Figure
3-1


Legend
Hartwick PinesState Park
Camp Grayling Military Reservation
Potential Pedestrian Enhancements
Shore to Shore Trail
Grayling Area Non-Motorized Pathway
I-75
M-93
W North
City of Graying
M-72
M-72
M-93
S Military Rd
I-75
W 4 Mile Rd
N
0 0.25 0.5 1 Miles
Existing Trails with Enhancements
Figure 3-2

3.2 Traffic Analysis

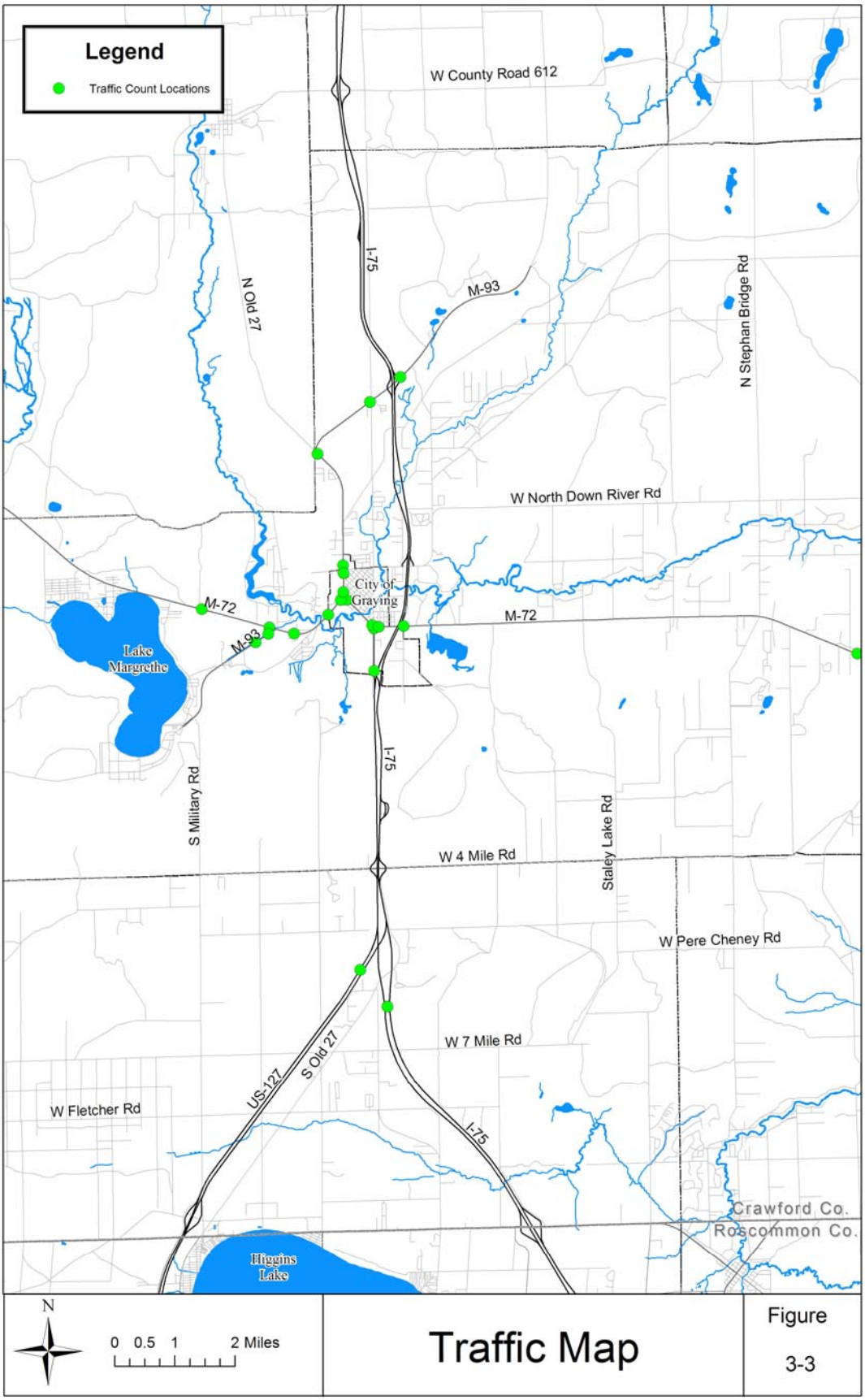
The travel forecasting models developed for this project were based on existing counted data, information found in the Michigan statewide travel demand model and supplemental external data provided by the land-use maps. Existing peak period turning movement counts and daily segment volumes were collected during 2007. A background growth rate was then applied to these numbers to arrive at future "No-Build" volumes. The additional documented traffic from the planned amusement park was then added as background traffic for all scenarios. The final step of the traffic analysis for this project required the analysis of several interchange scenarios using the statewide model for changes to travel paths to determine future "Build" traffic volumes of each scenario.

3.3 Existing Traffic Data & Conditions (2007) Capacity Analysis

In 2007 and continuing into the start of 2008, the Study Team conducted an extensive data collection effort to gain an understanding of existing conditions in the study area. The first part of this phase was to collect traffic data for the peak traffic hours, as described below. Existing traffic data that had been collected within the past five years by NEMCOG, MDOT, the City of Grayling and the Crawford County Road Commission was provided to the team for review. This data was then supplemented with additional traffic counts conducted at thirty-three intersections to assure a thorough evaluation in the study area and to confirm the various turning patterns present at each intersection. See Figure 3-3 which shows all the traffic count locations within the study area. URS performed intersection turning movement counts at each of the thirty-three(33) key intersections during both a.m. and p.m. peak periods within the study area, in addition, mid-day supplemental counts were taken during the month of June for the five highlighted intersections, below. All of these counts were performed in January – March 2007 and June to July 2007 to capture the a.m. and p.m. peak-hours of the network for both winter and summer seasons. The thirty-three intersections where weekday traffic counts were collected by URS, with the assistance of NEMCOG, MDOT, Crawford County Road Commission and the City of Grayling are as follows:

Intersection Study Area

- Four Mile/Stephan Bridge
- Johnson/Federal Hwy (South State Line)
- Legion/N. Higgins Lake
- M-93/Wilcox Bridge
- Military/N. Higgins Lake
- NB I-75 Ramp/ Four Mile
- NB I-75 Ramp/Federal Hwy
- NB I-75 Ramp/N. Down River
- Old 127/CR612 Ward
- SB I-75 Ramp/Four Mile
- SB I-75 Ramp/Federal Hwy
- SB I-75 Ramp/N. Down River
- N. Down River/Stephan Bridge
- M-72 East/Stephan Bridge
- Airport/US-27
- N. Down River/Roberts/Michigan Av.
- M-93/Military Road
- Military/Four Mile Road
- NB I-75 Ramp/CR 612
- NB 127 Ramp/N. Higgins Lake
- Old 127/CR 612 McRae
- Old 127/N. Higgins Lake
- SB I-75 Ramp/CR612
- SB I-75 Ramp/M-93
- SB 127 Ramp/N. Higgins Lake
- I-75 BL (James)/Michigan
- M-72 East/I-75BL
- I-75 BL/State St/M-72 East
- I-75 BL/I-75 (James)/M-72 West
- M-72 West/M-93
- Old 27/Four Mile Rd
- N. Down River/Alexia Ln
- North Down River/I-75 BL


Legend
Traffic Count Locations
W County Road 612
I-75
N Old 27
M-93
N Stephan Bridge Rd
W North Down River Rd
City of Graying
M-72
M-72
M-93
Lake Margrethe
S Military Rd
I-75
Staley Lake Rd
W 4 Mile Rd
W Pere Cheney Rd
W 7 Mile Rd
US-127
S Old 27
W Fletcher Rd
I-75
Crawford Co.
Roscommon Co.
Higgins Lake
N
0 0.5 1 2 Miles
Traffic Map
Figure
3-3

URS performed traffic counts for the study area intersections for the morning (7:00 – 9:00 AM), mid-day (11:00 AM – 1:00 PM) for several downtown intersections, and evening (4:00 – 6:00 PM) peak periods. The average morning peak-hour for downtown businesses in Grayling is between 8:00- 9:00 AM, however peak-hours in the study area outside downtown Grayling is between 7:30-8:30 AM. In order to compare and analyze the traffic model consistently the average of the two morning peak-hours (7:45-8:45 AM) was used in the analysis. While 4:30 – 5:30 PM was a consistent PM peak-hour between the downtown and the surrounding study area.

In addition to the turning movement counts, 24-hour ADT (Average Daily Traffic) counts were conducted at the following locations:

- Four Mile Rd – W. and E. of I-75
- Four Mile Rd - at I-75 Overpass
- Co. Rd 612 - 100' E. and W. I-75 Int.
- I-75 – 0.3 Mile S. of Four Mile Rd (N. of crossover)
- I-75 – 0.5 N. of Co. Rd 612 Int
- I-75 – 0.5 miles NW of M-93 Int
- I-75 – 0.5 miles N. of FAS-270 Int
- I-75 – 0.5 Mile S. of N. Down River Rd
- I-75 – 0.5 Mile N. of Seven Mile, S. of US-127 Int
- I-75 BL – on ramps N. of I-75
- I-75 BL – 0.1 Mile S. of S. Jct. M-72
- I-75 NB Ent. Ramp – from Four Mile Rd.
- I-75 SB Exit Ramp – To Four Mile Rd
- M-72 - 1.0 mile NW of Jct. M-93
- M-72 – 200' NW of M-93 SW Jct.
- M-72 – 1.0 Mile SE of Stephan Bridge Rd
- M-72/Huron – 100' East of BL-75 (James)
- M-72/I-75 BL/Cedar - .1 Mile NW of M-72/Huron St.
- M-72/I-75 BL/Cedar - 100' SE of North Jct. M-72/Lake
- M-72/M-93 - 100' SE of M-93 (W. of Grayling)
- M-72/M-93 100' NE of Evergreen
- M-72/M-93/Lake St.-100' SW of Jct. I-75BL/Cedar & McClellan
- M-93 - 100' NE of Camp Grayling Main Gate
- M-93 - 0.1 Mi SW of Jct. M-72
- M-93 - 0.5 Mi NE of I-75 Int.
- M-93/I-75BL - 100' N of N. Jct. M-72 (Cedar/James)
- M-93/I-75BL - 0.1 Mi N of North Down River Rd.
- M-93/I-75BL - 1.0 Mi SW of I-75, I-75 Bus. Loop Int.
- M-93/I-75BL/McClellen - 200' S of North Down River Rd.
- North Down River - East of I-75 Interchange (1 Mile north of Grayling)
- North Down River - West of I-75 Interchange (1 Mile north of Grayling)
- Old 27 - 100' NW of M-93 BL-75 (Hartwick Pines Rd.)
- Old US-27 – S. of 4 Mile Rd. (Beaver Creek Twp)
- US-127 - 1.0 MI SW of I-75 Int.-Beaver Creek Twp
- US-127 - 1.0 MI SW of I-75 Int.-Beaver Creek Twp
- I-75 - 0.1 Mile S. of NB Exit Ramp to Rest Area
- I-75 NB Exit Ramp - To 4 Mile Rd. (Beaver Creek Twp)
- I-75 Rest Area - 2 Mi N. of US-127 (S of Grayling)
- I-75 SB Ent. Ramp - From 4 Mile Rd. (Beaver Creek Twp)
- M-72 - 0.1 Mile E. of I-75 Overpass
- M-93/I-75BL - 0.1 Mi SE of Old US-27 Grayling Hwy, Grayling Twp

Existing 24-hour traffic volumes are shown in Appendix B. Along with the 24-hour counts, the data collected also included vehicle classifications in order to analyze commercial and non-commercial volumes within the study area. Video-taping and personal interviews, were also utilized to gather information regarding primary traffic origins and destinations within the study area while traffic volumes were being counted.

Existing signal timing and phasing data, including cycle lengths, splits and offsets, were obtained from the Michigan Department of Transportation, City of Grayling and Crawford County Road Commission. This information was utilized by the traffic model (*Synchro*) for evaluation of the existing conditions.

The *Synchro* software package was used to perform a capacity analysis at each of the study area intersections and interchanges. *Synchro* implements the Intersection Capacity Utilization (ICU) 2003 method for determining intersection capacity. This method compares the current volume to the intersections ultimate capacity. *Synchro* also implements the methods of the 2000 Highway Capacity Manual (HCM), Chapters 15, 16, and 17; Urban Streets, Signalized Intersections, and Unsignalized Intersections. If the intersection is coordinated, *Synchro* explicitly calculates the progression factor. With the Highway Capacity Software (HCS), it is necessary to estimate the effects of coordination. *Synchro* calculates the effects of coordination automatically and accurately, while permitting the use of more complex signal operations as required.

Conventional analysis of basic freeway segments, freeway/ramp junctions, and signalized and unsignalized intersections involves the determination of a "Level-of-Service" (LOS). Levels-of-Service range from "A" to "F", similar to an alphabetic grading system, with each level describing a different set of operational characteristics. LOS "A" describes operational performance under light traffic volumes (on freeway segments and freeway/ramp junctions) or with minimal delay (at signalized and unsignalized intersections). LOS "F" describes a high density of freeway and ramp congestion or intersection failure with extensive delays and long vehicular queues. LOS "C" or "D" is considered acceptable for peak-hour traffic operation of freeway segments, freeway/ramp junctions, and at signalized intersections in urbanized areas according to AASHTO.

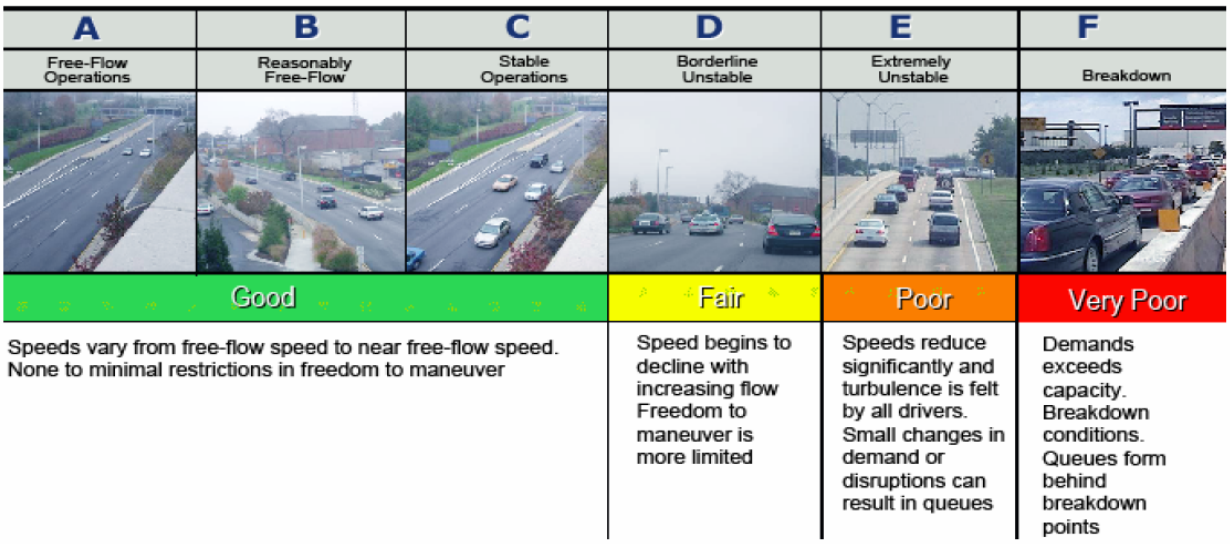
Level-of-Service is a function of average delay encountered by the motorist and is a traditional method of measuring efficiency of traffic flow. Delay is a measure of driver discomfort, frustration, fuel consumption and the cost of lost travel time. Different Levels-of-Service are given in terms of average delay per vehicle for signalized and unsignalized intersections. The Level-of-Service criteria, as defined by the HCM are described in Table 3-1 and illustrated in Figure 3-4 for basic freeway segments, freeway/ramp junctions, signalized intersections, and unsignalized intersections. As shown in Table 3-1, density is the performance measure used to define the limits of each Level-of-Service for basic freeway segments and freeway/ramp junctions, whereas control delay is the performance measure used for signalized and unsignalized intersections. Control delay includes all delay caused by traffic control (whether it be a traffic signal or STOP sign), which includes deceleration delay, time spent waiting at the intersection, and acceleration delay.

TABLE 3-1
PEAK-HOUR LEVEL-OF-SERVICE RANGES
HIGHWAY CAPACITY MANUAL (2000)

Level-of-Service	Basic Freeway Segments	Freeway / Ramp Junctions	Signalized Intersections	Unsignalized Intersections
	Density (pc/mi)	Density (pc/mi)	Control Delay (sec/veh)	Control Delay (sec/veh)
A	⩽11	⩽10	⩽10	⩽10
B	11 – 18	10 – 20	10 – 20	10 – 15
C	18 – 26	20 – 28	20 – 35	15 – 25
D	26 – 35	28 – 35	35 – 55	25 – 35
E	35 – 45	>35	55 – 80	35 – 50
F	>45	Demand exceeds capacity	>80	>50

Source: 2000 Highway Capacity Manual

FIGURE 3-4
PEAK-HOUR LEVEL-OF-SERVICE DESIGNATIONS



Level-of-Service "A", "B", and "C" are accepted especially during peak-hour traffic as reasonable design criteria. LOS "D", "E" and "F" are generally unacceptable.

The existing (2007) winter and summer levels-of-service for the morning and afternoon peak-hours for the local roads are displayed in Tables 3-2 and 3-3. The state trunkline corridors are shown in Table 3-4 and 3-5. Capacity analysis worksheets for all existing (2007) intersection capacity analyses are included in Appendix B of this report.

The existing (2007) winter and summer levels-of-service for the morning and afternoon peak-hours at the Freeway Ramps are displayed in Tables 3-6 and 3-7. Capacity analysis worksheets for all existing (2007) intersection capacity analyses are included in Appendix B of this report.

TABLE 3-2
PEAK-HOUR LEVELS-OF-SERVICE AND DELAY – WINTER 2007
LOCAL ROADS STUDY AREA

Intersection	Signal	Approach / Movement	Morning Peak-Hour		Afternoon Peak-Hour	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
North Down River/Alexia Ln	No	EB South Down River Rd	A	3.3	A	4.5
		WB South Down River Rd	A	0.0	A	0.0
		Alexia Ln	A	9.3	A	9.3
North Down River/Stephan Bridge	No	EB South Down River Rd	A	0.0	A	0.0
		WB South Down River Rd	A	2.3	A	3.2
		NB Stephan Bridge	A	9.4	A	9.6
		SB Stephan Bridge	A	0.0	A	9.8
Four Mile/Stephan Bridge	No	EB Four Mile Rd	A	8.4	A	8.4
		WB Four Mile Rd	A	0.0	A	0.0
		NB Stephan Bridge	A	0.0	A	0.0
		SB Stephan Bridge	A	0.0	A	0.0
Four Mile/Old US-27	No	EB Four Mile Rd	A	0.0	A	0.0
		WB Four Mile Rd	A	0.2	A	3.5
		Old US-27	A	9.5	B	10.2
Four Mile/ S. Military	No	Four Mile Rd	A	8.8	A	8.7
		NB Military Rd	A	0.0	A	0.0
		SB Military Rd	A	4.0	A	3.2
Four Mile/I-75 NB En-trance Ramp	No	WB Four Mile Rd	A	0.0	A	2.1
		EB Four Mile Rd	A	3.1	A	0.0
		NB I-75 On Ramp	A	9.8	B	10.1
Four Mile/I-75 SB Exit Ramp	No	WB Four Mile Rd	A	1.8	A	2.1
		EB Four Mile Rd	A	0.0	A	0.0
		SB I-75 Exit Ramp	A	9.5	B	10.1
Military/N. Higgins Lake	No	Higgins Lake Rd	A	8.6	A	8.8
		NB Military Rd	A	0.0	A	0.0
		SB Military Rd	A	6.9	A	6.7
Legion/N.Higgins Lake	No	EB Higgins Lake	A	0.0	A	0.0
		WB Higgins Lake	A	0.0	A	0.0
		Legion	A	9.1	A	9.2
N. Down River/i-75BL	No	EB N. Down River	B	12.2	B	12.5
		WB N. Down River	C	18.1	C	15.5
		NB I-75	A	0.2	A	0.4
		SB I-75	A	2.4	A	1.3
N. Down River/Roberts/Michigan Av.	No	EB N. Down River	A	1.1	A	1.1
		WB N. Down River	A	5.6	A	4.5
		Michigan Ave.	C	17.8	C	15.7
		Roberts St.	C	23.0	C	24.4
Johnson/Federal Hwy (S. State Line)	No	EB Federal Hwy	A	0.0	A	0.2
		WB Federal Hwy	A	0.0	A	0.0
		Johnson Rd	A	10.0	B	10.1

Source: URS Corporation, February 2007

All local road approaches in the study area during the two peak-hours operate at LOS C or better during the winter months.

TABLE 3-3
PEAK-HOUR LEVELS-OF-SERVICE AND DELAY – SUMMER 2007
LOCAL ROADS STUDY AREA

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
North Down River/Alexia Ln	No	EB South Down River Rd	A	3.0	A	4.6
		WB South Down River Rd	A	0.0	A	0.0
		Alexia Ln	A	9.3	A	9.6
North Down River/Stephan Bridge	No	EB South Down River Rd	A	0.0	A	0.0
		WB South Down River Rd	A	3.1	A	3.0
		NB Stephan Bridge	A	9.5	A	10.0
		SB Stephan Bridge	A	0.0	A	9.1
Four Mile/Stephan Bridge	No	EB Four Mile Rd	A	8.5	A	8.6
		WB Four Mile Rd	A	0.0	A	0.0
		NB Stephan Bridge	A	0.0	A	0.0
		SB Stephan Bridge	A	0.0	A	0.0
Four Mile/Old US-27	No	EB Four Mile Rd	A	0.0	A	0.0
		WB Four Mile Rd	A	0.1	A	4.4
		Old US-27	A	9.5	B	11.5
Four Mile/ S. Military	No	Four Mile Rd	A	8.8	A	9.1
		NB Military Rd	A	0.0	A	0.0
		SB Military Rd	A	3.1	A	3.0
Four Mile/I-75 NB Entrance Ramp	No	WB Four Mile Rd	A	1.0	A	3.5
		EB Four Mile Rd	A	3.5	A	0.0
		NB I-75 On Ramp	B	10.3	B	10.2
Four Mile/I-75 SB Exit Ramp	No	WB Four Mile Rd	A	1.4	A	1.6
		EB Four Mile Rd	A	0.0	A	0.0
		SB I-75 Exit Ramp	A	9.7	B	10.4
Military/N. Higgins Lake	No	Higgins Lake Rd	A	8.6	A	9.4
		NB Military Rd	A	0.0	A	0.0
		SB Military Rd	A	7.3	A	6.6
Legion/N.Higgins Lake	No	EB Higgins Lake	A	0.0	A	0.0
		WB Higgins Lake	A	0.0	A	0.0
		Legion	A	9.3	A	9.6
N. Down River/i-75BL	No	EB N. Down River	B	13.1	C	15.1
		WB N. Down River	C	15.8	D	26.7
		NB I-75	A	0.0	A	0.3
		SB I-75	A	1.9	A	1.4
N. Down River/Roberts/Michigan Av.	No	EB N. Down River	A	0.6	A	1.0
		WB N. Down River	A	5.3	A	4.7
		Michigan Ave.	B	12.5	C	24.5
		Roberts St.	C	20.0	E	39.9
Johnson/Federal Hwy (S. State Line)	No	EB Federal Hwy	A	0.1	A	0.4
		WB Federal Hwy	A	0.0	A	0.0
		Johnson Rd	A	9.2	A	9.3

Source: URS Corporation, August 2007

All local road approaches in the study area during the two peak-hours operate at LOS D or better during the summer months, with the following exceptions:

- *North Down River Rd/Roberts Rd/Michigan Av.* – The southbound approach of Roberts operates at LOS E during the afternoon peak-hours with a delay of 39.9 sec/vehicle. The increased delay and poor

level-of-service for the southbound approach is partly a result of a single lane configuration for all three turning movements at each approach and the high volume of westbound vehicles turning left, therefore, eliminating any gaps that would be available for the southbound approach.

TABLE 3-4
PEAK-HOUR LEVELS-OF-SERVICE AND DELAY – WINTER 2007
M-72, M-93, OLD US-127 AND I-75BL STUDY AREA

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
M-72East/Stephan Bridge	No	EB M-72 East	A	1.0	A	2.9
		WB M-72 East	A	0.2	A	0.2
		NB Stephan Bridge	A	9.7	A	10.0
		SB Stephan Bridge	A	9.2	A	9.7
M-72 East/I-75BL	Yes	EB M-72	C	20.7	C	24.2
		WB M-72	C	22.7	C	24.5
		NB I-75BL	B	18.6	B	19.7
		State Street	B	11.7	B	12.9
M-72 West/M-93	Yes	EB M-72	B	18.9	B	18.7
		WB M-72	B	18.0	B	19.1
		NB Ole Down	B	18.0	B	18.0
		SB Ole Down	C	20.7	B	18.7
M-93/Wilcox Bridge	No	EB M-93	A	7.1	A	0.0
		WB M-93	A	7.8	A	0.2
		Wilcox Bridge	A	7.1	A	9.0
M-93/S.Military Road	No	EB M-93	A	0.0	A	0.0
		WB M-93	A	2.3	A	4.6
		S. Military Rd	A	9.0	A	8.9
Old US-27/Ward	No	EB Ward	A	8.6	B	11.0
		WB Ward	A	9.5	B	10.7
		NB Old US-27	A	0.0	A	0.5
		SB Old US-27	A	1.4	A	1.8
Old US-27/CR 612	No	EB CR 612	A	9.5	B	10.4
		WB CR 612	A	9.8	B	10.4
		NB Old US-27	A	1.2	A	1.1
		SB Old US-27	A	0.3	A	0.2
Old US-27/N. Higgins Lk.	No	EB Higgins Lake	A	0.0	A	0.6
		WB Higgins Lake	A	2.5	A	2.7
		NB Old US-27	A	8.7	A	9.0
		SB Old US-27	A	9.4	A	9.2
Old 27/Airport Rd	No	EB Airport Rd	A	8.3	A	7.7
		WB Airport Rd	A	8.9	A	8.4
		NB Old -27	B	10.1	A	7.4
		SB Old -27	A	9.7	A	8.3
I-75BL/State Street	No	State Street	B	14.4	D	26.9
		NB I-75 BL	A	0.0	A	0.0
		SB I-75 BL	A	0.2	B	0.2
I-75BL (James)/Michigan	Yes	SEB	B	19.9	C	22.0
		NWB	C	23.8	C	26.2
		NEB	C	22.7	C	23.6
		SWB	C	26.1	C	32.4
I-75BL (James)/I-75BL	Yes	NEB I-75BL	C	24.4	B	18.2
		NWB James	E	56.5	E	63.3
		SWB James	C	20.4	C	21.7

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
		SB I-75 BL	B	18.4	C	20.9

Source: URS Corporation, February 2007

All approaches on the state trunkline routes in the study area during the two peak-hours operate at LOS D or better during the winter months, with the following exceptions:

- *I-75BL (James Street)/I-75 BL* –The North Westbound approach operates at LOS E for both peak-hours during the winter months. This is a signalized intersection with a cycle time of 80 seconds. The average delay for the north westbound approach is 56.5 sec/veh and 63.3 sec/veh for morning and afternoon peak-hours, respectively. This poor level-of-service and significant approach delay is a result of high traffic volumes turning left and right (northwest bound) with only a short interval of protected green time. Adjusting the signal timing would improve the conditions at this intersection and better accommodate the existing traffic volumes.

TABLE 3-5
PEAK-HOUR LEVELS-OF-SERVICE AND DELAY – SUMMER 2007
M-72, M-93, OLD US-127 AND I-75BL STUDY AREA

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
M-72 East/Stephan Bridge	No	EB M-72 East	A	1.8	A	2.3
		WB M-72 East	A	0.3	A	0.2
		NB Stephan Bridge	A	10.0	A	11.3
		SB Stephan Bridge	A	9.3	A	10.1
M-72 East/I-75BL	Yes	EB M-72	C	20.8	C	25.5
		WB M-72	C	23.9	C	25.9
		NB I-75BL	B	18.4	C	22.3
		State Street	B	13.8	B	12.9
M-72 West/M-93	Yes	EB M-72	B	19.3	B	19.0
		WB M-72	B	18.9	C	23.8
		NB Ole Down	B	18.3	B	18.4
		SB Ole Down	B	18.9	B	18.9
M-93/Wilcox Bridge	No	EB M-93	A	0.0	A	0.0
		WB M-93	A	0.0	A	0.1
		Wilcox Bridge	A	8.9	A	8.8
M-93/S.Military Road	No	EB M-93	A	0.0	A	0.0
		WB M-93	A	2.0	A	5.0
		S. Military Rd	A	9.1	A	9.1
Old US-27/Ward	No	EB Ward	B	10.4	A	9.9
		WB Ward	B	11.2	A	10.0
		NB Old US-27	A	0.4	A	0.4
		SB Old US-27	A	1.8	A	1.8
Old US-27/CR 612	No	EB CR 612	B	10.1	B	10.8
		WB CR 612	A	9.3	A	9.9
		NB Old US-27	A	1.0	A	1.1
		SB Old US-27	A	0.5	A	0.2
Old US-27/N. Higgins Lk.	No	EB Higgins Lake	A	1.3	A	0.4
		WB Higgins Lake	A	3.5	A	3.3
		NB Old US-27	A	8.7	A	9.5
		SB Old US-27	B	10.1	B	10.3
Old 27/Airport Rd	No	EB Airport Rd	B	11.0	B	11.1
		WB Airport Rd	A	8.1	A	7.9

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
		NB Old -27	A	9.1	A	7.8
		SB Old -27	B	10.2	B	10.3
I-75BL/State Street	No	State Street	B	14.6	D	28.9
		NB I-75 BL	A	0.0	A	0.0
		SB I-75 BL	A	0.2	B	0.2
I-75BL (James)/Michigan	Yes	SEB	C	20.0	C	24.3
		NWB	C	23.6	C	30.5
		NEB	C	22.3	C	23.8
		SWB	C	26.7	E	66.2
I-75BL (James)/I-75BL	Yes	NEB I-75BL	C	21.9	C	22.9
		NWB James	D	52.3	E	70.2
		SWB James	B	19.6	C	21.3
		SB I-75 BL	B	19.9	C	20.0

Source: URS Corporation, August 2007

All approaches on the State trunkline routes in the study area during the two peak-hours operate at LOS D or better during the summer months, with the following exceptions:

- *I-75BL(James Street)/Michigan*–This intersection is a signalized intersection with a cycle length of 80 seconds. During the afternoon peak-hour the south westbound approach operates at a LOS E with a delay of 66.2 sec/vehicle. The southwest left turning traffic has a level-of-service F with significant delay of 83.4 sec/veh. This particular movement has a high volume of traffic without a protected phase in the cycle time. The signal timing and cycle length should be adjusted accordingly during the afternoon peak-hour to accommodate the increased traffic volumes.

- *I-75BL (James Street)/I-75 BL* – This is a signalized intersection with a cycle time of 80 seconds. During the afternoon peak-hour the north westbound approach operates at LOS E with a delay of 70.2 sec/veh. This poor level-of-service and significant approach delay is a result of high volume of traffic turning both left and right (northwest bound) with only a short interval of protected green time. Upon further review, the northwest approach traffic turning right has a delay of 83.6 sec/veh and has a level-of-service F which also contributes significantly to the overall approach LOS. As detailed previously, the signal timing should be adjusted accordingly during the peak-hours to accommodate the traffic volumes at this intersection, particularly for the north westbound approach.

TABLE 3-6
PEAK-HOUR LEVELS-OF-SERVICE AND DELAY – WINTER 2007
I-75 & US-127 STUDY AREA

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
NB I-75 Ramp/Four Mile	No	EB Four Mile Rd	A	3.1	A	2.1
		WB Four Mile Rd	A	0.0	A	0.0
		NB I-75 Ramp	A	9.8	B	10.1
NB I-75 Ramp/Federal Hwy	No	EB Federal Hwy	A	2.8	A	1.4
		WB Federal Hwy	A	0.0	A	0.0
		NB I-75 Ramp	B	11..4	B	11.2
NB I-75Ramp/N. Down River	No	EB N. Down River	A	4.3	A	3.7
		WB N. Down River	A	0.0	A	0.0
NB I-75 Ramp/CR 612	No	EB CR 612	A	5.3	A	1.3
		WB CR 612	A	0.0	A	0.0
		NB I-75 Ramp	A	8.8	A	8.9
NB I-75 Ramp/M-93	No	EB M-93	A	4.0	A	4.4
		WB M-93	A	0.0	A	0.0
		NB Ramp	A	9.0	A	8.8
SB I-75 Ramp/Four Mile	No	EB Four Mile Rd	A	0.0	A	0.0
		WB Four Mile Rd	A	1.8	A	2.1
		SB I-75 Ramp	A	9.5	B	10.1
SB I-75 Ramp/Federal Hwy	No	EB Federal Hwy	A	0.0	A	0.0
		WB Federal Hwy	A	0.3	A	0.5
		SB I-75 Ramp	A	9.8	B	10.3
SB I-75 Ramp/N. Down River	No	EB N. Down River	A	0.0	A	0.0
		WB N. Down River	A	0.0	A	0.0
		SB I-75 Ramp	B	10.1	B	10.2
SB I-75 Ramp/CR612	No	EB CR 612	A	0.0	A	0.0
		WB CR 612	A	4.1	A	2.2
		SB I-75 Ramp	A	8.9	A	8.8
SB I-75 Ramp/M-93	No	EB M-93	A	0.0	A	0.0
		WB M-93	A	1.8	A	3.4
		SB I-75 RAMP	A	9.1	A	8.8
NB US-127 Ramp/N. Higgins Lake	No	EB Higgins Lake	A	2.6	A	0.6
		WB Higgins Lake	A	0.0	A	0.0
		NB US-127 Ramp	A	8.6	A	9.0
SB US-127Ramp/N. Higgins Lake	No	EB Higgins Lake	A	0.0	A	0.0
		WB Higgins Lake	A	3.0	A	3.0
		SB US-127 Ramp	A	8.9	A	9.3

Source: URS Corporation, February 2007

All approaches within the freeway ramp area during the two peak-hours operate at LOS B or better during the winter months.

TABLE 3-7
PEAK-HOUR LEVELS-OF-SERVICE AND DELAY – SUMMER 2007
I-75 & US-127 STUDY AREA

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
NB I-75 Ramp/Four Mile	No	EB Four Mile Rd	A	3.5	A	0.0
		WB Four Mile Rd	A	1.0	A	3.5
		NB I-75 Ramp	B	10.3	B	10.2
NB I-75 Ramp/Federal Hwy	No	EB Federal Hwy	A	3.3	A	1.3
		WB Federal Hwy	A	0.0	A	0.0
		NB I-75 Ramp	B	11.7	B	12.5
NB I-75Ramp/N. Down River	No	EB N. Down River	A	3.3	A	4.0
		WB N. Down River	A	0.0	A	0.0
NB I-75 Ramp/CR 612	No	EB CR 612	A	2.0	A	5.3
		WB CR 612	A	0.0	A	0.0
		NB I-75 Ramp	A	9.1	A	8.9
NB I-75 Ramp/M-93	No	EB M-93	A	5.6	A	3.6
		WB M-93	A	0.0	A	0.0
		NB Ramp	A	9.5	A	9.9
SB I-75 Ramp/Four Mile	No	EB Four Mile Rd	A	0.0	A	0.0
		WB Four Mile Rd	A	1.4	A	1.6
		SB I-75 Ramp	A	9.7	B	10.4
SB I-75 Ramp/Federal Hwy	No	EB Federal Hwy	A	0.0	A	0.0
		WB Federal Hwy	A	0.5	A	0.6
		SB I-75 Ramp	B	10.1	B	11.1
SB I-75 Ramp/N. Down River	No	EB N. Down River	A	0.0	A	0.0
		WB N. Down River	A	0.0	A	0.0
		SB I-75 Ramp	B	10.1	B	11.1
SB I-75 Ramp/CR612	No	EB CR 612	A	0.0	A	0.0
		WB CR 612	A	1.8	A	2.9
		SB I-75 Ramp	A	8.9	A	8.7
SB I-75 Ramp/M-93	No	EB M-93	A	0.0	A	0.0
		WB M-93	A	2.9	A	4.3
		SB I-75 RAMP	A	8.7	A	9.3
NB US-127 Ramp/N. Higgins Lake	No	EB Higgins Lake	A	2.4	A	0.3
		WB Higgins Lake	A	0.0	A	0.0
		NB US-127 Ramp	A	9.0	A	9.2
SB US-127Ramp/N. Higgins Lake	No	EB Higgins Lake	A	0.0	A	0.0
		WB Higgins Lake	A	2.3	A	3.0
		SB US-127 Ramp	A	8.5	A	9.0

Source: URS Corporation, August 2007

All approaches within the freeway ramp area during the two peak-hours operate at LOS B or better during the summer months.

3.3.1 Summary of Existing Traffic Operations

In general, existing traffic conditions (2007) during the morning and afternoon peak-hours both during the summer and winter months operate at acceptable levels-of-service. It should be noted that the levels-of-service listed in the above tables are based on the average stopped delay for vehicles making all moves (left, through, and right) from each approach.

For all the roadway segments, the travel time and delay data shows a fairly consistent trend throughout the course of the day and season. Based on observations and traffic analyses, the afternoon peak-hour resulted in longer queues and more delay than the morning peak-hour for a few intersections. This is a result of the intersections having to accommodate vehicles traveling to and from the various retail generators in the area in addition to the usual afternoon peak-hour commuter traffic. In contrast, many of the retail stores along the corridors do not open until after the morning commuter peak-hour.

3.4 Existing Travel Patterns

A travel characteristic survey was performed within the study area which was used to identify the present system inadequacies, provide a basis to forecast future land use and travel, derive travel relationships, and calibrate travel demand models. The information collected was used to identify origin-destination travel patterns, physical facility characteristics, average travel speed, travel time/delay, and travel volumes.

Based on the travel characteristic survey that was performed, there are three forms of dominant traffic patterns within the Grayling area. The first travel pattern represents the trips that begin or end within the project limits rather than passing through. The second is the growing volume of traffic, particularly heavy commercial truck traffic that is passing through. The third pattern is defined by the military traffic.

The existing travel patterns were evaluated and utilized for the development of the travel demand model which was used to project future traffic patterns. The primary patterns analyzed relate to users of the interchanges within the project area. Generally, travel patterns are only impacted within the immediate area of Downtown Grayling. The travel demand model was analyzed using selected link analyses of existing and proposed accesses to the interstate. The pattern changes found by the modeling were applied to the future No-Build volumes and Alternatives.

3.5 Existing Conditions Crash Analysis

A crash analysis was performed using data provided by MDOT from May, 2002 through April, 2008 and Crawford County from May, 2002 through December 2007. Data was summarized to identify and analyze possible safety deficiencies or other correctible causes within the study area. The crash data that was supplied by MDOT and Crawford County has been summarized and shown on Figures 3-5. Each crash was located on the map to provide a graphical representation of the type and location of crash to facilitate the identification of existing crash patterns. The crash reports, as provided by NEMCOG, and other tables used in the analysis of the crash data is included in Appendix C. Several of the intersections/roadways within the study area have little or no crash history; the following sections of this study represent the findings of the crash analysis at those locations which have experienced a measurable number of crashes. Table 3-8 represents the segmental crash rates and corresponding statewide average crash rates for each segment analyzed. This excludes any accidents that occurred at an intersection or a ramp terminal, which will be independently analyzed later in the study.

TABLE 3-8
SEGMENTAL CRASH ANALYSIS

Segment	*Number of Crashes	Number of Injury Crashes	Number of Fatalities	Crash Rate (Per Year)	Average Crash Rate Statewide (Per Year)
M-72 West	93	8	1	258	291 (A)
M-93	60	2	0	**375**	277 (B)
I-75BL/M-93 (S. of Vilas Rd)	49	6	0	146	575 (C)
I-75BL/M-93 (N. of Vilas Rd)	59	5	0	**500**	277 (B)
I-75BL/M-93 (S. of M-72)	8	3	0	23	450 (D)
I-75BL/M-93 (N. of M-72)	27	6	0	145	730 (E)
M-72 East	99	9	0	105	277(B)
I-75 N. Higgins Lake Rd-US-127 Merge	171	28	0	60	136 (F)
I-75 4 Mile-Rest Area	84	16	0	32	136 (F)
US-127-N. Higgins Lake	73	18	3	57	136 (F)
S. Military Road	69	9	0	72	277 (B)
Four Mile Road	48	6	0	41	277 (B)
North Down River Rd	105	16	0	129	277 (B)

(A)-MDOT Statewide 4-Lane Non-Divided Free Access, Rural Highway, 1999
(B) -MDOT Statewide 2-lane Rural Highway 1999
(C) -MDOT Statewide 3-lane Urban Highway 1999
(D) – MDOT Statewide 4-lane Divided Free Access, Urban Highway, 1999
(E) - MDOT Statewide 4-lane Non-Divided Free Access, Urban Highway, 1999
(F)-MDOT Statewide 4-lane divided, Limited Access, Rural Highway 1999
Note: Crash rates greater than the statewide average crash rate are shown in **bold** and shaded.
*Excludes crashes at ramps or intersections
Source: MDOT, NEMCOG

As shown in Table 3-8, the M-93 Segment that follows near Lake Margrethe has a higher-than-average statewide crash rate. However, this is a very rural low lit roadway that is in a heavily wooded area. Eighty percent of all the crashes are a single vehicle hitting an animal. The other segment of roadway that is higher-than-average statewide crash rate is M-93/I-75 BL (North of Old-27). The majority of these crashes were a result of an animal crossing the road. For both of these segments, deer warning signs should be considered to help reduce the frequency of animal crashes.

The crash data was further analyzed by studying the major intersections within the study limits, the results of which are shown in Table 3-9.

TABLE 3-9
INTERSECTION CRASH ANALYSIS

Intersection	Top 3 Crash Types		*Total Crashes	% Injury Crashes	# of People Injured
	Crash Type	Percent			
M-93/M-72 West	Animal	37.03	27	22.22	7
	Rear End	22.22			
	Fixed Object	11.11			
M-93/M-72/James/I-75BL (McCellan)	Angle	42.3	26	15.4	10
	Rear End	15.4			
	Side Swipe	11.5			
M-93/Margrethe Blvd.	Animal	75.0	8	0	0
	Over turn	12.5			
	Fixed Object	12.5			
M-93/Old Lake Rd.	Animal	33.3	3	0	0
	Side Swipe	33.3			
	Fixed Object	33.3			
M-93/Military Rd.	Fixed Object	50.0	6	0	0
	Angle Straight	33.33			
	Animal	16.67			
M-72 East/I-75 BL (State St.)	Rear End – Straight	33.33	9	22.22	2
	Fixed Objects	11.1			
	Backing	11.1			
M-72East/Stephan Bridge	Angle Straight	50.0	4	75.00	4
	Fixed Object	25.0			
	Side Swipe	25.0			
Military Rd/Four Mile Rd	Animal	31.8	22	27.3	10
	Angle-Straight	18.2			
	Fixed Objects	18.2			
Four Mile/Old 27	Angle Turn	100	1	0	0
Four Mile Rd/ N. I-75 Exit	Animal	100	1	0	0
Four Mile Rd/ S. I-75 Exit	Fixed Objects	100	5	60.0	6*
North Down River Rd/Michigan Av.	Angle-Straight	62.5	8	0	0
	Rear End - Straight	37.5			
North Down River Rd/Stephan Bridge	Animal	4	6	33.3	5
	Angle-Straight	1			
	Sideswipe	1			
North Down River Rd/Wilcox Bridge	Animal	60	5	0	0
	Fixed Objects	40			
North Down River/I-75 Ramp	Fixed Objects	100	2	0	0

Intersection	Top 3 Crash Types		*Total Crashes	% Injury Crashes	# of People Injured
	Crash Type	Percent			
North Down River/I-75 BL	Angle	57.1	7	42.8	5
	Side Swipe	14.3			
	Head On	14.3			
Old 27/I-75 BL	Fixed Object	25.0	4	50.0	3
	Angle	25.0			
	Side Swipe	25.0			

*Includes 3 fatal injuries.

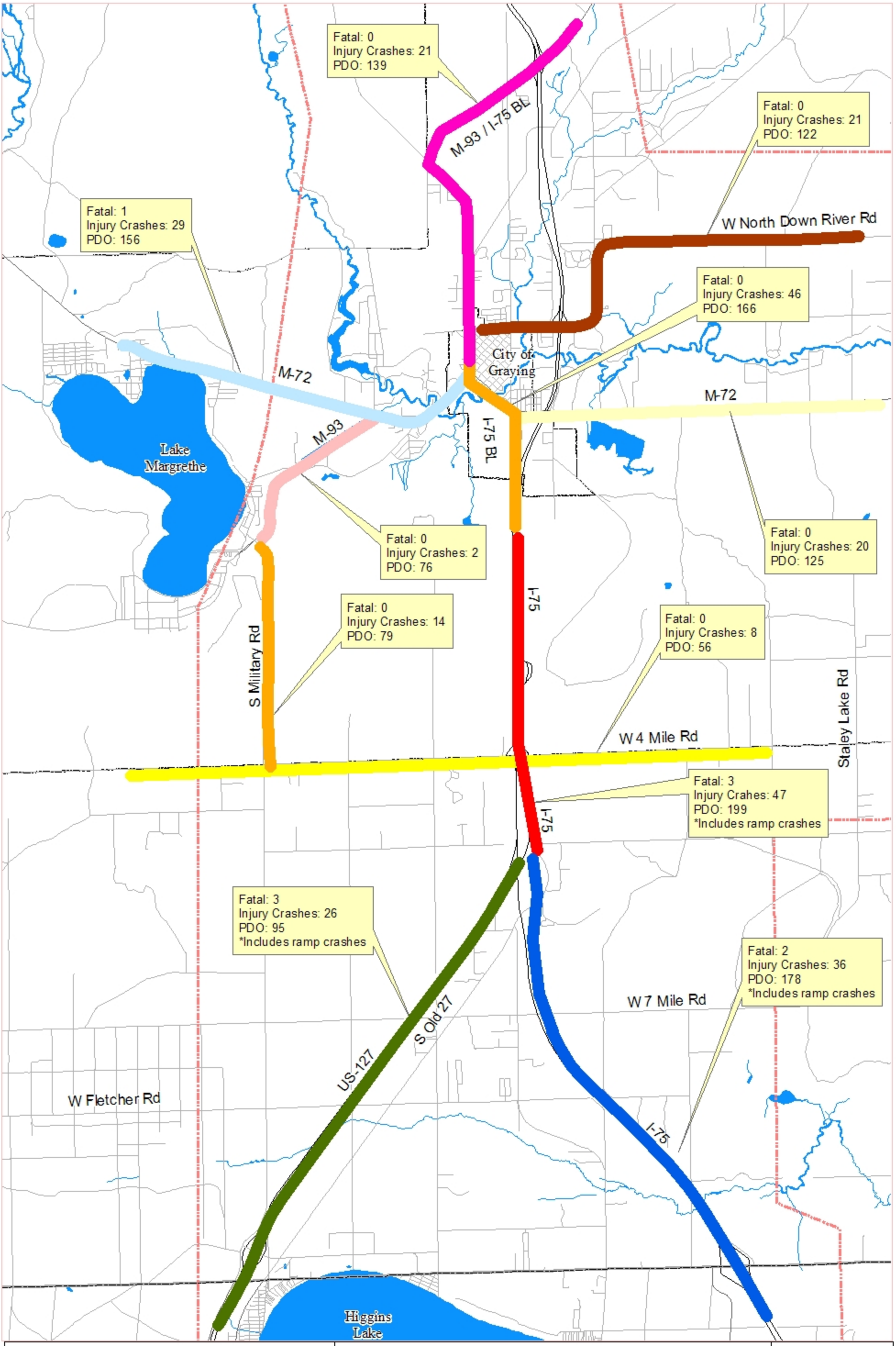
For further analysis, the total number of crashes on each of the segments in Table 3-8 was broken down by crash type. Such a breakdown of the five most common crash types are shown in Table 3-10. The table shows the raw number of each type of crash over the six-year period (five-year period for the county roads) while the overall percentage of each type of crash for each segment is shown in parentheses. The number of weather-related crashes is also shown in Table 3-10.

TABLE 3-10
CORRIDOR CRASH TYPES

Corridor	Rear End	Angle	Fixed Object	Animal	Side Swipe	Wet Condition	Icy Conditions
M-72 West	47 (25.41)	10 (5.4)	9 (4.86)	79 (42.7)	16 (8.65)	35 (18.92)	25 (13.51)
M-72 East	12 (8.28)	10 (6.9)	16 (11.03)	76 (52.41)	13 (8.97)	14 (9.66)	25 (17.24)
M-93	0 (0)	1 (1.28)	4 (5.13)	65 (83.33)	2 (2.56)	14 (17.95)	13 (16.67)
I-75 BL/M-93(N. of Vilas Rd)	15 (9.38)	15 (9.38)	28 (17.5)	68 (42.5)	8 (5.01)	27 (16.88)	33 (20.63)
I-75 BL/M-93(S. of Vilas Rd)	74 (34.91)	58 (27.36)	9 (4.25)	2 (0.94)	29 (11.79)	47 (22.17)	19 (8.96)
I-75, north of US-127 to South of M-72	15 (6.1)	10 (4.07)	63 (25.61)	60 (24.39)	15 (6.10)	46 (18.70)	75 (30.49)
I-75, N. Higgins Lake to US127 merge	5 (2.34)	4 (1.87)	41 (19.16)	90 (42.06)	7 (3.27)	33 (15.42)	48 (22.43)
US-127-N. Higgins Lake	3 (2.48)	0 (0)	38 (31.41)	43 (35.54)	2 (1.65)	12 (9.92)	44 (36.36)
Military Road	0 (0)	7 (7.53)	17 (18.28)	52 (55.9)	2 (2.15)	7 (7.53)	33 (35.48)
Four Mile Road	2 (3.13)	8 (12.5)	9 (14.1)	34 (53.1)	3 (4.69)	9 (14.1)	13 (20.3)
North Down River Road	6 (4.20)	8 (5.59)	24 (16.8)	83 (58.0)	3 (2.1)	20 (13.99)	27 (18.9)
Total Crashes (% of Crashes)	179 (13.56)	131 (9.9)	258 (19.5)	652 (49.39)	100 (7.58)	264 (15.89)	355 (21.4)

*Including any accidents that occurred at intersections or ramps.

Examination of Table 3-10 reveals that 49.39 percent of all crashes are animal crashes. Fixed object crashes account for 19.5 percent of all crashes. The poor weather conditions accounted for 37.29 percent of the crashes.



Existing Crash Data

Figure 3-5

The crash data and analysis shown in Tables 3-8, 3-9 and 3-10 can be summarized as follows:

M-72 West

Background

This section of roadway which is west of I-75 and south of North Down River Road had 29 personal injury accidents out of 185 total accidents in a 2.237 mile span. A total of 185 crashes were reported on this section of roadway during the 6 year data collection period, which is an average of 30.8 crashes per year. The predominant crash types were animal/vehicle (42.7 percent), rear end-straight (17.3 percent) and rear end left and side swipe same direction (6.49 percent).

The crash data was further analyzed by type of crash and the conditions in which the crash took place. Investigation of the crash characteristics indicates that the majority of the crashes, 84.32 percent, were property damage only, 15.68 percent of the crashes involved possible injuries to occupants. One fatality was reported which involved a pedestrian and alcohol was involved. The majority, 59.46 percent, of the crashes occurred during daylight hours, with 18.92 and 13.51 percent of the crashes occurring with either wet or icy conditions, respectively. After analyzing where the crash took place it was determined that 49.7 percent of the accidents occurred at an intersection with M-72, while the remaining 50.3 percent occurred along mid-block of M-72 West.

M-72 East

Background

This section of roadway, also known as Huron Street, is west of I-75 and south of North Down River Road had 20 personal injury accidents out of 145 total accidents in a 6.43 mile span. A total of 145 crashes were reported on this section of roadway during the 6 year data collection period, which is an average of 24.2 crashes per year. The predominant crash types were animal/vehicle (52.41 percent), fixed object with single vehicle (11.03 percent) and rear end-straight (7.59 percent).

The crash data was further analyzed by type of crash and the conditions in which the crash took place. Investigation of the crash characteristics indicates that the majority of the crashes, or 86.21 percent, were property damage only, 13.79 percent of the crashes involved possible injuries to occupants, and no fatalities were reported. The majority, 58.62 percent, of the crashes occurred during daylight hours, with 9.66 and 17.24 percent of the crashes occurring with either wet or icy conditions, respectively. After analyzing where the crash took place it was determined that 31.7 percent of the accidents occurred at an intersection with M-72 East, while the remaining majority 68.3 percent occurred along mid-block of M-72 East.

M-93

Background

This section of roadway which is west of I-75 and south of North Down River Road had 2 personal injury accidents out of 78 total accidents in a 2.606 mile span. The crash rate on this section of roadway during the 6 year data collection period was an average of 13 crashes per year. The predominant crash types were animal/vehicle (83.33 percent), fixed object with single vehicle (5.13 percent), miscellaneous single vehicle (3.85 percent) and overturns (3.85 percent). This segment of roadway's 6 year crash rate (375 as highlighted in Table 3-8) was higher than the average statewide crash rate (277) for a 2-lane rural highway. This crash rate is a result of the high percentage of animal/vehicle accidents that occurred. The percentage of other crash types is quite low and does not present itself as an unsafe roadway.

Investigation of the crash characteristics indicates that the majority of the crashes or 97.44 percent were property damage only, 2.56 percent of the crashes involved possible injuries to occupants and no fatalities were reported. The majority, 65.38 percent, of the crashes occurred on dry surfaces with the majority, 62.82 percent, of the crashes occurred in the dark hours. After analyzing where the crash took place it was determined that 23 percent of the accidents occurred at an intersection with M-93 with the remaining 77 percent occurred along mid-block of M-93.

I-75 BL/M-93 (North of Vilas Road)

Background

This section of roadway which is east and west of I-75 and north of Vilas Road had 21 personal injury accidents out of 160 total accidents in a 7.473 mile span. The crash rate on this section of roadway during the 6 year data collection period was an average of 26.7 crashes per year. The predominant crash types were animal/vehicle (42.5 percent), fixed object with single vehicle (17.5 percent) and rear-end straight (7.5 percent). This segment of roadway's 6 year crash rate (500 as highlighted in Table 3-8) was higher than the average statewide crash rate (277) for a 2-lane rural highway. This crash rate is a result of the high percentage of animal/vehicle accidents that occurred along this roadway. The percentage of other crash types is quite low and does not present itself as an unsafe roadway.

Investigation of the crash characteristics indicates that the majority of the crashes, 86.87 percent, were property damage only and no fatalities were reported. After analyzing where the crash took place it was determined that 36.3 percent of the accidents occurred at an intersection with I-75 BL/M-93 with the remaining 63.7 percent occurred along mid-block of M-93/I-75 BL.

I-75 BL/M-93 (South of Vilas Road)

Background

This section of roadway which is west of I-75 and south of Vilas Road had 46 personal injury accidents out of 212 total accidents in a 2.775 mile span. The crash rate on this section of roadway during the 6 year data collection period was an average of 35.3 crashes per year. The predominant crash types were rear-end straight (34.91 percent), angle-straight (27.36 percent), and side swipe in same direction (11.79 percent).

Investigation of the crash characteristics indicates that the majority of the crashes, 78.3 percent, were property damage only and no fatalities were reported. After analyzing where the crash took place it was determined that 84.4 percent of the accidents occurred at an intersection with I-75 BL/M-93 while the remaining 15.6 percent occurred along mid-block of M-93/I-75 BL.

I-75 (North of US-127 to South of M-72)

Background

This section of highway is south of the Four Mile Interchange (including ramps) where US-127 merges in to I-75 to south of M-72. This section of highway had 47 personal injury accidents out of 246 total accidents. The crash rate on this section of roadway during the 6 year data collection period was an average of 41 crashes per year. The predominant crash types were fixed objects (25.61 percent), animal (24.39 percent), and overturn (20.33 percent). With 18.70 and 30.49 percent of the crashes occurred with either wet or icy conditions, respectively.

Investigation of the crash characteristics indicates that the majority of the crashes, 79.67 percent, were property damage only. There were 3 fatal crashes reported along this segment of highway. Two of the crashes occurred on the SB Exit Ramp at the Four Mile Interchange. Since the two fatal crashes in 2005-2006, MDOT relocated the signage for the US-127 farther south beyond the SB Four Mile Ramp thus minimizing any confusion with the ramp and the US-127 roadway. The third fatal crash occurred north of US-127 merge but south of the Four Mile Interchange. A pedestrian was walking along I-75 and was struck by a vehicle.

I-75 (N. Higgins Lake to US-127 Merge)

Background

This section of highway is at the North Higgins Lake Interchange (including ramps) to where US-127 merges into I-75. This section of highway had 36 personal injury accidents out of 214 total accidents. The crash rate on this section of roadway during the 6 year data collection period was an average of 35.7 crashes per year. The predominant crash types were animal (42.06 percent), overturn (23.83 percent) and fixed objects (19.16 percent). Surface conditions of the pavement indicate that the majority of the crashes occurred while the surface was dry (62.15 percent), while 15.42 and 22.43 percent of the crashes occurred with either wet or icy conditions, respectively.

Investigation of the crash characteristics indicates that the majority of the crashes, 82.25 percent, were property damage only. There were 2 fatal crashes reported along this segment of highway. Both fatal crashes were single vehicle accidents in which the vehicle overturned. The surface conditions of the pavement indicate that the surface was dry at the time of the accidents.

US-127

Background

This section of highway is at the North Higgins Lake Interchange (including ramps). This section of highway had 26 personal injury accidents out of 121 total accidents. The crash rate on this section of roadway during the 6 year data collection period was an average of 20.2 crashes per year. The predominant crash types were animal (35.54 percent), fixed objects (31.41 percent) and overturn (19.83 percent). Surface conditions of the pavement indicate that the majority of the crashes occurred while the surface was dry (53.72 percent), while 9.92 and 36.36 percent of the crashes occurred with either wet or icy conditions, respectively.

Investigation of the crash characteristics indicates that the majority of the crashes, or 76.03 percent, were property damage only. There were 3 fatal crashes reported along this segment of highway. Two of the fatal crashes involved a vehicle losing control, leaving the roadway and hitting a fixed object. The third fatal crash involved two vehicles in which one vehicle lost control while passing on snow covered roads. The pavement conditions at the time of the three fatal crashes were either wet or snowy.

Military Road

Background

This section of roadway which is west of I-75 and south of North Down River Road had 14 personal injury accidents out of 93 total accidents in an 8.333 mile span. A total of 93 crashes were reported on this section of roadway during the 5 year data collection period, which is an average of 18.6 crashes per year. The predominant crash types were animal/vehicle (55.9 percent), and fixed object crashes (18.28 percent).

The crash data was further analyzed by type of crash and the conditions in which the crash took place. Investigation of the crash characteristics indicates that the majority of the crashes, or 84.95 percent, were property damage only, 15.05 percent of the crashes involved possible injuries to occupants, and no fatalities were reported. The majority, 51.6 percent, of the crashes occurred during daylight hours. With 7.53 and 35.48 percent of the crashes occurring with either wet or icy conditions, respectively. After analyzing where the crash took place it was determined that 25.8 percent of the accidents occurred at an intersection with Military Road with the remaining 74.2 percent occurred along mid-block of Military Road.

Four Mile Road

Background

This section of roadway which is east and west of I-75 and south of M-72 had 8 personal injury accidents out of 64 total accidents in an 8.105 mile span. A total of 64 crashes were reported on this section of roadway during the 5 year data collection period, which is an average of 12.8 crashes per year. The predominant crash types were animal/vehicle (53.1 percent), and fixed object crashes (14.1 percent).

The crash data was further analyzed by type of crash and the conditions in which the crash took place. Investigation of the crash characteristics indicates that the majority of the crashes, 87.5 percent, were property damage only, 12.5 percent of the crashes involved possible injuries to occupants, no fatalities were reported. The majority, 59.4 percent, of the crashes occurred during daylight hours, with 14.1 and 20.3 percent of the crashes occurring with either wet or icy conditions, respectively. After analyzing where the crash took place it was determined that 25.0 percent of the accidents occurred at an intersection with Four Mile Road with the remaining 75.0 percent occurred along mid-block of Four Mile Road.

North Down River Road

Background

This section of roadway which is east and west of I-75 and north of M-72 had 21 personal injury accidents out of 143 total accidents in a 7.712 mile span. A total of 143 crashes were reported on this section of roadway during the 5 year data collection period, which is an average of 28.6 crashes per year. The predominant crash types were animal/vehicle (58.0 percent), and fixed object crashes (16.8 percent).

The crash data was further analyzed by type of crash and the conditions in which the crash took place. Investigation of the crash characteristics indicates that the majority of the crashes, 85.3 percent, were property damage only, 14.7 percent of the crashes involved possible injuries to occupants, no fatalities were reported. The majority, 63.64 percent, of the crashes occurred during daylight hours. With 13.99 and 18.9 percent of the crashes occurred with either wet or icy conditions, respectively. After analyzing where the crash took place it was determined that 26.57 percent of the accidents occurred at an intersection with North Down River Road with the remaining 73.43 percent occurred along mid-block of North Down River Road.

The accident data statistics provide a better understanding to the safety of a roadway. The types and number of crashes at each intersection or along a roadway will be used when determining what improvements may be proposed at an intersection to improve safety of all users.

The segments designated were examined to determine if factors such as weather and time of day caused any trends in the accidents. Time of day did not seem to be a significant factor in the crashes with the exception to the animal accidents, which occurred more frequently at night.

Accidents in the study area were also analyzed by the type of accident. The main categories of accidents are as follows: over 49 percent of the accidents involved a single vehicle hitting an animal, 19.5 percent involved a fixed object, 13.6 percent of the accidents were rear-end accidents, 9.9 percent were angle accidents and 7.58 percent were side-swipe accidents. All the intersections and segments of roadways that were examined did not have a correctable accident history problem. However, countermeasures to reduce each type of accident have been examined in detail in the specific sections, but are also summarized below.

Countermeasures:

Preventing accidents from occurring is the most effective means to improve roadway safety. This task is very difficult to accomplish, however, understanding why accidents occur is the first step to achieving this goal. Studies show that 96 percent of all accidents involve some form of driver error. There are several countermeasures which can be implemented to reduce the likelihood of accidents. They are as follows:

To reduce the numerous single vehicle/animal accidents within the project limits, a review and upgrade of deer crossing warning signs is recommended. See Figure 3-6. These signs alert the driver's awareness for animals.

Figure 3-6: Advance Crossing Signs that could be used to alert drivers to unexpected entries into the roadway.

The second most frequent crash pattern is the vehicle/fixed object accidents. The most common fixed objects are trees adjacent to the roadway. However, a large number of accidents also involve utility poles. If a fixed object is repeatedly getting hit, then measures should be taken to correct this area by clearing a safe path and allowing drivers time and space to recover from errors and to minimize the severity of the accident if one occurs. Proper clearing to the limits of the clear zone for each roadway, the use/upgrade of guardrail, breakaway signpost and light standards can reduce the damage when a vehicle leaves the travel lane.

4.0 Future (2027) CONDITIONS AND TRAFFIC ANALYSIS

To assess the effectiveness of the roadway network, the future conditions of 2027 were evaluated. Traffic forecasts for 2027 were developed using regional background growth factors and vehicle trip generation estimates for development anticipated within the study area.

4.1 Background Traffic Growth

Traffic growth is expected to occur between existing conditions and any given future year due to overall growth and development of the region. This growth is typically termed as "background growth" and must be accounted for as part of the future volumes. Michigan statewide travel demand forecasting model was used to estimate the overall background traffic growth in the region. Based on the travel demand model forecasts, 1.1 percent average annual growth rates were applied to the existing traffic volumes to develop future year 2027 No-Build peak-hour traffic volumes for each of the key intersections.

4.2 Future Land Use

Communities within the study area may adopt future land use plans, but those that have adopted local zoning ordinances develop one. Such is the case in Grayling, Frederic, Maple Forest and Roscommon Townships, where both zoning ordinances and Master Plans have been adopted. A composite of the future land uses planned in each community, excluding Frederic Township which does not regulate land development at a local level, was prepared and analyzed to identify development trends. Because much of the City of Grayling is developed, larger developments are likely to occur in the outlying townships. It is expected that future development will continue to spread from the City of Grayling into the townships as the availability of land near the city diminishes. See Figure 4-1 for a map of the projected future land use.

Future growth is planned on the remaining privately-owned land. Future commercial centers are planned at most of the expressway interchanges located within the study area. This supports the concept that by continuing the low-density pattern of development required due to the presence of publicly-owned land, Centers of commercial activity are anticipated at the following locations:

- I-75/County Road 612 (exit 264) interchange in Maple Forest Township
- I-75/I-75BL (exit 254) interchange at the south boundary of the City of Grayling
- I-75/Four Mile Road (exit 251) interchange in Grayling and Beaver Creek Townships
- US-127/Higgins Lake Drive (exit 244) interchange in Gerrish Township
- I-75/Military Road (exit 206) interchange in Lyon Township

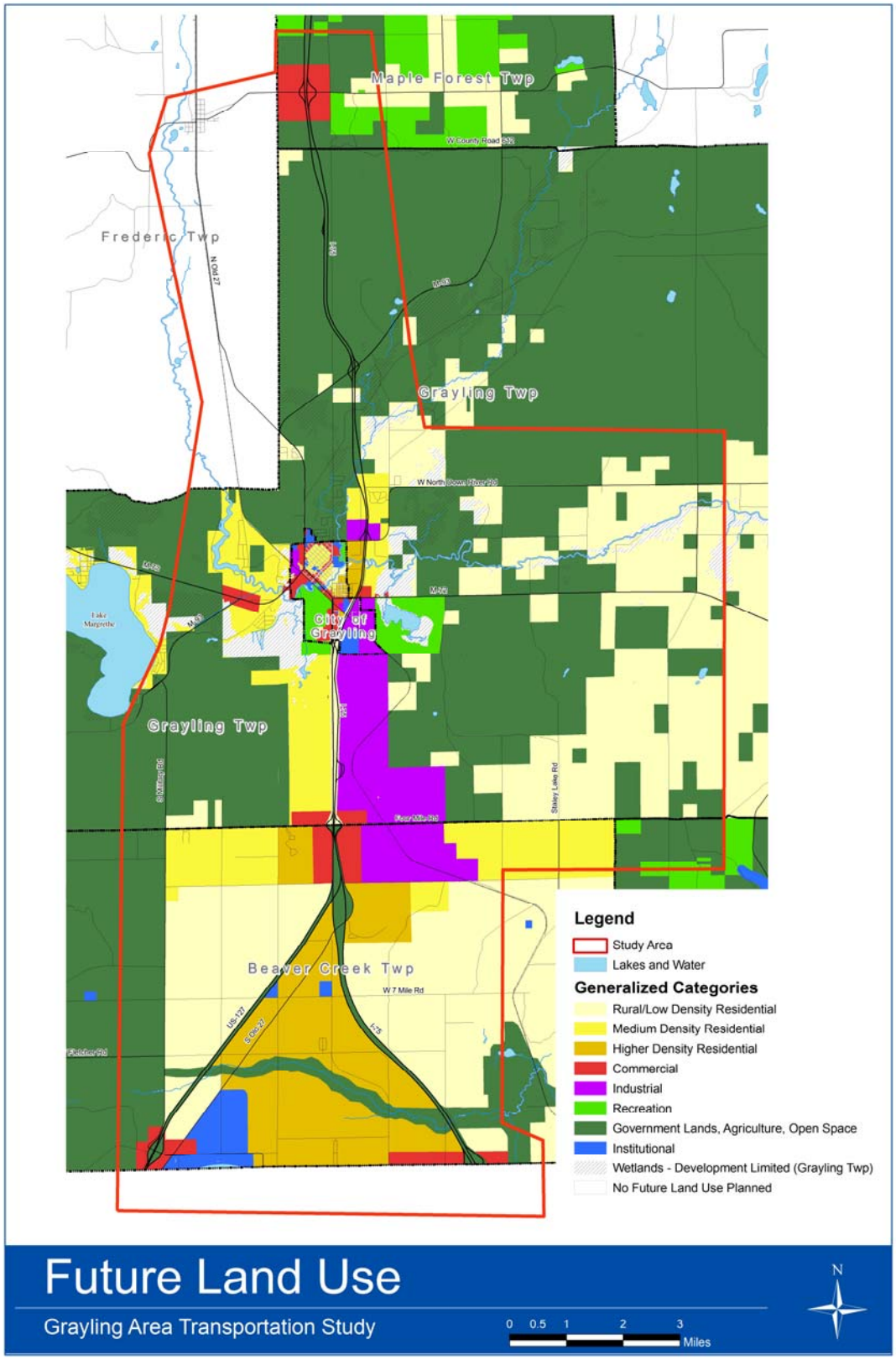
4.3 Economic Development

As noted earlier in this chapter, recent employment is in decline both locally and state-wide. The retail industry, which currently provides a large percentage of jobs in both Crawford and Roscommon Counties, is in decline due to current economic conditions. However, as the region continues to grow, the local economy is likely to shift away from manufacturing jobs to more service-related and professional jobs. This will require additional skills and education which may not currently be provided. Local economic development offices should consider ways to best match educational programming to these emerging job sectors.

Economic Development in Crawford County is likely to be centered around the City of Grayling, where the largest concentration of jobs is present. Some growth can be expected throughout the county as more people work from home via the internet or "commute" to work from outlying areas of the County. In particular, several medical employees at the Grayling Mercy Hospital commute from other areas of the state or come on temporary work visits. This suggests there may be opportunity for local residents to fill these positions, provided there are skilled workers avail-

able. Other opportunities for growth are expected in the retail service and resort recreation industries. The proposed Mainstreet America Theme Park at the city's south end could possibly become a catalyst for other growth in the area. Tourism is already a strong industry in Northern Lower Michigan, and both Crawford and Roscommon Counties could benefit if the proposed park can capture some of the through traffic traveling along I-75.

Figure 4-1
Future Land Use Map



4.4 Trip Generation for Future Development

Future changes in the project area are generally accounted for by using the growth rates described previously. However, the future Mainstreet America Theme Park, which is located just south of Grayling, Michigan is not included in the statewide model. Therefore, in addition to the No-Build volumes developed with growth rates, the future No-Build peak-hour traffic volumes generated by the planned Mainstreet America Theme Park were added. The theme park trip generation and distribution were estimated based on the traffic impact study report "Main Street America Theme Park Traffic Impact Study" dated in April 16, 2007 by the Mannik & Smith Group, Inc. The figures in Appendix D show the future No-Build a.m. and p.m. peak-hour turning movement volumes for each of the key intersections in the winter season, and show the future No-Build peak-hour volumes in the summer season.

4.5 Future Traffic Data & Conditions (2027) N0-Build Capacity Analysis

The future (2027) No-Build analysis consists of applying the 1.1% growth rate to 2007 traffic volumes, and adding the trips generated by the Mainstreet America Theme Park, and these resulting volumes were added to the existing street network, without any modifications to the geometry of the roadways. However, upgrades to the traffic signal systems, recommendations for signal coordination and already proposed MDOT project geometric improvements are included and the impacts of these enhancements, reviewed. The resulting traffic volumes for future (2027) No-Build, winter and summer peak-hours at the key intersections in the study area are shown in Appendix D.

The future (2027) No-Build winter and summer peak-hour levels-of-service for the morning and afternoon peak-hours at the key intersections are displayed in Table 4-1 through Table 4-7. Capacity analysis worksheets for all future 2027 intersection capacity analyses are included in Appendix D of this report.

TABLE 4-1
PEAK-HOUR LEVELS-OF-SERVICE AND DELAY – WINTER 2027-NO-BUILD
LOCAL ROADS STUDY AREA

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
North Down River/Alexia Ln	No	EB South Down River Rd	A	3.4	A	4.5
		WB South Down River Rd	A	0.0	A	0.0
		Alexia Ln	A	9.8	A	9.8
North Down River/Stephan Bridge	No	EB South Down River Rd	A	0.0	A	0.0
		WB South Down River Rd	A	2.3	A	3.3
		NB Stephan Bridge	A	9.7	B	10.1
		SB Stephan Bridge	A	0.0	B	10.2
Four Mile/Stephan Bridge	No	EB Four Mile Rd	A	8.5	A	8.4
		WB Four Mile Rd	A	0.0	A	0.0
		NB Stephan Bridge	A	0.0	A	0.0
		SB Stephan Bridge	A	0.0	A	0.0
Four Mile/Old US-27	No	EB Four Mile Rd	A	0.0	A	0.0
		WB Four Mile Rd	A	0.1	A	2.1
		Old US-27	A	9.9	B	12.1
Four Mile/ S. Military	No	Four Mile Rd	A	9.0	A	8.9
		NB Military Rd	A	0.0	A	0.0
		SB Military Rd	A	4.0	A	3.3
Military/N. Higgins Lake	No	Higgins Lake Rd	A	8.7	A	8.9
		NB Military Rd	A	0.0	A	0.0
		SB Military Rd	A	7.0	A	6.7
Legion/N.Higgins Lake	No	EB Higgins Lake	A	0.0	A	0.0
		WB Higgins Lake	A	0.0	A	0.0

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
		Legion	A	9.2	A	9.4
N. Down River/I-75BL	No	EB N. Down River	B	12.6	B	12.3
		WB N. Down River	C	20.4	B	14.4
		NB I-75	A	0.2	A	0.4
		SB I-75	A	2.7	A	1.3
N. Down River/Roberts/Michigan Av.	No	EB N. Down River	A	1.1	A	1.2
		WB N. Down River	A	6.3	A	5.0
		Michigan Av.	F	97.7	E	36.5
		Roberts	F	62.1	F	74.6
Johnson/Federal Hwy (S. State Line)	No	EB Federal Hwy	A	0.0	A	0.2
		WB Federal Hwy	A	0.0	A	0.0
		Johnson Rd	B	10.7	B	11.1

With the addition of 2027 background traffic and trips generated by future developments, all approaches in the local road study area during both peak-hours operate at LOS D or better during the winter, with the following exceptions:

- *N. Down River/Roberts/Michigan Ave.* –The northbound approach subsequently operates at LOS F during the morning peak-hour and LOS E during the evening peak-hour. The southbound approach operates at LOS F for both peak-hours. The northbound and southbound approaches operate with an unacceptable level-of-service because of the high volume of traffic and minimal gaps created on North Down River. With each approach sharing one lane for all turning movements, backups and delays will occur at both Roberts and Michigan Avenue.

TABLE 4-2
PEAK-HOUR LEVELS-OF-SERVICE AND DELAY – SUMMER 2027-NO-BUILD
LOCAL ROADS STUDY AREA

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
North Down River/Alexia Ln	No	EB South Down River Rd	A	3.0	A	4.8
		WB South Down River Rd	A	0.0	A	0.0
		Alexia Ln	A	9.7	B	10.3
North Down River/Stephan Bridge	No	EB South Down River Rd	A	0.0	A	0.0
		WB South Down River Rd	A	3.2	A	3.1
		NB Stephan Bridge	A	9.9	B	10.8
		SB Stephan Bridge	A	0.0	B	9.2
Four Mile/Stephan Bridge	No	EB Four Mile Rd	A	8.5	A	8.6
		WB Four Mile Rd	A	0.0	A	0.0
		NB Stephan Bridge	A	0.0	A	0.0
		SB Stephan Bridge	A	0.0	A	0.0
Four Mile/Old US-27	No	EB Four Mile Rd	A	0.0	A	0.0
		WB Four Mile Rd	A	0.1	A	0.9
		Old US-27	A	9.9	C	19.6
Four Mile/ S. Military	No	Four Mile Rd	A	9.0	A	9.7
		NB Military Rd	A	0.0	A	0.0
		SB Military Rd	A	3.1	A	3.2
Military/N. Higgins Lake	No	Higgins Lake Rd	A	8.8	A	9.8
		NB Military Rd	A	0.0	A	0.0
		SB Military Rd	A	7.3	A	6.6
Legion/N.Higgins Lake	No	EB Higgins Lake	A	0.0	A	0.0
		WB Higgins Lake	A	0.0	A	0.0

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
		Legion	A	9.7	B	10.1
N. Down River/I-75BL	No	EB N. Down River	B	12.7	B	14.1
		WB N. Down River	B	14.8	C	22.7
		NB I-75	A	0.3	A	0.4
		SB I-75	A	2.0	A	1.5
N. Down River/Roberts/Michigan Av.	No	EB N. Down River	A	0.6	A	1.1
		WB N. Down River	A	5.8	A	5.4
		Michigan Ave.	C	18.5	F	189.7
		Roberts	F	51.0	F	430.6
Johnson/Federal Hwy (S. State Line)	No	EB Federal Hwy	A	0.1	A	0.4
		WB Federal Hwy	A	0.0	A	0.0
		Johnson Rd	A	9.9	A	9.7

With the addition of 2027 background traffic and trips generated by future developments, all Local Road approaches in the study area during both peak-hours operate at LOS D or better during the summer, with the following exceptions:

- *N. Down River/Roberts/Michigan Ave.* –The northbound approach subsequently operates at LOS F during the afternoon peak-hour. The southbound approach operates at LOS F for both peak-hours. The northbound and southbound approaches operate with an unacceptable level-of-service because of the volume of traffic and minimal gaps created on North Down River. With each approach sharing one lane for all turning movements, backups and delays will occur at both Roberts and Michigan Avenue.

TABLE 4-3
PEAK-HOUR LEVELS-OF-SERVICE AND DELAY – WINTER 2027-NO-BUILD
M-72, M-93, OLD US-127 AND I-75BL STUDY AREA

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
M-72East/Stephan Bridge	No	EB M-72 East	A	1.0	A	3.0
		WB M-72 East	A	0.2	A	0.2
		NB Stephan Bridge	B	10.1	B	10.6
		SB Stephan Bridge	A	9.5	B	10.2
M-72 East/I-75BL	Yes	EB M-72	D	36.0	F	82.3
		WB M-72	C	26.7	D	43.6
		NB I-75BL	B	17.6	C	25.5
		State St.	A	3.2	A	6.1
M-72 West/M-93	Yes	EB M-72	B	20.0	B	19.5
		WB M-72	B	18.8	C	20.6
		NB Ole Down	B	18.2	B	18.4
		SB Ole Down	C	22.6	B	19.3
M-93/Wilcox Bridge	No	EB M-93	A	0.0	A	0.0
		WB M-93	A	0.4	A	0.1
		Wilcox Bridge	A	9.0	A	9.1
M-93/S.Military Road	No	EB M-93	A	0.0	A	0.0
		WB M-93	A	2.3	A	4.7
		S. Military Rd	A	9.3	A	9.1
Old US-27/Ward	No	EB Ward	A	8.7	B	12.1
		WB Ward	A	9.9	B	11.9
		NB Old US-27	A	0.0	A	0.5
		SB Old US-27	A	1.4	A	1.9
Old US-27/CR 612	No	EB CR 612	A	10.0	B	11.4
		WB CR 612	B	10.3	B	11.4
		NB Old US-27	A	1.2	A	1.1
		SB Old US-27	A	0.4	A	0.3
Old US-27/N. Higgins Lk.	No	EB Higgins Lake	A	0.0	A	0.5
		WB Higgins Lake	A	2.6	A	2.7
		NB Old US-27	A	8.7	A	9.2
		SB Old US-27	A	0.0	A	9.3
Old 27/Airport Rd	No	EB Airport Rd	A	9.1	A	8.1
		WB Airport Rd	A	9.9	A	9.2
		NB Old -27	B	14.0	A	8.1
		SB Old -27	B	11.6	A	9.2
I-75BL/State Street	No	State Street	B	12.1	C	19.8
		NB I-75 BL	A	0.0	A	0.0
		SB I-75 BL	A	0.2	A	0.2
I-75BL (James)/Michigan	Yes	EB Michigan	C	33.1	D	50.4
		WB Michigan	C	24.2	D	44.7
		NB I-75BL	B	12.5	B	10.3
		SB I-75BL	B	13.4	D	37.7
I-75BL (James)/M-72 West	Yes	NB I-75BL	B	11.9	B	18.3
		SB I-75 BL	C	30.7	D	51.2
		NEB M-72	C	27.1	C	26.2
		SWB M-72	C	20.5	D	36.8

With the addition of 2027 background traffic and trips generated by future developments, all approaches on the state trunklines in the study area during both peak-hours of winter operate at LOS D or better, with the following exceptions:

- *M-72 East/I-75BL*–This signalized intersection has a cycle length of 120 seconds. The east bound approach operates at LOS F during the afternoon peak-hour. This approach is going into a commercial development and therefore has minimal traffic signal timing allocated for this phase, thus creating backups and delays for the nominal amount of traffic entering the development.

TABLE 4-4
PEAK-HOUR LEVELS-OF-SERVICE AND DELAY – SUMMER 2027-NO-BUILD
M-72, M-93, OLD US-127 AND I-75BL STUDY AREA

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
				Delay (sec/veh)	LOS	Delay (sec/veh)
M-72East/Stephan Bridge	No	EB M-72 East	A	1.9	A	2.5
		WB M-72 East	A	0.3	A	0.2
		NB Stephan Bridge	B	10.6	B	12.9
		SB Stephan Bridge	A	9.7	B	11.1
M-72 East/I-75BL	Yes	EB M-72	D	36.3	F	99.8
		WB M-72	C	26.6	D	42.2
		I-75BL	B	19.8	C	30.3
		State St	A	9.1	B	12.2
M-72 West/M-93	Yes	EB M-72	C	20.6	C	20.2
		WB M-72	C	20.9	D	49.2
		NB Ole Down	B	18.7	B	19.7
		SB Ole Down	B	19.5	B	19.5
M-93/Wilcox Bridge	No	EB M-93	A	0.0	A	0.0
		WB M-93	A	7.4	A	1.1
		Wilcox Bridge	A	9.6	A	9.0
M-93/S.Military Road	No	EB M-93	A	0.0	A	0.0
		WB M-93	A	2.1	A	5.2
		S. Military Rd	A	9.2	A	9.6
Old US-27/Ward	No	EB Ward	B	10.4	B	11.2
		WB Ward	B	10.6	B	12.7
		NB Old US-27	A	0.4	A	0.4
		SB Old US-27	A	1.8	A	1.9
Old US-27/CR 612	No	EB CR 612	B	10.8	B	12.2
		WB CR 612	A	9.7	B	10.6
		NB Old US-27	A	1.0	A	1.1
		SB Old US-27	A	0.5	A	0.3
Old US-27/N. Higgins Lk.	No	EB Higgins Lake	A	1.4	A	0.3
		WB Higgins Lake	A	3.6	A	3.4
		NB Old US-27	A	8.8	A	9.9
		SB Old US-27	B	10.6	B	10.8
Old 27/Airport Rd	No	EB Airport Rd	B	14.7	C	18.1
		WB Airport Rd	A	8.9	A	9.6
		NB Old -27	B	11.3	B	10.8
		SB Old -27	B	13.4	C	15.7
I-75BL/State Street	No	State Street	B	11.5	C	23.3
		NB I-75 BL	A	0.0	A	0.0
		SB I-75 BL	A	0.2	B	0.2
I-75BL (James)/Michigan	Yes	EB Michigan	C	32.5	D	51.8
		WB Michigan	C	24.1	D	49.5

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
				Delay (sec/veh)	LOS	Delay (sec/veh)
		NB I-75BL	A	9.7	F	88.9
		SB I-75BL	B	16.9	D	36.5
I-75BL (James)/M-72 West	Yes	NB I-75BL	B	12.1	C	22.4
		SB I-75 BL	C	29.7	E	62.3
		NEB M-72	B	15.8	C	32.3
		SWB M-72	C	23.3	C	31.2

With the addition of 2027 background traffic and trips generated by future developments, all approaches in the study area during both peak-hours of the summer operate at LOS D or better, with the following exceptions:

- *M-72 East/I-75BL*–This signalized intersection has a cycle length of 120 seconds. The east bound approach operates at LOS F during the afternoon peak-hour. This approach is going into a commercial development and therefore has minimal traffic signal timing allocated for this phase, thus creating backups and delays for the nominal amount of traffic entering the development.

- *I-75BL (James)/Michigan Ave*.–This intersection operates under signalization utilizing a cycle length. Of 120 seconds The northbound approach subsequently operates at LOS F during the afternoon peak-hour. This approach has a tremendous amount of traffic volume for the through/right turn movement, which is the reason for the high delay and backups. Adjusting the signal timing phasing for this intersection would be difficult without affecting the other three approach level of services which currently operate at a LOS D.

- *I-75BL (James)/M-72 West* – This intersection is signalized with a cycle length of 120 seconds. The southbound approach operates at LOS E during the afternoon peak-hour. The afternoon peak-hour has a delay of 62.3 sec/veh. This delay is caused by the high volume of through/right southbound turning movements. The other approaches have far more traffic than the southbound approach therefore, it would be difficult to adjust the signal timing for each phase without affecting the other three approach level of services.

TABLE 4-5
PEAK-HOUR LEVELS-OF-SERVICE AND DELAY – WINTER 2027-NO-BUILD
I-75 & US-127 STUDY AREA

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Four Mile/I-75 NB Entrance Ramp	No	WB Four Mile Rd	A	0.0	A	0.0
		EB Four Mile Rd	A	3.2	A	3.9
		NB I-75 On Ramp	B	10.5	C	15.1
NB I-75 Ramp/Federal Hwy	No	EB Federal Hwy	A	3.0	A	1.5
		WB Federal Hwy	A	0.0	A	0.0
		NB I-75 Ramp	B	13.0	B	12.7
NB I-75Ramp/N. Down River	No	EB N. Down River	A	4.5	A	4.1
		WB N. Down River	A	0.0	A	0.0
NB I-75 Ramp/CR 612	No	EB CR 612	A	5.4	A	1.4
		WB CR 612	A	0.0	A	0.0
		NB I-75 Ramp	A	9.0	A	9.1
NB I-75 Ramp/M-93	No	EB M-93	A	4.6	A	4.4
		WB M-93	A	0.0	A	0.0
		NB Ramp	A	10.0	A	9.1
Four Mile/I-75 SB Exit Ramp	No	WB Four Mile Rd	A	1.8	A	3.7
		EB Four Mile Rd	A	0.0	A	0.0
		SB I-75 Exit Ramp	A	9.9	B	12.6
SB I-75 Ramp/Federal Hwy	No	EB Federal Hwy	A	0.0	A	0.0
		WB Federal Hwy	A	0.3	A	0.6
		SB I-75 Ramp	B	10.5	B	11.5
SB I-75 Ramp/N. Down River	No	EB N. Down River	A	0.0	A	0.0
		WB N. Down River	A	0.0	A	0.0
		SB I-75 Ramp	B	11.1	B	11.1
SB I-75 Ramp/CR612	No	EB CR 612	A	0.0	A	0.0
		WB CR 612	A	4.0	A	2.3
		SB I-75 Ramp	A	9.2	A	9.0
SB I-75 Ramp/M-93	No	EB M-93	A	0.0	A	0.0
		WB M-93	A	2.1	A	3.5
		SB I-75 RAMP	A	9.3	A	8.9
NB US-127 Ramp/N. Higgins Lake	No	EB Higgins Lake	A	2.8	A	0.4
		WB Higgins Lake	A	0.0	A	0.0
		NB US-127 Ramp	A	8.7	A	9.2
SB US-127Ramp/N. Higgins Lake	No	EB Higgins Lake	A	0.0	A	0.0
		WB Higgins Lake	A	3.0	A	3.0
		SB US-127 Ramp	A	9.1	A	9.6

During the winter, with the addition of 2027 background traffic and trips generated by future developments, all approaches for the I-75 Ramps and US-127 Ramps during both peak-hours operate at LOS C or better.

TABLE 4-6
PEAK-HOUR LEVELS-OF-SERVICE AND DELAY – SUMMER 2027-NO-BUILD
I-75 & US-127 STUDY AREA

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
NB I-75 Ramp/Four Mile	No	EB Four Mile Rd	A	3.6	A	5.1
		WB Four Mile Rd	A	0.0	A	0.0
		NB I-75 Ramp	B	11.0	E	40.9
NB I-75 Ramp/Federal Hwy	No	EB Federal Hwy	A	3.5	A	1.4
		WB Federal Hwy	A	0.0	A	0.0
		NB I-75 Ramp	B	13.5	C	15.2
NB I-75Ramp/N. Down River	No	EB N. Down River	A	3.5	A	4.7
		WB N. Down River	A	0.0	A	0.0
NB I-75 Ramp/CR 612	No	EB CR 612	A	5.4	A	2.0
		WB CR 612	A	0.0	A	0.0
		NB I-75 Ramp	A	9.1	A	9.4
NB I-75 Ramp/M-93	No	EB M-93	A	5.6	A	3.7
		WB M-93	A	0.0	A	0.0
		NB I-75 Ramp	A	10.0	B	10.6
SB I-75 Ramp/Four Mile	No	EB Four Mile Rd	A	0.0	A	0.0
		WB Four Mile Rd	A	1.5	A	6.0
		SB I-75 Ramp	B	10.3	E	43.2
SB I-75 Ramp/Federal Hwy	No	EB Federal Hwy	A	0.0	A	0.0
		WB Federal Hwy	A	0.6	A	0.6
		SB I-75 Ramp	B	11.0	B	13.0
SB I-75 Ramp/N. Down River	No	EB N. Down River	A	0.0	A	0.0
		WB N. Down River	A	0.0	A	0.0
		SB I-75 Ramp	B	11.0	B	12.8
SB I-75 Ramp/CR612	No	EB CR 612	A	0.0	A	0.0
		WB CR 612	A	3.0	A	1.8
		SB I-75 Ramp	A	8.9	A	9.1
SB I-75 Ramp/M-93	No	EB M-93	A	0.0	A	0.0
		WB M-93	A	3.0	A	4.5
		SB I-75 RAMP	A	8.9	A	9.8
NB US-127 Ramp/N. Higgins Lake	No	EB Higgins Lake	A	2.3	A	0.2
		WB Higgins Lake	A	0.0	A	0.0
		NB US-127 Ramp	A	9.2	A	9.6
SB US-127Ramp/N. Higgins Lake	No	EB Higgins Lake	A	0.0	A	0.0
		WB Higgins Lake	A	2.4	A	3.0
		SB US-127 Ramp	A	8.6	A	9.3

With the addition of 2027 background traffic and trips generated by future developments, all approaches in the study area during both peak-hours operate at LOS C or better, for the summer, with the following exceptions:

- *NB I-75 Ramp/Four Mile* - This intersection operates under stop control for the northbound movement. The northbound approach operates at LOS E during the afternoon peak-hour with an average approach delay of 40.9 sec/veh. The westbound traffic volumes are significant from the Mainstreet America Theme Park, which minimize the adequate gaps necessary for the northbound left turn movements, which are the highest traffic movement for this approach. A traffic signal at this terminal with the high volume of proposed future Mainstreet America Theme Park traffic is recommended in the Traffic Impact Study and would improve the traffic operations under the No-Build scenario.

- *SB I-75 Ramp/Four Mile*– This intersection operates under stop control for the southbound movement. The southbound approach operates at LOS E during the afternoon peak-hour with an average approach delay of 43.2 sec/veh. The westbound through and left turning traffic volumes are significant which minimize the adequate gaps necessary for the southbound left turn movements. A traffic signal at this terminal, with the high volume of proposed future Mainstreet America Theme Park traffic, is recommended in the Traffic Impact Study and would improve the traffic operations under the No-Build scenario.

4.7 Summary of Future (2027) No-Build Traffic Operations

The key intersections within the study area were analyzed with the traffic volumes for 2027. Congestion and delays in 2027 were quantified with traffic from the anticipated developments to understand the relative impact of local growth. The future "No-Build" analysis would not make any significant capacity revisions to the existing roadway system that were not already programmed projects. MDOT is currently in the process of creating design plans for the reconstruction of I-75BL in Grayling in 2009. The reconstruction of I-75BL from M-72 East to Charles Street will be expanded from a four lane cross section to five lanes and then transitioned back to four lanes from Charles Street to the AuSable River. The project will also include north of the AuSable River to M-72 West, converting the existing four lane cross-section to three lanes. This reconstruction will occur in 2009. This alternative does include traffic signal optimization measures that provide some benefit to improve travel time on the roadway network and reduce congestion. The results of this analysis clearly indicate that the roadway system is expected to experience an increase in delay and congestion due to growth in traffic volumes and the limited capacity of the intersections to accommodate the high-demand turning movements. The following intersections are projected to experience the greatest impacts, assuming no changes to the existing street network:

- *N. Down River/Roberts*/Michigan Ave.
- *I-75BL/M-72 West*
- *I-75BL/Michigan Ave.* (existing signalized intersection)
- *M-72 East/I-75BL* (existing signalized intersection)
- *NB I-75 Ramp/Four Mile Road*
- *SB I-75 Ramp/Four Mile Road*

With the increase in traffic volumes it is not surprising that travel times will increase by 2027 without any major improvements. The downtown business loop routes within the study area are expected to experience the greatest increases in travel times.

Additional operational improvements can be achieved with the following traffic signal enhancements:

- Update all existing traffic signal locations along the I-75 Business loop to actuated controller, requiring the installation of vehicle detection. These timings will require pedestrian push-buttons for crossing I-75 BL at M-72 East and at Michigan Ave. As pedestrian clearance times are based on estimated crossing distance, additional locations may require push-buttons if the 'flash don't walk' time exceeds the limit of vehicular splits.
- Actuated permissive-protected left turn phases, dog-house type of signal heads or 4-section heads with flashing yellow arrow would be necessary.
- All three existing signalized business loop intersections running actuated with coordination.

5.0 ALTERNATIVES AND ROAD IMPROVEMENTS

5.1 Description and Evaluation of Alternatives

A large number of conceptual alternatives for improving I-75 access were initially considered and presented to the Steering Committee. They have been narrowed down to several feasible alternatives located along I-75 and other roadways within the study limits, that were carried forward for first conceptual design review and then operational review. Additional geometric data and cost estimates for each the following conceptual alternatives is included in further depth in Appendix E.

5.1.1 North Down River Road Interchange

Currently the North Down River Road interchange is a partial interchange onto I-75, Figure 5-1, providing an entrance ramp for northbound (NB) I-75 traffic and an exit ramp for southbound (SB) I-75 traffic. These two existing ramps are diamond ramps that are located in the northeast and northwest quadrants. The existing ROW at the interchange restricts any work in the southern quadrants without acquisition of additional real-estate. North Down River Road is currently a two lane, two way roadway with narrow shoulders that runs east and west between I-75 and M-93. North Down River Road services the adjacent residential areas, access to downtown Grayling, as well, as commercial areas of Grayling, including a local medical park.

Figure 5-1: Existing I-75 & North Down River Road Interchange

Alternative 1

The main focus of the improvements at the North Down River Road interchange was to provide full access to I-75. This alternative adds a NB I-75 exit ramp and a SB I-75 entrance ramp. A standard diamond interchange ramp is proposed in the southeast quadrant to provide a NB exit ramp, Figure 5-2. Approximately 7.68 acres of additional limited access ROW is required for this ramp. The proposed ROW is currently vacant, forested land. The southwest quadrant of the interchange is not conducive to the addition of a ramp due to a significant number of residential buildings. To avoid these residential im-

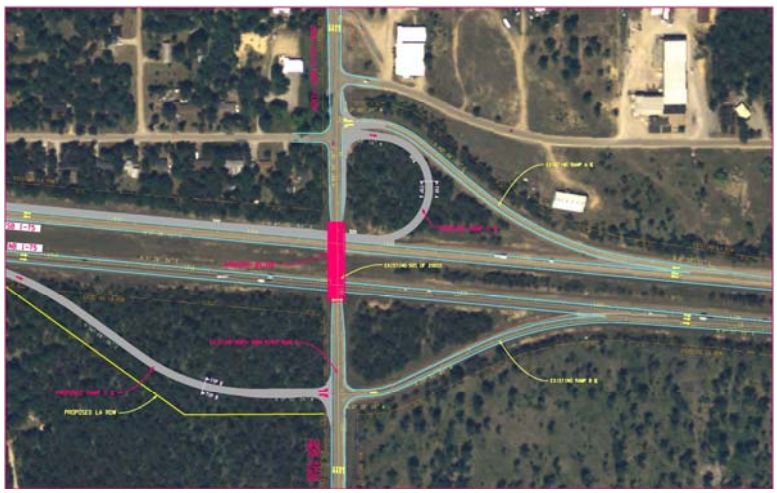


Figure 5-2: Alternative 1 I-75 & North Down River Road Interchange

pacts, a 182 foot radius loop ramp is proposed in the northwest quadrant between SB I-75 and the SB exit ramp. No additional ROW is required for the proposed loop ramp. Each of the ramps would tie into North Down River Road with stop controlled ramp terminals.

This alternative provides access to the City of Grayling via North Down River Road to Michigan Avenue. This alternative also provides full access to NB and SB I-75, M-72 via North Down River Road, and M-93.

With the upgraded ramp configurations, a new bridge consisting of three 12 foot lanes and two eight foot shoulders will have to be reconstructed to provide adequate width across the bridge as well as additional length (totaling approximately 260 feet) across I-75 for the new SB I-75 acceleration lane. An additional 12 foot width could be added, with additional costs, for non-motorized traffic, if desired. The new ramp lanes and shoulders have been designed to meet current MDOT standards. The ramp geometrics have been designed to meet MDOT standards (GEO-101, VII-131, and GEO-370). These new improvements, along with ROW, will cost approximately $4,769,000 for this alternative.

5.1.2 M-72 Interchange

The I-75 freeway currently passes over M-72 East at the edge of Grayling City limits, Figure 5-3. There are two separate structures, one for NB I-75 and the second for SB I-75. No access between I-75 or M-72 is currently permitted at this location.

Figure 5-3: Existing I-75 at M-72

Alternative 1

The first alternative reviewed to provide full access at the M-72 interchange was a Michigan tight diamond, Figure 5-4. This alternative will require approximately 4.46 acres of ROW in all four quadrants to construct the diamond ramps. Much of this ROW is commercial property where businesses will have to be relocated. In an effort to minimize the required ROW, retaining walls will be necessary to keep the ramps closer to mainline I-75. The final lengths and heights of the walls will be determined once a more detailed survey is acquired. Since the ramps will be close to mainline I-75, the NB and SB I-75 structures will also need to be

Figure 5-4: Alternative 1 I-75 & M-72 Interchange

replaced to ensure proper sight distance along M-72. With this alternative, the adjacent drives and local roads will need to be closed and traffic rerouted via the local road system, due to proximity of the ramp terminals both to the east and west of I-75.

The cost associated with the construction and ROW acquisition for this alternative is approximately $7,797,000.

Alternative 2

Alternative 2 is a similar option for providing full access to M-72, with tight ramps that deflect from I-75. Instead of standard terminals, the ramps meet, forming a single point urban interchange (SPUI) beneath the I-75 freeway, Figure 5-5. This configuration controls the interchange traffic with a single traffic signal and free flow right turn lanes. Approximately, 3.12 acres of commercial ROW and retaining walls will be required. However, this configuration allows the ramps to be closer to mainline, using less ROW than Alternative 1. The new interchange configuration will require new I-75 bridges to span the wider M-72 corridor above the ramp terminals. It is estimated that the structures will be approximately 285 feet long. Like Alternative 1, the adjacent drives and local roads will need to be closed and traffic rerouted due to proximity of the ramp terminals both to the east and west of I-75.

Figure 5-5: Alternative 2 I-75 & M-72 Interchange

The costs associated with the construction and ROW acquisition for this Alternative is approximately $8,699,000. Although ROW acquisition for this alternative is less than Alternative 1, this type of interchange has higher construction costs.

This alternative, along with Alternative 1, provides direct access to M-72 east, facilitating the adjacent industrial park and future service/employee entrance to the Mainstreet America Theme Park through the industrial park. Both configurations were designed to current MDOT standards (GEO-101, VII-131, and GEO-370) for interchange configuration, lane widths, shoulder widths, and curve criteria.

Figure 5-6: Existing I-75 Grayling Business Loop Interchange

5.1.3 I-75 Grayling Business Loop Interchange

The existing I-75 Business Loop interchange is a partial access interchange located at the southern limits of Grayling. Access is provided for SB I-75 entering traffic and NB I-75 exiting traffic, Figure 5-6. Theses two non-standard

ramps weave away from I-75 and become the I-75 Business Loop. There is a significant amount of existing ROW width in the vicinity of the interchange, however the wide median and sweeping curves of I-75 prohibit ramp reconfiguration without major modifications to the existing I-75 freeway.

Alternative 1

The first alternative developed for the I-75 Business Loop interchange is to provide full access to I-75 while minimizing the number of structures and maintaining the existing free flow conditions, Figure 5-7. To accomplish this, a NB entrance ramp and a SB exit ramp are needed. To accommodate the proposed interchange within the existing ROW, the NB and SB freeways were brought closer together by narrowing the median. This alternative requires reconstructing approximately 5,800 feet of NB and SB I-75 freeway. Having real estate on the outside of the freeway allows for a standard "right on/right off" ramp configuration that is consistent with driver expectation. With this Alternative, two standard diamond interchange ramps are proposed in the east half of the interchange. These single lane ramps will provide access to and from NB I-75. The ramp terminals meet at a roundabout intersection that sends traffic across a proposed structure (approximately 200 feet long) to the west side of I-75. At this point, the roadway turns north and becomes the I-75 Business Loop. The single lane roundabout provides free-flow traffic movement that doesn't require any additional traffic control. Due to public opinion regarding roundabout intersections, the roundabout could be replaced with a traditional stop controlled terminal.

Figure 5-7: Alternative 1 I-75 Grayling Business Loop Interchange

Realigning I-75 Business Loop further to the west will provide access for the SB I-75 ramps. A standard diamond interchange ramp extends south beyond the proposed structure over I-75 and ties into SB I-75 as an entrance ramp. For the SB exit ramp, a standard deflection off SB I-75 directs traffic away from mainline and then curves and terminates into the lengthened portion of the Business Loop. The interchange ties into the I-75 Business Loop providing access to gas stations, restaurants, and hotels for freeway traffic.

This configuration was designed to current MDOT standards (GEO-101, VII-131, and GEO-370) for interchange configuration, lane widths, shoulder widths, and curve criteria.

No additional ROW is required for the proposed interchange layout. The construction cost associated with this Alternative is approximately $8,133,000.

Figure 5-8: Alternative 2 I-75 Grayling Business Loop Interchange

Alternative 2

A second alternative for providing full access at the I-75 Business Loop inter-

change is a directional interchange. This method provides fully directional, free flow ramps. This interchange shifts NB I-75 to the west, thus creating a narrower median with SB I-75 and requires reconstructing NB I-75. The NB shift provides additional real estate within the existing ROW footprint to allow for a standard "right on/right off" ramp configuration that meets driver expectation. The new NB exit ramp deflects off NB I-75 and then curves back as a fly-over ramp that ties into the existing I-75 Business Loop, detailed in Figure 5-8. This ramp also merges with a SB exit loop ramp that has a radius of 180 feet. Both of these single lane ramps provide free flow movement with no traffic control. The SB I-75 Business Loop is proposed to be extended and have a loop fly-over ramp to tie into the right side of NB I-75 as well as a standard diamond entrance ramp onto SB I-75. Similar to the NB I-75 Business Loop ramp, the SB I-75 Business Loop ramp is free flow requiring no traffic control. The free flow movements on and off I-75 will tie directly into the I-75 Business Loop boulevard section. This configuration will provide direct access to local businesses, such as adjacent hotels, gas stations, restaurants, and convenience stores.
The design of this interchange was completed in accordance with MDOT standards for lane widths, shoulder widths, curve criteria, and acceleration lengths on the freeway (GEO-101, VII-131, and GEO-370). This Alternative requires approximately 5,000 feet of NB I-75 reconstruction, the construction of four new structures, and ramp reconstruction.

The realignment of NB I-75 provides adequate real estate for this interchange within the existing ROW. A small portion of ROW (approximately 0.63 acres) will be required for the SB exit ramp. The cost for this portion of ROW and construction for this alternative is approximately $9,895,000.

Figure 5-9: Existing I-75 & 4 Mile Road Interchange

5.1.4 Four Mile Road Interchange

The Four Mile Road interchange is currently a full-access interchange located south of Grayling, Figure 5-9. Four Mile Road is a two-lane, two-way road that crosses I-75. With the addition of the Mainstreet America Theme Park, the Four Mile Road interchange will incur a significant amount of additional traffic. The proposed alternatives were developed in coordination with the options presented by the Mainstreet America Theme Park Traffic Impact Study and to help increase the traffic capacity of the interchange while maintaining acceptable levels-of-service.

Alternative 1

The first alternative for the Four Mile Road interchange is to increase terminal capacity and add additional turn lanes along Four Mile Road without changing the vertical and horizontal alignment and configuration of the interchange. This alternative is consistent with the first phase of recommendations presented in the Mainstreet America Theme Park Traffic Impact Study, see Figure 5-10.

Figure 5-10: Alternative 1 I-75 & 4 Mile Road Interchange

A two-way center left turn lane is proposed through both ramp terminal inter-

sections along with a 330 foot EB right turn lane off Four Mile Road onto the SB I-75 entrance ramp and a right turn lane continued from the five lane cross-section east of I-75 that terminates at the NB I-75 entrance ramp. Each terminal intersection will be controlled by a traffic signal. The SB I-75 exit ramp terminal has an added 250 foot turn bay to allow both right and left turning movements, as well as, turn storage. The proposed NB I-75 exit ramp has been realigned to become a two lane exit ramp. It also develops a third lane at the terminal to service dual right turns, as well as, a single left turn. In order to accept the dual right turns from the NB I-75 exit, Four Mile Road must be widened to a five lane cross-section including two EB through lanes, a two-way center turn lane, a WB through lane, and a WB right turn lane into the NB I-75 entrance ramp. The costs associated with the development of this five lane cross-section is not included with this alternative but will be included with the development of the Mainstreet America Theme Park. In this alternative, the existing Four Mile Road Bridge over I-75 is left in place. This bridge restricts the width of the roadway to only one lane in each direction and limits the vertical sight distance at the terminals. These restrictions control the storage lengths of the turn lanes which prohibits expansion over this structure.

This alternative will require additional ROW along Four Mile Road for the widening of the corridor and is further expanded on in the discussion of the Four Mile Road corridor. The cost for the proposed construction is approximately $1,446,000.

Alternative 2

Alternative 2 for Four Mile Road, is a second option for providing increased capacity to the interchange to accommodate growth in the area and additional phases of expansion of the Mainstreet America Theme Park. Figure 5-11 details the creation of additional ramp movements to the existing interchange configuration. Heavy traffic movements from NB I-75 to EB Four Mile Road and heavy movements from WB Four Mile Road to SB I-75 created by the Mainstreet America Theme Park, requires additional free flow ramp configurations. In this alternative, these movements are accommodated by a NB I-75 dual exit ramp and a free flow loop ramp with a 230 foot radius for WB to SB I-75 traffic.

Figure 5-11: Alternative 2 I-75 & 4 Mile Road Interchange

The NB I-75 exit ramp is realigned within the existing Old US-27 ROW where Old US-27 has been removed and realigned with the first entrance drive to the proposed Mainstreet America Theme Park. The proposed loop ramp in the northwest quadrant requiring realignment of the existing SB exit ramp to fit the loop ramp while meeting current MDOT design standards (GEO-101, VII-131, VII-330, and GEO-370). In addition to the SB exit ramp being realigned, the SB entrance ramp will also have to be realigned to tie into the acceleration lane of the SB I-75 loop ramp to provide adequate acceleration lane width and length for both entrance ramps.

In order to realign the ramps, Four Mile Road will need to be widened to a five lane cross-section across I-75. This widened cross-section will allow for turn lanes and storage for all ramp movements with minimal impacts to through traffic. The costs associated with the development of this five lane cross-section is not included with this alternative but will be included with the development of the Mainstreet America Theme Park. This alternative includes a widened structure over I-75 that will accommodate a five lane cross-section, upgraded shoulder widths, and additional width for a non-motorized path.

This Alternative will require approximately 10.1 acres of ROW along the west side of the I-75 corridor for the realignment of the SB I-75 exit ramp and the EB to SB I-75 entrance ramp. This ROW required will affect the commercial property in the NW quadrant of the interchange. Retaining walls may be used to minimize the impacts on adjacent property, however, a more detailed survey will be required to finalize the required lengths. The additional width of Four Mile Road will also require ROW. The combination of ROW costs and construction cost total approximately $7,341,000.

Alternative 3

A third alternative to increase the interchange capacity while minimizing ROW is the development of a single point interchange (SPUI), Figure 5-12. This type of interchange is designed to accommodate large volumes of traffic, especially left turning vehicles, in areas where ROW restricts larger, more traditional interchanges.

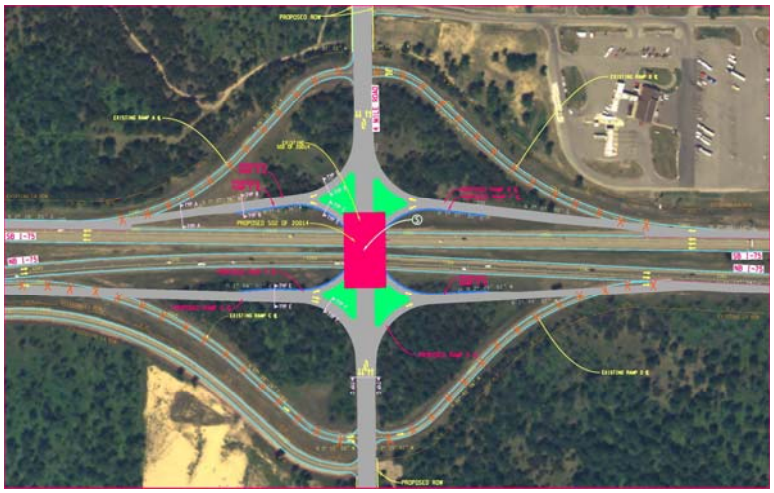


Figure 5-12: Alternative 3 I-75 & 4 Mile Road Interchange

The single point interchange has four tight diamond ramps that deflect from I-75 and meet at a central point (signalized intersection) above the freeway on a single structure. The traffic follows lane lines across the bridge to facilitate multiple movements at the same time. Several of the ramp movements are free flow; however, traffic signals above the structure are required to control conflicting left turn and through traffic movements. To provide the tight proximity of the ramps to I-75, retaining walls need to be placed in coordination with the structure. The size and limits of the retaining walls can be determined once a more detailed survey is obtained.

On Four Mile Road there is a five lane cross-section to the east of I-75 which ties into the proposed Mainstreet America Theme Park cross-section. Additional ROW is required for the proposed widening along Four Mile Road, but no ROW is required along the interchange ramps. The ROW along Four Mile Road is further expanded on in the discussion of the Four Mile Road corridor. Critical limited access ROW is maintained for the length of MDOT's current ROW to avoid adjacent driveways from impacting on the performance of the SPUI and Four Mile Road. The ROW and construction costs for this alternative total approximately $15,146,000.

Figure 5-13: Existing I-75 Grayling Business Loop

5.1.5 I-75 Business Loop/M-72 East Intersection

The existing I-75 Business Loop/M-72 East intersection is a signalized intersection within the City of Grayling. Figure 5-13 details the large curve on the I-75 Business Loop which compounded with the close proximity of the State Street intersection, significant number of driveway access points, and signalized intersections. The alternatives developed for this intersection are set to improve the geometrics, reduce the complexity of Wayfinding associated with the intersection and ultimately the capacity of the intersection.

Alternative 1

The first alternative for the I-75 Business Loop/M-72 intersection is to eliminate the signalized intersection and replace it with a four leg roundabout as shown in Figure 5-14. This two lane roundabout, with 62 foot inside turning radius and 180 foot outside diameter, enables free flow movement for all directions while encompassing the I-75 Business Loop, M-72 East, and State Street. All movements would move through one common point, decreasing conflicting movements. The placement of this roundabout is designed to facilitate the offset location of State Street. This configuration would require approximately 0.25 acres of additional ROW to construct the two lane roundabout, and additional access management for the control of adjacent driveways. Commercial parking lots adjacent to the roadway currently occupy the ROW required for this Alternative. Parking space numbers and driveway access will have to be reviewed and analyzed for this alternative once a more detailed survey is obtained.

Figure 5-14: Alternative1 I-75 Grayling Business Loop

The cost for additional ROW and construction of the roundabout and corresponding roadwork total approximately $510,000.

Alternative 2

The second alternative for the I-75 Business Loop/M-72 East/State Street intersection requires additional signs to restrict movements and the installation of a traffic signal at the I-75 BL and Charles Street intersection. The large skew angle and short distance of the I-75 Business Loop/M-72 East intersection to the I-75 Business Loop/State Street intersection create challenging travel patterns with traffic entering the I-75 Business Loop from several closely spaced locations. This alternative was developed to limit the access in and out of State Street at the I-75 Business Loop intersection. With the use of signing, left turns from State Street to the Business Loop and from the Business Loop to State Street will be prohibited. This traffic control will only allow right turns onto State Street and right turns off State Street onto the I-75 Business Loop. Permitting only right turns will eliminate numerous conflicting movements associated with left turning maneuvers.

This alternative may be coordinated with reconstruction of the I-75 BL, as well as, work at Charles Street and Alger Street that is proposed by the City of Grayling. The State Street and I-75 Business Loop can be configured with the M-72 intersection through the use of signing, pavement markings, and a traffic signal at the I-75 BL and Charles Street. With the additional work being proposed on Charles Street and Alger Street, alternative routes around State Street will be easily achieved without increased inconvenience to the driver.

5.2 Corridor Improvements

In addition to the freeway interchanges and highway intersections, the corridors that connect them throughout the study area were also reviewed. Improvements to these corridor roadways can increase traffic capacity, improve access to the City of Grayling, and facilitate the growth of non-motorized traffic within the project limits. The following are corridor improvements discussed in detail.

5.2.1 North Down River Road Corridor

With the potential of a full access interchange located at North Down River Road and I-75, the corridor of North Down River Road would become a main arterial to the City of Grayling. The additional traffic created by the development of a full access interchange would require improvements/expansion to the existing corridor from M-93 to just east of the freeway interchange.

The increased traffic and diversity (commercial and military vehicles) would create additional wear to the structure of the North Down River roadbed. North Down River Road will need to be reconstructed with the appropriate pavement structure. The reconstruction of this roadway would include full removal of the existing road with new subbase, aggregate base, and pavement, and placement of a three lane cross-section with full width shoulders for use by non-motorized vehicles. The wider cross-section along this section of North Down River Road will require replacement of the bridge over the Au Sable River. This bridge should be constructed wide enough for a three lane cross-section (36 feet) with adequate space for a 12 foot shoulder/non-motorized traffic lane and a positive barrier separation between vehicular traffic and multimodal traffic.

To keep the added traffic flowing along North Down River Road, a center left turn lane will be added to the two through lanes of traffic. This added lane would be used by vehicles turning left onto the local City of Grayling streets and adjacent driveways allowing the remaining traffic to pass by uninterrupted. Also, wider shoulders (8 foot paved) should be provided for possible vehicle breakdown and non-motorized vehicles. In addition to road improvements, a traffic signal at the intersection of North Down River Road and M-93 would be required to accommodate the additional westbound left-turning traffic originating from the freeway with destinations on the west side of Grayling.

The cost associated with reconstructing the North Down River Road corridor is approximately $1,644,000.

5.2.2 I-75 Business Loop Corridor

The existing I-75 Business Loop corridor from M-72 West to the I-75 interchange is a main arterial for the City of Grayling. Commercial trucks coming through the I-75 Business Loop cause additional congestion due to narrow lane widths (~10'), tight turning radii, and numerous drive way access points. Another factor in the congestion of the Business Loop is access management for cross streets and driveway access. The I-75 Business Loop is scheduled to be reconstructed in 2009, from M-72 East to M-72 West by MDOT. The reconstruction from M-72 East to Charles Street will be expanded from a four lane cross section to five lanes and then transitioned back to four lanes from Charles Street to the AuSable River. The project will also include north of the AuSable River to M-72 West, converting the existing four lane cross-section to three lanes. This project will incorporate the current state standards including: curve radii, lane widths, shoulder widths, and updated drainage. The City also plans to install a new traffic signal at the intersection of the I-75 BL and Charles Street. In an effort to increase level-of-service through the corridor, signal timing is currently being analyzed and will be further reviewed and updated accordingly with the modification to the new cross-section. This 2009 construction project will also consolidate and eliminate drives through access management.

5.2.3 M-72 East Corridor

The M-72 East corridor is currently a two lane, two way roadway that runs from the I-75 Business Loop to the east of the freeway. If a full access interchange is constructed at I-75 and M-72 East, this highway will need to be upgraded and widened to account for the additional traffic. This would be accomplished with widening M-72 to a cross-section with three 12 foot lanes, the center lane being a two-way left turn lane. Separating the left turning movements from the through lane will help maintain traffic flow through the corridor. In addition to the added lane, shoulders would be widened and improved to meet current standards.

If a full access interchange is not constructed at I-75, the M-72 corridor on the east side of I-75 will still need to be upgraded and widened. Currently the two lane roadway passes the entrance to the Industrial Park which has a large volume of truck traffic. In addition to the truck traffic, the Industrial Park will be a secondary service/employee entrance to the Mainstreet America Theme Park on Four Mile Road. With the additional traffic and truck traffic, the M-72 corridor should be widened to a three lane section from the I-75 overpass through the Industrial Park entrance to allow for a center, two way left turn lane based on the traffic volumes and percent of traffic volume turning along M-72 East (MDOT Traffic and Safety Note 605A).

The cost for widening and upgrading the M-72 East corridor are approximately $650,000 and does not include any ROW impacts that will need to be further reviewed, with the use of a full survey (topographical and ROW).

5.2.4 M-72 West Corridor

The M-72 West corridor has been continually updated over the past ten years. These updates include reconstruction and widening of the highway to a variable four to five lane cross-section, non-motorized paths, curb and gutter, and streetscape features. The majority of the work was completed from the M-72 West/I-75 Business Loop intersection westerly to the limits of the M-72 West/M-93 intersection. No additional work to the M-72 West corridor is required.

5.2.5 Four Mile Road Corridor

The existing Four Mile Road corridor from Military Road to the I-75 interchange is a two lane, two way roadway. The Mainstreet America Theme Park has proposed a five lane cross-section that will extend from the limits of the Mainstreet America Theme Park entrances westerly to the Four Mile Road and I-75 interchange. This corridor improvement will help traffic congestion and turning movements between the Mainstreet America Theme Park and the I-75. These improvements that are also being developed and implemented on behalf of the Mainstreet America Theme Park project include the realignment of Old US-27 with the first Mainstreet America Theme Park entrance drive.

To compliment the proposed improvements to the corridor in the vicinity of the Mainstreet America Theme Park, additional improvements should be made from I-75 westerly to Military Road, to sustain the interchange recommendations proposed by the Traffic Impact Study. The five lane cross-section to the east should be carried across the I-75 interchange where the two outside turn lanes can be dropped along with the center left turn lane after the entrance to the truck stop and a two lane cross-section, with widened shoulders (8 foot paved), carried to Military Road. With the widening of Four Mile Road, the existing pavement structure should be rehabilitated to support the additional traffic. The 8 foot shoulders will help increase capacity and also provide width for potential pedestrians and non-motorized development.

The reconstruction cost of the two lane roadway with widened shoulders including ROW along the Four Mile Road corridor is approximately $2,263,000.

5.3 Alternate Routes/By-Pass

Through the study process, alternate routes, or by-passes, were detailed as a method that should be reviewed to improve traffic flow through the congested areas of Grayling. Currently in the Grayling area, traffic that chooses to

travel from I-75 to Traverse City via M-72 West must exit the freeway at the I-75 BL and travel through Grayling to continue on M-72 West. This added traffic that doesn't intend on stopping is still required to filter through other City traffic. M-72 East is also located away from an I-75 interchange; therefore traffic traveling east is required to travel through Grayling to reach M-72 East as well. Traffic that desires to return to I-75 from Traverse City via M-72 West must determine to head north or south. Traveling north on I-75 from M-72 West requires entrance onto the freeway at the North Down River Road interchange, or heading further north to the M-93 interchange. Traveling south on I-75 from Traverse City requires traffic to be routed through the City of Grayling to the south onto the I-75 Business Loop where it has an entrance ramp onto SB I-75.

A signed alternate route would allow through traffic to by-pass the city and alleviate additional, unnecessary congestion. Slower moving trucks could also avoid tighter turns associated with the Downtown, narrow bridge crossings, and a significant number of driveways that impact commercial vehicles could be minimized by the use of a by-pass.

5.3.1 Military Road Route

Military Road is one option for an alternate by-pass route (truck or vehicular). Traffic wishing to head towards Traverse City on M-72 West from US-127 can exit the freeway at the Higgins Lake exit (Exit #206) and head north on Military Road. Military Road then intersects M-93 which heads north to M-72 West.

Currently traffic heading north on US-127 that desires to head on M-72 West towards Traverse City must merge onto I-75 and exit onto the I-75 Business Loop. The traffic then heads through Grayling and turns onto M-72 West. A signed by-pass route, with some road rehabilitation to Military Road and M-93, could reduce this traffic from the City and ultimately lower traffic congestion.

Road improvements that could be implemented along the Military Road route would be an overlay of the existing pavement along with widening of the shoulders, if necessary. This will make the route more desirable for by-passing traffic. The cost of this construction work is approximately $2,616,000. The cost associated with the signing of the by-pass route is approximately $10,000.

One additional caveat to the Military Road by-pass route is the road grades near the intersection of Military Road and M-93. This long grade makes it undesirable for trucks to use this route because of the time loss climbing the hill after a stopped condition. The alignment of Military Road can be altered to help alleviate a portion of the grade as well as remove the stop condition. This by-pass upgrade would require approximately 1700' of road construction, involving a substantial amount of embankment as well as the additional take of new ROW. This reconstruction would cost approximately $1.3 million. In addition, approximately 7.80 acres of ROW, currently owned by the State of Michigan would need to be acquired by Crawford County prior to construction.

5.3.2 Four-Mile Road Route

Another option for an alternate by-pass route is similar to the Military Road Route, but instead of just US-127 traffic, all NB traffic from US-127 and I-75 can exit at the Four Mile Road interchange (Exit #251). Once on Four Mile Road, traffic will head west and intersect Military Road, at which point it will follow Military Road to M-93, and finally M-72 West.

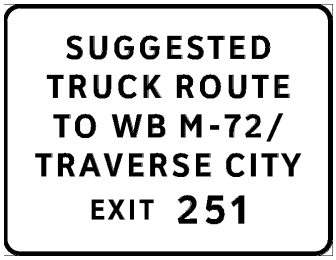


Figure 5-15: Potential Truck Route Sign

This route would allow traffic that wishes to reach M-72 West (Traverse City) from NB US-127 or I-75 can do so without going through the City of Grayling. For the by-pass to be effective, alternative route signs and road rehabilitation to Four Mile Road, Military Road, and M-93 would be required. Approximately $5,000 would be needed to install signing along the proposed route. Figure 5-15 details the proposed freeway signing required for the adoption of the by-pass route. This alternate route would lower traffic congestion on the I-75 Business Loop and potentially support through truck traffic.

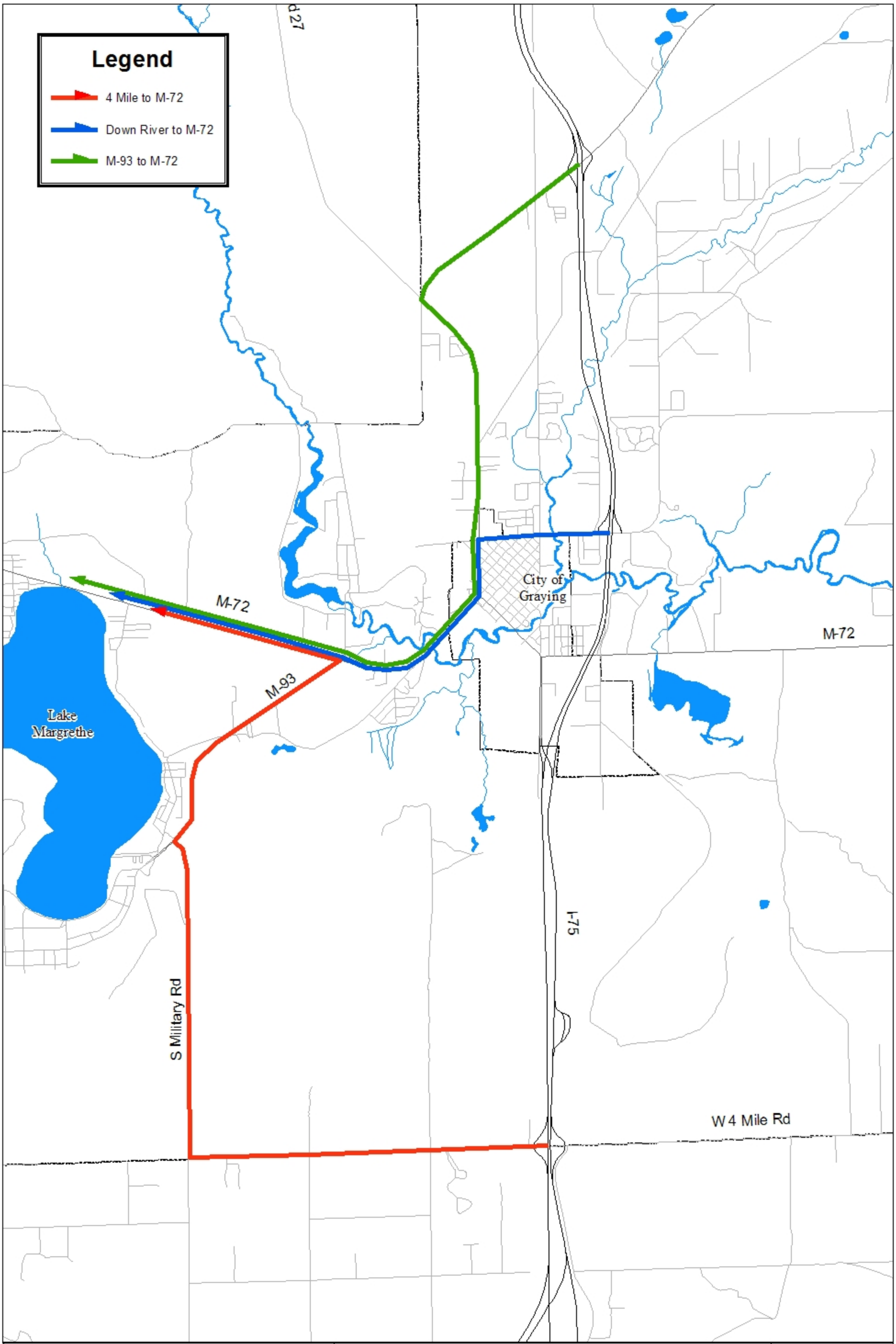
5.3.3 North Down River Road Route

North Down River Road is an east/west road that runs on the north side of the City of Grayling. Currently, North Down River Road has a partial interchange providing access to I-75 for NB entrance traffic and SB exit traffic. If a full access interchange is added, North Down River Road would become a major access point for Grayling, as well as a route that could efficiently access M-72 West.

Figure 5-16: Potential By-Pass Sign

Traffic on I-75 wishing to travel west towards Traverse City via M-72 West could exit at North Down River Road and follow it to M-93 which leads to M-72 West. Figure 5-16 details the proposed signing that could be installed along the route to redirect traffic. This alternate route would allow traffic to get a more direct route to Traverse City via M-93 and M-72 West. Currently, no signing is present at North Down River Road. Traffic from the north heading into Grayling and wishing to access M-72 West is directed to exit at the M-93 interchange. Also, traffic from the south is directed to exit I-75 at the I-75 Business Loop at which point they must travel through the City of Grayling to access M-72 West towards Traverse City. An alternate route along North Down River Road would alleviate unnecessary non-destination trips along the I-75 Business Loop.

To make the alternate route work efficiently, a full access interchange at North Down River Road would be required, along with proper route signing, road widening, a traffic signal at M-93 and North Down River Road, and road rehabilitation along North Down River Road from I-75 to M-93. The cost associated with the proposed signing is approximately $5,000, while the roadwork estimates are included under the corridor enhancements. See Figures 5-17 which illustrates all the above mentioned alternate by-pass routes.



Routes from I-75

Figure 5-17

5.4 Access Management Concepts

Widening and intersection improvements improve traffic operations along a road. Given limited funds and the sometimes negative impact of road widening, the Grayling area needs to promote programs that can better manage the existing system. One technique to help preserve capacity and promote safety while delaying or avoiding the need for costly or disruptive widening is access management. Access management involves standards that regulate the number, spacing and design of access points, and require the use of shared access systems where practical. Those standards minimize conflict points, reduce the potential for crashes and help preserve the road's ability to carry traffic. Access management protects the public investment in the roadway by minimizing congestion and crash potential but still provides property owners with reasonable, though not always direct, access.

Access management is generally implemented either as part of road reconstruction or improvements or application of standards as sites are proposed for development or redevelopment. Consequently, access management requires a joint effort between MDOT, the Road Commission and local government in terms of both standards and review. Accordingly, the local zoning ordinances are important tools for implementing access management concepts. An access management plan was previously prepared for the M-72 Corridor which resulted in the development of an overlay zone for the corridor as a means of implementing the study recommendations. Both the City and Township of Grayling have adopted basic access management standards into their Zoning Ordinances. Both ordinances regulate the number, width and spacing of driveways. These regulations could be expanded to include standards for alternative access points, medians, and sight distance, as discussed below. The recommendations presented in the M-72 Corridor Access Management Plan led to several driveway closures, modifications and relocations along M-72, when the portion west of the City of Grayling was reconstructed. This has improved both the function and aesthetics of the corridor.

Crawford County and local governments should work together to implement the standards suggested here. These guidelines generally relate to a subdivision or site plan of a particular development that is being reviewed at the local level, but also relate to the public right-of-way, which typically falls under the jurisdiction of the road agency (either MDOT or Crawford County Road Commission). Thus implementation of these guidelines will require coordination with those two agencies so that driveway permits are not granted until all access requirements are met through the site plan approval process. The Access Management Guidebook, developed by MDOT and a number of Michigan Road Commissions, can be used as a resource to familiarize local municipalities with the various tools available and how to implement them.

The number of access points (i.e. driveways) should be limited to one per development where practical. Every effort should be made to limit the number of driveways and encourage access using side roads, service drives, frontage roads, or shared driveways. Along major roads, access points should be properly spaced from one another and from nearby road intersections. Access points should also be aligned with those across the road or should be properly offset following the accepted standards or guidelines. The basic principles of Access Management are discussed below, along with suggested standards that should be considered in the Grayling area.

Number of Access Points. Access to a development should consist of either a single two-way driveway or a pair of one-way driveways. Certain developments can be considered for additional driveways, such as:

1. Uses that generate significant traffic may be considered for more than one driveway. Where possible, these second access points should be located on a side road or shared with adjacent uses. Some suggest that

uses expected to generate over 400 trips in the peak-hour or 4000 vehicle trips per day may require additional accesses. Traffic impact studies, provided by the developer, can help determine the anticipated increase in traffic to determine whether it qualifies for additional driveways.

2. Larger parcels with major road frontages of at least 300 ft. may be allowed additional driveways. Additional driveways should only be considered following the submittal of a traffic impact study which demonstrates the need for additional access.

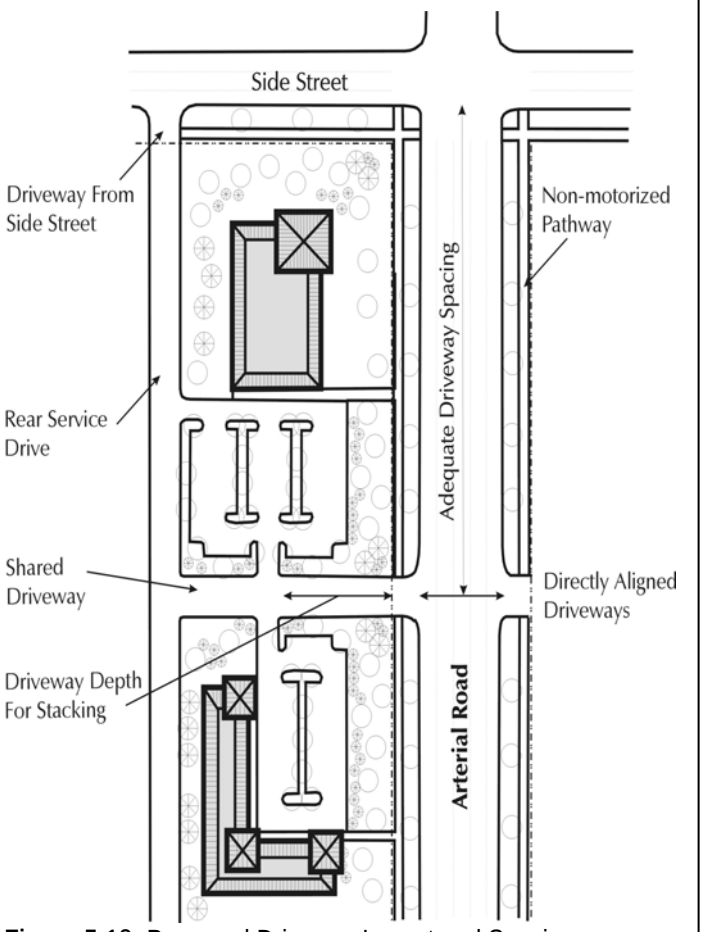


Figure 5-18: Proposed Driveway Layout and Spacing

Where parcels have frontage on both a major road and a side road, access should be provided off of the side road or should use alternative access, as described below.

Alternative Access. Along major or arterial roads, alternative access should be encouraged that uses shared driveways, rear service drives, frontage roads, or cross-access connections between parking lots. In some cases certain turning movements, especially left turns, should be limited where safety hazards may be created or where traffic flow may be impeded. Left turn restrictions may be lifted if improvements are made to the road, such as the installation of a turn or passing lane.

Alternative access should be sought more aggressively in areas located within one-quarter mile of and existing or planned signal locations. In these situations, use of rear service drives is ideal since they allow for better on-site stacking than "frontage" roads. Service drives, rear access drives, frontage roads and shared driveways should also be sought in areas where lot sizes are narrow or where existing driveways are so numerous that they impede the flow of traffic. By focusing traffic to a few strategically placed entrance points, slower turning traffic can use an alternative access drive and move out of the flow of through traffic.

In developing areas, development proposals should include provisions for future frontage or service drives, but may use direct access to the major road on a temporary basis until the frontage or service drive is constructed. Use of cross-access easements can accommodate connections between parking lots until a more formal service drive can be created. Temporary driveways and access points should be closed when the frontage road or service drive is constructed.

Local communities, the Crawford County Road Commission and MDOT should establish standards that can be incorporated into local ordinances to address right-of-way setbacks, driveway throat depths, location of parking, and standards for frontage roads and service drives.

Sight Distance. Due to sight distance limitations on some roads there may be fewer locations appropriate for driveway placement. Sight distance is needed to ensure vehicles entering the transportation system have adequate visibility of oncoming traffic. Minimum sight distance requirements are determined by the government agency with juris-

diction over the roadway. If minimum distances cannot be met, indirect access through another property or side road should be sought. Municipalities in the study area should coordinate with MDOT and the Crawford County Road Commission to implement the appropriate sight distance requirements for their area.

Driveway Spacing and Location. The spacing of driveways from intersections and other driveways will assist in the reduction of turning movement conflicts. Some general guidelines are as follows:

1. Spacing from Expressway Ramps. A minimum of 600 ft. is recommended between expressway ramps and any driveway.

2. Spacing from Intersections. The minimum distance, on the same side of the road, between a driveway and an intersecting road should be 100 ft. along a major road and 250 ft. from any existing or future signalized intersection. In cases where spacing cannot be met, a right turn in, right turn out driveway could be considered for access, with left turns accommodated through shared driveways located farther from the intersection, frontage roads, service drives or side streets. For non-major road roads spacing from intersections is recommended to be 75 ft. See Table 5-1 for the spacing requirements. If the amount of road frontage is not sufficient to meet these criteria, the driveway should be constructed along the property line farthest from the intersection to encourage future shared use, and/or a frontage road or rear access service drive should be developed.

TABLE 5-1
MINIMUM DRIVEWAY SPACING FROM INTERSECTION

Location of Access Point	Type of Intersecting Road	Minimum Spacing for a Full Movement Driveway	Minimum Spacing for a Driveway Restricting Left-turns
Along an arterial road	Expressway ramp	600	600
	Another arterial	300	125
	Median opening	N/A	75
	Collector or local	200	125
Along a collector road	Any road	125	75
Along a local street	Any road	75	50

These guidelines can also generally be applied to spacing from access points on the opposite side of the road. Preferably, major access points should be aligned with, or 250 ft. from, major access points on the opposite side. The actual dimension will vary depending upon existing and expected turning movements. Deviations from these guidelines should only be considered if it can be demonstrated by a traffic impact study that the driveway operation will not result in conflicts with vehicles at the adjacent intersection. Traffic impact studies should be required.

A detailed traffic impact statement should be required for larger developments that will generate higher volumes of traffic, generally measured as more than 100 peak-hour directional trips or 750 or more trips on an average day. The study should include an evaluation of traffic impacts at each of the site's access points and nearby intersections.

The traffic impact study should include trip generation rates based on the most recent edition of Trip Generation published by the Institute of Transportation Engineers. The traffic impact study should address site access issues, such as the potential to share access or use service drives, and should identify the likely impact the project will have on local levels-of-service, either along adjacent roadways or intersections. The study should analyze options to mitigate traffic impacts, including needed changes to access or improvements to the roadway or intersection.

TABLE 5-2
DRIVEWAY SPACING GUIDELINES

Posted Speed (mph)	Driveway Spacing* (in feet)	
	Minimum	Recommended
30	150	185
35	175	245
40	200	300
45	315	350
50+	350	455
* As measured from the centerline of each driveway. Note: Spacing on boulevards may be adjusted		
Source: MDOT: The Access Management Guidebook		

3. Spacing from Other Driveways. Minimum and desirable driveway spacing requirements should be determined based on posted speed limits along the parcel frontage, based upon the Driveway Spacing Guidelines Table 5-2. The recommended values provided in the table are based on the distance necessary to allow an exiting vehicle to enter the major road traffic stream without causing oncoming traffic to decrease their speed by more than 10 mph, and should be required where parcel size permits. The "minimum" values in the table are based on the distances required to avoid conflicts between vehicles turning right or left from adjacent driveways.

   In order to prevent left turn conflicts, possible driveways should be aligned with those across the road or offset a sufficient distance from driveways across the road in accordance with the minimum spacing standards listed in the table. In the case of expansion, alteration or redesign of existing development where it can be demonstrated that pre-existing conditions prohibit adherence to the minimum driveway spacing standards, the driveway spacing requirements could be modified, but the driveway spacing should not be less than 60 ft.

Medians. Some of the arterial roads within the study area, such as the I-75 Business Loop through Grayling, are designed with a center median. Wide medians require turning movements from side streets and driveways to be right turn-only with left-turns accommodated at well spaced median crossovers. Medians make spacing between driveways less of a concern, but driveway placement must consider proper spacing from median crossovers. Driveways located too close can cause abrupt weaving across travel lanes. For road segments where a wider median is not practical, direct left turns in and out of some cross streets or signalized intersections may be necessary to accommodate larger vehicles.

Minimum Lot Widths. Local zoning ordinances should be amended to require larger lot widths for commercial properties fronting on major arterials. This will ensure that lots have adequate width to meet the above access spacing standards. Overlay districts can be used to address more specific areas in need of attention. Provisions should be included that allow narrower lots in areas where shared driveways and service drives are provided that meet the above driveway spacing standards.

Implementation of the above access recommendations will help to preserve the capacity and useful life of roads. Travel time and congestion will be decreased. Crash potential will be reduced. While individual land owners may see the regulations as a burden, over the long term, a well managed access system improves access to properties and maintains travel efficiency, thereby enhancing economic prosperity of local business. A strong access management program also helps coordinate land use and transportation decisions to improve the overall quality of life in the community.

5.5 Multi-modal Traffic

A mode is, simply put, a method of transportation. The term “multi-modal” suggests use of more than one means of travel within a single trip. This can include driving to a park and ride lot and commuting by bus, with the modes involved being the automobile and bus. The primary goal of multi-modal transportation systems is to reduce the dependence on automobile travel. This often involves the use of public transit or carpooling that allows people to leave their personal vehicles in favor of modes that carry multiple people at once, such as by bus, light rail, streetcars or other public transit options. In Crawford County, these options are somewhat limited. However, multi-modal can also

include non-motorized means of travel, such as use of pathways or on-street bike lanes. Multi-Modal pathways are distinguished from recreational trails through their use as a means of commuting from one place to another. Multi-modal pathways are provided through the City of Grayling and along M-72 as it travels through Grayling Township. Many cyclists use county and local roads as a means of travel, but since many of these roads carry only light vehicular traffic, they are considered safe for this purpose. However, in the future as traffic increases, additional pathways or bike lanes may be needed.

The Crawford County Transportation Authority (CCTA) is the local provider of bus service in the area. CCTA serves all of Crawford County, especially the City of Grayling, where the highest resident population exists. Established in 1976, CCTA provided one of the first county-wide bus systems in Michigan. It operates 17 vehicles on a request-basis, weekdays from 6 am to 6 pm. The Crawford County Commission on Aging provides on-demand services which are especially valuable to aging residents with increasingly limited mobility. As the population of the area ages as predicted, demand for door-to-door service will increase. In addition, weekend service is also likely to be needed in the future. As a Transportation Authority, CCTA can improve these services through general funding sources or local bond issues. In addition to the county bus service, other private bus services are available that maintain stops in Grayling. The Greyhound Bus Line offers nationwide bus service and service to Canada from a local bus station located at the Goodale's Bakery in Grayling. Greyhound provides local service to most cities in Michigan, more so than other states in the Midwest. Indian Trails, Inc. is more of a charter bus service with routes throughout Michigan. Indian Trails shares the bus station with Greyhound, as well as, certain routes throughout the state.

The closest Amtrak stations are located in Kalkaska (23.2 miles), Mancelona (24.2 miles) and Boyne Falls (36.3 miles). Amtrak is a nationwide system that provides service to most major cities. In Michigan, Amtrak carries people to most major cities in addition to several smaller cities and towns. Regional cooperation may be needed to provide bus service from the Grayling area to Kalkaska using a series of bus stops or larger transfer stations located at the county line.

In order to improve multi-modal options in the Grayling area, local communities need to plan early for pathway improvements, bus stop enhancements, and overall system connections. For example, providing pathway connections to local bus stops allows residents the option to take the bus over driving. Providing proper facilities at each bus stop, such as bike racks, shelters, route information, etc. are critical to encouraging more use of local public transit. Communities not adequately served by pathways, bike lanes and transit stops should include the following in their master plans:

- Transit stop locations
- Location of non-motorized systems, including multi-purpose pathways, local sidewalks and bike lanes
- Identify gaps within the sidewalk and pathway system, and prioritize them based on need and frequency of use
- Consider partnerships with local transportation providers, especially the CCTA
- Evaluate accessibility to residents with disabilities or mobility restrictions, and identify needed system improvements
- Consider future needs for additional transit stops and regional bus line connections

5.6 Non-Motorized

Currently there is a pedestrian trail system that runs throughout the area. One leg of the pathway follows M-93 at the edge of the ROW heading north out of Grayling. It then continues to follow M-93 where it reaches I-75 at which point the multi-modal traffic is forced onto the roadway in order to cross the I-75 freeway and continue on the path. The alternative shown in Figure 5-19 is an example of improvements that can be made to help enhance the areas multi-modal trail system. This alternative has a widened corridor on M-93 over I-75. This widening accounts for two 12 foot lanes, a 3 foot paved shoulder, and a 12 foot non-motorized pathway with a positive barrier separation from vehicular traffic. The M-93 bridge over I-75 will need to be replaced and upgraded with the new lane and shoulder widths. In addition, barrier will be placed adjacent to the roadway to provide safe crossing for multi-modal traffic without disrupting traffic flow. This alternative can be used as a model for several locations; the configuration can be placed at the Four Mile Road overpass and North Down River Road overpass.

Figure 5-19: M-93 Overpass at I-75 with Widening for Non-Motorized Trail

5.7 Future (2027) Alternatives Traffic Data & Capacity Analysis

Many conceptual interchange alternatives were reviewed as detailed previously, however, several were dropped from proceeding to the operational analysis, upon confirming one or more major design deficiencies from a geometric, real estate or public comment standpoint. Therefore only the following interchange alternatives were carried forward for future (2027) operational analysis:

- Providing full access at the I-75/North Down River Road interchange (Figure 5-2 – Alternative 1)
- Providing full access at the I-75/I-75 Business Loop interchange (Figure 5-8 – Alternative 2)
- Reconfigure the I-75/4 Mile Road interchange with full access (Operational analysis for future conditions included in Mainstreet America Theme Park Traffic Impact Study and the Future (2027) No-Build analysis)

The future (2027) build morning and afternoon peak-hour turning movement volumes for each of the intersections in the winter and summer seasons, are presented in Appendix D. The figures in the appendix only show those key intersections which were identified to be impacted by each of the interchange build scenarios.

5.7.1 I-75 / North Down River Rd Full Access Interchange & Upgrade of North Down River Rd

The future build peak-hour traffic volumes were developed by adjusting the future No-Build peak-hour traffic volumes with diverted trips caused by the introduction of a full access interchange at North Down River Road. This interchange will offer full NB and SB access to the I-75 interstate freeway. Diverted trips were estimated based on the ratio of intersection turning movement volumes, logical diversion routes for those new access, and the statewide travel demand model. These traffic projections include the 1.1% growth rate to 2007 traffic volumes, and the additional future build-out trips generated by the Mainstreet America Theme Park. The resulting traffic volumes for future (2027), winter and summer peak-hours at the key intersections in the study area are shown in Appendix D.

The future (2027) winter and summer peak-hour levels-of-service for the morning and afternoon peak-hours at the key intersections are displayed in Table 5-3 and Table 5-4. Additional operational improvements that are recommended for this alternative along the I-75BL and included with the traffic model include:

- The modification of the I-75BL/Michigan St. traffic signal to a two-phase for Michigan St..
- A new traffic signal at I-75BL/M-93/North Down River Road.
- Modifications to the traffic signal cycle lengths for the three traffic signals along I-75BL from 90 seconds during the AM peak-hour to 80 seconds during the PM peak-hour.
- Modification to the southbound lefts at M-72 East from a protected to permissive-protected.

Capacity analysis worksheets for all future 2027 intersection capacity analyses are included in Appendix D of this report.

TABLE 5-3
PEAK-HOUR LEVELS-OF-SERVICE AND DELAY – WINTER 2027
I-75 / NORTH DOWN RIVER ROAD FULL ACCESS INTERCHANGE

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
M-72 East/I-75BL	Yes	EB M-72	D	35.6	D	46.7
		WB M-72	C	26.1	D	37.3
		NB I-75BL	B	13.0	D	39.5
		State Street	A	3.6	B	14.8
M-72 West/M-93	Yes	EB M-72 West	B	19.9	B	19.5
		WB M-72 West	B	18.8	C	20.6
		NB M-93	B	18.2	B	18.4
		SB M-93	C	22.6	B	19.3
North Down River/Alexia Ln	No	EB South Down River Rd	A	3.4	A	4.5
		WB South Down River Rd	A	0.0	A	0.0
		Alexia Ln	A	9.8	B	9.8
I-75BL/State Street	No	State Street	B	12.5	C	15.9
		NB I-75 BL	A	0.0	A	0.0
		SB I-75 BL	A	0.3	A	0.2
North Down River/I-75 SB Exit Ramp	No	WB North Down River	A	3.0	A	1.4
		EB North Down River	A	0.0	A	0.0
		SB I-75 Exit Ramp	B	11.2	B	10.8
N. Down River/Michigan/Roberts	No	EB N. Down River	A	0.4	A	0.7
		WB N. Down River	A	4.3	A	3.5
		Michigan	C	15.7	C	19.2
		Roberts	C	16.5	F	66.5
N. Down River/I-75BL	Yes	EB N. Down River	B	13.0	B	10.3
		WB N. Down River	B	13.4	B	10.2
		NB I-75 BL	A	6.9	A	3.6
		SB I-75 BL	A	6.0	A	3.5
North Down River/I-75 NB Ramp	No	WB North Down River	A	6.0	A	3.6
		EB North Down River	A	0.0	A	0.0
		NB I-75 Ramp	B	12.1	A	0.0
I-75BL (James)/Michigan	Yes	NEB Michigan	C	29.0	C	20.5
		SWB Michigan	C	30.3	C	33.7
		NWB James	A	2.5	A	3.9
		SEB James	A	3.3	A	8.0

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
I-75BL (James)/M-72 West	Yes	NB I-75BL	B	12.5	A	9.3
		SB I-75 BL	D	37.0	D	35.5
		NEB James	C	20.7	C	20.3
		SWB James	C	21.8	C	27.6

With the future 2027 build peak-hour traffic volumes adjusted to reflect a full access interchange at North Down River Road, along with the 2027 background traffic and trips generated by future developments, all approaches that would be affected in the study area during both peak-hours of winter operate at LOS D or better, with the following exceptions:

- *N. Down River/Michigan/Roberts* –The southbound approach subsequently operates at LOS F during the afternoon peak-hour. The southbound approach operates at an unacceptable level-of-service because of the volume of traffic and minimal gaps created on North Down River Road. With each approach sharing one lane for all turning movements, backups and delays will occur at Roberts.

TABLE 5-4
PEAK-HOUR LEVELS-OF-SERVICE AND DELAY – SUMMER 2027
I-75 / NORTH DOWN RIVER ROAD FULL ACCESS INTERCHANGE

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
M-72 East/I-75BL	Yes	EB M-72	D	38.0	D	37.4
		WB M-72	C	26.0	D	35.7
		NB I-75BL	B	13.0	C	22.7
		State Street	A	5.7	B	12.1
M-72 West/M-93	Yes	EB M-72 West	C	20.6	C	20.2
		WB M-72 West	C	20.9	D	49.2
		NB M-93	B	18.7	B	19.7
		SB M-93	B	19.5	B	19.5
North Down River/Alexia Ln	No	EB South Down River Rd	A	3.0	A	4.8
		WB South Down River Rd	A	0.0	A	0.0
		Alexia Ln	A	9.7	B	10.3
I-75BL/State Street	No	State Street	B	12.2	C	19.1
		NB I-75 BL	A	0.0	A	0.0
		SB I-75 BL	A	0.2	A	0.3
North Down River/I-75 SB Exit Ramp	No	WB North Down River	A	2.1	A	0.8
		EB North Down River	A	0.0	A	0.0
		SB I-75 Exit Ramp	B	10.7	B	11.6
N. Down River/Michigan/Roberts	No	EB N. Down River	A	0.2	A	0.8
		WB N. Down River	A	4.1	A	3.3
		Michigan	B	12.4	C	24.6
		Roberts	B	13.8	F	164.3
N. Down River/I-75BL	Yes	EB N. Down River	A	9.3	B	10.3
		WB N. Down River	A	9.6	B	11.6
		NB I-75 BL	A	4.4	A	5.4
		SB I-75 BL	A	4.1	A	4.9
North Down River/I-75 NB Ramp	No	WB North Down River	A	4.3	A	3.7
		EB North Down River	A	0.0	A	0.0
		NB I-75 Ramp	B	11.8	C	16.6
I-75BL (James)/Michigan	Yes	NEB Michigan	C	28.7	C	20.1
		SWB Michigan	C	31.6	D	37.3
		NWB James	A	1.5	B	11.1
		SEB James	A	4.1	B	18.3

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
I-75BL (James)/M-72 West	Yes	NB I-75BL	C	23.7	E	66.4
		SB I-75 BL	F	317.9	C	34.4
		NEB James	B	16.7	C	27.3
		SWB James	C	24.5	C	23.3

With the future 2027 build peak-hour traffic volumes adjusted to reflect a full access interchange at North Down River Road, along with the 2027 background traffic and trips generated by future developments, all approaches that would be affected in the study area during both peak-hours of summer operate at LOS D or better, with the following exceptions:

- *North Down River/Michigan/Roberts* –The southbound approach subsequently operates at LOS F during the afternoon peak-hour. The average delay for the southbound approach is 164.3 sec/vehicle. The southbound approach operates at an unacceptable level-of-service because of the additional volume of North Down River Road through traffic with minimal gaps. As the traffic redistributes itself within the network, due to the addition of this full access interchange, a traffic signal warrant analysis will need to be conducted to ensure left-turning vehicles for all four approaches are accommodated.

- *I-75BL (James)/M-72 West* –The southbound I-75 BL approach operates at a LOS F during the morning peak-hour during the summer months. This signalized intersection maintains a cycle time of 80 seconds. The average delay for the southbound approach is 317.9 sec/vehicle. This failing level of service and significant approach delay is a result of a high volume of left turning vehicles for the southbound movement. The northbound I-75 BL operates at a LOS E during the afternoon peak-hour, with an average delay of 66.4 sec/vehicle. This approach also has a poor level of service due to the high volume of left turning vehicles from the northbound approach. The signal timing and coordination can be further adjusted accordingly during the peak-hour to accommodate the increased traffic volumes particularly for the southbound approach in the morning and the northbound approach in the afternoon hours.

5.7.2 I-75 / I-75 Grayling Business Loop Full Access Interchange

The future build peak-hour traffic volumes were developed by adjusting the future No-Build peak-hour traffic volumes with diverted trips caused by the introduction of a full access interchange at the south limits of the City of Grayling and the I-75BL. This interchange will offer full NB and SB access to the I-75 freeway, through free flowing directional ramps. Diverted trips were estimated based on the ratio of intersection turning movement volumes, logical diversion routes for those new access, and the statewide travel demand model. These traffic projections include the 1.1% growth rate to 2007 traffic volumes, and the additional future build-out trips generated by the Mainstreet America Theme Park. The resulting traffic volumes for future (2027), winter and summer peak-hours at the key intersections in the study area are shown in Appendix D.

The future (2027) winter and summer peak-hour levels-of-service for the morning and afternoon peak-hours at the key intersections are displayed in Table 5-5 and Table 5-6. Additional operational improvements that are recommended for this alternative along the I-75BL and included with the traffic model include:

- A new traffic signal at I-75BL/M-93/North Down River Road.
- Modifications to the traffic signal cycle lengths for the three traffic signals along I-75BL from 90 seconds during the AM peak-hour to 80 seconds during the PM peak-hour.

Capacity analysis worksheets for all future 2027 intersection capacity analyses are included in Appendix D of this report.

TABLE 5-5
PEAK-HOUR LEVELS-OF-SERVICE AND DELAY – WINTER 2027
I-75 / I-75 BUSINESS LOOP FULL ACCESS INTERCHANGE

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
M-72 East/I-75BL	Yes	EB M-72	D	38.1	D	37.3
		WB M-72	C	26.7	C	27.8
		NB I-75BL	B	16.1	C	23.1
		State Street	A	4.4	A	7.6
M-72 West/M-93	Yes	EB M-72 West	B	19.9	B	19.5
		WB M-72 West	B	18.8	C	20.6
		NB M-93	B	18.2	B	18.4
		SB M-93	C	22.6	B	19.3
North Down River/Alexia Ln	No	EB South Down River Rd	A	3.4	A	4.5
		WB South Down River Rd	A	0.0	A	0.0
		Alexia Ln	A	9.8	A	9.8
I-75BL/State Street	No	State Street	B	12.4	C	19.9
		NB I-75 BL	A	0.0	A	0.0
		SB I-75 BL	A	0.2	A	0.2
North Down River/I-75 SB Exit Ramp	No	WB North Down River	A	0.0	A	0.0
		EB North Down River	A	0.0	A	0.0
		SB I-75 Exit Ramp	B	10.8	B	11.0
N. Down River/Michigan/Roberts	No	EB N. Down River	A	1.1	A	1.2
		WB N. Down River	A	7.1	A	4.7
		Michigan	D	31.4	D	28.1
		Roberts	D	31.8	F	50.8
N. Down River/I-75BL	Yes	EB N. Down River	B	12.6	B	12.3
		WB N. Down River	C	20.1	B	13.9
		NB I-75	A	0.2	A	0.4
		SB I-75	A	2.7	A	1.3
N. Down River/I-75BL	Yes	EB N. Down River	B	12.6	B	12.3
		WB N. Down River	C	20.1	B	13.9
		NB I-75	A	0.2	A	0.4
		SB I-75	A	2.7	A	1.3
North Down River/I-75 NB Ramp	No	WB North Down River	A	0.0	A	0.0
		EB North Down River	A	3.5	A	3.1
		NB I-75 Ramp	A	0.0	A	0.0
I-75BL (James)/Michigan	Yes	NEB Michigan	C	23.9	C	21.1
		SWB Michigan	C	29.1	D	37.5
		NWB James	A	3.4	A	5.3
		SEB James	A	5.7	A	7.8
I-75BL (James)/M-72 West	Yes	NB I-75BL	B	16.2	A	9.6
		SB I-75 BL	C	32.6	C	30.5
		NEB James	C	26.9	B	17.8
		SWB James	C	20.7	C	24.6

With the addition of 2027 background traffic, trips generated by future developments and adjusting the future no-build peak-hour traffic volumes for the use of the full access interchange at the south limits of the City of Grayling and the I-75BL, all the above approaches detailed in Table 5-5 operate at LOS D or better, with the following exceptions:

- *North Down River/Michigan/Roberts* –The southbound approach for this intersection subsequently operates at LOS F during the afternoon peak-hour. The average delay for the southbound approach is 50.8 sec/vehicle. The southbound approach operates at an unacceptable level-of-service because of the signifi-

cant volume of traffic and minimal gaps created on North Down River Road. As the traffic redistributes itself within the network, due to the addition of this full access interchange, a traffic signal warrant analysis will need to be conducted to ensure left-turning vehicles for all four approaches are accommodated.

TABLE 5-6
PEAK-HOUR LEVELS-OF-SERVICE AND DELAY – SUMMER 2027
I-75 / I-75 BUSINESS LOOP FULL ACCESS INTERCHANGE

Intersection	Signal	Approach / Movement	Morning PEAK-HOUR		Afternoon PEAK-HOUR	
			LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
M-72 East/I-75BL	Yes	EB M-72	D	35.9	E	68.5
		WB M-72	C	26.9	E	67.4
		NB I-75BL	B	17.1	C	23.1
		State Street	A	5.5	A	9.5
M-72 West/M-93	Yes	EB M-72 West	C	20.6	C	20.2
		WB M-72 West	C	20.9	D	49.2
		NB M-93	B	18.7	B	19.7
		SB M-93	B	19.5	B	19.5
North Down River/Alexia Ln	No	EB South Down River Rd	A	4.8	A	4.8
		WB South Down River Rd	A	0.0	A	0.0
		Alexia Ln	B	10.3	B	10.3
I-75BL/State Street	No	State Street	B	12.1	D	25.5
		NB I-75 BL	A	0.0	A	0.0
		SB I-75 BL	A	0.2	A	0.2
North Down River/I-75 SB Exit Ramp	No	WB North Down River	A	0.0	A	0.0
		EB North Down River	A	0.0	A	0.0
		SB I-75 Exit Ramp	B	10.9	B	12.7
N. Down River/Michigan/Roberts	No	EB N. Down River	A	0.6	A	1.1
		WB N. Down River	A	5.5	A	5.1
		Michigan	C	16.7	F	117.0
		Roberts	E	35.4	F	86.7
N. Down River/I-75BL	Yes	EB N. Down River	B	12.2	B	14.1
		WB N. Down River	B	13.7	B	19.8
		NB I-75 BL	A	0.3	A	0.4
		SB I-75 BL	A	1.4	A	1.5
N. Down River/I-75BL	Yes	EB N. Down River	B	12.2	B	14.1
		WB N. Down River	B	13.7	B	19.8
		NB I-75 BL	A	0.3	A	0.4
		SB I-75 BL	A	1.4	A	1.5
North Down River/I-75 NB Ramp	No	WB North Down River	A	0.0	A	0.0
		EB North Down River	A	2.8	A	3.8
		NB I-75 Ramp	A	0.0	A	0.0
I-75BL (James)/Michigan	Yes	NEB Michigan	C	23.6	C	21.8
		SWB Michigan	C	29.3	E	69.3
		NWB James	A	2.7	C	32.9
		SEB James	A	5.2	C	32.9
I-75BL (James)/M-72 West	Yes	NB I-75BL	B	11.6	D	46.2
		SB I-75 BL	C	30.7	D	41.7
		NEB James	B	15.5	C	34.2
		SWB James	C	23.7	C	25.2

With the addition of 2027 background traffic, trips generated by future developments and adjusting the future no-build peak-hour traffic volumes for the use of the full access interchange at the south limits of the City of Grayling and the I-75BL, all the above approaches detailed in Table 5-6 operate at LOS D or better, with the following exceptions:

- *M-72 East/I-75BL*– This signalized intersection operates with a 100 second cycle length. The eastbound and westbound approaches operate at a LOS E during the afternoon peak-hour with an average approach delay of 68.5 sec/veh and 67.4, respectively. This poor level-of-service and approach delay is a result of high volume of traffic turning both left and right (westbound and eastbound) with only a short interval of protected green time. Upon further review, the westbound approach traffic turning left has a delay of 112.0 sec/vehicle and has a level-of-service F and the eastbound approach traffic turning left is 84.5 sec/vehicle, which also contributes significantly to the overall approach level-of-service. As detailed previously the signal timing should be adjusted accordingly during the peak-hours to accommodate the traffic volumes at this intersection, particularly for the east and westbound approaches.

- *N. Down River/Michigan/Roberts* –This intersection is controlled under a two way stop with the eastbound and westbound to move freely. The southbound approach subsequently operates at LOS E during the morning peak-hour and a LOS F during the afternoon peak-hour. The average delay for the southbound approach is 35.4 sec/vehicle for the morning and 86.7 sec/vehicle for the afternoon peak-hour. The northbound approach also has a LOS F during the afternoon peak-hour with a average delay of 117.0 sec/vehicle. The south and northbound approaches operate at unacceptable level-of-services because of the significant volume of traffic and minimal gaps created on North Down River Road. As the traffic redistributes itself within the network, due to the addition of this full access interchange, a traffic signal warrant analysis will need to be conducted to ensure left-turning vehicles for all four approaches are accommodated.

- *I-75BL(James Street)/Michigan*–This intersection is a signalized intersection with a cycle length of 100 seconds. During the afternoon peak-hour the south westbound approach operates at a LOS E with a delay of 69.3 sec/vehicle. The southwest left turning traffic has a level-of-service F with significant delay of 88.7 sec/veh. This particular movement has a high volume of traffic without having a protected phase in the cycle time. The signal timing and cycle length should be adjusted accordingly during the afternoon peak-hour to accommodate the increased traffic volumes.

6.0 ALTERNATIVE EVALUATIONS

Several of the individual interchanges and corridor alternatives stated previously may be stand alone projects, however, maintain logical complimentary combinations that are recommended to be constructed with the main chosen alternative. These combinations will help to better fit the needs of the City and surrounding areas of concern. The selection of the individual alternatives, development of project combinations and prioritization of the selected alternatives was derived from a matrix analysis performed by the Steering Committee, additional public input, and the results of the operational analysis.

Each of the alternatives and combinations were evaluated using criteria which are appropriate to the study area. The results of the evaluation, and comparison to each of the criteria, were used to establish the project recommendations and setting a priority for implementation.

The 11 criteria are briefly described below. The results, with a priority for each alternative are shown in Figure 6-1.

Mitigate Capacity Deficiency

Does the alternative relieve traffic flow congestion?

Connectivity

Does the alternative improve overall circulation and efficiency of the transportation network within the study area?

Safety

Does the alternative contain elements that will allow the street or interchange to be made safer for pedestrians and vehicles?

Land Use/Development

Will the alternative support and enhance anticipated developments and the future growth within the study area?

Multi-Modal

Does the alternative contain elements that will allow improvements in service for transit, pedestrian and non-vehicle travel?

Use of Existing Right-of-Way

Does the alternative contain improvements that can be substantially implemented within the existing right-of-way?

Early Action and Committed Projects

Is the alternative consistent with the approved Early Action and Committed Project list?

Strategic Opportunity Plan

Does the alternative meet the goals of the City of Grayling's Master Plan Prepared in April 2008?

Downtown Connection

Does the alternative increase the ability to provide better service to the downtown businesses?

Feasibility and Constructability

Based on traffic engineering and transportation planning judgment, can the alternative be implemented within reasonable parameters of cost and construction guidelines?

Avoidance of Supplemental Impacts

Can the alternative be implemented so it will not cause adverse impacts on the environment, population groups, land use, or other community values?

The only combination of alternatives that were further developed were ones that showed significant operational improvement to the roadways within the project limits, were publicly acceptable, and fundable/constructible projects.

6.1 North Down River Road Combination

The development of a full access interchange at I-75 for North Down River Road was determined to have satisfied most of the project goals and objectives; adding upgrades to North Down River Road completes the system by adding enhancements for access and providing by-pass options. This full access interchange will increase the traffic on the North Down River Road corridor from traffic going to the City of Grayling, as well as, through traffic going to Traverse City via M-72 West. This increased traffic flow will put the existing North Down River Road configuration over capacity, negating part of the benefit of the new interchange, thereby demanding the upgrades detailed for North Down River Road to a three lane cross-section.

To avoid the "bottle neck" of traffic flow on North Down River Road, the corridor should be improved with the addition of the full interchange. It is recommended that North Down River Road be widened to a minimum of a three lane cross-section with widened shoulders, new structures, and a traffic signal at the intersection of I-75BL/M-93 and North Down River Road as stated in the North Down River Road corridor section.

One of the study goals is wayfinding, specifically a truck route or by-pass for the City of Grayling. With the addition of a new interchange and upgraded corridor on North Down River Road, it is recommended that a signed truck route and/or by-pass route is placed for traffic to use North Down River Road to access M-72 West for Traverse City. Having through truck traffic and traveling traffic use this route will help unnecessary congestion throughout Grayling where traffic was forced through the City without the addition of the full interchange and upgraded corridor on North Down River Road. Two large traffic generators that would be positively impacted by the by-pass route are the Maneuver Area Training Equipment Site (MATES) and the residents living east of I-75. This route can be utilized by providing signs on I-75 giving instructions for accessing Traverse City or the I-75 freeway for returning trips.

The route along North Down River Road is also conducive to providing direct access to the hospital, medical park, and the northern portion of the City of Grayling. This new option allows direct access to downtown on Michigan Avenue as well as the hospital and medical parks located on North Down River Road. Traffic coming from I-75 can exit and enter at the full interchange provided.

6.2 Four Mile Road/Military Road By-Pass Combinations

Several by-pass options were developed for this project, with an optional truck route along Four Mile Road or Military Road being the most popular, by the public and Steering Committee. However, the implementation of this alternative will require pavement rehabilitation, signing, and shoulder widening to make the route efficient as well as desirable to drivers.

Currently, the selected truck routes have worn pavement structures along the corridor. To make the route desirable for drivers, a well maintained and signed route is necessary. To achieve this, Four Mile Road will need to be reconstructed or rehabilitated with widened shoulders. With Military Road potentially being used as a by-pass route as well, it too will need to be upgraded. It is recommended that Military Road be overlaid with new asphalt and have the shoulders widened. In addition to resurfaced roads, the by-pass routes should be evaluated for left turn lanes and/or passing flares throughout the corridor at major crossroads and commercial and residential entrances.

A negative aspect of this alternative combination is the vertical grade present on M-93. The existing roadway along M-93 south of M-72 West has a steep vertical grade that is undesirable to commercial trucks. Truck drivers will have

to determine the balance of time savings between the slower speeds caused by steep grades or the additional congestion incurred by traveling through the City of Grayling and additional signalized intersections used to reach M-72 West or the freeway, depending on direction of travel.

Alternative Evaluation Matrix

Table 6-1

Grayling

Transportation Study

			Criteria														
Alternatives	**Cost (Thousands)**			**Mitigate Capacity Deficiency**		**Connectivity**		**Safety**	**Land Use and Develop-ment**	**Multi-Modal**	**Use of Existing Right-of-Way**	**Early Action and Commit-ted Projects**	**Strategic opportunity Plan**	**Downtown Connection**	**Feasibility and Constructability**	**Avoidance of Supplemental Impacts**
	Construc-tion	Row	Total	Existing	Future	N-S	E-W									
Interchanges																
No Build																
M-93																
Alt 1-Wider Structure																
N. Down River Road																
Alt 1- Full Access Parclo Diamond Interchange	$4,711	$58	$4,769		X				X	X			X	X	X	X
M-72																
Alt 1- Full Access Tight Diamond Inter-change	$5,630	$2,167	$7,797		X	X	X		X	X			X	X	X	
Alt 2- Full Access - SPUI	$6,532	$2,167	$8,699		X	X	X		X	X			X	X	X	
I-75 BL																
Alt 1- Full Access Diamond Inter-change	$8,133	$0	$8,133		X	X					X		X	X	X	X
Alt 2- Full Access with Fly over Ramps	$9,876	$19	$9,895		X	X					X		X	X	X	
4 Mile Road																
Alt 1- Add Storage lanes to existing Ramps	$1,424	$22	$1,446	X					X			X			X	X
Alt 2- New Bridge, New WB to SB loop Ramp and add Storage Lanes	$6,948	$393	$7,341		X			X	X	X		X			X	
Alt 3- Full Access - SPUI	$15,126	$20	$15,146		X			X	X	X	X	X			X	X
I-75 BL/M-72																
Alt 1 Round-a-bout	$360	$150	$510	X				X							X	

X = Project generally supports criteria in a positive way. See Project descriptions

TBD = To be determined.

Cost includes design; Estimates made with planning level information and 2008 dollars

Cost only includes a preliminary engineering analysis and study.

Alternative Evaluation Matrix

Table 6-1

Grayling

Transportation Study

			Criteria														
Alternatives	**Cost (Thousands)**			**Mitigate Capacity Deficiency**		**Connectivity**		**Safety**	**Land Use and Develop-ment**	**Multi-Modal**	**Use of Existing Right-of-Way**	**Early Action and Commit-ted Projects**	**Strategic opportunity Plan**	**Downtown Connection**	**Feasibility and Constructability**	**Avoidance of Supplemental Impacts**
	Construction	Row	Total	Existing	Future	N-S	E-W									
Corridor Improvements																
No Build																
N. Down River Road — 3 Lane	$1,644		$1,644		X		X		X	X			X	X	X	X
I-75 BL												X				
M-72 East	$650		$650				X			X	X			X		
M-72 West																
4 Mile Road — 5 Lane	$2,263		$2,263				X		X	X		X			X	X
Military Road Overlay	$2,616		$2,616			X				X	X				X	X
Alternate/Bypass Routes																
No Build																
Military Road/US —127	$10		$10	X	X	X			X		X		X		X	X
4 Mile Road	$5		$5	X	X		X		X		X		X		X	X
N. Down River Road	$5		$5				X		X		X		X		X	X

x = Project generally supports criteria in a positive way. See Project descriptions

TBD = To be determined.

cost includes design; Estimates made with planning level information and 2008 dollars.

Cost only includes a preliminary engineering analysis and study.

7.0 PUBLIC INVOLVEMENT

Methodology and Summary

This section defines methods which were utilized to collect public input for the Grayling Area Transportation Study and summarizes the public's input through a series of bullet points gathered from several public meetings. Following the detailed evaluation of interchange and by-pass alternatives for Grayling, the design team presented the alternatives to the community for review and additional comment.

Gallery walks, audience participation technology, and individual interviews were several methods utilized to gather public input over the last year and a half of the Grayling Area Transportation Study. Techniques for acquiring community input from Grayling residents included a formal presentation that summarized the Grayling Area Transportation Study process followed by a gallery walk (open house). The gallery walk allowed individuals from the public to share their opinions about the interchange and by-pass alternatives displayed in an informal setting.

Summary of Initial Public Meeting – December 19, 2006

Gallery Walk

At the Grayling Township Hall interested citizens were shown aerial photography and land use maps to gather their opinions regarding Grayling's existing transportation system. Through one-on-one conversations with community members primary concerns were both collected and utilized to assist in the decision making process within this study. The main topics of discussion and concern included the following bullets.

- The rumor of a new development (theme park) on 4 Mile Road was a concern for some citizens so it was decided that the communities future needs at the intersection of 4 Mile Road and I-75 should be investigated.

- There was a development option for a Wal-Mart and Walgreens at the corner of I-75 Business Loop and M-72 on 1.9 acres. Some citizens were worried that current accessibility to the freeway in this area hampers business possibilities and therefore should be investigated through the course of this study.

Summary of Public Meeting – May 24, 2007

Audience Participation Technology and individual interviews

The Audience Participation Technology and Public Interviews both utilized a questionnaire and set of graphics to gather demographic information and individual opinions and preferences regarding Grayling's existing and possible future transportation network.

A formal presentation to the public at the Grayling Public Library was given; to clarify the scope of the project; to define the transportation and land use planning process; and gather public input through multiple choice and visual preference survey questions. Attendees expressed their opinions anonymously through the use of keypad poling.

Public interviews were also utilized by mailing out survey forms first with a follow up phone call to setup an appointment, if possible. The interviews began with emphasis placed on the survey questions, which were used in the keypad poling, for guidance to obtain relevant information for the transportation and land use planning study.

The following bullets summarize the publics' feedback regarding the questions utilized through the keypad poling meeting and individual interviews.

- Concerns regarding lack of interstate access to the downtown business district (easy on/easy off).
- Reservations pertaining to the use of roundabouts or traffic circles for an alternative to traffic signals in Grayling.
- Support for a local road bypass routing around Grayling for both truck and thru traffic based on concerns voiced by the public regarding truck and thru traffic.
- Support for new sidewalks, bike paths, or bike lanes in the Grayling area.

Summary of Public Meeting – June 24, 2008

Gallery Walk

After gathering extensive public comments and opinions regarding Grayling's existing transportation network URS created design alternatives for specific interchanges and bypasses which were identified through coordination with the Grayling Area Transportation Study's steering committee. Following the steering committee's evaluation of the design alternatives the community was invited to attend a gallery walk thru which presented the design alternatives on June 24, 2008 for additional comment. The community feedback on the proposed design alternatives along with the benefits for each alternative as shown in the design evaluation matrix (Figure 7-1) provides the basis for recommending functional and feasible transportation improvements in the Grayling area.

The citizens who attended this public meeting were shown the following: (1) alternatives for the North Down River Road, M-72, I-75 BL, and Four Mile interchanges; (2) the I-75 BL/M-72 intersection; and (3) alternate/bypass routes. Through one-on-one conversations with community members, the design team gathered the following input on the transportation design alternatives:

- Alternative #1 for North Down River Road was the preferred alternative for improving traffic in downtown Grayling as well as providing for future development around the interchange.
- Alternative #1 for North Down River Road provides for easier access around Grayling and could help alleviate traffic congestion downtown which stems from through traffic to Traverse City. Members of the community thought this route would be more direct and would keep unnecessary traffic out of downtown Grayling.
- Signage for Alternative #1 for North Down River Road should clearly indicate that it is the route to Traverse City/Kalkaska (M-72).
- Signage for the I-75 BL interchange should clearly indicate it is the route to downtown Grayling, and the I-75 BL should be increased from three (3) to four (4) lanes to decrease congestion.
- Concern over the impact of Alternatives #1 and #2 for I-75 Grayling Business Loop on adjacent properties was expressed, specifically that these alternatives may negatively impact properties north of the intersection.
- Improvements to the North Down River Road access on I-75 were preferable before any changes to the I-75 Grayling Business Loop.

- A suggestion was made to re-configure a portion of M-72 which access I-75 from the east. It was proposed that the option of going through the traffic light into Walgreens be move to the center left-turn lane, as this re-design may provide for smoother traffic flow with less waiting at the light.

Summary of Crawford County Governmental Forum– September 8, 2008
Governmental Forum

The citizens, who attended this public governmental forum, were presented with the recommendations and findings of the Final Transportation Study. The following short term and long term alternatives/improvements were discussed:

- North Down River Road/I-75 Interchange-Construct a full access interchange at North Down River Road vs. full access at I-75 BL/I-75 Interchange.

- Four Mile interchange – Expansion of the Four Mile Road Interchange with the construction of the Mainstreet America Theme Park.

- Pros and Cons of alternate/bypass routes

- Access management for incoming developments and future construction projects.

- Signal optimization for the current and future traffic signals along the corridors.

- Non-motorized connectivity and ADA compliance.

- Review and upgrade deer crossing warning signs and review obstacles within the clear zone to potentially reduce the number of accidents within the study area.

Following the presentation, a question and answer period was conducted in which members of the study team gathered input from the citizens on the issues related to the transportation design alternatives and improvements. A suggestion was made to re-configure a portion of Military Road at M-93 which would be the suggested truck route. This would reduce the vertical grade and horizontal curve at the intersection, which is more desirable for the acceleration and deceleration of commercial vehicles.

8.0 RECOMMENDATIONS

The Grayling Area Transportation Study was focused on enhancing the existing transportation system to improve and diversify access to I-75 from the Grayling area. The primary needs for the interstate access improvements are as follows:

- Reduce Congestion within the Study Area
- Reduce Complexity of Wayfinding
- Promote Economic Vitality

The following recommendations were developed with the goal of meeting the above needs, while minimizing environmental impacts, reducing accidents, adding/enhancing non-motorized connectivity, and maintaining the recommended interchange spacing:

- Constructing a full access interchange at I-75 and North Down River Road, widening North Down River Road to three lanes from the interchange to M-93/I-75BL, and the addition of a new traffic signal at I-75BL/M-93 and North Down River Road. These improvements significantly reduce the congestion along the I-75BL from M-72 East to M-72 West, by removing non-destination traffic along this section of highway. While numerous intersections within the downtown area experience failing levels-of-service for the future (2027) No-Build scenario, only two intersections are failing during the summer with the addition of a full access interchange at I-75 and North Down River Road. Only one location may be upgraded to a full access interchange within the study area without violating the minimum rural interchange spacing of 3 miles as recommended in "A Policy On Design Standards Interstate System." This recommendation is described in detail in Sections 5.1, 5.2 and Section 6.1.
- Improvements to the North Down River Road, M-72 East, I-75 Business Loop and Four Mile Road Corridors could alleviate congestion and improve the overall level of service. This would be accomplished by changing the curve radii, lane widths, shoulder widths, eliminating drives through access management, separating turning movements from the through lane to help maintain traffic flow along the corridor and adjusting the signal timing at each intersection. The corridor improvements are further discussed in detail in Section 5.2.
- Installation of signing for a by-pass for an optional truck route along Four Mile Road or Military Road. The diversion of these trips (commercial vehicles) from the I-75BL through Grayling will increase the capacity of this roadway. For further detail see Section 5.3 and Section 6.2.
- The existing M-93 Overpass at I-75 is a major crossing for the Hartwick Pines Trail. To make this crossing non-motorized vehicles need to share the roadway with motorized vehicles. To eliminate this potential conflict, it is recommended that the existing M-93 structure be widened to accommodate this crossing. This recommendation is described in detail in Section 5.6.
- Review & upgrade deer crossing warning signs, thereby, potentially reducing the numerous single vehicle/animal accidents within the study area. For further detail see Section 3.5.

8.1 Funding Sources

There are many possible funding sources that could be utilized to fund the alternatives mentioned within the study. This section identifies a few possibilities and provides information about each source. The funding sources available are presented with regards to the project function they serve and the funding category for which they are a part of. For the purpose of this study the funding sources that were analyzed include, MDOT, the Crawford County Road Commission, the City of Grayling, Townships and private developers.

MDOT has a variety of state trunkline funds which are allocated on a statewide basis and distributed by the MDOT North Region and Grayling TSC. A few of the possible funding sources available through MDOT are as follows:

- Resurface, Restoration and Rehabilitation (R&R) – Minor Resurfacing and widening
- Reconstruction – Major reconstruction and widening
- Increase Capacity – Funds or new construction and widening
- Safety Funds – traffic signals and/or intersection reconfigurations
- Intelligent Transportation Fund – Signal Timing Projects and/or warrants

The City of Grayling is allocated transportation funding annually through Act 51 based on their current recorded mileage and the classification of the streets. The streets within the governing body have a classification which is either major or local depending on the traffic volume, importance to industrial, commercial, educational or other traffic generating centers. Act 51 creates the Michigan Transportation Fund (MTF) which consists of the revenues collected through higher user taxes-state motor fuels taxes, vehicle registration fees and other miscellaneous automobile related taxes. The city is also eligible to apply for TEDF Category Funds, as well as, other funding options available to the city through their local DDA board, TIFA, or bonding or local grants for local Historic Preservation, lumbering, State Parks, land and water conservation fund and DNR's Recreational Improvement Fund.

The Crawford County Road Commission has two major funding sources allocated for them by MDOT on a yearly basis called the Transportation Economic Development Fund (TEDF) Category D and the State Transportation Program Fund (STP). The STP provides funding to municipalities for projects on the Federal-Aid Highway System. These funds were created to assist in the funding of highway, road and street projects necessary to support economic growth. The following are the types of projects eligible for TEDF:

- Category A – Road projects related to target industry development and redevelopment opportunities.
- Category D – Road improvements in rural counties to create an all season road network.
- Category E – Construction or reconstruction of roads essential to the development of commercial forests in Michigan.
- Category F – Road and street improvements in cities in rural counties.

The TEDF Category A Fund is open to all road agencies and to private developers working directly with road agencies. This fund provides a means to fund transportation projects that promote job creation or retention through working with State government, local agencies and businesses.

Another fund that road agencies are eligible for is the State Infrastructure Bank (SIB) loan program which has a limited amount of money for low interest loans for transportation improvements. The SIB program offers a range of loans and credit options to help finance eligible surface transportation projects that otherwise might go unfunded or experience substantial delays.

Private Developers can coordinate with local agencies in developing public/private funding plans for new development projects. Private developers should participate in the funding of all road improvements that benefit their development or are a result of their development.

Another possible funding source would be an "earmark" or line item in Federal legislation. Earmarks are funds provided by the Congress for projects or programs that are to be considered "high priority projects". It is the term used to refer to a provision in legislation that direct funds to be spent on specific projects. In order to use this type of funding a U.S. Representative or Senator must include funding for a specific project in legislation that is considered and approved by Congress and the President.

As with each one of these above mentioned funding options they all have their own eligibility and selection criteria that are established by law, regulation or administratively, resulting in a separate application process. It is recommended that the funding options mentioned above be evaluated among the Technical Steering Committee member agencies as possible options for the study area.

8.2 Funding Strategies For The Alternatives

The challenge of maintaining a safe and efficient transportation system that enhances economic development and local quality of life is no small challenge. It will require a variety of tools and strategies to facilitate public and private partnerships and intergovernmental collaboration. Recognizing that all of the agencies involved in this study are facing limited budgets, opportunities for partnerships for future funding will be essential. It will also require citizens to recognize their responsibility to help fund the growing transportation needs and services.

In order to achieve the goals to improve the overall transportation system, the following key strategies will need to be achieved:

- Focus improvements on Corridors of highest significance
- Determine the improvement benefits to the improved route and surrounding network
- Determine if the improved route provides economical growth and development
- Determine the cost share percentage for each project regarding agency or private developer who would be impacting the existing traffic operations.
- Measure performance for all modes of transportation

As part of the future negotiations and strategies among the Technical Steering Committee and participating stakeholders, it is important to consider MDOT's Long Range Plan and their guiding principle regarding Local-Access Interchanges. The principle states:

> *Local-Access Interchange: Improvements to existing interchanges and construction of new interchanges present a special need for state and local coordination. Over the life of the MI Transportation Plan MDOT will be focusing its limited resources on improving the operations of trunkline to trunkline interchanges. The limited number of trunkline local interchange improvement projects may be selected in response to traffic needs on a statewide priority basis but will require local coordination and a concurrent local commitment through right-of –way donation, project funding, and/or a concurrent local commitment to widen the local road as necessary.*

In addition, any work that would be required to facilitate operations because of a private development would be the responsibility of the developer. Negotiations would have to be reached to determine the costs associated with any road, freeway or structure including right of way costs that may need to be acquired. The developers' contributions for transportation improvements should be solicited in the context of a short and long range transportation plan. State and local agencies need to continue to form a partnership with the community to accomplish needed improvements and manage the system to preserve the significant public and private investment in transportation facilities.

Context Sensitive Solutions Key Principles:

1. Balance safety, mobility, community, and environmental goals in all projects.
2. Involve the public and affected agencies early and continuously.
3. Consider the needs of not just automobiles and trucks, but also pedestrians, bicyclists, transit and snowmobiles.
4. Apply flexibility inherent in design standards.
5. Incorporate aesthetics as an integral part of good design.

8.3 Aesthetic Enhancements

Context Sensitive Solutions. Context Sensitive Solutions (CSS) is a relatively new approach to planning and designing transportation projects which emerged in the 1990s. The Michigan Department of Transportation (MDOT) defines CSS as a collaborative interdisciplinary approach to developing transportation projects. Under CSS, MDOT solicits dialogue with local governments, road commissions, industry groups, land use advocates, and state agencies early in a project's planning phase. A cooperative spirit and an awareness of community interests help achieve the ultimate goal--projects that fit their surroundings while effectively serving transportation needs.

CSS is responsive to the values the public places on aesthetic, cultural and natural resources. As the population grows and the number of bigger and faster vehicles increases, safety also becomes an important public value. For those who do not drive, alternative travel options are critical to maintaining quality of life.

In December 2004, the Governor of the State of Michigan issued an Executive Directive (No. 2003-25) regarding CSS requiring MDOT to consider the following in the design and development of any transportation project:

1. *Incorporate* context sensitive design into transportation projects whenever feasible.
2. *Review* procedures, organizational structure, and staffing to encourage and institutionalize context sensitive design for transportation projects.
3. *Create* educational programs for staff and consultants that develop the attitudes and skills necessary to implement context sensitive design for transportation projects, including highway design, communications skills, and process improvements.
4. *Analyze* the tools necessary for expanded use of context sensitive design for transportation projects, including but not limited to three-dimensional presentation tools.
5. *Develop* policies and procedures to expand the use of context sensitive design for transportation projects.

Conventional roadway design standards that define minimum driveway width, design speed and minimum parking supply generally focus on maintaining efficient traffic flow. They often reflect the assumption that bigger-and-faster-is-better, resulting in wider roadways and higher design speeds. However, wider and straighter roads can increase traffic speeds and spread out development, which can result in reduced accessibility, pedestrian safety and livability.

Figure 8-1: Example of CSS applied along the I-75 Business Loop in Grayling

CSS strives to redirect this focus to consider the conservation and enhancement of important natural and cultural features that contribute to road character and that positively impact the immediate vicinity of the road. Instead of only considering technical operations of the roadway, less measurable elements are also considered, such as the provision of proper pedestrian and bicycle options, or preserving a historic building or site. There are several opportunities to apply CSS such as:

- Coordination of signage among all jurisdictions along major corridors such as M-72, M-93, I-75 BL and Four Mile Road.
- Burial of any overhead utility lines during site development or corridor improvement projects. This is especially important within the City of Grayling, where buildings are concentrated into commercial nodes.
- Shared landscape regulations along key corridors, especially along corridors that cross several jurisdictions, such as M-93, M-72 and Four Mile Road. CSS should be applied during any road reconstruction or streetscape projects. Landscaping regulations should strongly encourage preservation of existing vegetation, especially landmark trees, and should encourage use of plants that are native to the region.
- Development of wayfinding systems should consider the character of the area and include design that complements it.
- Use of decorative street lighting within commercial areas or significant residential neighborhoods to unify the area and identify key destinations
- Installation of unified street furniture such as benches, newspaper and waste receptacles to create a more inviting environment.
- Inclusion of natural-looking materials in the reconstruction of any overpasses and exits.

8.4 Non-Motorized Enhancements

Communities are recognizing the increasing role that non-motorized transportation facilities can play in providing alternative travel options. In addition to providing for non-motorized travel, sidewalks and pathways can offer recreational opportunities and can also improve interaction between residential neighborhoods, destination areas and neighboring communities. All future roadway project should evaluate the need for expansion of these facilities.

In order to achieve an effective non-motorized network within the study area, the following must be achieved:

1. Accommodating bicyclists and pedestrians on arterial streets.
2. Providing appropriate facilities that consider the necessary function and purpose.
3. Overcoming barriers such as highway crossings and intersections.

Sidewalks

Sidewalks should be installed along both sides of streets located in a more urban setting, such as those within the City of Grayling. Often constructed of concrete, sidewalk must be a minimum of five feet wide. Sidewalks are generally constructed along the outer edge of the road right-of-way to provide as much separation from the travel portion of the road, and to prevent the need to remove and replace them during road construction. Local communities should determine where they expect the largest volumes of pedestrian traffic, usually within core commercial areas, and develop policies to install sidewalks along existing developments and to require them with any new development. Local zoning ordinances can address the need for sidewalks, while other general codes should be adopted to address their construction and maintenance. These codes should also be updated to address the need for pathways, discussed below.

Figure 8-2: Pathway along I-75 Business Loop in the City of Grayling

Pathways

Pathways are similar to sidewalks in that they provide a means for non-motorized travel. However, unlike sidewalks, pathways are intended to provide regional non-motorized links between various destinations and recreation sites. Pathways located along major corridors help alternative transportation options for pedestrians and bicyclists. Because they are often used by multiple types of non-motorized users, it is recommended that pathways be constructed of asphalt at least 10 feet in width. Wider pathways can accommodate higher volumes of traffic, especially in the Grayling region, where cyclists and other non-motorized pathway users are seeking both local and regional destinations.

A 10-foot wide planting strip should be provided within all rights-of-way to provide extra separation from motor vehicle traffic. Planting strips that are more densely vegetated can also decrease road noise, improve corridor aesthetics and increase the pedestrian's sense of security.

Figure 8-3: Sample Bike Lane

Bike Lanes

Bike lanes in the street pavement width are areas dedicated specifically to bicyclists. Bike lanes can be incorporated into the physical road design, or can be a separate lane outside the road. Bike lanes provide cyclists with a

dedicated path for higher speed non-motorized uses and allows them to move more quickly since they can avoid conflicts with pedestrians using a multi-use pathway. Because bike lanes in the Grayling area will typically be used by cyclists seeking recreational options, they should be considered in developed areas and more natural areas alike to provide a variety of opportunities.

On-street bike lanes may be appropriate in more developed areas, or where traffic is not moving at high speeds. Where off-street options exist, a 4-foot bicycle lane should be located alongside the roadway. Separated lanes further define the road space, provide bicyclists with obstruction-free travel, decrease the stress level of bicyclists who would otherwise be required to ride in traffic, and provide a signal to motorists that cyclists have a right to the road. Bike lanes also help buffer pedestrians from traffic and increase motorist safety by improving sight distance. The following design criteria should be applied when installing a bike lane:

1. Bike Lane Widths. The proposed minimum width of bike lanes is 4-feet, as measured from the center of stripe to the inner edge of curb, not including the 1.5 to 2 foot gutter pan. This width enables cyclists to ride far enough from the curb to avoid debris and drainage grates, yet far enough from passing vehicles to avoid conflicts.
2. Bike Lane Markings. Bike lanes create an exclusive or preferential travel lane for bicyclists with markings including an 8 inch wide white stripe and bicycle symbols with directional arrow stencils on pavement. Bike lanes should be striped to a marked crosswalk or a point where turning vehicles would normally cross.

Figure 8-4: Sample Crosswalk

Crosswalks

Crosswalks should provide safe and comfortable areas for crossing streets. The visibility of crosswalks needs to be maximized in order to improve their effectiveness. Crosswalk design commonly uses striped (or "zebra") markings, which are more visible than simple double line markings or textured crossings that use non-slip bricks or pavers, which raise a driver's awareness through increased noise and vibration. Colored pavers are ideal since they provide both a visual and textured change in pavement to increase the visibility of the crosswalk.

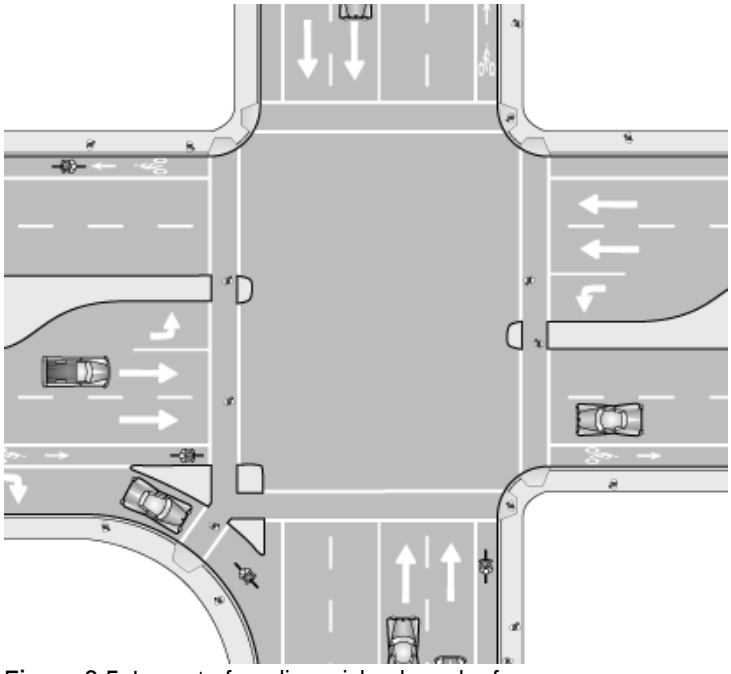


Figure 8-5: Layout of medians, islands and refuges

Medians, Islands and Refuges

Roads with a five lane cross-section have a large expanse of pavement which is uninviting to pedestrians. Placing a raised refuge island at wide intersections is a viable option to help promote non-

motorized activity at these wide intersections. Raised islands benefit pedestrians by:

- Narrowing the travel portion of the road, allowing pedestrians to cross fewer lanes at a time, and to navigate one-directional traffic at a time;
- Providing a refuge so that slower pedestrians can wait for a break in the traffic stream;
- Reducing the total crossing distance (which provides signal timing benefits); and
- Providing an opportunity to place easily accessible pedestrian push-buttons.

An island should be large enough to provide refuge for several pedestrians waiting at one time (minimum of 4 feet wide, preferably 8 feet or more). For wheelchair accessibility at-grade cuts should be provided rather than ramps.

Pedestrian Signals

A pedestrian-activated signal should be installed at signaled intersections within the City of Grayling, or where high volumes of pedestrian traffic is observed or anticipated. Signals can also be bike-activated through pavement magnets. Recent advancements in traffic signals can improve safety for those crossing the road in the middle of a block, can provide pedestrians with "count-down" elements, and can also enhance the environment for disabled citizens by providing audible devices or textured crosswalks.

Signage

Signage can include road striping, as well as, separate signs placed along the roadway. Recommended signs include both advance warning and pedestrian crossing signs at the crossing itself, and regulatory signs at intersections to reinforce the message that motorists must yield to pedestrians. Pedestrian crossing signs should be used where a crossing is not normally encountered, usually at mid-block locations, where an adjacent development is likely to generate a fairly high number of crossings. Locations near schools and other areas with high levels of pedestrian traffic should be evaluated on a location specific basis.