



City of Marquette Traffic Study

March 3, 2017



City of Marquette Traffic Study

CONTENTS

Introduction.....	4
Community Overview	4
Purpose and Objective	4
Study Area	4
Methodology and Approach.....	5
Field Reconnaissance and Data Collection	5
Capacity Analysis and Mitigation Measures Analysis	5
Warrant Analysis	7
Pedestrian and Bicycle Safety Improvements	7
Stakeholder Input	7
Other Studies.....	7
Existing Conditions	9
Existing Traffic Data.....	9
Intersection Turning Movement Counts	9
Corridor Traffic Counts	9
Existing Capacity Analyses	9
Signalized Intersections	9
Unsignalized Intersections	9
Corridor Analyses	10
Speed Limits	10
Warrant Analyses	13
All-Way Stop Warrant Analyses.....	13
Signal Warrant Analyses	13
Intersection/Corridor Mitigation Measures (Year 2013).....	15
Traffic Growth and Committed Roadway Improvements	18
Traffic Growth	18
Other Future Developments.....	19
Marquette Hospital	19
Fire Station	20

Cliff Dow Site	20
Traffic Signal at Grove Street/McClellan Avenue Intersection	20
Future No-Build Conditions (Year 2030)	21
Traffic Projections.....	21
Intersection Turning Movement Volumes	21
Corridor Traffic Volumes	21
Future Capacity Analyses.....	21
Signalized Intersections	21
Unsignalized Intersections	22
Corridor Analyses	22
Intersection/Corridor Mitigation Measures (Year 2030)	23
Pedestrian/Bicycle Accommodation Analysis & Recommendations	24
Pedestrian Facilities.....	24
Bicycle Facilities	26
Truck Routes	28
Conclusions and Recommendations.....	29
Intersection/Roadway Improvements.....	29
Pedestrian and Bicycle Facility Improvements	30
Construction Costs and Prioritization	30

FIGURES

Figure 1	Study Area
Figures 2A – 2J	Existing Peak Hour Turning Movement Counts (2013)
Figure 3	Existing Annual Average Daily Traffic Volumes (2013)
Figures 4A & 4B	Existing Level of Service Summary (2013)
Figures 5A–5G	Mitigation Locations (2013)
Figures 6A – 6J	Future Peak Hour Turning Movement Counts (2030)
Figure 7	Future Annual Average Daily Traffic Volumes (2030)
Figures 8A–8C	Future Level of Service Summary (2030 No-Build)
Figures 9A & 9B	Mitigation Locations (2030)
Figure 10	Recommended Sidewalk System Additions
Figure 11	Recommended Bikeway System Additions

TABLES

Table 1	Study Area Intersections and Segments
Table 2	Previous and Current Studies
Table 3	Existing Level of Service Summary – Signalized Intersections (2013)
Table 4	Existing Level of Service Summary – Unsignalized Intersections (2013)
Table 5A	Warrant Analyses Summary – All Way Stop Warrant
Table 5B	Warrant Analyses Summary – Traffic Signal Warrants
Table 6	Locations for Mitigation Analysis
Table 7	Future Level of Service Summary – Signalized Intersections (2030 No-Build)
Table 8	Future Level of Service Summary – Unsignalized Intersections (2030 No-Build)
Table 9	Prioritized List of Mitigation Projects and Costs

APPENDICES

Appendix A	12-hour Turning Movement Count Summaries
Appendix B	2-Day/24-hour Corridor Count Summaries
Appendix C	Stakeholder Input/Previous and Current Studies
Appendix D	Signalized Intersection Capacity Analyses (2013)
Appendix E	Unsignalized Intersection Capacity Analyses (2013)
Appendix F	Warrant Analyses All-Way Stop Warrant Analyses Signal Warrant Analyses
Appendix G	Signalized/Unsignalized Intersection Capacity Analyses – Mitigation Measures (2013)
Appendix H	Signalized Intersection Capacity Analyses (2030)
Appendix I	Unsignalized Intersection Capacity Analyses (2030)
Appendix J	Signalized/Unsignalized Intersection Capacity Analyses – Mitigation Measures (2030)
Appendix K	Truck Route Feasibility Study
Appendix L	Marquette Hospital Transportation Improvements Project Traffic Impact Study

INTRODUCTION

Community Overview

The City of Marquette is located in the central region of Michigan's Upper Peninsula. With a population of 21,355, it is the largest community in Michigan's Upper Peninsula. In addition to being a population center, it serves as the regional center for education, health care, recreation, and retail. This regional draw is particularly evident due to Northern Michigan University (NMU) and Marquette General Hospital, both of which are located in the City of Marquette.



Marquette has a total land area of 19.4 square miles and is home to a variety of valuable natural resources. Historically, the area's mineral and lumber resources attracted settlers to the region and supported a primarily resource-based economy. Other critical resources include the area's hydrology, particularly due to its location along the shoreline of Lake Superior. It also has heavily wooded areas and a hilly topography that add to its scenic charm.

Today, Marquette's economy is less dependent on natural resource industries, such as mining, and is primarily focused on service industries. This is in large part due to the University and Hospital's large staffing needs. In the future, Marquette plans to broaden its economic base, creating a greater diversity of sustainable employment opportunities for residents.

Purpose and Objective

The City of Marquette Traffic Study was commissioned for the express purpose of evaluating the City's existing traffic volumes, patterns and providing recommendations and options to address identified deficiencies. The study included a City-wide data collection effort to obtain intersection turning movement volumes, bicycle and pedestrian volumes, and segment traffic volumes. Using these volumes, an analysis of key intersections and segments within the City was completed. Any identified deficiencies in intersection or segment operations were further evaluated to develop mitigation measures to improve the operation such as the installation of stop control or the retiming of an existing traffic signal. Bicycle and pedestrian volumes were also considered as part of these evaluations.

Study Area

The study area for this project encompasses key intersections and roadway segments located within the City of Marquette's corporate limits. There were 81 intersections and 34 roadway segments included for this study as shown on Figure 1 and as summarized in Table 1.

METHODOLOGY AND APPROACH

Field Reconnaissance and Data Collection

Existing data and information was obtained from the City in addition to historical data and studies from other agencies including the Board of Light and Power, the Michigan Department of Transportation (MDOT), NMU, MarqTran, and the City of Marquette Police Department. This data included previous traffic count information, traffic signal phasing and timings, indications of existing operational concerns, plans and inventories relating to the study area, and crash data at each intersection.

Traffic data was collected at the intersections and segments shown on Figure 1 and listed in Table 1. Miovision cameras were used for the turning movement intersection counts. The count period was from 6 a.m. to 6 p.m. on either a Tuesday or Wednesday. This twelve-hour period captures the peak traffic volumes that are used for operational analysis and also provides the data needed to conduct stop sign and traffic signal warrant analyses. The intersection counts included classification counts (cars, single unit vehicles, and multi-unit vehicles) in addition to pedestrians and bicyclists. These are included in Appendix A with the peak hour volumes summarized on Figures 2A through 2J.

Nu-Metrics HI-STAR counters were used to obtain traffic volumes for the roadway segments. This data was collected for a 48-hour time period beginning at 12 a.m. on a Tuesday and ending at 12 a.m. the following Wednesday. This interval was identified as the time period when traffic volumes are most representative of typical conditions during a normal week, and this time period is also a standard practice in the traffic engineering industry. These are included in Appendix B. The Average Daily Traffic volumes derived from these counts are shown on Figure 3.

Capacity Analysis and Mitigation Measures Analysis

The *Synchro 8* software program, which is the most recent version of the software, was used for the analysis of operations at each of the study intersections. *Synchro* is a macroscopic traffic analysis and optimization software tool that supports the *Highway Capacity Manual's* methodology for intersection analysis (discussed below). This software tool was chosen for this study as it is widely used in the traffic engineering industry, and is also utilized by the City's Engineering Department. The City's existing *Synchro 6* model was used as the base model and was imported into *Synchro 8*. The model was then updated using the new traffic counts. Changes to the model were also made to reflect existing roadway geometry, intersection traffic control and signal timings.

Analyses were completed for six different scenarios: Existing traffic for the AM Peak, Mid-Day Peak, and PM Peak hours, and year 2030 No-Build traffic for the AM Peak, Mid-Day Peak, and PM Peak hours. The "No-Build" scenarios assume that normal traffic growth occurs between now and the year 2030, with no capacity modifications to the existing roadway network except for projects that are already identified/planned and likely to be built (note: it was assumed that for the "No-Build" scenarios, normal ongoing capital maintenance and road resurfacing/reconstruction projects would still occur consistent with the City's capital improvement plan. "Capacity improvements" which are also assumed to be part of the No-Build scenarios would typically include planned improvements such as added lanes at intersections, construction of new road segments, construction of roundabouts, road widening, etc.). The realignment of Lakeshore Boulevard between Hawley Street and Wright Street with a roundabout at the Lakeshore Boulevard/Wright Street intersection is currently being studied by the City. While this project will need to go through the public review process before it is finalized, it was decided that this project could be constructed by the year 2030, so it was included in the future "No-Build" roadway

network for this study. A future traffic volume forecast for the year 2030 No-Build scenario was developed through applying a compound annual growth factor (based primarily on historical growth rates) to existing traffic volumes. This is an industry standard method for estimating future traffic growth. The roadway segment counts were used to develop a City-wide Average Daily Traffic map for both existing traffic and 2030 No-Build traffic.

The determination of acceptable traffic operation at an intersection is based on the Highway Capacity Manual Level of Service (LOS) calculated using the methods of the Transportation Research Board *Highway Capacity Manual*, 2010 Edition. The *Highway Capacity Manual* (HCM) details methodologies for assessing the operational characteristics of various aspects of public roads and non-motorized facilities. These methodologies have been developed over 60 years based on empirical analyses and studies. HCM methodologies were utilized for this project and are based on travel delay experienced by users, which is then converted to LOS. While other potential methodologies have been developed in recent years (such as the Intersection Capacity Utilization (ICU) method), the HCM methodology remains the industry standard for evaluating, planning and designing public roadways. The Federal Highway Administration (FHWA) also requires the use of HCM for projects that could involve Federal funding. The LOS is a quantitative measure that describes the quality of operating conditions within the traffic stream and the perception of motorists. The LOS of an intersection is based on the total delay experienced by vehicles waiting to travel through an intersection. The LOS is defined in terms of this total delay, as measured by the average number of seconds of delay per vehicle. Vehicle delay is a means of measuring factors such as driver comfort and convenience, safety, maneuverability, fuel consumption, and lost travel time. The LOS is based on a scale of “A” to “F”, with “A” being the best situation. LOS “A” describes traffic operations with very low delay (i.e., most vehicles stop only the minimum amount necessary before entering the intersection). A LOS “F” results in very high delays with long queues of vehicles. In this case, the volume often exceeds the capacity of the intersection. Traffic is interrupted and impeded to the point that it can become “gridlocked” and the capacity of the road system is greatly diminished. The following exhibit summarizes the specific LOS criteria for signalized and unsignalized intersections.

Level of Service	Control Delay per Vehicle (sec)	
	Signalized Intersections	Unsignalized Intersections
A	10.0	10.0
B	> 10.0 and 20.0	> 10.0 and 15.0
C	> 20.0 and 35.0	> 15.0 and 25.0
D	> 35.0 and 55.0	> 25.0 and 35.0
E	> 55.0 and 80.0	> 35.0 and 50.0
F	> 80.0	> 50.0

Source: Transportation Research Board, *Highway Capacity Manual*, 2010.

The *Synchro 8* model was used to calculate LOS for this study according to the methods of the *Highway Capacity Manual*. These were calculated for the AM, Mid-Day and PM Peak hours in both the existing and year 2030 No-Build traffic scenarios. An intersection operating at LOS D is typically considered to have an acceptable operation. Based on discussions with the City staff, it was agreed that LOS E or worse was the threshold for when mitigation should be evaluated at an intersection. For this study, the LOS criteria applied to individual movements at the intersection, not just overall level of service. If an

intersection had no movements at LOS E or F, mitigation was considered optional. For all intersections operating at an unacceptable level of service based on existing or year 2030 No-Build traffic volumes, potential mitigation measures were identified which would reduce travel delays and congestion. A range of mitigation measures was considered for both the near term and long term. These options ranged from low cost improvements, such as traffic signal retiming or the installation of all-way stop control, to higher cost improvements, such as the installation of new traffic signals or the construction of a turn lane or roundabout.

Warrant Analysis

The existing turning movement traffic counts, pedestrian counts, and crash data were used to conduct all-way stop and signal warrant analyses at unsignalized and signalized intersections. These analyses followed procedures in the *Michigan Manual on Uniform Traffic Control Devices (MMUTCD)*. The four (4) distinct all-way stop warrants consider vehicular volumes, crash history, visibility, speed and other conflict criteria. There are eleven (11) warrants that are reviewed for the potential need for the installation of traffic signals. These warrants consider traffic volumes, pedestrian volumes, crash experience and other criteria that are applicable in specific scenarios such as nearby railroad crossings.

Pedestrian and Bicycle Safety Improvements

An analysis of pedestrian and bicycle facilities was also completed. Existing pedestrian and bicycle count information along with input from various stakeholders (discussed below and detailed in Appendix C) was utilized to evaluate the existing pedestrian and bicycle facility networks and to identify gaps in the existing systems. Based on the identified needs and gaps, recommendations were then developed on potential additions to each of these networks.

Stakeholder Input

Stakeholder input was a valuable factor considered as the team conducted mitigation analyses and developed recommendations. A kick-off meeting was held with City staff to obtain their input on existing operational concerns. Early in the process, various non-City agencies and special interest groups were contacted to obtain input on the project regarding specific problems or deficiencies, data or reports that would benefit the study, transportation improvements that are either already planned/funded or that should be considered, in addition to any other input they wanted to provide. All responses received from non-City agencies and groups are included in Appendix C. In addition, a table in Appendix C summarizes the input received from each of these agencies/groups. The comments and input received were considered as the study was conducted, including in the selection of recommended mitigation measures (assuming a location met the applicable criteria that would warrant mitigation, taking into account the results of the study process).

Other Studies

Previous and current studies completed by the City and other agencies or groups were reviewed as this traffic study was conducted. A list of these studies is included in Table 2, which includes a brief summary of each study's relevant content and how this information was used in the study.

Recommendations from the Northern Michigan University Master Plan were considered at those intersections or road segments which are under the City's jurisdiction and were identified by the City as being within the scope of this study (i.e., the intersections and segments identified in Figure 1 and Table 1). Only one location from the Master Plan (the Presque Isle Avenue/Fair Avenue intersection) met the criteria set for requiring mitigation. That location is discussed further in the "Intersection/Corridor Mitigation Measures (2013)" section below. In addition, based on comments received from NMU staff,

it was determined that pedestrian improvements would be beneficial along Wright Street, particularly at the Sugarloaf Avenue intersection.

MarqTran is the Marquette County Transit Authority which provides bus service throughout Marquette County. MarqTran provided information on their bus routes, both within Marquette and between the communities in the County. It should also be noted that NMU runs a private shuttle service for students and staff.

EXISTING CONDITIONS

Existing Traffic Data

Intersection Turning Movement Counts

Intersection turning movement counts were collected at 81 intersections within the City between 6 a.m. and 6 p.m. The counts were collected on one of the following weekday dates in 2013: October 1, 2, 8 or 9; and December 3 or 4. These dates were identified as optimal because NMU was in session (the University generates substantial traffic volumes), and they would therefore be representative of the peak traffic conditions that occur on regular basis. Copies of the count summaries are included in Appendix A. The peak hours were identified as 7:15-8:15 a.m., 12:00-1:00 p.m., and 4:30-5:30 p.m. These have been shown graphically on Figures 2A through 2J – Existing Peak Hour Turning Movement Counts (2013).

Corridor Traffic Counts

Forty-eight hour directional counts were taken on 34 corridors throughout the City as shown on Figure 1. Twenty eight out of the 34 corridor location counts were taken on October 8 and 9, 2013. The remaining 6 locations were in the vicinity of the Veridea Development that was then under construction in 2013. Therefore, they were counted on September 30 and October 1, 2014. Summaries of these counts are included in Appendix B. These counts were converted to Average Daily Traffic (ADT) volumes. Average Daily Traffic, sometimes referred to as mean daily traffic, is the average number of total vehicles traveling both ways passing a specific point in a set period of time. Time periods vary with the minimum time required being 24 hours. This study used a 48 hour time period. These ADT volumes are shown on Figure 3 – Existing Annual Average Daily Traffic Volumes (2013/2014).

Existing Capacity Analyses

Signalized Intersections

As described in the Methodology section above, the existing peak hour turning movement counts, intersection geometry and signal timings were input into the *Synchro 8* model. Using the 2010 *Highway Capacity Manual* (HCM) methodology (described in the “Methodology and Approach” section above and available through the *Synchro* software), the existing Levels of Service (LOS) were determined for each of the signalized intersections. These are summarized in Table 3. Copies of the analyses are included in Appendix D. Figure 4A graphically summarizes the overall intersection LOS, and Figure 4B shows the individual movement LOS for the intersections with movements at LOS D, E or F. Two of the intersections, as follows, currently have movements at LOS E or F and will be evaluated for mitigation to improve their operation.

- McClellan Avenue/Fair Avenue (Intersection ID #7)
- U.S. 41/Grove Street (Intersection ID #49)

Unsignalized Intersections

The *Synchro 8* model for the three existing peak hours was also used to calculate the existing Levels of Service for each of the unsignalized intersections. These are summarized in Table 4 and shown graphically on Figures 4A and 4B. Copies of the analyses are included in Appendix E. Five intersections currently have movements at LOS E or F and will be evaluated for improvements in their operations:

- Presque Isle Avenue/Fair Avenue (Intersection ID #16)
- Front Street/Baraga Avenue (Intersection ID #37)

- McClellan Avenue/Ridge Street (Intersection ID #62)
- O'Dovero Drive/McClellan Avenue (Intersection ID #66)
- Lincoln Avenue/Wright Street (Intersection ID #69)

Corridor Analyses

The corridor analyses are not based on capacity calculations since the *2010 HCM* does not have a procedure which is applicable to the corridors included in this study. This is due to the characteristics of the corridors, which are mainly 2-lane, lower speed roadways. The *HCM* methodology for 2-lane roadways is only applicable to higher speed (greater than 45 mph) roadways.

In addition, the use of the multi-modal analysis method included in the *2010 HCM* was evaluated to see if it could provide meaningful results for the study corridors. This type of analysis is used to calculate a LOS for each of the modes of travel: car, bike, pedestrian, and transit. Each user type LOS is calculated independent of the others, and the analysis does not combine these separate LOS's into an overall LOS. Per the *Highway Capacity Manual*, this tool is "used to evaluate trade-offs in how the urban street right-of-way is allocated among the modes using the street". While this tool would be helpful for completing a very detailed alternative analysis for a corridor planning study, that is not the intent of this particular traffic study. More importantly, none of the study corridors have a high enough volume for the different modes to provide meaningful results upon which to make cross section recommendations (i.e. volumes are low enough that the LOS will be very good for all modes of travel). For this study, the corridors were evaluated based on the traffic operational criteria of ADT volumes, roadway cross section, spacing and number of traffic signals, intersection LOS, and input received from the City and the stakeholders. Non-motorized traffic along the corridors is addressed in Section IX - Pedestrian and Bicycle Accommodation Analysis and Recommendations.

The commonly accepted threshold volume for a 2-lane roadway operating at LOS D or better is in the range of 12,000 to 14,000 vehicles per day (vpd). However, the limiting factor for a roadway's capacity is typically the level of service and operation of the intersections in that corridor. With one exception, none of the existing ADT volumes on the corridor segments in the study are greater than 10,000 vpd, and therefore none of the segments warrant a 4-lane cross section. Wright Street east of Lincoln Avenue carries approximately 15,000 vehicles per day. While this volume of traffic may indicate a need to widen this section of roadway to a 4-lane cross section, the results of the intersection analyses along this corridor, including the three existing and one recommended signalized intersections along Wright Street, found that all can operate at an acceptable level of service (LOS D or better for all movements) through proper timing of the signals. Therefore, traffic signal timing improvements, rather than roadway widening, is the recommended improvement along this corridor.

Speed Limits

During the course of the study, speed limits were discussed in general terms. Although speed limit recommendations are not part of this study, the following information describes how speed limits are set within the boundaries of Michigan municipalities.

The Michigan Vehicle Code (Act 300 of 1949) provides guidance regarding how speed limits are established. More specifically MCL 257.627 (which is a section of the Michigan Vehicle Code) states in part:

"257.627 Speed limitations.

Sec. 627.

- (1) *A person operating a vehicle on a highway shall operate that vehicle at a careful and prudent speed not greater than nor less than is reasonable and proper, having due regard to the traffic, surface, and width of the highway and of any other condition then existing. A person shall not operate a vehicle upon a highway at a speed greater than that which will permit a stop within the assured, clear distance ahead.*
- (2) *Except in those instances where a lower speed is specified in this chapter or the speed is unsafe under subsection (1), it is prima facie lawful for the operator of a vehicle to operate that vehicle at a speed not exceeding the following, except when this speed would be unsafe:*
 - (a) *25 miles per hour on all highways in a business district.*
 - (b) *25 miles per hour in public parks unless a different speed is fixed and duly posted.*
 - (c) *25 miles per hour on all highways or parts of highways within the boundaries of land platted under the land division act, 1967 PA 288, MCL 560.101 to 560.293, or the condominium act, 1978 PA 59, MCL 559.101 to 559.276, unless a different speed is fixed and posted.*
 - (d) *25 miles per hour on a highway segment with 60 or more vehicular access points within 1/2 mile.*
 - (e) *35 miles per hour on a highway segment with not less than 45 vehicular access points but no more than 59 vehicular access points within 1/2 mile.*
 - (f) *45 miles per hour on a highway segment with not less than 30 vehicular access points but no more than 44 vehicular access points within 1/2 mile.*
- (3) *It is prima facie unlawful for a person to exceed the speed limits prescribed in subsection (2), except as provided in section 629."*

Based on subsections (2)(a), (2)(b), and (2)(c) above, speed limits within a municipality are set at 25 miles per hour (mph) if they are in a business district, public park, or within an area that is platted (this typically encompasses most residential areas). Speed limits are set at 25 mph in these situations unless a speed survey indicates that they should be set otherwise (see below for further explanation regarding what constitutes a "speed study" in Michigan). In unplatted areas that do not fall into the above categories, subsections (2)(d), (2)(e), and (2)(f) establish speed limits based on the number of "vehicular access points" per half mile of road (typically an access point is an intersecting side street or driveway). However, speed limits can be established differently than these directives if a speed survey is undertaken which justifies a different speed limit, or if the prima facie limit of 55 mph is applicable.

Speed surveys are at times conducted to assist in establishing speed limits. The Michigan State Police website (http://www.michigan.gov/msp/0,4643,7-123-1593_30536_25802-16169--,00.html) provides the following description of speed surveys:

"Speed Surveys

Driver behavior is an extension of societal attitudes. Most drivers respond to traffic regulations in a safe and reasonable manner as demonstrated by their consistently favorable driving records. Traffic laws which reflect the behavior of the majority of motorists are usually respected and

obeyed. In order for any traffic law to be enforceable, voluntary compliance must be practiced by the vast majority of drivers so violators can be easily identified. Realistic speed limits reflect this fact and recognize that unreasonable restrictions encourage widespread violations and disrespect for the entire traffic control system. Arbitrary laws unnecessarily restrict drivers, encourage violations, and lack public support. Studies show that the driving environment, not the posted speed limit, is the main influence on motorist speeds.

Speed studies are taken during times that represent normal free-flow traffic. Since modified speed limits are the maximum allowable speeds, roadway conditions must be close to ideal. The primary basis for establishing a proper, realistic speed limit is the nationally recognized method of using the 85th percentile speed. This is the speed at or below which 85% of the traffic moves. Studies have shown that changing the posted speed limit does not significantly change the 85th percentile speed. The driving environment, including other traffic on the roadway, roadway conditions, pedestrian traffic, etc., is a significant factor which influences the prevailing speed.

Use of the 85th percentile speed acknowledges that 15% of the drivers are traveling above a speed that is reasonable and proper. It is to this 15% that enforcement action is directed. Studies have shown that these are the drivers who cause many of the crashes and have the worst driving records.”

Speed surveys typically involve measuring the speeds being traveled by a representative sample of motorists to determine the 85th percentile speeds.

WARRANT ANALYSES

The All-Way Stop and Traffic Signal Warrant analyses were completed based on existing conditions. These included existing traffic volumes, roadway geometry, speed limits and crash experience. The traffic volumes were hourly totals based on the counts included in Appendix A. The roadway geometry and speed limits were based on field observations. The crash experience was based on six years of crash data provided by the City. A crash data summary was prepared which shows the number of crashes per year for each intersection. It also details the right turn/left turn crashes for use in the all-way stop warrant analyses and the right angle crashes for use in the signal warrant analyses. These data were required to complete the All-Way Stop and Traffic Signal Warrant analyses. Pedestrian and bicycle crashes were also noted during preparation of this summary, and this information was considered as part of the pedestrian and bicycle accommodation analysis. While crash data was used to complete the warrant analyses, an in-depth review of crash data was beyond the scope of this current study and would require additional funding that was not available. An in-depth study of crash data and potential safety improvements/countermeasures would be the focus of a “Safety Study”. This is typically considered to be a separate study from an operational traffic study such as this one. Copies of the All-Way Stop and Signal Warrant Analyses and the Crash Data Summary are included in Appendix F.

Warrant analyses followed the requirements published in the *Michigan Manual on Uniform Traffic Control Devices (MMUTCD)*. The *MMUTCD* is Michigan’s version of the Federal Highway Administration’s *Manual on Uniform Traffic Control Devices (MUTCD)*. The Federal *MUTCD* is developed and distributed as a set of national guidelines. Many States, including Michigan, develop clarifications and modifications to these guidelines that tailor them to specific needs and characteristics of their State, while maintaining the integrity of the national guidelines. Such is the case with the *MMUTCD*.

All-Way Stop Warrant Analyses

Each of the unsignalized intersections was analyzed to see if they met the minimum requirements for installation of an all-way stop. The analysis followed the requirements listed in the *MMUTCD*, Section 2B.07. Table 5A summarizes the results of these analyses. Three intersections that are currently side-street stop control met these minimum all-way stop control requirements:

- Third Street and Fair Avenue (Intersection ID #17)
- McClellan Avenue and Ridge Street (Intersection ID #62)
- McClellan Avenue and Baraga Avenue (Intersection ID #64)

Signal Warrant Analyses

The unsignalized intersections were also analyzed to see if they met the minimum requirements for installation of a traffic signal. The analysis followed the requirements listed in the *MMUTCD*, Section 4C and used the MDOT Traffic Signal Warrant Spreadsheet¹. The *MMUTCD* and *MDOT Traffic and Safety Note 210A* states that “The study should consider the effects of the right-turn vehicles from the minor-street approaches. Engineering judgment should be used to determine what, if any, portion of the right-

¹ The 2005 *MMUTCD* Signal Warrant Spreadsheet was used for the initial signal warrant analyses. Subsequent to the initial analyses being completed, MDOT issued the 2014 *MMUTCD* Signal Warrant Spreadsheet. A comparison of the results from the 2005 spreadsheet to results from the 2014 spreadsheet showed no difference in which warrants were met. The decision was made to only revise the warrant analyses to the new spreadsheet for the intersections which had met at least one of the signal warrants with the 2005 spreadsheet. In addition, the reduction for right turns on red as described above was included in the revised analyses.

turn traffic is subtracted from the minor-street traffic count when evaluating the count against the signal warrants listed in Paragraph 2.” Based on this and in agreement with City staff, these analyses were completed considering the effects of the right-turn vehicles from the minor street approaches. The following general guidance provided by MDOT was used in the analyses:

- If observations of the number of vehicles making right turns on red are available, they should be used to adjust the approach volume.
- If the right turn volume from the minor street is less than 50% of the approach volume, the approach volume should not be adjusted.
- If the right turn volume from the minor street is greater than 50%, 50% of the right turn volume should be subtracted from the approach volume.

The intersection turning movement counts completed for this study did not observe the ease of right turning traffic to make their turns, therefore the procedure described in the second and third bullets above was utilized.

In addition to performing a signal warrant analysis on the unsignalized intersections, seven of the existing signalized intersections were evaluated for warrants at the request of the City.

Table 5B summarizes results of these analyses. Two of the unsignalized intersections met a traffic signal warrant based on these minimum requirements:

- O’Dovero Drive and McClellan Avenue (Intersection ID #66)
- Lincoln Avenue and Wright Street (Intersection ID #69)

Two of the seven existing signalized intersections which were analyzed also met signal warrants:

- Seventh Street and College Avenue (Intersection ID #9)
- Washington Street and McClellan Avenue (Intersection ID #63)

The five existing signalized intersections which did not meet warrants were:

- Hewitt Avenue and Front Street (Intersection ID #30)
- Front Street and Spring Street (Intersection ID #38)
- Seventh Street and Magnetic Street (Intersection ID #74)
- Washington Street and Fifth Street (Intersection ID #75)
- Washington Street and Front Street (Intersection ID #79)

Traffic signal warrant analyses do not consider possible site distance concerns/issues. Additional study would be needed to determine if substandard sight distances exist at any of these locations and if other engineering solutions besides a traffic signal might address such concerns. Of these five intersections, one intersection meets the all-way stop control requirements. That intersection is:

- Washington Street and Front Street (Intersection ID #79)

INTERSECTION/CORRIDOR MITIGATION MEASURES (YEAR 2013)

The intersection capacity analyses completed for the 81 intersections indicate that seven of the intersections do not meet LOS E or better for all movements at the intersection. Each of these locations was further analyzed to develop recommended mitigation to address the poor Level of Service. Table 6 summarizes the reasons for potential mitigation (if required), the recommended mitigation, and possible additional studies which may be required. These recommendations are considered short-term improvements and are summarized on Figures 5A through 5G, which include mitigation recommendations, peak hour turning movement volumes, existing and 2030 No-Build peak hour levels of service and existing and year 2030 peak hour levels of service after mitigation is implemented. Copies of the intersection capacity analyses are included in Appendix G. Following is a summary of the analysis and recommended mitigation for each location:

- **Figure 5A: McClellan Avenue and Fair Avenue (Intersection ID #7)**
To improve the operation of this intersection, it is recommended that the traffic signal timings be adjusted to accommodate the heavy northbound right turn volume. This movement is heaviest during the AM Peak Hour and could be related to any of the significant traffic generators along Fair Avenue to the east, including medical center buildings associated with Marquette General Hospital, the High School and/or NMU. As activities move from the existing hospital to the new site on Baraga Ave., operations at this intersection should be reviewed for further modifications to the traffic signal timings. The volumes at this intersection do not indicate a corresponding peak in westbound left turn traffic during the PM Peak Hour which we would expect if all of this traffic was associated with one generator. Therefore, it is likely that the peak northbound right turn traffic in the AM is associated with a combination of these generators, and that the return traffic is distributed throughout the afternoon hours (this is because employees at the medical center buildings are most likely departing work at different times than the dismissal and class schedules of the High School and NMU).
- **Figure 5B: Presque Isle Avenue and Fair Avenue (Intersection ID #16)**
This intersection has a heavy westbound to southbound left turn volume which is the stop-controlled movement. Installation of a traffic signal would be the most cost-effective way to address this, however a traffic signal is not warranted since the volume of right turning vehicles from the side street was reduced based on the guidance described above. The other alternative for this location would be the installation of a mini-roundabout.
- **Figure 5C: U.S. 41 and Grove Street (Intersection ID #49)**
The operation of this intersection had been noted as a potential problem by the City and MDOT. It was originally recommended as a short-term improvement that the traffic signal timing be adjusted to bring the LOS to within an acceptable range. This intersection is planned for reconstruction as a roundabout during 2017 which will significantly change operations.
- **Figure 5D: McClellan Avenue and Ridge Street (Intersection ID #62)**
As with Presque Isle Avenue/Fair Avenue, a traffic signal would be warranted at this intersection if a reduction in the volume of right turning vehicles was not considered in the warrant analysis. However, the right turn reduction was considered, since such an approach is consistent with MDOT's standard procedures for warrant analyses. Three options could be considered at this location. An all-way stop was warranted. However, this option provides only minimal improvement to the intersection level of service. The other options would be to install a traffic

signal or a roundabout. The traffic signal would cost less than the roundabout, although a southbound to westbound right-turn lane would also need to be constructed in order to improve all movements to LOS D or better.

- Figure 5E: O'Dovero Drive and McClellan Avenue (Intersection ID #66)

It is recommended that a traffic signal be installed at this intersection to improve the level of service. McClellan Avenue would need to be widened to construct center left-turn lanes at the intersection. The existing motel driveway east of McClellan would need to be incorporated into the operations of the signal, and the driveway realigned and widened to better line up with O'Dovero Drive on the west side of McClellan. Also, because this intersection is only 350 feet south of the U.S. 41 intersection, it should be interconnected with the U. S. 41 traffic signal.



O'Dovero Drive west of McClellan Avenue

- Figure 5F: Lincoln Avenue and Wright Street (Intersection ID #69)

Two mitigation options could be considered at this location. This intersection meets signal warrants, and installation of a traffic signal is the most cost-effective option to improve the intersection level of service. To signalize the intersection, left-turn lanes should be provided on all four approaches to the intersection. This may require some pavement restriping, but should not require pavement widening. The Lincoln Avenue southbound approach, which is an entrance into a parking lot, should either be closed or realigned to line up with the northbound approach. The traffic signal should include countdown pedestrian signals and should be interconnected with the traffic signals along Wright Street. High visibility crosswalks should also be installed. The other option to be considered is a roundabout. This option is more costly than a traffic signal and would require right-of-way acquisition.

- Front Street and Baraga Avenue (Intersection ID #37)

This intersection does not meet all-way stop or signal warrants. Additional geometric improvements beyond the pavement markings that were added in 2013 do not improve the LOS to within acceptable levels. No additional improvements to this intersection are recommended at this time, however, it is recommended that this intersection be evaluated more closely as part of the Baraga Avenue Corridor Study (a separate study currently being undertaken by the City) in which the alignment of Baraga Avenue across the intersection could be improved.



**Baraga Avenue west of Front Street
(looking eastbound)**

It is also recommended to provide mitigation along two corridors in the study. Interconnecting the traffic signals along Wright Street between McClellan Avenue and Presque Isle Avenue is recommended to improve progression through this roadway segment. An interconnected system is also recommended on Washington Street between McClellan Avenue and Front Street. This segment of Washington Street has a total of seven existing traffic signals which are spaced between 600 and 2,000 feet apart. These intersections all operate at an acceptable level of service, however interconnecting them would improve traffic flow between the lakefront and U.S. 41.

TRAFFIC GROWTH AND COMMITTED ROADWAY IMPROVEMENTS

Traffic Growth

In order to evaluate the operation of the study intersections for the future conditions (year 2030 No-Build), the *Synchro* model was updated to reflect conditions anticipated to exist in the year 2030. The current population growth rate for the City of Marquette was provided by City staff at the project kickoff meeting and is about 0.3 percent per year based on the most recent census information. A traffic growth rate of 0.5 percent per year was chosen in order to be conservative in the volumes developed for 2030. To develop “base” 2030 No-Build traffic volumes, the existing traffic volumes were increased by this 0.5 percent per year growth rate for 17 years (2013 to 2030).

In addition to the traffic increase based on population growth, traffic from two approved developments was included in the year 2030 traffic projections – the Founders Landing development located along the lakefront between Baraga Avenue and Genesee Street, and the Veridea Group development located along Washington Street near Lincoln Avenue. The traffic from the two approved developments was added to the “base” 2030 No-Build traffic. For the Founders Landing development, trips were estimated based on the remaining buildings to be constructed and the anticipated land use within each building. The *ITE Trip Generation Manual, 9th Edition* was used for the trip generation rates to develop the traffic volumes. The Veridea Group development was under construction at the time traffic counts were taken, and traffic was not yet being generated by the development. The trip generation volumes included in the August 18, 2012 Traffic Impact Study for this development (prepared by Midwest Traffic Consulting, LLC) were used. The estimated trips from each of these developments were distributed to the adjacent street network and then added to the “base” traffic to develop the 2030 No-Build traffic volumes to be included in the *Synchro* model. Traffic impacts from other potential developments, including the relocation of Marquette General Hospital and the development of the Cliff Dow site, were not included in the year 2030 forecasted traffic volumes since many particulars that would be needed to develop accurate traffic forecasts for these sites were not known at the time of this study. These particulars include specific traffic generating land uses and locations, site plans with drive locations, exact building square footages, number of employees, etc. Once the current study is complete, all *Synchro* model files will be provided to City staff, and they will be able to model future traffic additions to the network.



**Washington Street/Lincoln Avenue
intersection with Veridea Development**

The roadway network for the year 2030 No-Build *Synchro* model was modified for one capacity improvement that is currently being studied. That improvement is the realignment of Lakeshore Boulevard between Hawley Street and Wright Street and the construction of a roundabout at the Lakeshore Boulevard/ Wright Street intersection. This realignment is part of the Lakeshore Boulevard Coastal Restoration project. The project is currently being studied per grant funding and will need to be

vetted through the public process before it is finalized. Through discussions with the City, it was decided to include this capacity improvement as part of the 2030 scenarios' roadway network.

Other Future Developments

Marquette Hospital

Another private action that will change traffic patterns is the relocation of Marquette General Hospital from its existing location on College Avenue between Seventh Street and Presque Isle Avenue. The new site of hospital is on West Baraga Avenue. A separate Traffic Impact Study (TIS) was prepared for the new hospital (see Appendix L). The study area of the TIS includes the following existing intersections plus the proposed hospital accesses:

- US-41 and M-553/McClellan Avenue
- US-41 and Seventh Street/Grove Street
- US-41 and Front Street
- Grove Street and M-553
- Grove Street and Homestead/Anderson Street
- Seventh Street and Fisher Street
- Seventh Street and Baraga Avenue
- Seventh Street and Washington Street
- Seventh Street and Spring Street
- Baraga Avenue and McClellan Avenue
- Washington Street and McClellan Avenue

The scenarios analyzed include:

- Existing Conditions
- Opening Year 2018 Background Conditions
- Opening Year 2018 No Build Conditions
- Opening Year 2018 Build Conditions
- Design Year 2038 Background Conditions
- Design Year 2038 No Build Conditions
- Design Year 2038 Build Conditions

The analysis from the TIS determined the recommended roadway improvements, included in the Preferred Alternative, that are proposed for the study area to accommodate the proposed relocation of Marquette General Hospital. These Preferred Alternative roadway improvements are illustrated in **Error! Reference source not found.** of the TIS and summarized as follows:

- Main Hospital Entrance Connection to US-41 with a Roundabout Intersection;
- The existing intersection of US - 41 with Grove/Seventh Streets is converted to a roundabout intersection;
- The proposed intersection of Baraga Avenue with the Main Hospital Entrance is proposed as a compact urban roundabout with two northbound lanes for traffic entering the site from US-41;
- The westbound approach of Baraga Avenue at McClellan Avenue is restricted to prohibit left turns and through traffic and allow right turns only. All other movements at this intersection will continue to be permitted, and the intersection will continue to operate as stop controlled on Baraga Avenue approaches and free flow on McClellan Avenue;

- McClellan Avenue is widened to provide northbound and southbound left turn lanes at Baraga Avenue and to lengthen the northbound left turn lane at Washington Street;
- The existing traffic signal at the intersection of McClellan Avenue and Washington Street is modified to provide permitted/protected left turn phasing;
- Seventh Street is widened to provide a center left turn lane from north of Spring Street to Fisher Street and left turn lanes are provided on the Baraga Avenue and Spring Street minor leg approaches to Seventh Street.
- Non-motorized facilities will be constructed alongside and as part of the above roadway improvements to accommodate pedestrians and bicycles consistent with City and MDOT plans and requirements.

These improvements are slated for construction during 2017 and 2018.

The Final Traffic Impact Study for the Marquette Hospital Transportation Improvement Project is included in Appendix L.

Fire Station

A consolidated fire station is being considered at the northwest corner of Spring Street and Seventh Avenue. As with the hospital relocation, it is recommended that a traffic impact study be completed for this which would evaluate the operation of the immediately adjacent intersections: Seventh Street with Washington Street, Spring Street and Baraga Avenue. The study should also review other intersections which are difficult for emergency vehicles to cross. Two specifically mentioned by the Fire Chief are Lincoln Avenue/Washington Street and Front Street/Washington Street. The timings at these locations should also be reviewed as the recommended Washington Street traffic signal interconnect is installed and timings are implemented. It is also possible that emergency vehicle signal pre-emption could be implemented as part of signal upgrades. These considerations were factored into the evaluation of mitigation on this corridor.

Cliff Dow Site

The Cliff Dow site, a 46-acre parcel of land in the northeast portion of the City, was also not included in this study. The type and size of the development that may eventually be located on this land is not yet known. Similarly, site access conditions and locations are not known at this time. Once development plans are finalized, it is recommended that a traffic impact study be conducted to determine what, if any, roadway improvements will be needed in the vicinity of the site to accommodate traffic expected to be generated by the planned development. City staff will have access to the *Synchro 8* software and the specific *Synchro* models developed through this study for use in evaluating development scenarios at the Cliff Dow site or any other potential traffic additions to the system.

Traffic Signal at Grove Street/McClellan Avenue Intersection

Finally, discussions with both City and MDOT staff indicated that a traffic signal installation is proposed at the Grove Street/McClellan Avenue intersection. This location did not warrant mitigation based on this study, and because the signal is proposed as an MDOT project, it has not been included as part of mitigation recommendations.

FUTURE NO-BUILD CONDITIONS (YEAR 2030)

As discussed previously, future No-Build scenarios were analyzed for the AM, Mid-Day and PM peak hours. The “No-Build” scenarios assume that normal traffic growth occurs between now and the year 2030, with no capacity modifications to the existing roadway network except for projects that are already identified/planned and likely to be constructed (note: it was assumed that for the “No-Build” scenarios, normal ongoing capital maintenance and road resurfacing/reconstruction projects would still occur consistent with the City’s capital improvement plan. “Capacity improvements” which are also assumed to be part of the No-Build scenarios would typically include identified/planned improvements such as added lanes at intersections, construction of new road segments, construction of roundabouts, road widening, etc.). Reviewing expected traffic operations of the existing network in the year 2030 based on anticipated traffic growth allows identification of potential future infrastructure needs that would not be apparent when only looking at existing traffic volumes. This is why the No-Build scenario is evaluated.

Traffic Projections

Intersection Turning Movement Volumes

Based on the description given in the previous section, year 2030 No-Build peak hour turning movement counts were developed for the AM, Mid-day and PM peak hours. These are shown on Figures 6A through 6J.

Corridor Traffic Volumes

In order to develop the year 2030 No-Build corridor traffic volumes, the growth rate of 0.5 percent per year was applied to the 2013/2014 corridor traffic counts. These volumes are summarized on Figure 7 – Future Annual Average Daily Traffic Volumes.

Future Capacity Analyses

Signalized Intersections

As noted in the previous section, the 2030 No-Build peak hour turning movement volumes were input into the *Synchro 8* model, which had also been updated to include the realignment of Lakeshore Boulevard. The Levels of Service were determined for each of the signalized intersections and are summarized in Table 7. Copies of the capacity analyses are included in Appendix H. Figure 8A graphically summarizes the overall intersection LOS, and Figures 8B and 8C show the individual movement LOS for the five signalized intersections with movements at LOS D, E or F. Out of the 25 signalized intersections that were studied, three (3) of these have movements at LOS E or F. The McClellan Avenue/Fair Avenue and U.S. 41/Grove Street intersections were discussed in the Intersection/Corridor Mitigation Measures (2013) section above regarding improvements to address existing operational deficiencies. Each of these intersections will require further mitigation as a result of the additional traffic present by the year 2030. These mitigation measures are discussed in the Intersection/Corridor Mitigation Measures (2030) section below.

- McClellan Avenue/Wright Avenue (Intersection ID #6)
- McClellan Avenue/Fair Avenue (Intersection ID #7)
- U.S. 41/Grove Street (Intersection ID #49)

Unsignalized Intersections

The *Synchro 8* model was also used to determine the Levels of Service for the unsignalized intersections with the 2030 No-Build traffic volumes and geometry. Table 8 summarizes these Levels of Service, Figure 8A shows the LOS graphically, and Figures 8B and 8C show the individual movement LOS for the ten unsignalized intersections with movements at LOS D, E or F. Copies of these analyses are included in Appendix I. Of the 56 unsignalized intersections studied, seven (7) locations have movements at LOS E or F. Five of these intersections were identified with poor LOS in existing conditions and were discussed in the Intersection/Corridor Mitigation Measures (2013) section above. At these five locations, the mitigation recommendations in that section (for year 2013) are also expected to address the deficiencies identified in the year 2030 No-Build scenario as well. Two additional intersections (U.S. 41/Hampton Street and McClellan Avenue/Baraga Avenue) were forecasted to have poor LOS as a result of the additional traffic by the year 2030. These two intersections are discussed below.

- Presque Isle Avenue/Fair Avenue (Intersection ID #16)
- Front Street/Baraga Avenue (Intersection ID #37)
- U.S. 41/Hampton Street (Intersection ID #55)
- McClellan Avenue/Ridge Street (Intersection ID #62)
- McClellan Avenue and Baraga Avenue (Intersection ID #64)
- O'Dovero Drive/McClellan Avenue (Intersection ID #66)
- Lincoln Avenue/Wright Street (Intersection ID #69)

Corridor Analyses

Following the methodology described in the Existing Conditions Corridor Analyses section (in which the corridors were evaluated based on the operational criteria of ADT volumes, intersection operations, roadway cross section, spacing and number of traffic signals), no further corridors warrant mitigation based on 2030 No-Build traffic volumes.

INTERSECTION/CORRIDOR MITIGATION MEASURES (YEAR 2030)

The intersection capacity analyses completed for the 81 intersections using the 2030 No-Build traffic volumes and geometry indicate that a total of ten intersections do not meet the “LOS E or better” criteria for all movements at the intersection. Seven of these were the same ones as discussed in the “Intersection/Corridor Mitigation Measures (2013)” section above. Each of these seven locations was further analyzed to develop recommended mitigation to address the substandard Level of Service. Two of the seven intersections (McClellan Avenue/Fair Avenue and U.S. 41/Grove Street) will require additional mitigation beyond what was described previously for the year 2013. Intersection capacity analysis *Synchro* output sheets are included in Appendices G and J. The following mitigation recommendations are considered long term improvements and are also summarized on Figures 5A, 5D, 9A and 9B:

- **Figure 5A: McClellan Avenue and Fair Avenue (Intersection ID #7)**
To address the heavy northbound right turn volume it is recommended that a northbound to eastbound right-turn lane be constructed. This will require modification to the existing traffic signal installation and adjustment to the signal timings.
- **Figure 5D: U.S. 41 and Grove Street (Intersection ID #49)**
Traffic signal timing was originally recommended to be revised to bring the LOS to within an acceptable range. With the Marquette Hospital relocation to Baraga Avenue, this intersection is being reconstructed as a roundabout intersection in 2017.
- **Figure 9A: McClellan Avenue and Wright Street (Intersection ID #6)**
It is recommended that the traffic signal be retimed to account for the heavy northbound right-turn movement. If the signal is not already interconnected with the adjacent signals, that should be installed.
- **Figure 9B: U.S. 41 and Hampton Street (Intersection ID #55)**
This intersection did not meet all-way stop or signal warrants. An analysis using the existing 2-way stop control and adding left turn lanes to Hampton Street was completed, but the level of service did not improve to an acceptable level. Hampton Street has a relatively low volume compared with adjacent streets; therefore the cost of construction of a roundabout would not be justified. It is recommended that a detailed crash analysis and an evaluation of the impacts of restricting Hampton Street to right-in/right-out only be completed.
- **McClellan Avenue/Baraga Avenue (Intersection ID #64)**
This intersection met the all-way stop warrant, however installation of an all-way stop mid-way between the two adjacent signalized intersections (Washington Street and U.S. 41) is not reasonable and would not provide an acceptable level of service. With the Marquette Hospital relocation, the westbound approach of Baraga Avenue at McClellan Avenue will be restricted to prohibit left turns and through traffic, and will allow right turns only. All other movements at this intersection will continue to be permitted, and the intersection will continue to operate as stop controlled on Baraga Avenue approaches and free flow on McClellan Avenue.

PEDESTRIAN/BICYCLE ACCOMMODATION ANALYSIS & RECOMMENDATIONS

The existing pedestrian and bicycle facilities have been evaluated to identify deficiencies in the existing system. This analysis complements the previous studies and recommendations described earlier in this report and provides some general recommendations to be applied throughout the City. Data and information from a variety of sources were used in the analysis as discussed below.

Pedestrian and bicycle count data was collected at each of the 81 study locations. These volumes were used to assist in identifying corridors and intersections which warrant additional facilities. The counts for this study were taken in fall and winter when pedestrian and bicycle activity at some locations could theoretically be at lower levels than during warmer weather months. However, it was indicated by stakeholders that student activity while NMU is in session drives a significant amount of the pedestrian and bicycle activity in the City, with the result being that some locations experience highest volumes while NMU is in session. These counts were only one input to the analysis since there is not a universally accepted standard regarding what level of pedestrian or bicycle activity justifies provision of additional facilities. The analysis and recommendations also relied on input from City staff and stakeholders as well as the professional judgment of the consultant team.

Other resources evaluated included the *Draft City of Marquette Community Master Plan, Chapter 6 - Transportation*, the *Third Street Corridor Sustainable Development Plan (version 5.0)* and input from various stakeholders including City staff, Northern Michigan University, Marquette Bikeability Committee and Marquette Access Group. Finally, evaluation of the corridors and intersections was accomplished using field visits, aerial photography and video recordings taken during field visits.

Pedestrian Facilities

An assessment of the existing sidewalk network within the City was completed in order to identify gaps in the system which would warrant the construction of additional sidewalk links. Figure 10 depicts this existing sidewalk network and identifies the recommended additions to the existing network.

The following list includes the sidewalk links being recommended for addition to the system and are shown graphically on Figure 10. As these links are added to the system, crossing improvements such as crosswalks and ADA ramps should be added at related intersections.

- Wright Street – McClellan Avenue to Lakeshore Boulevard (north side – McClellan Avenue to a point easterly of Sugar Loaf Avenue at the existing sidewalk and Vanevera Avenue to Wilkinson Avenue; south side – Sugar Loaf Avenue to Presque Isle Avenue and NMU Dome entrance to Lakeshore Boulevard)
- Center Street – Vanevera Avenue to Tracy Avenue (both sides)
- Fair Avenue – McClellan Avenue to 7th Street (north side – McClellan Avenue to Lincoln Avenue and Northrup Street to 8th Street; south side – 8th Street to 7th Street)
- Presque Isle Avenue – Norwood Street to Wright Street (west side)
- Magnetic Street – Fourth Street to Third Street (north side)
- Hewitt Avenue – Seventh Street to Oak Street (south side)
- Ridge Street – Sixth Street to Fifth Street (north side)
- Ridge Street – McClellan Avenue to Lincoln Avenue (south side)
- McClellan Avenue – US 41 to Washington Street (west side) including improved pedestrian crossing of US 41
- McClellan Avenue – Washington Street to Fair Avenue (both sides)

- Washington Street – McClellan Avenue easterly to Garfield Avenue (south side)
- US 41 – Hampton Street to Genesee Street (east side)
- Altamont Street – Mesnard Street to Fisher Street (west side – Jackson Street to U.S. 41 overpass; east side – Mesnard street to Fisher Street)
- Altamont Street – Jackson Street to U.S. 41 (east side)
- Hampton Street – Adams Street to Altamont Street (both sides)
- Mesnard Street – Bothwell Middle School to Altamont Street (north side)

In addition to these specific segments, sidewalk should be filled in to connect all areas where the sidewalk is intermittent along the block. There are two areas within the City where this is most prevalent, but this guidance should be followed throughout the City in order to complete the sidewalk system. The most prevalent areas include the areas both north and south of Wright Street between Sugarloaf Avenue and Presque Isle Avenue and the areas south of U.S. 41, north of Pioneer Road and west of Adams Street.

On Presque Isle Avenue at Summit Street and Waldo Street, there are two existing overhead flashing signals (yellow for Presque Isle Avenue, red for Summit Street or Waldo Street). These overhead signals were installed when both intersections were cross streets that extended east into the area that is now part of the Northern Michigan University campus. Although these locations both are used by students to cross Presque Isle, it is recommended that the overhead signals be removed and that crosswalks be upgraded to high visibility crosswalks. Warning signs for the crossings should also be reviewed for retro-reflectivity and proper placement.

Several other locations have been identified as having a higher concentration of pedestrian activity, and improved pedestrian crossings are recommended as follows:

- Wright Street between Sugarloaf Avenue and Lincoln Avenue – There is a high concentration of pedestrian crossings to and from the NMU parking lot north of Wright Street. A high visibility crosswalk has been installed, but it is recommended that advanced warning signs with flashers also be installed to alert drivers to this mid-block crossing. Installation of a grade separated crossing (overpass or tunnel) could also be considered, although costs would be considerably higher, and there would be design challenges in order to meet ADA requirements.
- U.S. 41/McClellan Avenue – As noted above, an improved crossing of the west leg of U.S. 41 is recommended, including high visibility crosswalks, pedestrian countdown signals and advanced warning signs. Installation of a grade-separated facility for non-motorized traffic (tunnel or overpass) could be investigated.
- Washington Street/McClellan Avenue - Improvements should include high visibility crosswalks, pedestrian countdown signals and advanced warning signs.
- U.S. 41/Genesee Street – Improvements should include high visibility crosswalks, pedestrian countdown signals and advanced warning signs.

The following list includes general recommendations which should be reviewed when maintenance or infrastructure improvements are programmed at intersections within the City. Evaluation of the applicability of these should be included in the normal design/review process for each location.

- Provision of high visibility crosswalks consisting of white 12-inch bars perpendicular to the crossing direction (ladder style). This design provides better visibility of the crosswalk to the driver.

- Provision of curb extensions (bulb outs) to shorten crossing distance and provide traffic calming (see photograph). These should be constructed after more detailed studies are completed on whether this measure is appropriate for the location.



Example of curb extension or bulb-out.

Innovative Intersection Safety Improvement Strategies and Management Practices: A Domestic Scan. FHWA, September 2006.

- Upgrades to signalized intersections to meet current *Michigan Manual on Uniform Traffic Control Devices* and *Proposed Right-of-Way Accessibility Guidelines (PROWAG)*. *PROWAG* serves to improve accessibility to all users, including the physically disabled. These documents may include facilities such as countdown pedestrian signals, audible pedestrian signals, properly located pedestrian pushbuttons and other related improvements to accessibility.

Bicycle Facilities

The existing bicycle network in the City was assessed to identify gaps in the system which would warrant the construction of additional links. The existing network is sparse when compared to the demand that was identified during the bicycle counts and when compared to input received from the City and stakeholders. While the intersections along Lakeshore Boulevard (Lakeshore Multi-Use Path) generally had the highest bicycle volumes, relatively high volumes were also encountered elsewhere, particularly in the vicinity of Northern Michigan University. Figure 11 depicts the existing bicycle network along with the recommendations for additional bikeway segments.



Lakeshore Multi-Use Path near NMU Campus

The additional bikeway segments being recommended are primarily the same as those recommended in the *Draft Community Master Plan* and the *Third Street Corridor Sustainable Development Plan*, with the exception of a link on Fair Avenue between McClellan Avenue and Lincoln Avenue and several additional links south of US 41. Further study of each of the recommended corridors shown on Figure 11 will be

required to identify whether the bikeway should be an on-street bike lane, a shared bike lane (sharrows), or a separate bike path.

Following are the recommended additional locations which were included in the *Third Street Corridor Sustainable Development Plan*:

- Sugarloaf Avenue – Hawley Street to Wright Street
- Wright Street – Sugarloaf Avenue to Presque Isle Avenue
- Lincoln Avenue – Washington Street to Wright Street
- Kaye Avenue – Lincoln Avenue to Presque Isle Avenue
- Seventh Street/Tracy Avenue – Baraga Avenue to Wright Street
- Presque Isle Avenue – Kaye Avenue to Hawley Street
- Fair Avenue – Presque Isle Avenue to Lakeshore Boulevard
- Third Street – Fisher Street to Fair Avenue
- Pine Street – Ridge Street to Fair Avenue
- Hewitt Avenue – Seventh Street to Lakeshore Boulevard
- Ridge Street – Seventh Street to Lakeshore Boulevard
- Baraga Avenue – McClellan Avenue to Lakeshore Boulevard
- McClellan Avenue – US 41 to Washington Street

The following ten segments are recommended but had not been included in the *Third Street Plan*:

- Hawley Street – Wilkinson Avenue to Dead River (north side)
- Fair Avenue – McClellan Avenue to Lincoln Avenue
- Altamont Street – Pioneer Road to Baraga Avenue
- Pioneer Road – Altamont Street to Division Street
- Division Street – Pioneer Road to Genesee Street
- Division Street – McClellan Avenue to Pioneer Road
- Genesee Street – Altamont Street to US 41
- Wilson Street – existing path easterly of McClellan Avenue to the existing Iron Ore Heritage Trail (north side)
- McClellan Avenue – Washington Street to Fair Avenue
- Washington Street – McClellan Avenue to Lakeshore Boulevard (see discussion in following paragraph)

A recommendation to provide bicycle facilities along Washington Street was made by the Marquette Bikeability Committee. Washington Street would need to be widened to provide adequate width for bike lanes in addition to the single through lane in each direction and center median. However, Washington Street could be marked with sharrows for cyclists traveling this corridor for “non-recreational” purposes (i.e. commuting). This traffic study does recommend that the recreational bicyclists along Washington Street should be encouraged to use the multi-use path which runs parallel to Washington Street about 200 feet to the south.

Also, as noted in the Sidewalk Facilities section, in addition to an improved at-grade crossing of the west leg of U.S. 41 at McClellan Avenue, installation of a grade-separated facility for non-motorized traffic (tunnel or overpass) could be investigated.

TRUCK ROUTES

During the course of the traffic study, the consultant team was requested to assess potential truck routes to assist the City in their ongoing evaluation of this issue. While not part of the original study, applicable information related to this topic has been included in Appendix K.

CONCLUSIONS AND RECOMMENDATIONS

This study analyzed intersections, road segments, and non-motorized facilities within the City of Marquette. These locations were evaluated for traffic operations and system connectivity for both existing (year 2013) traffic volumes and year 2030 traffic volumes. All-way stop and traffic signal warrants were also evaluated. For intersections and road segments, mitigation recommendations were developed for any locations which had movements at LOS E or F. For non-motorized facilities, mitigation recommendations were developed to: connect “gaps” in the current non-motorized system; provide a basic bicycle facility network consistent with other ongoing City planning efforts, and; improve pedestrian crossing facilities.

Based on these analyses, the following recommendations for mitigation are made:

Intersection/Roadway Improvements

- McClellan Avenue/Wright Street (Intersection ID #6)
Near term - Retime existing traffic signal. Upgrade to interconnect with signals along Wright Street.
- McClellan Avenue/Fair Avenue (Intersection ID #7)
Near term – Retime existing traffic signal.
Long term – Install northbound right turn lane.
- Presque Isle Avenue/Fair Avenue (Intersection ID #16)
Near term – Option 1: Install a traffic signal; Option 2: Install a mini-roundabout.
- Front Street/Baraga Avenue (Intersection ID #37)
No mitigation recommended. Geometric improvements do not improve level of service. Include intersection in the ongoing Baraga Avenue Corridor Study currently underway.
- U.S. 41/Grove Street (Intersection ID #49)
This intersection is being reconstructed as a roundabout in 2017.
- U.S. 41/Hampton Street (Intersection ID #55)
No mitigation recommended. Geometric improvements do not improve level of service. Impacts of converting to Hampton Street movements to right-in/right-out should be studied.
- McClellan Avenue/Ridge Street (Intersection ID #62)
Near term - Option 1: Install a traffic signal. Option 2: Install a roundabout.
- McClellan Avenue/Baraga Avenue (Intersection ID #64)
With the Marquette Hospital relocation, the east leg of this intersection has been restricted to right in right out operation.
- McClellan Avenue/O’Dovero Drive (Intersection ID #66)
Near term – Install traffic signal. Widen McClellan Avenue to add left turn lanes. Realign and widen westbound approach. Interconnect with U.S. 41/McClellan Avenue signal.
- Lincoln Avenue/Wright Street (Intersection ID #69)
Near term – Option 1: Install traffic signal with left turn lanes on all four intersection approaches. Realign or close southbound approach (driveway into private property). Install pedestrian countdown signals with high visibility crosswalks. Interconnect with signals along Wright Street. Option 2: Install a roundabout.
- Washington Street Interconnect

Upgrade traffic signals to include interconnect system. Implement system timings to provide progression through system. Do not extend system to U.S. 41 since that system is on different cycle length and maintained by MDOT.

- Wright Street Interconnect

Upgrade traffic signals to include interconnect system. Implement system timings to provide progression through system.

Pedestrian and Bicycle Facility Improvements

- Sidewalks

Recommended sidewalk connections are shown on Figure 10.

- Pedestrian Crossing Improvements

Upgrades recommended across Wright Street between Sugarloaf Avenue and Lincoln Avenue, across west leg of U.S. 41 at McClellan Avenue (possible grade separation), U.S. 41 at Genesee Street, McClellan Avenue at Washington Street, and Presque Isle Avenue at Summit Street and Waldo Street.

- Bicycle Facilities

Recommended multi-use paths and/or on-street bike lanes are shown on Figure 11.

- Non-motorized crossings

When maintenance or infrastructure improvements are programmed at intersections, evaluate/implement the following items where feasible and appropriate:

Provide high visibility crosswalks consisting of white 12-inch bars perpendicular to the crossing direction (ladder style).

Provide curb extensions (bulb outs) to shorten crossing distance and provide traffic calming.

When signals infrastructure is upgraded, meet current *Michigan Manual on Uniform Traffic Control Devices* and *Proposed Right-of-Way Accessibility Guidelines (PROWAG)*. PROWAG serves to improve accessibility to all users, including the physically disabled. This may include elements such as countdown pedestrian signals, audible pedestrian signals, and properly located pedestrian pushbuttons.

Construction Costs and Prioritization

Estimated construction costs were developed for mitigation recommendations that could be specifically defined. These are summarized in Table 9. Table 9 also designates a priority level for implementing each improvement with “high” priority indicating an improvement which should be funded and constructed in the near future (0-5 years), “medium” priority indicating improvements funded and constructed in 5-10 years, and “low” priority funded and constructed long term (10-20 years). These priority levels were set based on an evaluation of existing versus longer term issues, construction cost, safety issues and level of service.

Because traffic growth is dependent on many variables (some of which could not be foreseen at the time of this study), all locations should be monitored for degradation in operation even though the location may not have been identified for mitigation. Further study of each of the recommended improvements will be required to refine the design concepts and estimated construction costs. As individual projects are advanced, the City’s “Complete Streets Guiding Principles” should be incorporated to develop improvements which provide for multiple transportation modes. It is also

recommended that to the extent practical, the “7 Principles of Universal Design” be incorporated into future projects. These include the following: equitable use, flexibility in use, simple and intuitive, perceptible information, tolerance for error, low physical effort, and size and space for approach and use.

TABLE 1
Study Area Intersections and Segments

Int. #	Intersection Location
1	Lakeshore Boulevard and Peter White Drive
2	Lakeshore Boulevard and Hawley Street
3	Presque Isle Avenue and Hawley Street
4	Sugarloaf Avenue and Hawley Street
5	Sugarloaf Avenue and Wright Street
6	McClellan Avenue and Wright Street
7	McClellan Avenue and Fair Avenue
8	McClellan Avenue and Cleveland Street
9	Seventh Street and College Avenue
10	Presque Isle Avenue and Center Street
11	Presque Isle Avenue and Wright Street
12	Lakeshore Boulevard and Wright Street
13	Pine Street and Lakeshore Boulevard
14	Pine Street and Fair Avenue
15	Lakeshore Boulevard and Fair Avenue
16	Presque Isle Avenue and Fair Avenue
17	Third Street and Fair Avenue
18	Front Street and Fair Avenue
19	Presque Isle Avenue and Kaye Avenue
20	Fourth Street and College Avenue
21	Third Street and College Avenue
22	Pine Street and Magnetic Street
23	Front Street and Magnetic Street
24	Third Street and Magnetic Street
25	Fourth Street and Magnetic Street
26	Lakeshore Boulevard and Crescent Street
27	Lakeshore Boulevard and Hewitt Avenue
28	Spruce Street and Hewitt Avenue
29	Pine Street and Hewitt Avenue
30	Front Street and Hewitt Avenue
31	Third Street and Hewitt Avenue
32	Fourth Street and Hewitt Avenue
33	Front Street and Arch Street
34	Pine Street and Ridge Street
35	Lakeshore Boulevard and Spring Street
36	Lakeshore Boulevard and Baraga Avenue
37	Front Street and Baraga Avenue
38	Front Street and Spring Street
39	Third Street and Baraga Avenue
40	Fourth Street and Baraga Avenue

Int. #	Intersection Location
41	Seventh Street and Spring Street
42	Seventh Street and Baraga Avenue
43	Front Street and Fisher Street
44	Third Street and Fisher Street
45	Fourth Street and Fisher Street
46	Fifth Street and Fisher Street
47	Altamont Street and Fisher Street
48	Seventh Street and Fisher Street
49	U.S. 41 and Grove Street
50	U.S. 41 and Genesee Street
51	Division Street and Genesee Street
52	Altamont Street Genesee Street
53	Altamont Street and Hampton Street
54	Division Street and Hampton Street
55	U.S. 41 and Hampton Street
56	Division Street and Joliet Road
57	Division Street and Pioneer Road
58	Altamont Street and Pioneer Road
59	Division Street and McClellan Avenue
60	Third Street and Spring Street
61	U.S. 41 and Washington Street
62	McClellan Avenue and Ridge Street
63	McClellan Avenue and Washington Street
64	McClellan Avenue and Baraga Avenue
65	U.S. 41 and McClellan Avenue
66	O'Dovero Drive and McClellan Avenue
67	Grove Street and McClellan Avenue
68	Pioneer Road and McClellan Avenue
69	Lincoln Avenue and Wright Street
70	Lincoln Avenue and Fair Avenue
71	Lincoln Avenue and College Avenue
72	Lincoln Avenue and Cleveland Street
73	Lincoln Avenue and Washington Street
74	Seventh Street and Magnetic Street
75	Seventh Street and Washington Street
76	Fifth Street and Washington Street
77	Fourth Street and Washington Street
78	Third Street and Washington Street
79	Front Street and Washington Street
80	Front Street and Main Street
81	Lakeshore Blvd and Washington Street

TABLE 1 (cont.)
Study Area Intersections and Segments

#	Corridor Analysis Locations
C1	Hawley Street from City limits to Lakeshore Boulevard
C2	Sugarloaf Avenue from Wright Street to Hawley Street
C3	Wright Street from City limits to Lakeshore Boulevard
C4	Wright Street from City limits to Lakeshore Boulevard (Loc. 2)
C5	Presque Isle Avenue from College Avenue to Hawley Street
C6	Presque Isle Avenue from College Avenue to Hawley Street (Loc. 2)
C7	Center Street from Presque Isle Avenue to Tracy Avenue
C8	Fair Avenue from Presque Isle Avenue to Lakeshore Boulevard
C9	College Avenue from Lincoln Avenue to Front Street
C10	Magnetic Street from Lincoln Avenue to Front Street
C11	Magnetic Street from Lincoln Avenue to Front Street (Loc. 2)
C12	College Avenue from Lincoln Avenue to Front Street (Loc. 2)
C13	Fair Avenue from City limits to Seventh Street
C14	Fair Avenue from City limits to Seventh Street (Loc. 2)
C15	McClellan Avenue from U.S. 41 to Wright Street (Loc. 2)
C16	McClellan Avenue from U.S. 41 to Wright Street
C17	Grove Street from City Limits to U.S. 41
C18	Seventh Street from U.S. 41 to Fair Avenue (Loc. 2)
C19	Seventh Street from U.S. 41 to Fair Avenue
C20	Pine Street from Ridge Street to Fair Avenue
C21	Front Street from U.S. 41 to Fair Avenue
C22	Third Street from Fisher Street to Fair Avenue
C23	Fourth Street from Fisher Street to College Avenue
C24	Hewitt Avenue from Seventh Street to Lakeshore Boulevard (Loc. 2)
C25	Pine Street from Ridge Street to Fair Avenue (Loc. 2)
C26	Hewitt Avenue from Seventh Street to Lakeshore Boulevard
C27	Front Street from U.S. 41 to Fair Avenue (Loc. 2)
C28	Third Street from Fisher Street to Fair Avenue (Loc. 2)
C29	Fourth Street from Fisher Street to College Avenue (Loc. 2)
C30	Grove Street from City Limits to U.S. 41 (Loc. 2)
C31	Lincoln Avenue from Washington Street to Wright Street
C32	Lincoln Avenue from Washington Street to Wright Street (Loc. 2)
C33	Washington Street from U.S. 41 to Lakeshore Boulevard
C34	Washington Street from U.S. 41 to Lakeshore Boulevard (Loc. 2)

Table 2
Previous and Current Studies

Name	Contents or Date	Summary
2013-02-13 Marquette Drawing Set	Shoreline Restoration Concepts	Depicts relocation of Lakeshore Blvd as part of shoreline restoration. Used for 2030 No Build Synchro network.
Northern Michigan University Master Plan		15- to 20-year planning document for growth and redevelopment of the campus. Used for evaluation of mitigation in the vicinity of the NMU campus.
Community Master Plan Update - Draft Chapter 6 - Transportation	Currently being updated by City	Provided good description of existing transportation system and recommendations for improvements to the system. Used to develop pedestrian and bicycle facility recommendations.
Marquette Place Site Plan	Part of Founders Landing Development	Used to develop 2030 No Build Traffic
Complete Streets Resolution	Complete Streets Guiding Principles	Facilities for all modes should be included in planning, funding, designing, constructing, operating and maintaining new and modified streets.
Implementation Report - Marquette SGA (Smart Growth America)	Marquette Mobility Management and Coordination Implementation Plan - 2013	Mobility management strategies to improve effectiveness of transit network; Also improve the 3rd Street corridor and enhance walkability, bikeability and transit use.
Third Street Corridor Sustainable Development Plan	2/6/2013 - Version 5.0	Plan created to create a mixed-use corridor to link downtown with NMU and surrounding neighborhoods. Public input and charrettes to develop Vision plan for corridor. Used to develop pedestrian and bicycle facility recommendations.
Central UP Planning and Development	US-41/M-28 Comprehensive Corridor & Access Management Plan	Corridor and access management plan for US 41/M28. Includes recommendations at Washington/US 41 (p 4-6)/ US 41/McClellan (p. 4-7), US 41/Grove (p. 4-7)
Multi Use Path	CIP Multi Use Path Exhibit	Identifies existing and future multi-use paths within and near Marquette. Information is reflected on Figure 11 - Recommended Bikeway System Additions
Capital Improvement Plan 2013/2014 Budget		Supplemental information
City of Marquette Downtown Development Authority - Development Plan and Tax Increment Financing Plan #3	Development Plan and Tax Increment Financing Plan #3 - 2011	Description of Development Plan and proposed projects through 2036.
Downtown Parking	Downtown Marquette Parking Map	Shows On-Street and Parking lots
MarqTran Combined Schedules	Transit Route Maps	Information was considered as mitigation locations were reviewed.
Multi Use Map		Identifies groomed multi-use path along lakefront. Reflected on Figure 11 - Recommended Bikeway System Additions
Past Traffic Counts	1990 and 2000 ADTs	Counts taken at 72 locations throughout City.
Proposed 3rd Street Bus Route	Prop. Bus route from Mobility Management Strategies - Fig. 5.5	
Community Master Plan	2004	Previous version of Master Plan. This plan is currently being updated.
Gravel Street Ex11	Gravel Street Paving Capital Improvement Plan	
Presentation Meeting 2_MM_Marquette	Strategies and Alternatives for Marquette: Mobility Management - PowerPoint presentation	Focused on providing transit service within City to improve mobility.
Sidewalks	CIP Sidewalks Exhibit	Identifies types of sidewalks
City Traffic Counts Map 2007	Historic Counts	Presents roadway classifications, truck routes and traffic counts (Marquette - 2000; MDOT - 1999)
Downtown Development Plan and Parking Demand Analysis	1996	Parking study for downtown Marquette to address parking shortage

TABLE 3
Existing Level of Service Summary
Signalized Intersections (2013)

Intersection	AM Peak Hour		Mid-Day Peak Hour		PM Peak Hour		Notes
	Overall LOS	Delay (sec/veh)	Overall LOS	Delay (sec/veh)	Overall LOS	Delay (sec/veh)	
5 Sugarloaf Ave & Wright St	B	14.5	B	15.5	B	18.7	
6 McClellan Ave & Wright St	B	14.0	B	14.5	C	23.9	
7 McClellan Ave & Fair Ave	F	88.4	C	21.8	B	17.2	AM: NB TH/RT = F; Mid-Day: NB TH/RT = D
9 Seventh St & College Ave	B	10.3	B	17.7	B	14.7	
11 Presque Isle Ave & Wright St	A	7.5	B	10.2	B	11.9	
19 Presque Isle Ave & Kaye Ave	B	11.0	B	11.9	B	12.2	
20 Fourth St & College Ave	A	8.7	A	9.9	B	10.6	
30 Front St & Hewitt Ave	B	11.3	B	11.5	B	12.0	
31 Third St & Hewitt Ave	B	11.7	B	12.6	B	13.0	
38 Front St & Spring St	A	4.6	A	5.1	A	5.3	
49 U.S. 41 & Grove St	D	40.4	C	32.2	C	32.5	AM: SB Th/RT = F; SEB LT = E; SB LT, NB LT = D Mid-Day: SEB LT = E; SB TH/RT = F; NB LT, NWB LT = D PM: NWB LT, SEB LT = D; SB TH/RT = E, NB LT = D
50 U.S. 41 & Genesee St	B	13.6	B	12.8	B	14.8	
61 U.S. 41 & Washington St (NW)* U.S. 41 & Washington St (SE)*	A C	7.0 28.9	B C	12.3 22.2	A C	9.9 31.1	PM: NW TH = D
63 McClellan Ave & Washington St	B	14.4	B	15.9	B	16.4	
65 U.S. 41 & McClellan Ave (North)* U.S. 41 & McClellan Ave (South)*	B B	11.9 14.4	B B	13.6 13.4	B B	15.6 13.9	
70 Lincoln Ave & Fair Ave	B	12.2	B	13.2	B	12.6	
71 Lincoln Ave & College Ave	B	11.4	B	10.7	B	10.8	
73 Lincoln Ave & Washington St	B	11.8	B	11.9	B	14.1	
74 Seventh St & Magnetic St	B	11.9	B	14.4	B	9.2	
75 Seventh St & Washington St	B	12.1	B	14.6	B	14.8	
76 Fifth St & Washington St	B	11.2	B	12.7	B	12.7	
77 Fourth St & Washington St	A	9.4	B	10.9	B	10.4	
78 Third St & Washington St	B	13.3	B	15.2	B	14.8	
79 Front St & Washington St	A	3.3	A	6.3	A	5.3	

Indicates Intersection with Movements at Level of Service of E or F

Indicates Intersection with Movements at Level of Service of D

* Level of Service cannot be calculated using HCM 2010. HCM 2000 was used for these intersections.

TABLE 4
Existing Level of Service Summary
Unsignalized Intersections (2013)

Intersection	AM Peak Hour		Mid-Day Peak Hour		PM Peak Hour		Notes
	Overall LOS	Delay (sec/veh)	Overall LOS	Delay (sec/veh)	Overall LOS	Delay (sec/veh)	
1 Lakeshore Blvd & Peter White Dr	A	3.1	A	1.4	A	1.2	
2 Lakeshore Blvd & Hawley St	A	4.5	A	3.0	A	4.6	
3 Presque Isle Ave & Hawley St	A	5.3	A	5.9	A	5.6	
4 Sugarloaf Ave & Hawley St	A	4.7	A	5.3	A	6.0	
8 McClellan Ave & Clevel& St	B	12.7	B	13.4	B	17.1	
10 Presque Isle Ave & Center St	A	1.1	A	1.7	A	1.7	
12 Lakeshore Blvd & Wright St	A	2.9	A	3.3	A	3.8	
13 Pine St & Lakeshore Blvd	A	1.0	A	1.2	A	1.6	
14 Pine St & Fair Ave	A	7.5	A	8.0	A	8.5	
15 Lakeshore Blvd & Fair Ave	A	2.3	A	3.5	A	2.5	
16 Presque Isle Ave & Fair Ave	A	4.8	A	6.3	A	7.3	Mid-Day: WB LT = D PM: WB LT = E
17 Third St & Fair Ave	A	4.9	A	6.7	A	6.8	
18 Front St & Fair Ave	A	3.1	A	2.5	A	2.6	
21 Third St & College Ave	A	4.2	A	3.9	A	4.5	
22 Pine St & Magnetic St	A	1.8	A	2.0	A	2.2	
23 Front St & Magnetic St	A	2.1	A	1.7	A	2.4	
24 Third St & Magnetic St	A	1.4	A	1.4	A	2.1	
25 Fourth St & Magnetic St	A	3.4	A	3.4	A	3.6	
26 Lakeshore Blvd & Crescent St	A	1.7	A	0.8	A	1.3	
27 Lakeshore Blvd & Hewitt Ave	A	1.3	A	1.0	A	0.7	
28 Spruce St & Hewitt Ave	A	4.7	A	5.4	A	4.4	
29 Pine St & Hewitt Ave	A	7.2	A	7.3	A	7.4	
32 Fourth St & Hewitt Ave	A	1.4	A	1.9	A	2.3	
33 Front St & Arch St	A	7.9	A	8.4	A	9.2	
34 Pine St & Ridge St	A	3.2	A	3.2	A	3.6	
35 Lakeshore Blvd & Spring St	A	0.6	A	0.3	A	0.6	
36 Lakeshore Blvd & Baraga Ave	A	0.0	A	9.4	B	10.6	
37 Front St & Baraga Ave	A	2.4	A	3.3	A	4.4	PM: WB TH/LT = E
39 Third St & Baraga Ave	A	4.2	A	4.5	A	5.0	
40 Fourth St & Baraga Ave	A	3.6	A	4.8	A	4.4	
41 Seventh St & Spring St	A	1.0	A	1.8	A	2.0	
42 Seventh St & Baraga Ave	A	2.6	A	3.4	A	3.4	
43 Front St & Fisher St	A	1.3	A	1.1	A	1.4	

TABLE 4 (cont.)
Existing Level of Service Summary
Unsignalized Intersections (2013)

Intersection	AM Peak Hour		Mid-Day Peak Hour		PM Peak Hour		Notes
	Overall LOS	Delay (sec/veh)	Overall LOS	Delay (sec/veh)	Overall LOS	Delay (sec/veh)	
44 Third St & Fisher St	A	9.8	A	8.0	B	11.5	
45 Fourth St & Fisher St	A	8.7	A	8.5	A	9.3	
46 Fifth St & Fisher St	A	2.9	A	2.5	A	2.3	
47 Altamont St & Fisher St	A	6.6	A	3.7	A	4.9	
48 Seventh St & Fisher St	A	0.0	A	0.0	A	0.0	
51 Division St & Genesee St	A	3.8	A	5.1	A	5.7	
52 Altamont St & Genesee St	A	0.5	A	1.9	A	1.5	
53 Altamont St & Hampton St	A	3.4	A	6.4	A	6.1	
54 Division St & Hampton St	A	6.0	A	3.4	A	3.4	
55 U.S. 41 & Hampton St	A	1.5	A	1.3	A	1.7	PM: EB and WB = D
56 Division St & Joliet Rd	A	2.7	A	2.3	A	1.7	
57 Division St & Pioneer Rd	A	1.7	A	3.4	A	3.0	
58 Altamont St & Pioneer Rd	A	3.1	A	1.4	A	2.0	
59 Division St & McClellan Ave	A	1.1	A	1.8	A	3.0	
60 Third St & Spring St	A	1.9	A	2.8	A	2.8	
62 McClellan Ave & Ridge St	A	2.8	A	6.4	A	8.4	Mid-Day: WB LT = D, EB LT = E PM: WB TH/RT = D, EB TH/RT = E, EB LT and WB LT = F
64 McClellan Ave & Baraga Ave	A	2.1	A	6.1	A	4.9	
66 O'Dovero Dr & McClellan Ave	A	1.6	A	4.7	A	6.7	PM: EB LT = E
67 Grove St & McClellan Ave	B	11.5	B	10.3	C	15.4	
68 Pioneer Rd & McClellan Ave	A	3.3	A	2.9	A	2.4	
69 Lincoln Ave & Wright St	A	2.3	A	6.3	C	20.7	Mid-Day: NB TH = D PM: NB LT = F
72 Lincoln Ave & Cleveland St	A	2.3	A	2.2	A	2.0	
80 Front St & Main St	A	1.1	A	1.8	A	1.6	
81 Lakeshore Blvd & Washington St	A	1.4	A	1.9	A	1.4	

Indicates Intersection with Movements at Level of Service of E or F

Indicates Intersection with Movements at Level of Service of D

* Level of Service cannot be calculated using HCM 2010. HCM 2000 was used for these intersections.

+

TABLE 5A
Warrant Analyses Summary
All-Way Stop Warrant

Intersection	Existing Intersection Control Type	Met
		All Way Stop
1 Lakeshore Blvd & Peter White Dr	Yield	No
2 Lakeshore Blvd & Hawley St	1-way Stop	No
3 Presque Isle Ave & Hawley St	2-way Stop	No
4 Sugarloaf Ave & Hawley St	1-way Stop	No
8 McClellan Ave & Cleveland St	All-way Stop	Ex.-No
10 Presque Isle Ave & Center St	1-way Stop	No
12 Lakeshore Blvd & Wright St	1-way Stop	No
13 Pine St & Lakeshore Blvd	1-way Stop	No
14 Pine St & Fair Ave	All-way Stop	Ex.-No
15 Lakeshore Blvd & Fair Ave	1-way Stop	No
16 Presque Isle Ave & Fair Ave	1-way Stop	No
17 Third St & Fair Ave	2-way Stop	Yes
18 Front St & Fair Ave	1-way Stop	No
21 Third St & College Ave	2-way Stop	No
22 Pine St & Magnetic St	2-way Stop	No
23 Front St & Magnetic St	2-way Stop	No
24 Third St & Magnetic St	2-way Stop	No
25 Fourth St & Magnetic St	2-way Stop	No
26 Lakeshore Blvd & Crescent St	1-way Stop	No
27 Lakeshore Blvd & Hewitt Ave	1-way Stop	No
28 Spruce St & Hewitt Ave	2-way Stop	No
29 Pine St & Hewitt Ave	All-way Stop	Ex.-No
30 Hewitt Ave & Front St	Signal	No
32 Fourth St & Hewitt Ave	2-way Stop	No
33 Front St & Arch St	All-way Stop	Ex.-No
34 Pine St & Ridge St	1-way Stop	No
35 Lakeshore Blvd & Spring St	1-way Stop	No
36 Lakeshore Blvd & Baraga Ave	2-way Stop	No
37 Front St & Baraga Ave	2-way Stop	No
38 Front St & Spring St	Signal	No
39 Third St & Baraga Ave	All-way Stop	Ex.-No
40 Fourth St & Baraga Ave	2-way Stop	No
41 Seventh St & Spring St	2-way Stop	No
42 Seventh St & Baraga Ave	2-way Stop	No

Intersection	Existing Intersection Control Type	Met
		All Way Stop
43 Front St & Fisher St	1-way Stop	No
44 Third St & Fisher St	3-way Stop	Ex.-No
45 Fourth St & Fisher St	3-way Stop	No
46 Fifth St & Fisher St	1-way Stop	No
47 Altamont St & Fisher St	2-way Stop	No
48 Seventh St & Fisher St	2-way Stop	No
51 Division St & Genesee St	2-way Stop	No
52 Altamont St Genesee St	2-way Stop	No
53 Altamont St & Hampton St	2-way Stop	No
54 Division St & Hampton St	2-way Stop	No
55 U.S. 41 & Hampton St*	2-way Stop	No
56 Division St & Joliet Road	1-way Stop	No
57 Division St & Pioneer Road	1-way Stop	No
58 Altamont St & Pioneer Road	1-way Stop	No
59 Division St & McClellan Ave*	1-way Stop	No
60 Third St & Spring St	2-way Stop	No
62 McClellan Ave & Ridge St	2-way Stop	Yes
64 McClellan Ave & Baraga Ave	2-way Stop	Yes
66 O'Dovero Dr & McClellan Ave*	1-way Stop	No
67 Grove St & McClellan Ave*	All-way Stop	Ex.-No
68 Pioneer Rd & McClellan Ave*	2-way Stop	No
69 Lincoln Ave & Wright St	1-way Stop	No
72 Lincoln Ave & Cleveland St	1-way Stop	No
74 Seventh St & Magnetic St	Signal	No
75 Washington St & Fifth St	Signal	No
79 Washington St & Front St	Signal	Yes
80 Front St & Main St	2-way Stop	No
81 Lakeshore Blvd & Washington St	1-way Stop	No

* Indicates Intersection on MDOT Trunk Line

TABLE 5B
Warrant Analyses Summary
Traffic Signal Warrants

Intersection	Existing Intersection Control Type	Traffic Signal Warrants					
		Warrant 1 (8-Hour Volume)	Warrant 2 (4-Hour Volume)	Warrant 3 (Peak Hour)	Warrant 4 (Min. Ped. Volume)	Warrant 5 (School Crossing)	Warrant 7 (Crash Experience)
1 Lakeshore Blvd & Peter White Dr	None/Yield	No	No	No	No	No	No
2 Lakeshore Blvd & Hawley St	1-way Stop	No	No	No	No	No	No
3 Presque Isle Ave & Hawley St	2-way Stop	No	No	No	No	No	No
4 Sugarloaf Ave & Hawley St	1-way Stop	No	No	No	No	No	No
8 McClellan Ave & Cleveland St	All-way Stop	No	No	No	No	No	No
9 Seventh St & College Ave	Signalized	No	Yes	No	No	No	No
10 Presque Isle Ave & Center St	1-way Stop	No	No	No	No	No	No
12 Lakeshore Blvd & Wright St	1-way Stop	No	No	No	No	No	No
13 Pine St & Lakeshore Blvd	1-way Stop	No	No	No	No	No	No
14 Pine St & Fair Ave	All-way Stop	No	No	No	No	No	No
15 Lakeshore Blvd & Fair Ave	1-way Stop	No	No	No	No	No	No
16 Presque Isle Ave & Fair Ave	1-way Stop	No	No	No	No	No	No
17 Third St & Fair Ave	2-way Stop	No	No	No	No	No	No
18 Front St & Fair Ave	1-way Stop	No	No	No	No	No	No
21 Third St & College Ave	2-way Stop	No	No	No	No	No	No
22 Pine St & Magnetic St	2-way Stop	No	No	No	No	No	No
23 Front St & Magnetic St	2-way Stop	No	No	No	No	No	No
24 Third St & Magnetic St	2-way Stop	No	No	No	No	No	No
25 Fourth St & Magnetic St	2-way Stop	No	No	No	No	No	No
26 Lakeshore Blvd & Crescent St	1-way Stop	No	No	No	No	No	No
27 Lakeshore Blvd & Hewitt Ave	1-way Stop	No	No	No	No	No	No
28 Spruce St & Hewitt Ave	2-way Stop	No	No	No	No	No	No
29 Pine St & Hewitt Ave	All-way Stop	No	No	No	No	No	No
30 Hewitt Ave & Front St	Signalized	No	No	No	No	No	No
32 Fourth St & Hewitt Ave	2-way Stop	No	No	No	No	No	No
33 Front St & Arch St	All-way Stop	No	No	No	No	No	No
34 Pine St & Ridge St	1-way Stop	No	No	No	No	No	No
35 Lakeshore Blvd & Spring St	1-way Stop	No	No	No	No	No	No
36 Lakeshore Blvd & Baraga Ave	2-way Stop	No	No	No	No	No	No
37 Front St & Baraga Ave	2-way Stop	No	No	No	No	No	No
38 Front St & Spring St	Signalized	No	No	No	No	No	No
39 Third St & Baraga Ave	All-way Stop	No	No	No	No	No	No
40 Fourth St & Baraga Ave	2-way Stop	No	No	No	No	No	No
41 Seventh St & Spring St	2-way Stop	No	No	No	No	No	No
42 Seventh St & Baraga Ave	2-way Stop	No	No	No	No	No	No

TABLE 5B (cont.)
Warrant Analyses Summary
Traffic Signal Warrants

Intersection	Existing Intersection Control Type	Traffic Signal Warrants					
		Warrant 1 (8-Hour Volume)	Warrant 2 (4-Hour Volume)	Warrant 3 (Peak Hour)	Warrant 4 (Min. Ped. Volume)	Warrant 5 (School Crossing)	Warrant 7 (Crash Experience)
43 Front St & Fisher St	1-way Stop	No	No	No	No	No	No
44 Third St & Fisher St	3-way Stop	No	No	No	No	No	No
45 Fourth St & Fisher St	3-way Stop	No	No	No	No	No	No
46 Fifth St & Fisher St	1-way Stop	No	No	No	No	No	No
47 Altamont St & Fisher St	2-way Stop	No	No	No	No	No	No
48 Seventh St & Fisher St	2-way Stop	No	No	No	No	No	No
51 Division St & Genesee St	2-way Stop	No	No	No	No	No	No
52 Altamont St Genesee St	2-way Stop	No	No	No	No	No	No
53 Altamont St & Hampton St	2-way Stop	No	No	No	No	No	No
54 Division St & Hampton St	2-way Stop	No	No	No	No	No	No
55 U.S. 41 & Hampton St*	2-way Stop	No	No	No	No	No	No
56 Division St & Joliet Rd	1-way Stop	No	No	No	No	No	No
57 Division St & Pioneer Rd	1-way Stop	No	No	No	No	No	No
58 Altamont St & Pioneer Rd	1-way Stop	No	No	No	No	No	No
59 Division St & McClellan Ave*	1-way Stop	No	No	No	No	No	No
60 Third St & Spring St	2-way Stop	No	No	No	No	No	No
62 McClellan Ave & Ridge St	2-way Stop	No	No	No	No	No	No
63 Washington St & McClellan Ave	Signalized	Yes	Yes	Yes	No	No	No
64 McClellan Ave & Baraga Ave	2-way Stop	No	No	No	No	No	No
66 O'Dovero Dr & McClellan Ave*	1-way Stop	Yes	Yes	No	No	No	Yes
67 Grove St & McClellan Ave*	All-way Stop	No	No	No	No	No	No
68 Pioneer Rd & McClellan Ave*	2-way Stop	No	No	No	No	No	No
69 Lincoln Ave & Wright St	1-way Stop	Yes	Yes	Yes	No	No	No
72 Lincoln Ave & Cleveland St	1-way Stop	No	No	No	No	No	No
74 Seventh St & Magnetic St	Signalized	No	No	No	No	No	No
76 Washington St & Fifth St	Signalized	No	No	No	No	No	No
79 Washington St & Front St	Signalized	No	No	No	No	No	No
80 Front St & Main St	2-way Stop	No	No	No	No	No	No
81 Lakeshore Blvd & Washington St	1-way Stop	No	No	No	No	No	No

* Indicates Intersection on MDOT Trunk Line

TABLE 6
Locations for Mitigation for Vehicular Operations*

Intersection Details				Intersections		
ID #	NS	EW	Existing Traffic Control	Reasons for Potential Mitigation	Recommended Mitigation	Possible Additional Study
1	Lakeshore Blvd	Peter White Drive	NO CONTROL	No movements at LOS D, E or F	None	
2	Lakeshore Blvd	Hawley Street	1WS EB	No movements at LOS D, E or F	None	
3	Presque Isle Avenue	Hawley Street	2WS NS	No movements at LOS D, E or F	None	
4	Sugarloaf Avenue	Hawley Street	1WS NB	No movements at LOS D, E or F	None	
5	Sugarloaf Avenue	Wright Street	Signal	LOS D is worst LOS - mitigation is optional, pedestrian crossing issues, high traffic volumes	Signal Retiming. Add Countdown Pedestrian Signal Heads, High Visibility Crosswalks and Pedestrian Crossing Warning Signs. Upgrade signal to include interconnect system along Wright Street. Implement system timings.	Evaluate No Right Turn on Red restriction for SB to WB right turns.
6	McClellan Avenue	Wright Street	Signal	2030 movements at E/F	Signal Retiming. Upgrade signal to include interconnect system along Wright Street. Implement system timings.	
7	McClellan Avenue	Fair Avenue	Signal	Existing and 2030 movements at E/F	Signal Retiming; Install NB right turn lane to address 2030 traffic needs.	
8	McClellan Avenue	Cleveland Street	AWS	No movements at LOS D, E or F	None	
9	Seventh Street	College Avenue	Signal	No movements at LOS D, E or F	None	
10	Presque Isle Avenue	Center Street	1WS EB	No movements at LOS D, E or F	None	
11	Presque Isle Avenue	Wright Street	Signal	No movements at LOS D, E or F	Upgrade signal to include interconnect system along Wright Street. Implement system timings.	
12	Lakeshore Blvd	Wright Street	1WS EB	No movements at LOS D, E or F	None	
13	Pine Street	Lakeshore Boulevard	1WS NB	No movements at LOS D, E or F	None	
14	Pine Street	Fair Avenue	AWS	No movements at LOS D, E or F	None	
15	Lakeshore Blvd	Fair Avenue	1WS EB	No movements at LOS D, E or F	None	
16	Presque Isle Avenue	Fair Avenue	1WS WB	Existing and 2030 movements at E/F	Install Traffic Signal or Mini-roundabout	
17	Third Street	Fair Avenue	2WS NS	LOS D is worst LOS - Mitigation is optional	None, All-way stop warranted but not recommended	
18	Front Street	Fair Avenue	1WS NB	No movements at LOS D, E or F	None	
19	Presque Isle Avenue	Kaye Avenue	Signal	No movements at LOS D, E or F	None	
20	Fourth Street	College Avenue	Signal	No movements at LOS D, E or F	None	
21	Third Street	College Avenue	2WS EW	No movements at LOS D, E or F	None	
22	Pine Street	Magnetic Street	2WS EW	No movements at LOS D, E or F	None	
23	Front Street	Magnetic Street	2WS EW	No movements at LOS D, E or F	None	
24	Third Street	Magnetic Street	2WS EW	No movements at LOS D, E or F	None	
25	Fourth Street	Magnetic Street	2WS EW	No movements at LOS D, E or F	None	
26	Lakeshore Blvd	Crescent Street	1WS EB	No movements at LOS D, E or F	None	
27	Lakeshore Blvd	Hewitt Avenue	1WS EB	No movements at LOS D, E or F	None	
28	Spruce Street	Hewitt Avenue	2WS EW	No movements at LOS D, E or F	None	
29	Pine Street	Hewitt Avenue	AWS	No movements at LOS D, E or F	None	
30	Front Street	Hewitt Avenue	Signal	No movements at LOS D, E or F	None	
31	Third Street	Hewitt Avenue	Signal	No movements at LOS D, E or F	None	
32	Fourth Street	Hewitt Avenue	2WS EW	No movements at LOS D, E or F	None	
33	Front Street	Arch Street	AWS	No movements at LOS D, E or F	None	
34	Pine Street	Ridge Street	1WS SB	No movements at LOS D, E or F	None	
35	Lakeshore Blvd	Spring Street	1WS EB	No movements at LOS D, E or F	None	

TABLE 6 (cont.)
Locations for Mitigation for Vehicular Operations*

Intersection Details				Intersections		
DLZ #	NS	EW	Existing Traffic Control	Reasons for Potential Mitigation	Recommended Mitigation	Possible Additional Study
36	Lakeshore Blvd	Baraga Avenue	2WS NS	LOS C is worst LOS - Mitigation is optional; Atypical intersection control, future access for Founders Landing	Convert to 2-way stop as Founders Landing is developed.	Evaluate in conjunction with Baraga Avenue Corridor Study (ongoing study by City).
37	Front Street	Baraga Avenue	2WS EW	Existing and 2030 movements at E/F	Geometric improvements do not improve LOS.	Evaluate in conjunction with Baraga Avenue Corridor Study (ongoing study by City).
38	Front Street	Spring Street	Signal	No movements at LOS D, E or F	None	
39	Third Street	Baraga Avenue	AWS	No movements at LOS D, E or F	None	
40	Fourth Street	Baraga Avenue	2WS EW	No movements at LOS D, E or F	None	
41	Seventh Street	Spring Street	2WS EW	No movements at LOS D, E or F	None	
42	Seventh Street	Baraga Avenue	2WS EW	No movements at LOS D, E or F	None	
43	Front Street	Fisher Street	1WS EB	No movements at LOS D, E or F	None	
44	Third Street	Fisher Street	3WS	No movements at LOS D, E or F	None	
45	Fourth Street	Fisher Street	2WS EW	No movements at LOS D, E or F	None	
46	Fifth Street	Fisher Street	1WS SB	No movements at LOS D, E or F	None	
47	Altamont Street	Fisher Street	2WS NS	No movements at LOS D, E or F	None	
48	Seventh Street	Fisher Street	2WS NS, Y EB	No movements at LOS D, E or F	None	
49	US 41	Grove Street	Signal	Existing and 2030 movements at E/F	Reconstruction as a roundabout intersection	
50	US 41	Genesee Street	Signal	No movements at LOS D, E or F	None	
51	Division Street	Genesee Street	2WS EW	No movements at LOS D, E or F	None	
52	Altamont Street	Genesee Street	2WS EW	No movements at LOS D, E or F	None	
53	Altamont Street	Hampton Street	2WS NS	No movements at LOS D, E or F	None	
54	Division Street	Hampton Street	2WS EW	No movements at LOS D, E or F	None	
55	US 41	Hampton Street	2WS EW	2030 movements at E/F	Geometric improvements do not improve LOS.	Evaluate impacts of restricting Hampton Street movements to right-in/right-out only.
56	Division Street	Joliet Road	1WS WB	No movements at LOS D, E or F	None	
57	Division Street	Pioneer Road	1WS EB	No movements at LOS D, E or F	None	
58	Altamont Street	Pioneer Road	1WS SB	No movements at LOS D, E or F	None	
59	Division Street	McClellan Avenue	1WS	No movements at LOS D, E or F	None	
60	Third Street	Spring Street	2WS	No movements at LOS D, E or F	None	
61	US 41	Washington Street	Signal	LOS D is worst LOS - Mitigation is optional	Signal Retiming	
62	McClellan Avenue	Ridge Street	2WS EW	Existing and 2030 movements at E/F	All-Way Stop does not improve LOS. Install Traffic Signal or Roundabout.	
63	McClellan Avenue	Washington Street	Signal	No movements at LOS D, E or F	Upgrade signal to include interconnect system along Washington Street. Implement system timings.	
64	McClellan Avenue	Baraga Avenue	2WS EW	2030 movements at E/F	Right in right out on east approach	
65	McClellan Avenue	US 41	Signal	No movements at LOS D, E or F	None	
66	McClellan Avenue	O'Dovero Drive	1WS EB	Existing and 2030 movements at E/F	Traffic Signal Installation; Widen McClellan to provide LT lanes in both directions; Realign and widen east leg; Interconnect with US 41/McClellan.	

TABLE 6 (cont.)
Locations for Mitigation for Vehicular Operations*

Intersection Details				Intersections		
DLZ #	NS	EW	Existing Traffic Control	Reasons for Potential Mitigation	Recommended Mitigation	Possible Additional Study
67	McClellan Avenue	Grove Street	AWS	No movements at LOS D, E or F	None	
68	McClellan Avenue	Pioneer Road	2WS	No movements at LOS D, E or F	None	
69	Lincoln Avenue	Wright Street	1WS NB	Existing and 2030 movements at E/F	Install traffic signal or roundabout. For traffic signal, install left turn lanes on all legs. Realign or close north leg into parking lot. Install countdown pedestrian signals with high visibility crosswalks. Include signal in interconnect system along Wright Street. Implement system timings. Roundabout may require closing north leg into parking lot.	
70	Lincoln Avenue	Fair Avenue	Signal	No movements at LOS D, E or F	None	
71	Lincoln Avenue	College Avenue	Signal	No movements at LOS D, E or F	None	
72	Lincoln Avenue	Cleveland Street	1WS EB	No movements at LOS D, E or F	None	
73	Lincoln Avenue	Washington Street	Signal	No movements at LOS D, E or F	Upgrade signal to include interconnect system along Washington Street. Implement system timings.	
74	Seventh Street	Magnetic Street	Signal	No movements at LOS D, E or F	None	
75	Seventh Street	Washington Street	Signal	No movements at LOS D, E or F	Upgrade signal to include interconnect system along Washington Street. Implement system timings.	
76	Fifth Street	Washington Street	Signal	No movements at LOS D, E or F	Upgrade signal to include interconnect system along Washington Street. Implement system timings.	
77	Fourth Street	Washington Street	Signal	No movements at LOS D, E or F	Upgrade signal to include interconnect system along Washington Street. Implement system timings.	
78	Third Street	Washington Street	Signal	No movements at LOS D, E or F	Upgrade signal to include interconnect system along Washington Street. Implement system timings.	
79	Front Street	Washington Street	Signal	No movements at LOS D, E or F	Upgrade signal to include interconnect system along Washington Street. Implement system timings.	
80	Front Street	Main Street	2WS EW	No movements at LOS D, E or F	None	
81	Lakeshore Blvd	Washington Street	1WS EB	No movements at LOS D, E or F	None	

Corridors for Traffic Signal Progression Improvement					
Corridor	From	To	Reasons for Potential Mitigation	Recommended Mitigation	Possible Additional Study
Washington Street	US 41	Front Street	Candidate for Traffic Progression Improvement	Upgrade traffic signals to include interconnect system. Implement system timings to provide progression through system. Do not extend to US 41 since that system is on different cycle length and maintained by MDOT.	Adaptive Signal Control
Wright Street	McClellan Avenue	Presque Isle Avenue	Candidate for Traffic Progression Improvement	Upgrade traffic signals to include interconnect system. Implement system timings to provide progression through system.	

* Non-Motorized improvement recommendations are included in the Pedestrian and Bicycle Accommodation Analysis and Recommendations section of the Traffic Study.

Indicates intersections where mitigation is recommended to address movements at LOS E or F.

Indicates intersections where mitigation is optional to address movements at LOS D.

TABLE 7
Future Level of Service Summary
Signalized Intersections (2030 No-Build)

Intersection	AM Peak Hour		Mid-Day Peak Hour		PM Peak Hour		Notes
	Overall LOS	Delay (sec/veh)	Overall LOS	Delay (sec/veh)	Overall LOS	Delay (sec/veh)	
5 Sugarloaf Ave & Wright St	B	14.9	B	16.3	C	21.5	PM: NB LT = D
6 McClellan Ave & Wright St	B	15.1	B	15.4	C	34.2	PM: WB TH/RT = F
7 McClellan Ave & Fair Ave	F	113.8	C	27.0	B	19.2	AM: NB TH/RT = F
							Mid-Day: NB TH/RT = D
9 Seventh St & College Ave	B	10.7	B	18.3	B	15.7	
11 Presque Isle Ave & Wright St	A	7.8	B	11.1	B	13.5	
19 Presque Isle Ave & Kaye Ave	B	11.2	B	12.3	B	12.7	
20 Fourth St & College Ave	A	9.0	B	10.3	B	11.1	
30 Front St & Hewitt Ave	B	11.6	B	11.8	B	12.3	
31 Third St & Hewitt Ave	A	12.0	B	13.1	B	14.3	
38 Front St & Spring St	A	4.8	A	5.4	A	5.6	
49 U.S. 41 & Grove St	D	49.7	D	39.6	D	39.2	AM: NW LT, SB LT = D; SB TH/RT, NB TH/RT, SEB LT = F Mid-Day: NB LT, NWB LT = D; SEB LT, SB TH/RT = F PM: NB TH/LT, NWB LT, SEB LT, SB LT = D; SB TH/RT = F
50 U.S. 41 & Genesee St	B	14.3	B	13.4	B	15.8	
61 U.S. 41 & Washington St (NW)* U.S. 41 & Washington St (SE)*	A C	7.1 29.3	B C	12.5 23.3	B C	10.4 31.0	AM: NW TH = D; PM: NW TH = D
63 McClellan Ave & Washington St	B	15.1	B	17.0	B	17.7	
65 U.S. 41 & McClellan Ave (North)* U.S. 41 & McClellan Ave (South)*	B B	12.3 14.7	B B	14.0 13.8	B B	16.3 14.5	
70 Lincoln Ave & Fair Ave	B	12.6	B	13.7	B	13.2	
71 Lincoln Ave & College Ave	B	11.7	B	11.4	B	11.5	
73 Lincoln Ave & Washington St	B	12.4	B	15.4	B	16.8	
74 Seventh St & Magnetic St	B	12.4	B	14.7	A	9.6	
75 Seventh St & Washington St	B	13.2	B	15.9	B	16.3	
76 Fifth St & Washington St	B	11.5	B	13.4	B	13.3	
77 Fourth St & Washington St	A	9.5	B	11.2	B	10.7	
78 Third St & Washington St	B	13.6	B	14.0	B	15.3	
79 Front St & Washington St	A	3.6	A	6.6	A	5.5	

Indicates Intersection with Movements at Level of Service of E or F

Indicates Intersection with Movements at Level of Service of D

* Level of Service cannot be calculated using HCM 2010. HCM 2000 was used for these intersections.

TABLE 8
Future Level of Service Summary
Unsignalized Intersections (2030 No-Build)

Intersection	AM Peak Hour		Mid-Day Peak Hour		PM Peak Hour		Notes
	Overall LOS	Delay (sec/veh)	Overall LOS	Delay (sec/veh)	Overall LOS	Delay (sec/veh)	
1 Lakeshore Blvd & Peter White Dr	A	3.0	A	1.9	A	1.8	
2 Lakeshore Blvd & Hawley St	A	4.4	A	3.2	A	4.7	
3 Presque Isle Ave & Hawley St	A	5.5	A	6.2	A	5.7	
4 Sugarloaf Ave & Hawley St	A	4.8	A	5.4	A	6.6	
8 McClellan Ave & Cleveland St	B	15.0	B	11.3	C	24.3	PM: SB = D
10 Presque Isle Ave & Center St	A	1.4	A	2.1	A	2.2	
12 Lakeshore Blvd & Wright St	A	4.1	A	4.8	A	5.7	
13 Pine St & Lakeshore Blvd	A	1.5	A	1.5	A	1.8	
14 Pine St & Fair Ave	A	7.6	A	8.2	A	8.8	
15 Lakeshore Blvd & Fair Ave	A	3.0	A	3.7	A	3.7	
16 Presque Isle Ave & Fair Ave	A	4.9	A	7.0	A	8.6	Mid-Day: WB LT = D
							PM: WB LT = F
17 Third St & Fair Ave	A	5.2	A	7.7	A	7.9	PM: NB LT = D
18 Front St & Fair Ave	A	3.2	A	2.7	A	2.8	
21 Third St & College Ave	A	4.6	A	4.7	A	5.5	
22 Pine St & Magnetic St	A	2.7	A	2.8	A	2.8	
23 Front St & Magnetic St	A	3.0	A	2.2	A	2.9	
24 Third St & Magnetic St	A	1.7	A	1.8	A	2.9	
25 Fourth St & Magnetic St	A	3.8	A	4.1	A	4.2	
26 Lakeshore Blvd & Crescent St	A	1.9	A	0.9	A	1.4	
27 Lakeshore Blvd & Hewitt Ave	A	1.4	A	1.1	A	1.0	
28 Spruce St & Hewitt Ave	A	5.6	A	5.7	A	4.8	
29 Pine St & Hewitt Ave	A	7.3	A	7.4	A	7.6	
32 Fourth St & Hewitt Ave	A	1.9	A	2.1	A	3.0	
33 Front St & Arch St	A	8.1	A	8.8	A	9.9	
34 Pine St & Ridge St	A	3.1	A	3.5	A	3.6	
35 Lakeshore Blvd & Spring St	A	0.9	A	0.6	A	0.8	
36 Lakeshore Blvd & Baraga Ave	A	8.0	A	8.6	B	11.3	
37 Front St & Baraga Ave	A	3.8	A	5.7	B	15.0	AM: WB TH/LT = D; Mid-Day: WB TH/LT, EB TH/LT = D
							PM: EB TH/LT = E; WB TH/LT = F
39 Third St & Baraga Ave	A	4.7	A	5.4	A	6.3	
40 Fourth St & Baraga Ave	A	4.0	A	5.2	A	4.9	
41 Seventh St & Spring St	A	1.2	A	2.2	A	2.7	
42 Seventh St & Baraga Ave	A	3.1	A	3.8	A	4.3	

TABLE 8 (cont.)
Future Level of Service Summary
Unsignalized Intersections (2030 No-Build)

Intersection	AM Peak Hour		Mid-Day Peak Hour		PM Peak Hour		Notes
	Overall LOS	Delay (sec/veh)	Overall LOS	Delay (sec/veh)	Overall LOS	Delay (sec/veh)	
43 Front St & Fisher St	A	1.5	A	1.2	A	1.6	
44 Third St & Fisher St	B	10.1	A	8.1	B	13.3	
45 Fourth St & Fisher St	A	8.9	A	8.8	B	10.0	
46 Fifth St & Fisher St	A	3.1	A	2.8	A	2.8	
47 Altamont St & Fisher St	A	7.4	A	4.2	A	5.7	
48 Seventh St & Fisher St	A	0.0	A	0.0	A	0.0	
51 Division St & Genesee St	A	4.2	A	5.5	A	6.1	
52 Altamont St & Genesee St	A	1.0	A	2.4	A	1.9	
53 Altamont St & Hampton St	A	3.7	A	6.4	A	6.2	
54 Division St & Hampton St	A	6.7	A	3.9	A	3.7	
55 U.S. 41 & Hampton St	A	2.4	A	1.9	A	3.3	AM: WB = D; Mid-Day: EB = D PM: EB & WB = F
56 Division St & Joliet Rd	A	3.0	A	2.6	A	1.9	
57 Division St & Pioneer Rd	A	2.0	A	3.6	A	3.2	
58 Altamont St & Pioneer Rd	A	3.2	A	1.5	A	2.1	
59 Division St & McClellan Ave	A	1.4	A	2.0	A	3.6	
60 Third St & Spring St	A	2.2	A	3.1	A	3.4	
62 McClellan Ave & Ridge St	A	3.5	A	9.2	B	16.1	AM: EB LT & WB LT = D Mid-Day: EB TH & WB TH = D, WB LT = E, EB LT = F PM: EB LT = F, EB TH = F; WB LT = F, WB TH = E
64 McClellan Ave & Baraga Ave	A	2.6	A	8.9	A	7.2	Mid-Day: EB = E PM: EB & WB = D
66 O'Dovero Dr & McClellan Ave	A	1.9	A	6.1	B	10.9	Mid-Day: EB LT = D PM: EB LT = F
67 Grove St & McClellan Ave	B	12.6	B	11.0	B	18.4	PM: SB = C/D
68 Pioneer Rd & McClellan Ave	A	3.4	A	3.2	A	2.7	
69 Lincoln Ave & Wright St	A	2.7	B	11.4	D	47.0	Mid-Day: NB TH = F; PM: NB TH = F
72 Lincoln Ave & Cleveland St	A	2.3	A	2.3	A	2.0	
80 Front St & Main St	A	1.4	A	1.9	A	2.0	
81 Lakeshore Blvd & Washington St	A	1.5	A	2.0	A	1.6	

Indicates Intersection with Movements at Level of Service of E or F

Indicates Intersection with Movements at Level of Service of D

* Level of Service cannot be calculated using HCM 2010. HCM 2000 was used for these intersections.

TABLE 9
Prioritized List of Mitigation Projects and Costs

Intersections					
Intersection Details			Recommended Mitigation	Estimated Construction Cost	Recommended Priority
ID Number	NS	EW			
6	McClellan Avenue	Wright Street	Signal Retiming. Upgrade signal to include interconnect system along Wright Street. Implement system timings.	Near Term = \$35,000	High
7	McClellan Avenue	Fair Avenue	Signal Retiming; Install NB right turn lane to address 2030 traffic needs.	Long Term = \$80,000	Low
16	Presque Isle Avenue	Fair Avenue	Install Traffic Signal or Mini-roundabout	Near Term - Traffic Signal = \$160,000 Near Term - Mini Roundabout = \$300,000	Medium
37	Front Street	Baraga Avenue	Geometric improvements do not improve LOS.	NA	NA
55	US 41	Hampton Street	Geometric improvements do not improve LOS.	NA	NA
62	McClellan Avenue	Ridge Street	All-Way Stop does not improve LOS. Install Traffic Signal or Roundabout.	Near Term - Traffic Signal = \$210,000 Near Term - Roundabout = \$900,000	Medium
66	McClellan Avenue	O'Dovero Drive	Traffic Signal Installation; Widen McClellan to provide LT lanes in both directions; Realign and widen east leg; Interconnect with US 41/McClellan.	Near Term = \$210,000	Medium
69	Lincoln Avenue	Wright Street	Install traffic signal or roundabout. Traffic signal will require left turn lanes on all legs. Realign or close north leg into parking lot. Install countdown pedestrian signals with high visibility crosswalks. Include signal in interconnect system along Wright Street. Implement system timings.	Near Term - Traffic Signal = \$170,000 Near Term - Roundabout = \$750,000	High
Corridors for Traffic Signal Progression Improvement					
Corridor			Recommended Mitigation	Estimated Construction Cost	Recommended Priority
Washington Street			Upgrade traffic signals to include interconnect system. Implement system timings to provide progression through system. Do not extend to US 41 since that system is on different cycle length.	\$280,000	High
Wright Street			Upgrade traffic signals to include interconnect system. Implement system timings to provide progression through system.	\$105,000	High
Non-Motorized Improvements					
Element			Recommended Mitigation	Estimated Construction Cost	Recommended Priority
Sidewalks			Sidewalk Connections as shown on Figure 10	Varies based on linear feet of sidewalk constructed	Varies
Pedestrian Crossing Upgrades			Improve pedestrian crossings with high visibility crosswalks, advanced signing/flashers, potential grade separations	Varies based on improvements	Medium/High
Bicycle Facilities			Multi-use paths and/or on-street bike lanes as shown on Figure 11	Varies based on linear feet of facilities/type constructed	Varies

These preliminary construction costs have been estimated based on limited investigations. It is possible that these costs may change once more detailed engineering design is undertaken. Therefore, these estimates should only be used for general planning purposes (i.e., they are not recommended for use in programming capital funding). Costs are for construction only and do not include engineering fees or right-of-way acquisition costs.



LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



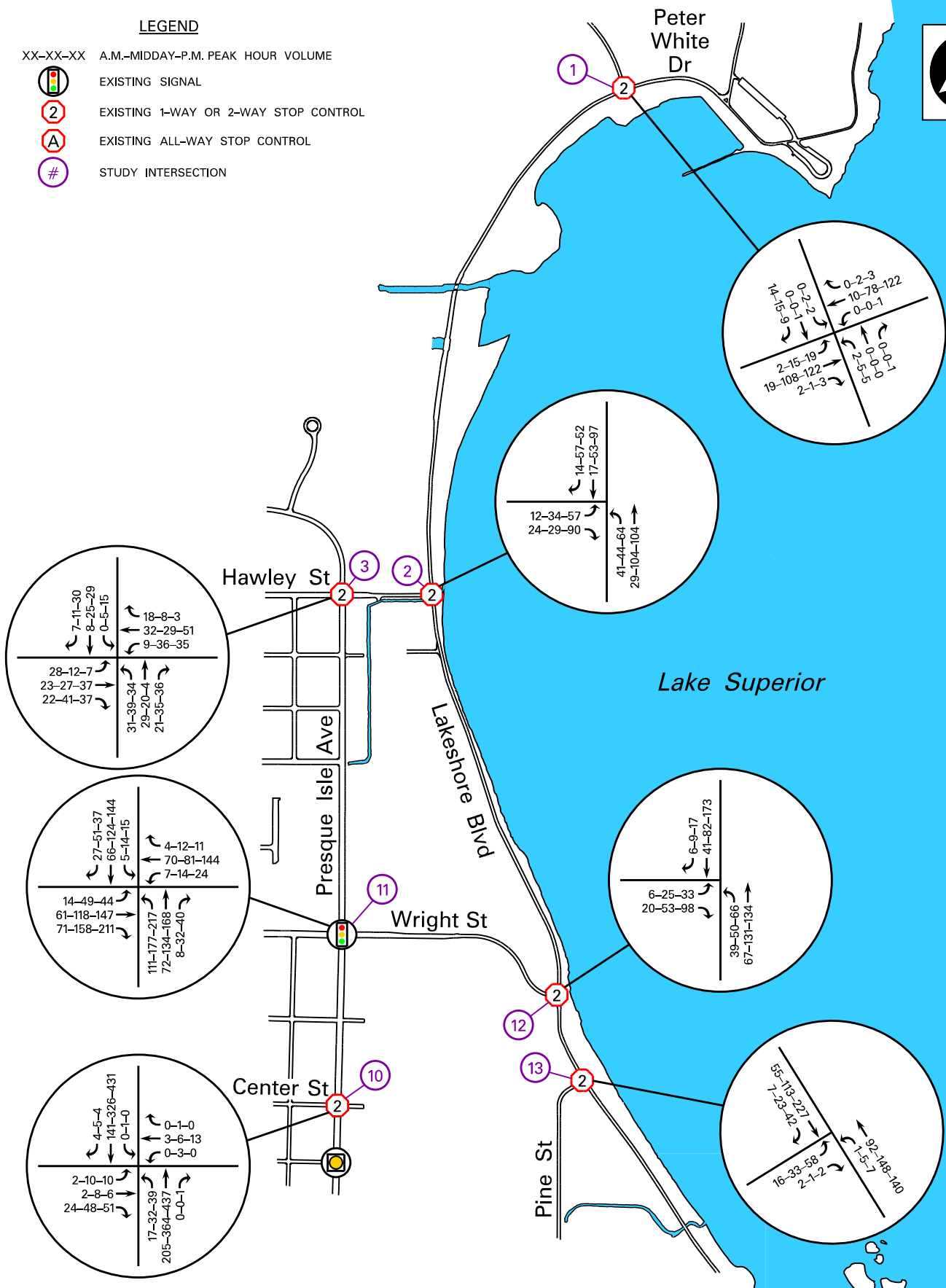
EXISTING 1-WAY OR 2-WAY STOP CONTROL



EXISTING ALL-WAY STOP CONTROL



STUDY INTERSECTION



CITY OF MARQUETTE TRAFFIC STUDY

FIGURE 2A
EXISTING PEAK HOUR
TURNING MOVEMENT COUNTS
(2013)

LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



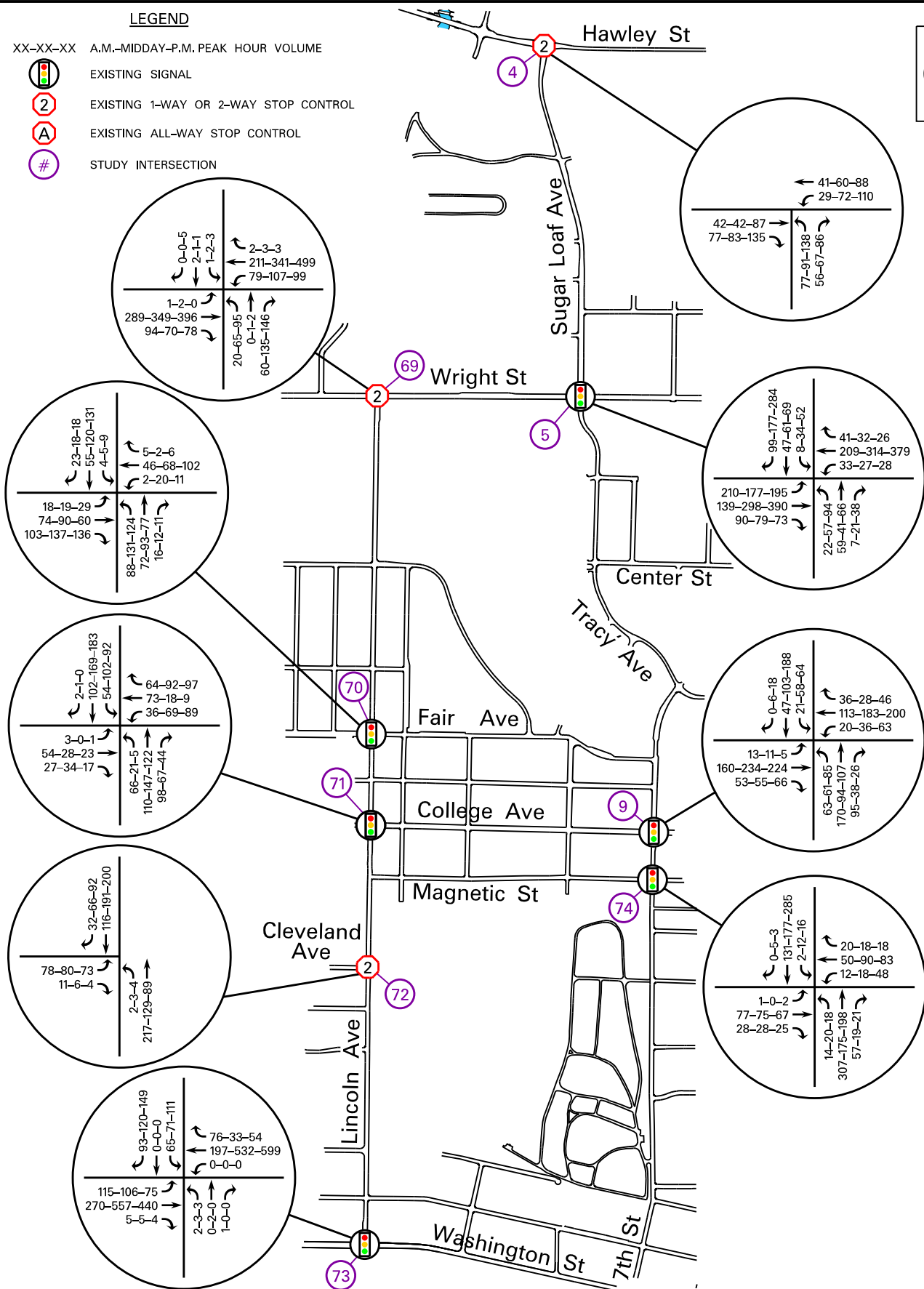
EXISTING 1-WAY OR 2-WAY STOP CONTROL



EXISTING ALL-WAY STOP CONTROL



STUDY INTERSECTION







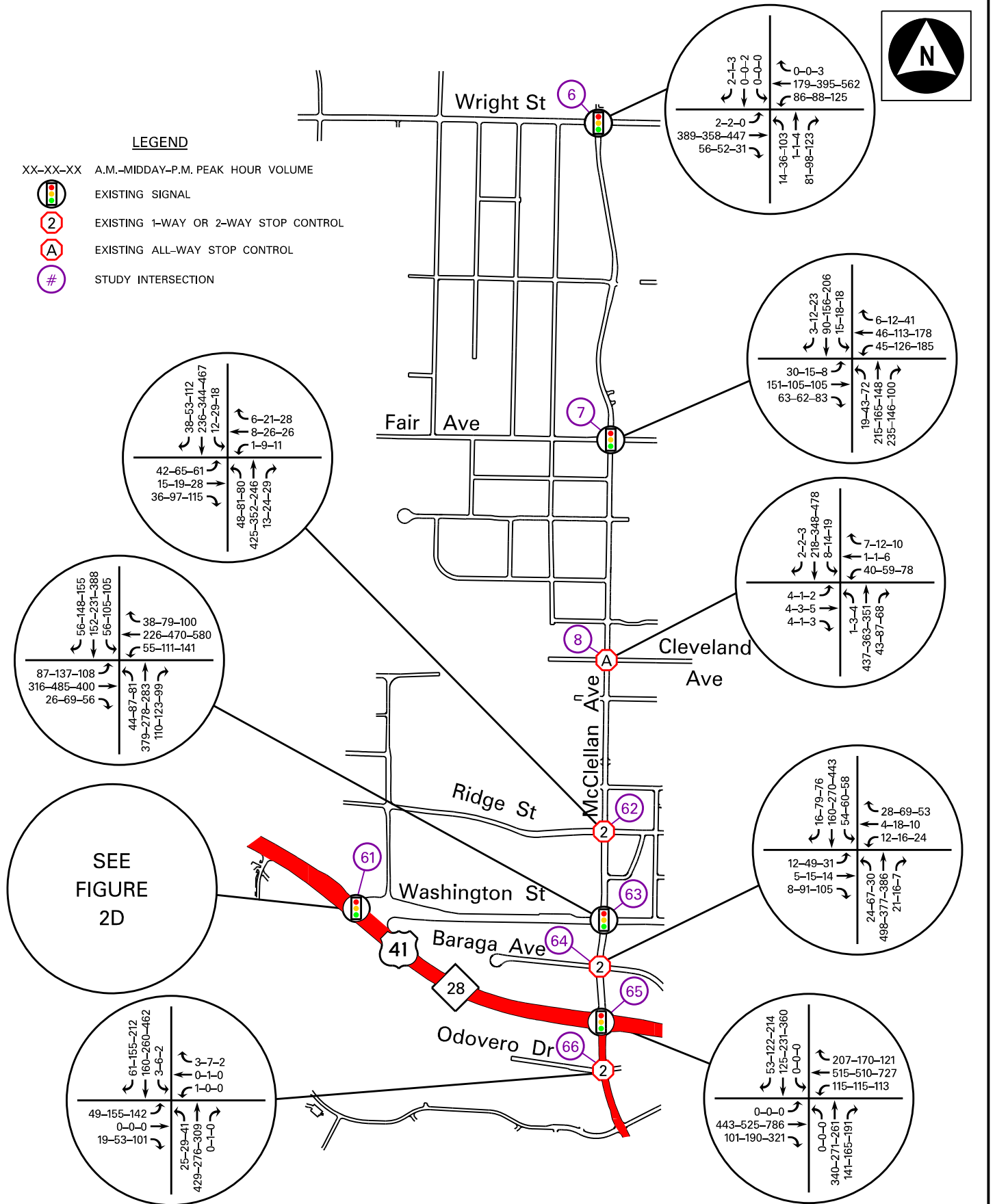
CITY OF MARQUETTE TRAFFIC STUDY

FIGURE 2B
EXISTING PEAK HOUR
TURNING MOVEMENT COUNTS
(2013)



LEGEND

- XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME
-  EXISTING SIGNAL
-  EXISTING 1-WAY OR 2-WAY STOP CONTROL
-  EXISTING ALL-WAY STOP CONTROL
-  STUDY INTERSECTION



CITY OF MARQUETTE TRAFFIC STUDY

FIGURE 2C
EXISTING PEAK HOUR
TURNING MOVEMENT COUNTS
(2013)

LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



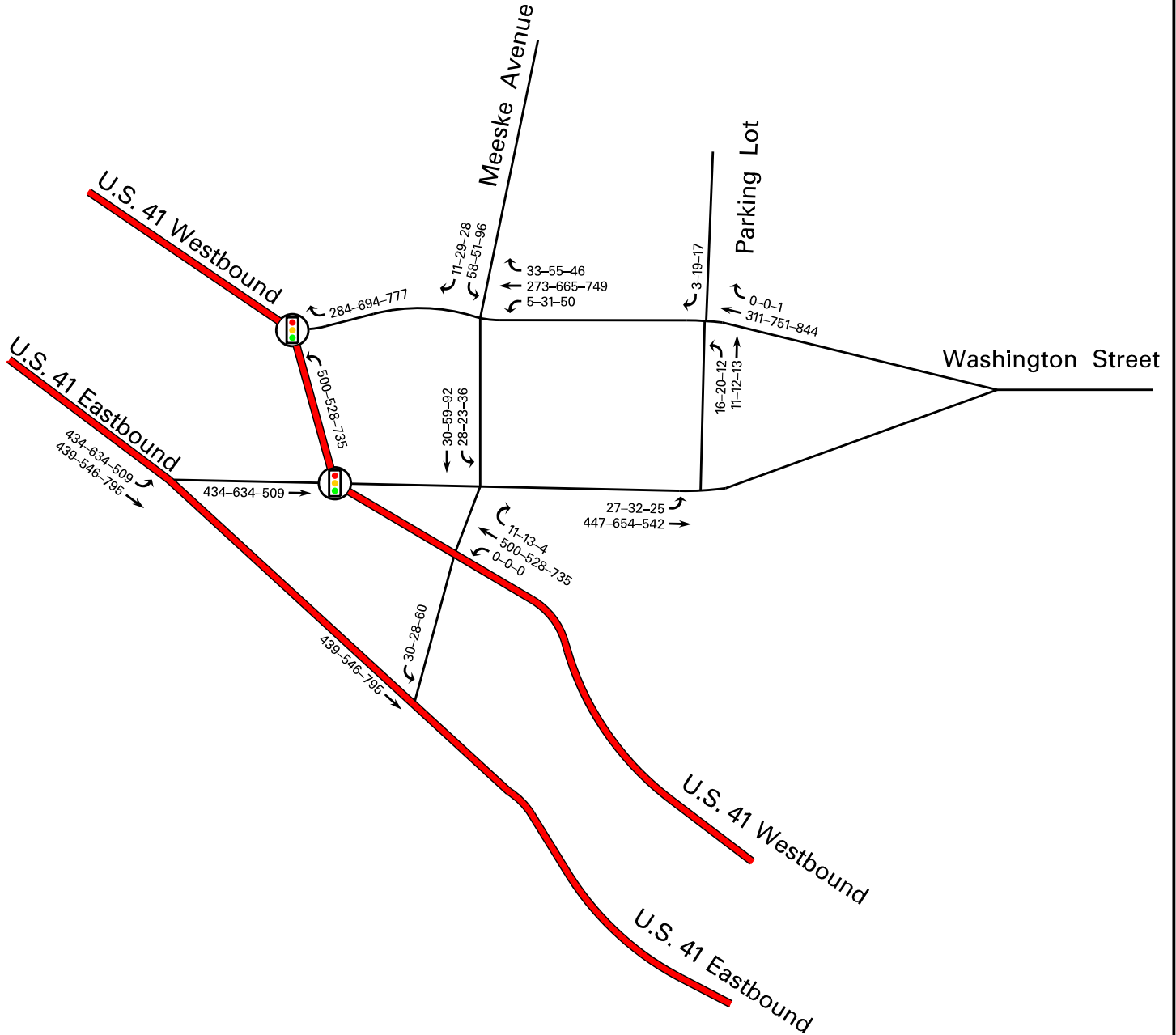
EXISTING 1-WAY OR 2-WAY STOP CONTROL



EXISTING ALL-WAY STOP CONTROL








STUDY INTERSECTION

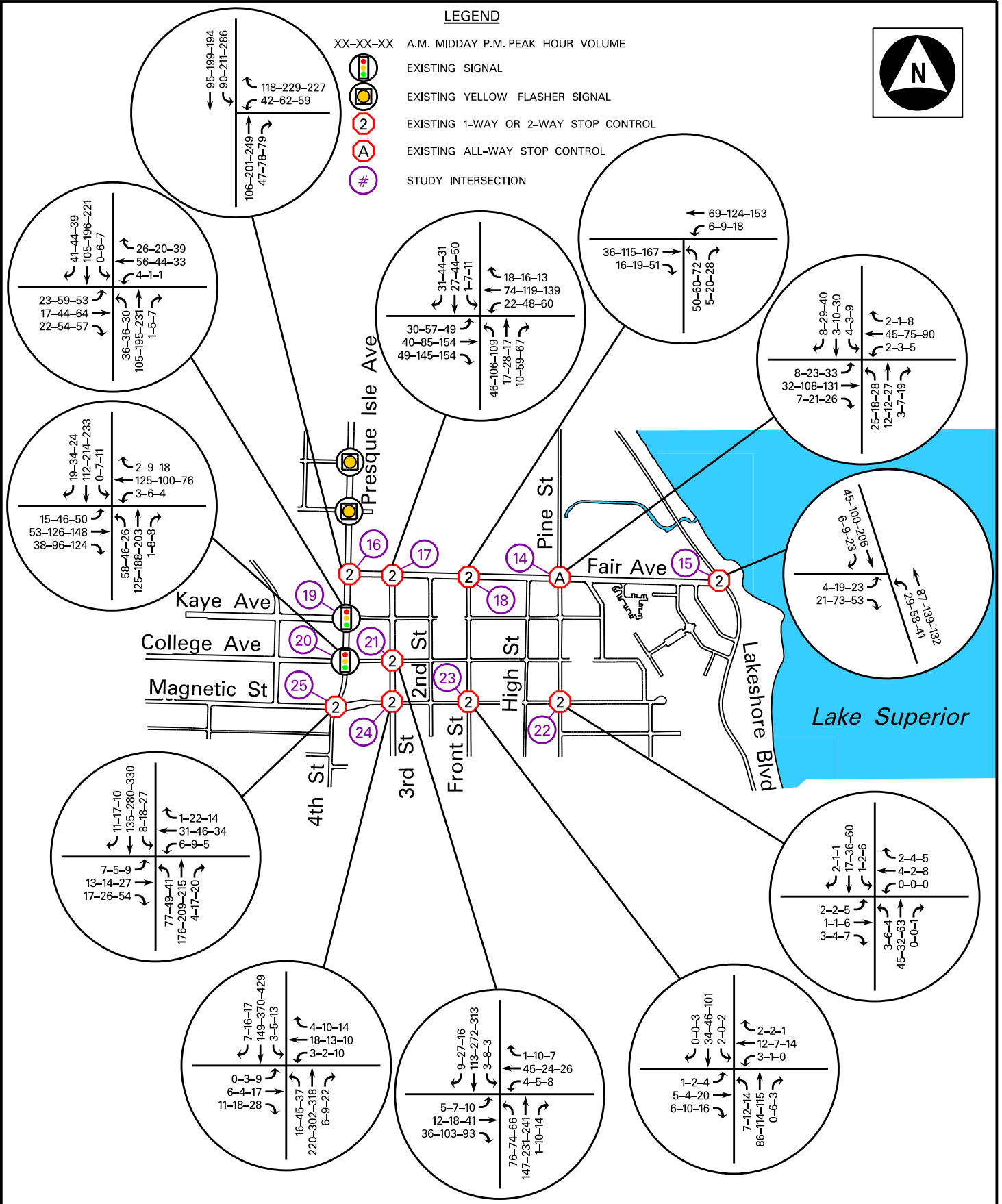


CITY OF MARQUETTE
TRAFFIC STUDY

FIGURE 2D
EXISTING PEAK HOUR
TURNING MOVEMENT COUNTS
(2013)

LEGEND

- XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME
-  EXISTING SIGNAL
-  EXISTING YELLOW FLASHER SIGNAL
-  EXISTING 1-WAY OR 2-WAY STOP CONTROL
-  EXISTING ALL-WAY STOP CONTROL
-  STUDY INTERSECTION



LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



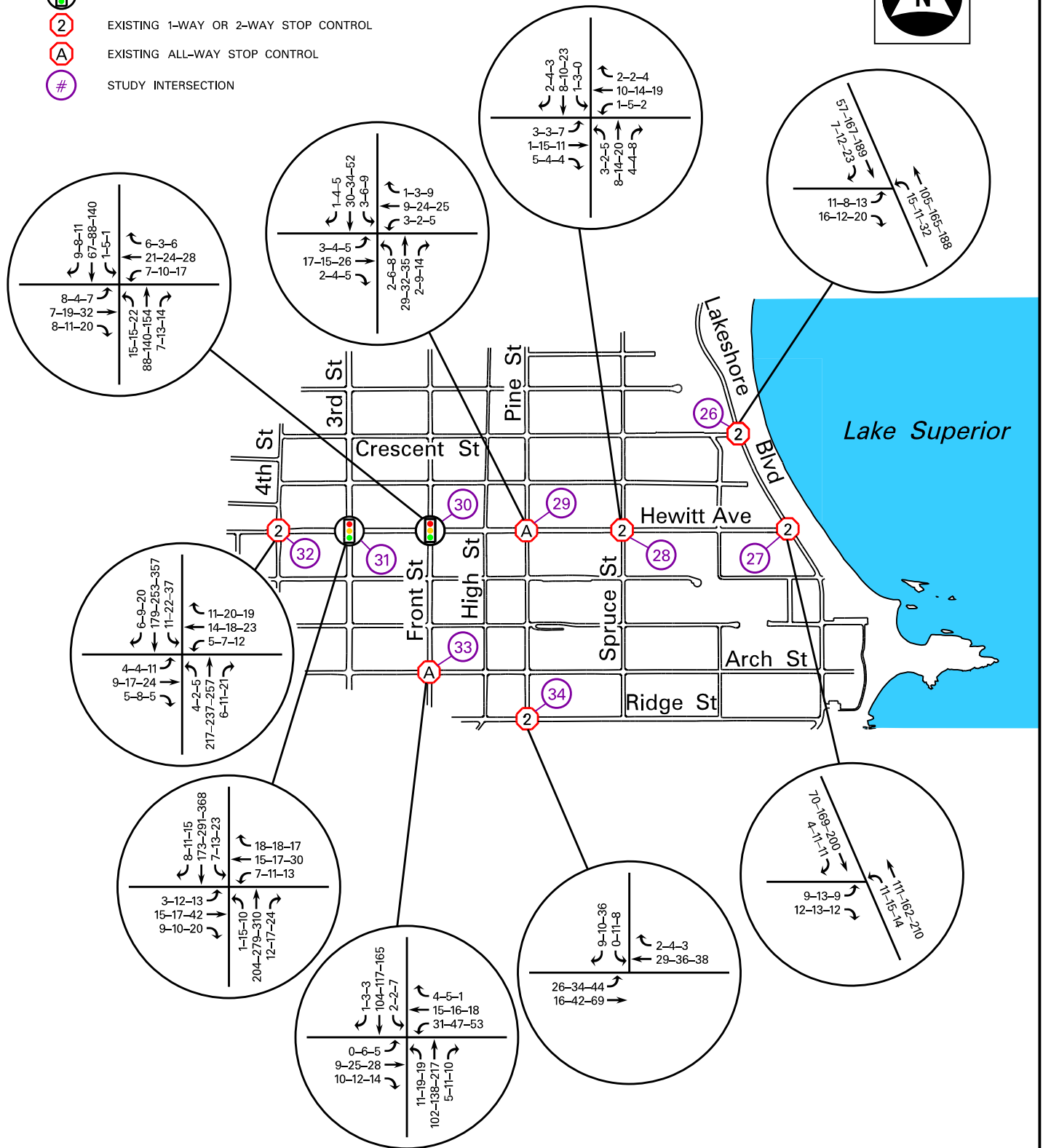
EXISTING 1-WAY OR 2-WAY STOP CONTROL



EXISTING ALL-WAY STOP CONTROL



STUDY INTERSECTION



LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



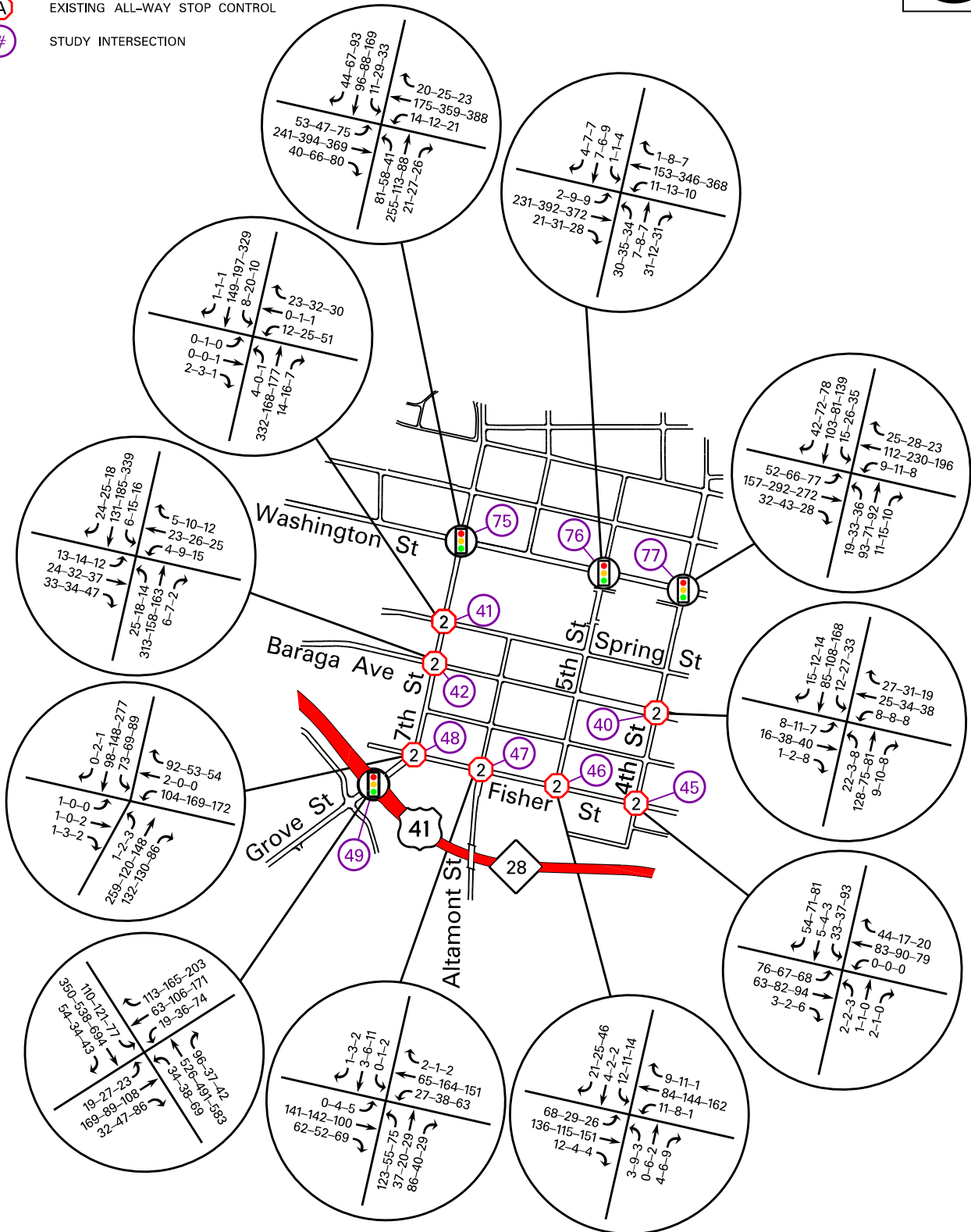
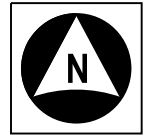
EXISTING 1-WAY OR 2-WAY STOP CONTROL



EXISTING ALL-WAY STOP CONTROL



STUDY INTERSECTION



CITY OF MARQUETTE TRAFFIC STUDY

FIGURE 2G
EXISTING PEAK HOUR
TURNING MOVEMENT COUNTS
(2013)

LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



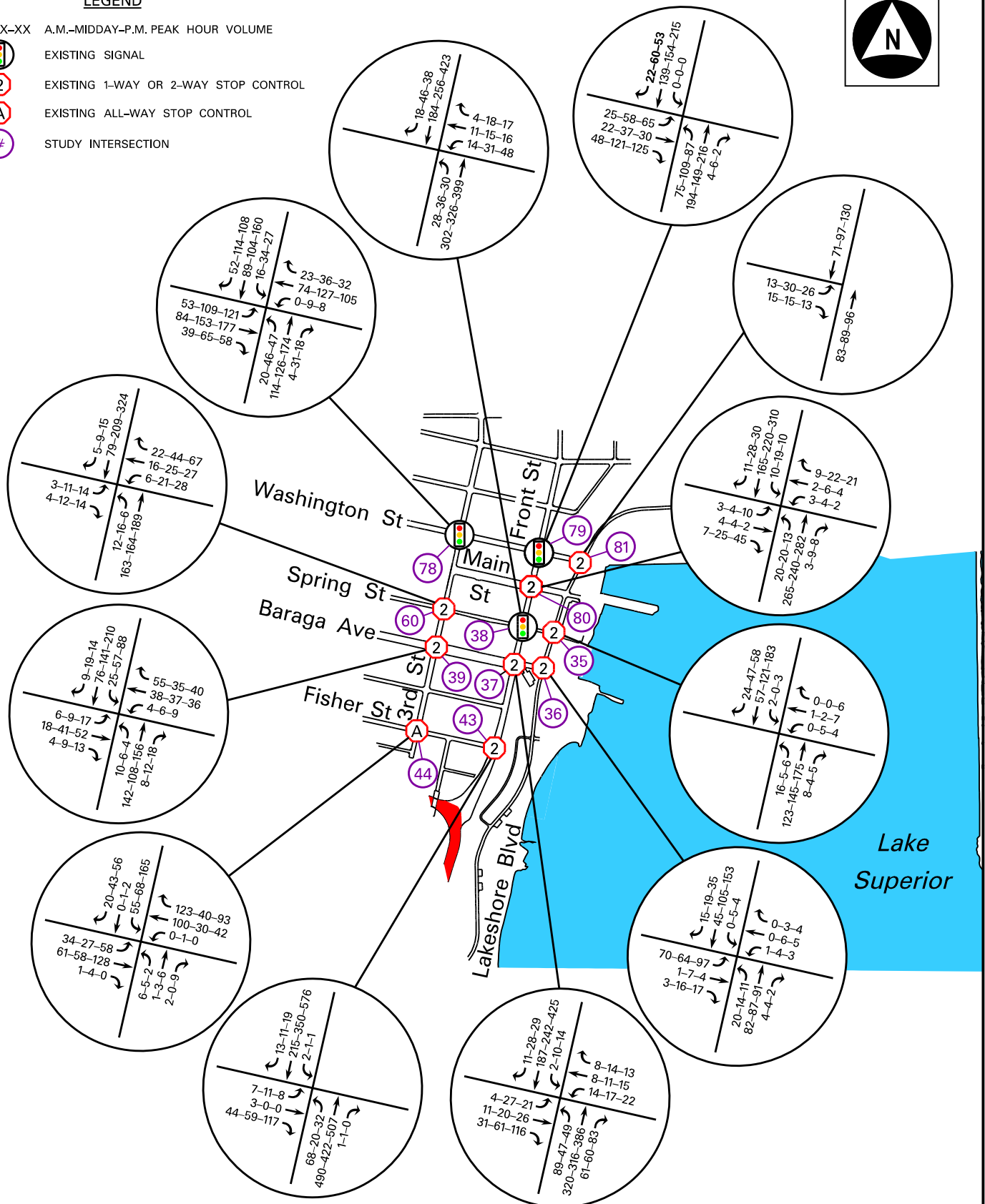
EXISTING 1-WAY OR 2-WAY STOP CONTROL



EXISTING ALL-WAY STOP CONTROL



STUDY INTERSECTION



LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



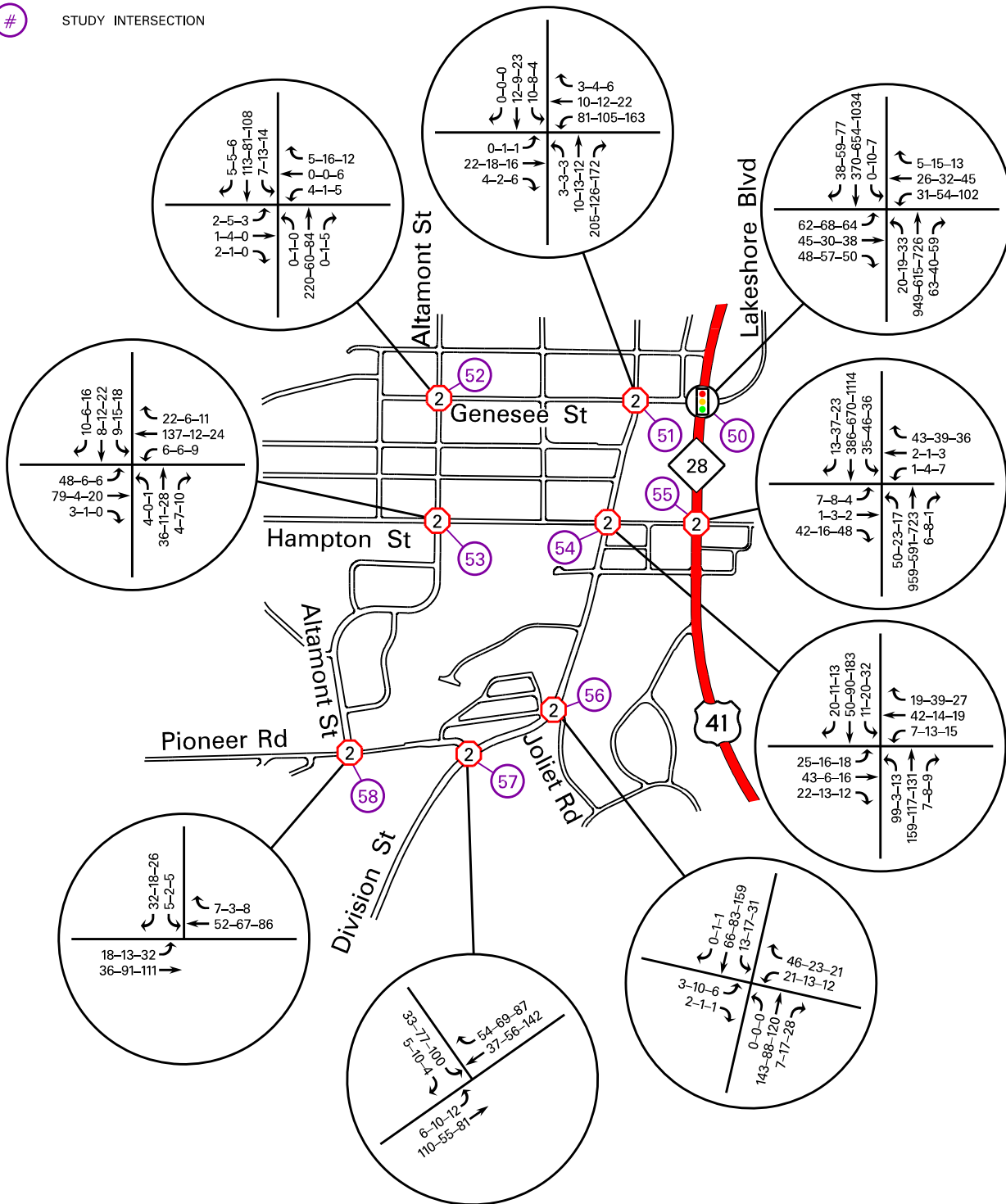
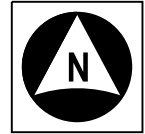
EXISTING 1-WAY OR 2-WAY STOP CONTROL



EXISTING ALL-WAY STOP CONTROL



STUDY INTERSECTION



LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



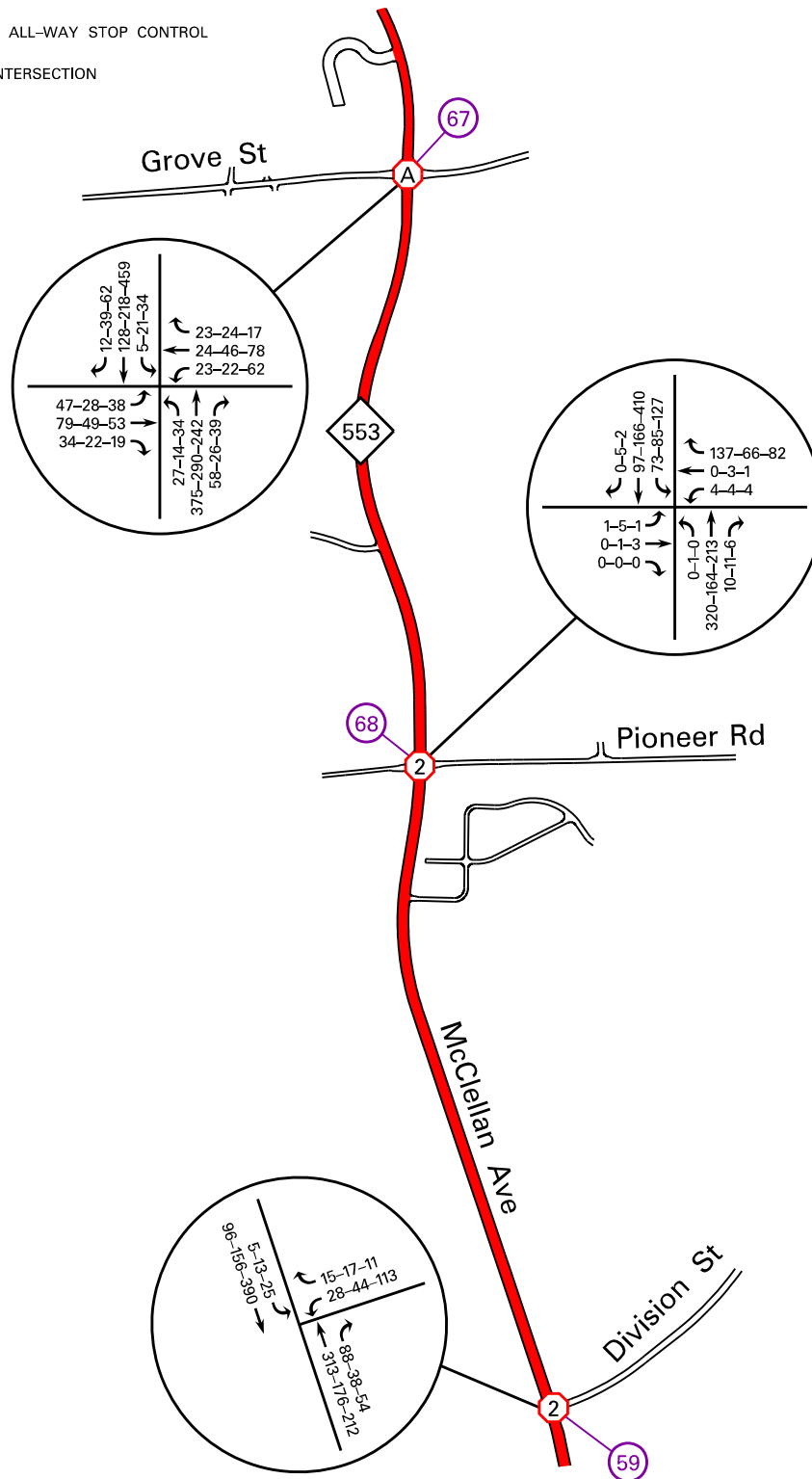
EXISTING 1-WAY OR 2-WAY STOP CONTROL



EXISTING ALL-WAY STOP CONTROL

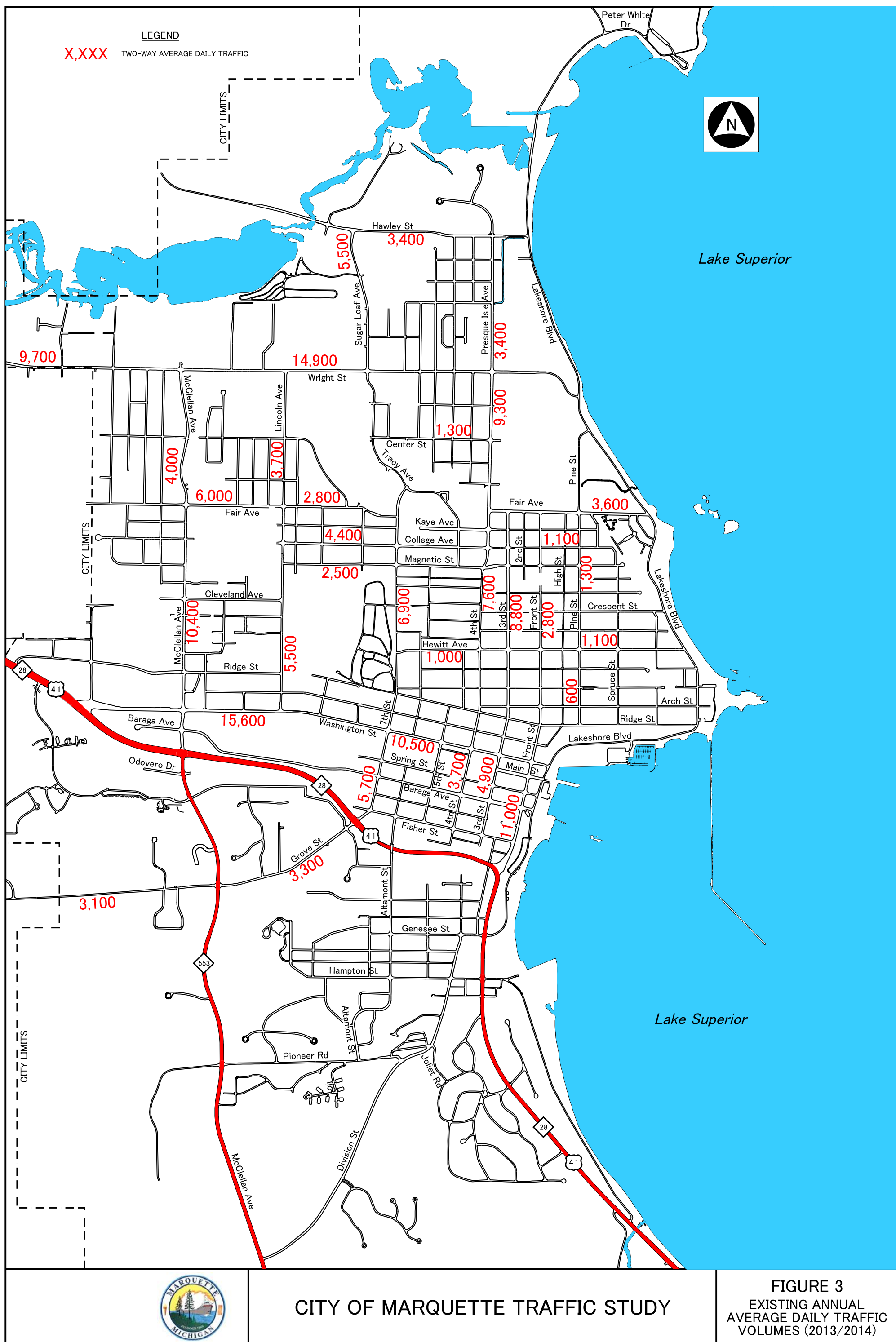


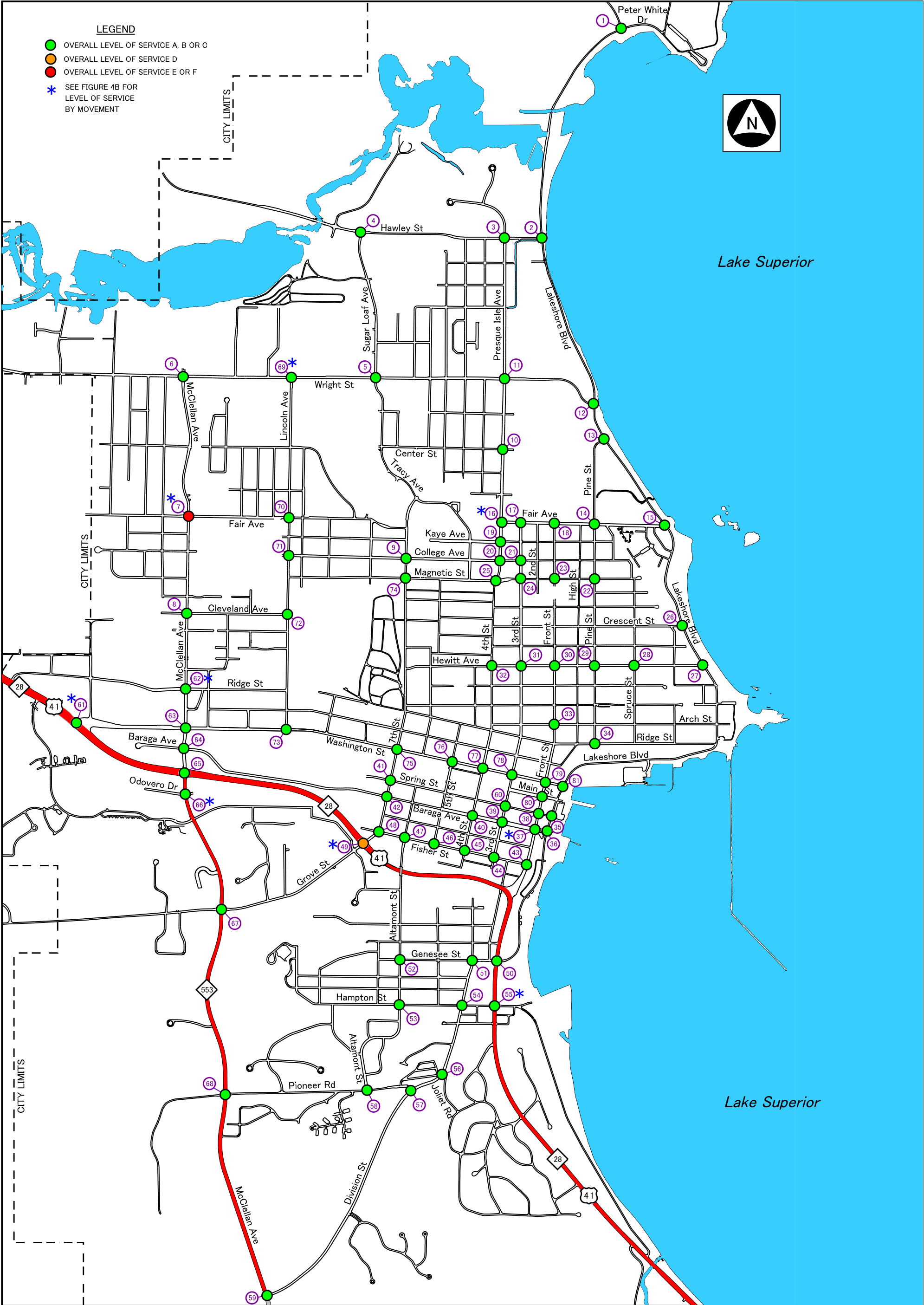
STUDY INTERSECTION



CITY OF MARQUETTE TRAFFIC STUDY

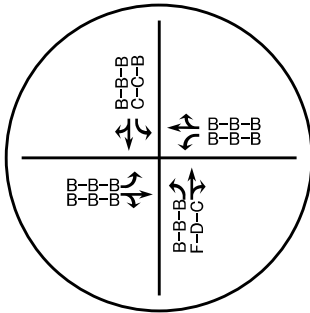
FIGURE 2J
EXISTING PEAK HOUR
TURNING MOVEMENT COUNTS
(2013)



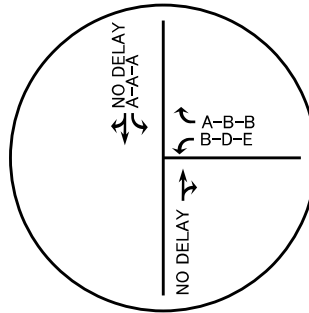


LEGEND

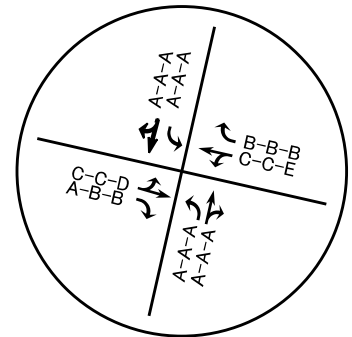
X-X-X A.M.-MIDDAY-P.M. LEVEL OF SERVICE
 * LEVEL OF SERVICE CALCULATED USING HCM 2000



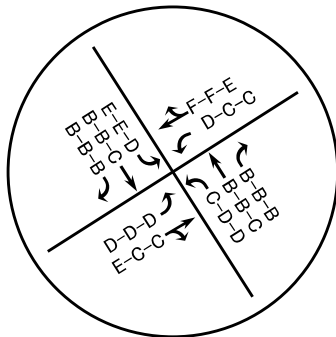
7 McClellan Ave & Fair Ave
 OVERALL LOS F-C-B



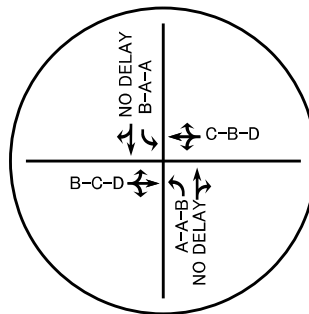
16 Presque Isle Ave & Fair Ave
 OVERALL LOS A-A-A



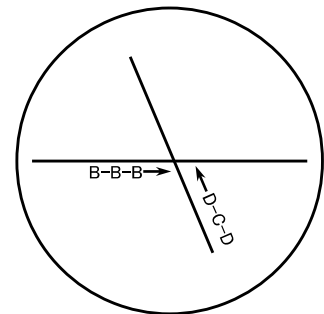
37 Front St & Baraga Ave
 OVERALL LOS A-A-A



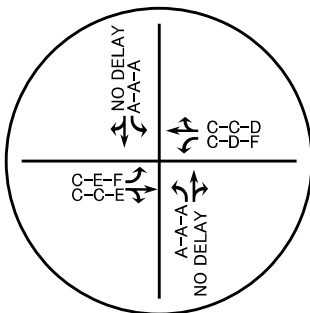
49 U.S. 41 & Grove St
 OVERALL LOS D-C-C



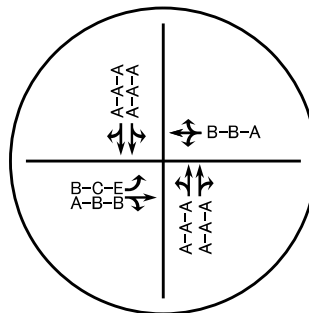
55 U.S. 41 & Hampton St
 OVERALL LOS A-A-A



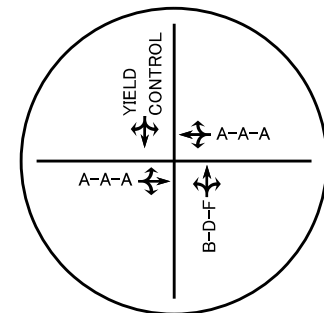
61 U.S. 41 & Washington St (SE) *
 OVERALL LOS C-C-C



62 McClellan Ave & Ridge St
 OVERALL LOS A-A-A



66 O'Dovero Drive & McClellan Ave
 OVERALL LOS A-A-A



69 Lincoln Ave & Wright St
 OVERALL LOS A-A-C

LOCATION: 7 – McClellan Avenue /Fair Avenue

EXISTING TRAFFIC CONTROL: Traffic Signal

SIGNAL OR ALL-WAY STOP WARRANT MET: Existing Traffic Signal

MITIGATION RECOMMENDED:

EXISTING OR NEAR TERM:

- Retime Traffic Signal
- Approximate Construction Cost – \$0

2030 /LONG TERM:

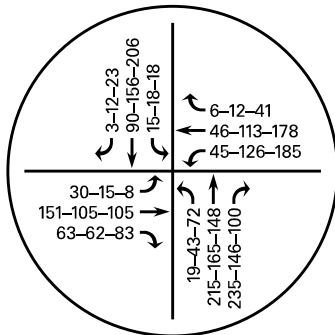
- Construct Northbound Right Turn Lane
- Reevaluate Traffic Signal Timing
- Approximate Construction Cost – \$80,000

ADDITIONAL STUDIES RECOMMENDED:

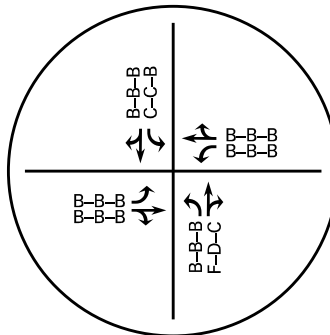
- None

These preliminary construction costs have been estimated based on limited investigations. It is possible that these costs may change once more detailed engineering design is undertaken. Therefore, these estimates should only be used for general planning purposes (i.e., they are not recommended for use in programming capital funding). Costs are for construction only and do not include engineering fees or right-of-way acquisition cost.

EXISTING PEAK HOUR TURNING MOVEMENT VOLUMES

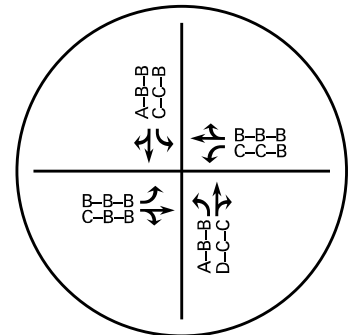


EXISTING PEAK HOUR LEVEL OF SERVICE



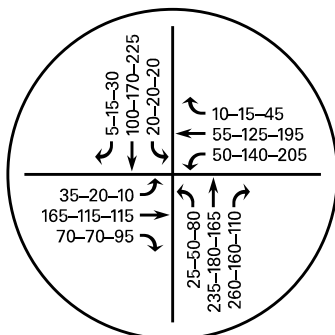
OVERALL LEVEL OF SERVICE:
AM: F (88.4 sec. of delay)
Mid-Day: C (21.8 sec. of delay)
PM: B (17.2 sec. of delay)

EXISTING PEAK HOUR LEVEL OF SERVICE WITH MITIGATION

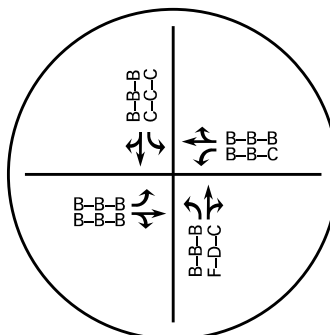


OVERALL LEVEL OF SERVICE:
AM: C (31.6 sec. of delay)
Mid-Day: B (18.6 sec. of delay)
PM: B (17.2 sec. of delay)

2030 NO BUILD PEAK HOUR TURNING MOVEMENT VOLUMES

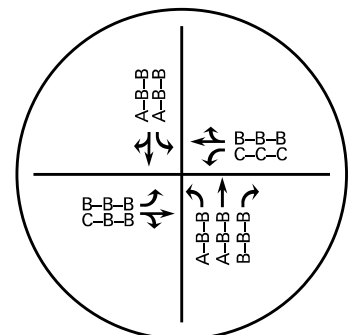


2030 NO BUILD PEAK HOUR LEVEL OF SERVICE



OVERALL LEVEL OF SERVICE:
AM: F (113.8 sec. of delay)
Mid-Day: C (27.0 sec. of delay)
PM: B (19.2 sec. of delay)

2030 PEAK HOUR LEVEL OF SERVICE WITH MITIGATION



OVERALL LEVEL OF SERVICE:
AM: B (18.0 sec. of delay)
Mid-Day: B (14.5 sec. of delay)
PM: B (15.7 sec. of delay)



**CITY OF MARQUETTE
TRAFFIC STUDY**

**FIGURE 5A
EXISTING TRAFFIC (2013)
MITIGATION
RECOMMENDATIONS**

LOCATION: 16 – Presque Isle Avenue and Fair Avenue

EXISTING TRAFFIC CONTROL: Stop Sign

SIGNAL OR ALL-WAY STOP WARRANT MET: Signal Warrant Met

MITIGATION RECOMMENDED:

EXISTING OR NEAR TERM:

- Option 1
 - Install Traffic Signal
 - Approximate Construction Cost – \$160,000
- Option 2
 - Install Mini-Roundabout
 - Approximate Construction Cost – \$300,000

2030 /LONG TERM:

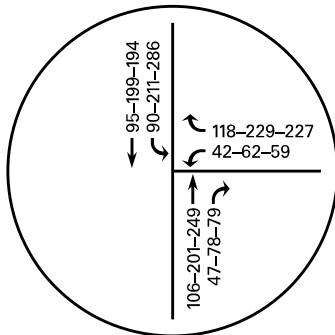
- No additional improvements recommended

ADDITIONAL STUDIES RECOMMENDED:

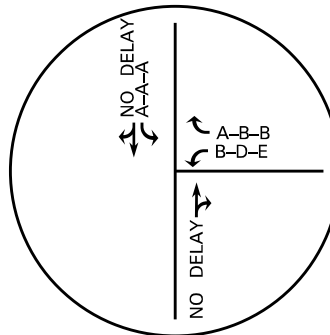
- None

These preliminary construction costs have been estimated based on limited investigations. It is possible that these costs may change once more detailed engineering design is undertaken. Therefore, these estimates should only be used for general planning purposes (i.e., they are not recommended for use in programming capital funding). Costs are for construction only and do not include engineering fees or right-of-way acquisition cost.

EXISTING PEAK HOUR TURNING MOVEMENT VOLUMES



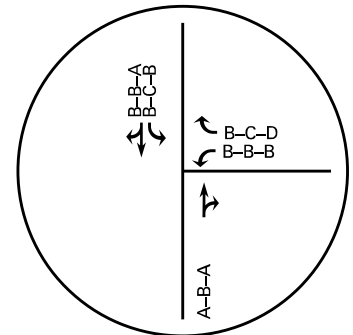
EXISTING PEAK HOUR LEVEL OF SERVICE



OVERALL LEVEL OF SERVICE:

AM: A (4.8 sec. of delay)
Mid-Day: A (6.3 sec. of delay)
PM: A (7.3 sec. of delay)

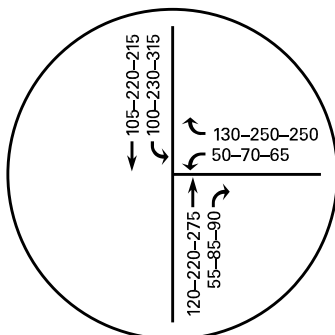
EXISTING PEAK HOUR LEVEL OF SERVICE WITH MITIGATION *



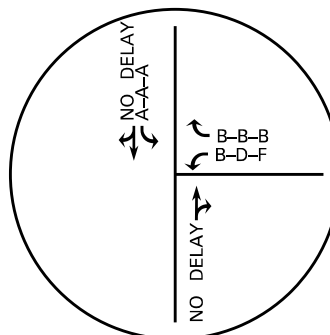
OVERALL LEVEL OF SERVICE:

AM: B (10.3 sec. of delay)
Mid-Day: C (21.2 sec. of delay)
PM: B (16.7 sec. of delay)

2030 NO BUILD PEAK HOUR TURNING MOVEMENT VOLUMES



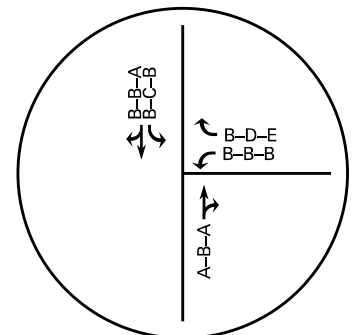
2030 NO BUILD PEAK HOUR LEVEL OF SERVICE



OVERALL LEVEL OF SERVICE:

AM: A (4.9 sec. of delay)
Mid-Day: A (7.0 sec. of delay)
PM: A (8.6 sec. of delay)

2030 PEAK HOUR LEVEL OF SERVICE WITH MITIGATION *



OVERALL LEVEL OF SERVICE:

AM: B (10.6 sec. of delay)
Mid-Day: C (24.5 sec. of delay)
PM: C (21.4 sec. of delay)

* Based on Signalized Intersection



**CITY OF MARQUETTE
TRAFFIC STUDY**

FIGURE 5B
EXISTING TRAFFIC (2013)
MITIGATION
RECOMMENDATIONS

LOCATION: 49 – U.S. 41 and Grove Street

EXISTING TRAFFIC CONTROL: Traffic Signal

SIGNAL OR ALL-WAY STOP WARRANT MET: Existing Traffic Signal

Reconstruction as a roundabout – updated
12/16/2016

MITIGATION RECOMMENDED:

EXISTING OR NEAR TERM:

- Retime traffic signal

2030 / LONG TERM:

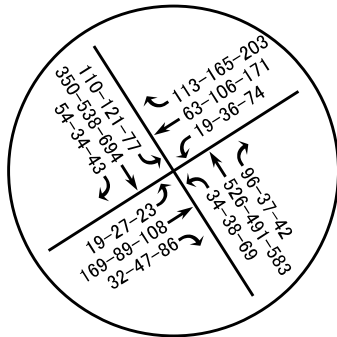
- Construct SB right turn lane
- Approximate Construction Cost – \$65,000

ADDITIONAL STUDIES RECOMMENDED:

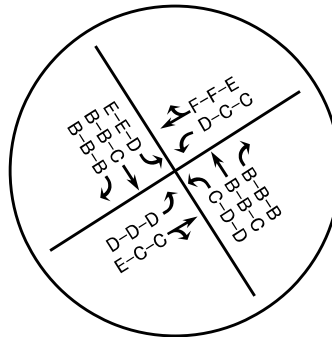
- Complete detailed crash analysis to identify any required safety improvements

These preliminary construction costs have been estimated based on limited investigations. It is possible that these costs may change once more detailed engineering design is undertaken. Therefore, these estimates should only be used for general planning purposes (i.e., they are not recommended for use in programming capital funding). Costs are for construction only and do not include engineering fees or right-of-way acquisition cost.

EXISTING PEAK HOUR TURNING
MOVEMENT VOLUMES

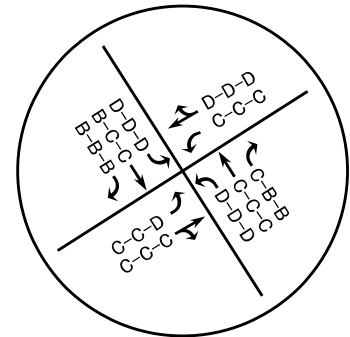


EXISTING PEAK HOUR
LEVEL OF SERVICE



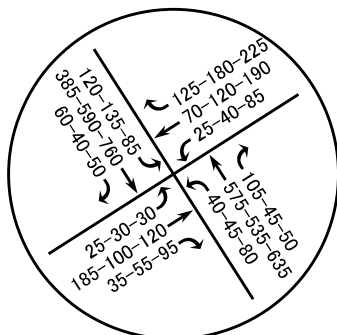
OVERALL LEVEL OF SERVICE:
AM: D (40.4 sec. of delay)
Mid-Day: C (32.2 sec. of delay)
PM: C (32.5 sec. of delay)

EXISTING PEAK HOUR
LEVEL OF SERVICE
WITH MITIGATION

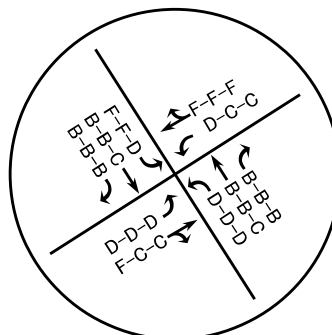


OVERALL LEVEL OF SERVICE:
AM: C (25.7 sec. of delay)
Mid-Day: C (26.5 sec. of delay)
PM: C (30.6 sec. of delay)

2030 NO BUILD PEAK HOUR
TURNING MOVEMENT
VOLUMES

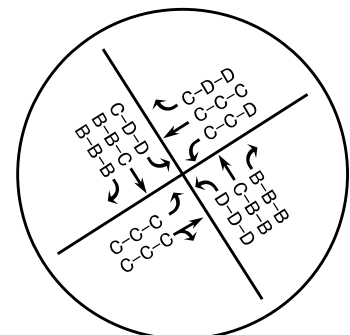


2030 NO BUILD PEAK HOUR
LEVEL OF SERVICE



OVERALL LEVEL OF SERVICE:
AM: D (49.7 sec. of delay)
Mid-Day: D (39.6 sec. of delay)
PM: D (39.2 sec. of delay)

2030 PEAK HOUR
LEVEL OF SERVICE
WITH MITIGATION



OVERALL LEVEL OF SERVICE:
AM: C (23.6 sec. of delay)
Mid-Day: C (21.8 sec. of delay)
PM: C (27.2 sec. of delay)



CITY OF MARQUETTE
TRAFFIC STUDY

FIGURE 5C
EXISTING TRAFFIC (2013)
MITIGATION
RECOMMENDATIONS

LOCATION: 62 – McClellan Avenue and Ridge Street

EXISTING TRAFFIC CONTROL: Stop Control

SIGNAL OR ALL-WAY STOP WARRANT MET: Traffic Signal or All-Way Stop Warrant Met

MITIGATION RECOMMENDED:

EXISTING OR NEAR TERM:

Option 1

- Install Traffic Signal
- Construct Southbound Right Turn Lane
- Approximate Construction Cost – \$210,000

Option 2

- Construct Roundabout
- Approximate Construction Cost – \$900,000

2030 / LONG TERM:

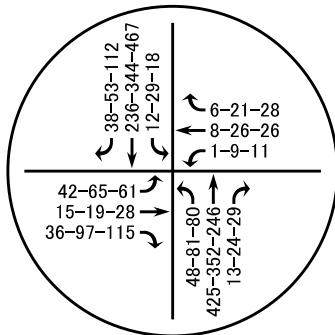
- No additional improvements recommended

ADDITIONAL STUDIES RECOMMENDED:

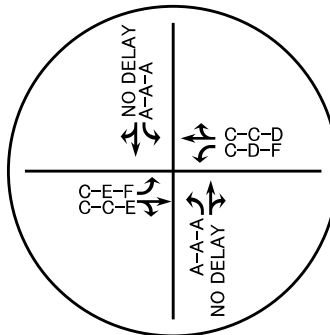
- None

These preliminary construction costs have been estimated based on limited investigations. It is possible that these costs may change once more detailed engineering design is undertaken. Therefore, these estimates should only be used for general planning purposes (i.e., they are not recommended for use in programming capital funding). Costs are for construction only and do not include engineering fees or right-of-way acquisition cost.

EXISTING PEAK HOUR TURNING MOVEMENT VOLUMES



EXISTING PEAK HOUR LEVEL OF SERVICE



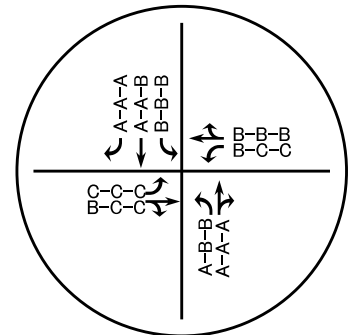
OVERALL LEVEL OF SERVICE:

AM: A (2.8 sec. of delay)

Mid-Day: A (6.4 sec. of delay)

PM: A (8.4 sec. of delay)

EXISTING PEAK HOUR LEVEL OF SERVICE WITH MITIGATION *



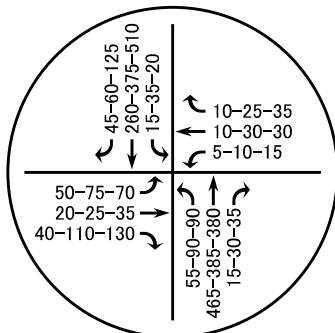
OVERALL LEVEL OF SERVICE:

AM: B (10.5 sec. of delay)

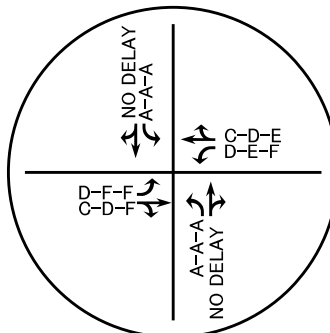
Mid-Day: B (11.9 sec. of delay)

PM: B (12.6 sec. of delay)

2030 NO BUILD PEAK HOUR TURNING MOVEMENT VOLUMES



2030 NO BUILD PEAK HOUR LEVEL OF SERVICE



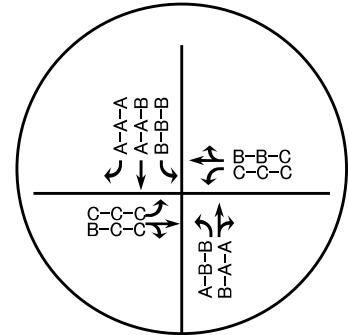
OVERALL LEVEL OF SERVICE:

AM: A (3.5 sec. of delay)

Mid-Day: A (9.2 sec. of delay)

PM: B (16.1 sec. of delay)

2030 PEAK HOUR LEVEL OF SERVICE WITH MITIGATION *



OVERALL LEVEL OF SERVICE:

AM: B (11.0 sec. of delay)

Mid-Day: B (12.4 sec. of delay)

PM: B (13.3 sec. of delay)

* Based on Signalized Intersection



CITY OF MARQUETTE
TRAFFIC STUDY

FIGURE 5D
EXISTING TRAFFIC (2013)
MITIGATION
RECOMMENDATIONS

LOCATION: 66 – O'Dovero Drive and McClellan Avenue

EXISTING TRAFFIC CONTROL: Stop Sign

SIGNAL OR ALL-WAY STOP WARRANT MET: Traffic Signal Warrant Met

MITIGATION RECOMMENDED:

EXISTING OR NEAR TERM:

- Install Traffic Signal
- Widen McClellan Avenue to provide left turn lanes
- Realign and widen east leg
- Interconnect with U.S. 41 / McClellan Avenue intersection
- Approximate Construction Cost – \$210,000

2030 / LONG TERM:

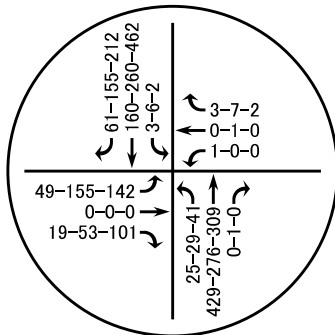
- No additional improvements recommended

ADDITIONAL STUDIES RECOMMENDED:

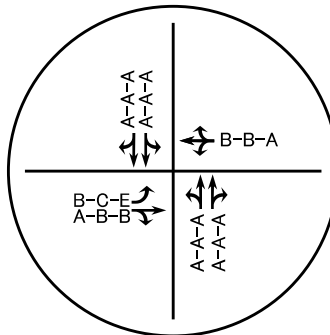
- None

These preliminary construction costs have been estimated based on limited investigations. It is possible that these costs may change once more detailed engineering design is undertaken. Therefore, these estimates should only be used for general planning purposes (i.e., they are not recommended for use in programming capital funding). Costs are for construction only and do not include engineering fees or right-of-way acquisition cost.

EXISTING PEAK HOUR TURNING MOVEMENT VOLUMES



EXISTING PEAK HOUR LEVEL OF SERVICE



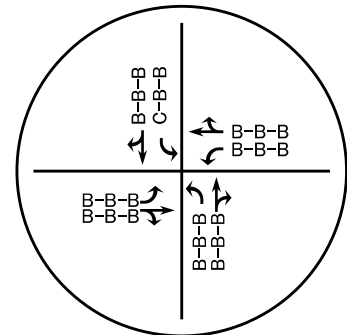
OVERALL LEVEL OF SERVICE:

AM: A (1.6 sec. of delay)

Mid-Day: A (4.7 sec. of delay)

PM: A (6.7 sec. of delay)

EXISTING PEAK HOUR LEVEL OF SERVICE WITH MITIGATION



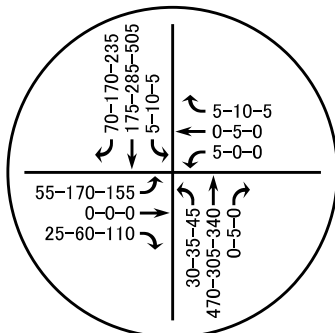
OVERALL LEVEL OF SERVICE:

AM: B (13.9 sec. of delay)

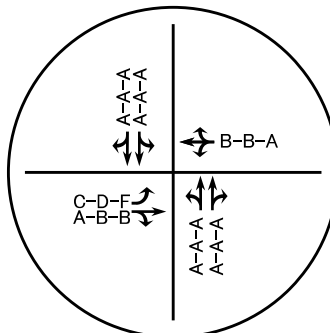
Mid-Day: B (15.7 sec. of delay)

PM: B (13.9 sec. of delay)

2030 NO BUILD PEAK HOUR TURNING MOVEMENT VOLUMES



2030 NO BUILD PEAK HOUR LEVEL OF SERVICE



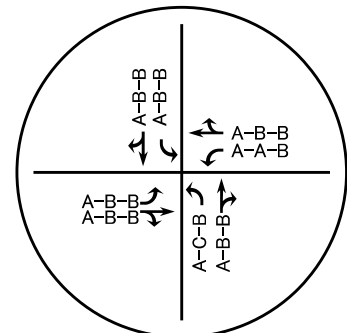
OVERALL LEVEL OF SERVICE:

AM: A (1.9 sec. of delay)

Mid-Day: A (6.1 sec. of delay)

PM: A (10.9 sec. of delay)

2030 PEAK HOUR LEVEL OF SERVICE WITH MITIGATION



OVERALL LEVEL OF SERVICE:

AM: A (5.6 sec. of delay)

Mid-Day: B (16.5 sec. of delay)

PM: B (15.0 sec. of delay)



CITY OF MARQUETTE
TRAFFIC STUDY

FIGURE 5E
EXISTING TRAFFIC (2013)
MITIGATION
RECOMMENDATIONS

LOCATION: 69 – Lincoln Avenue and Wright Street
 EXISTING TRAFFIC CONTROL: Stop Sign
 SIGNAL OR ALL-WAY STOP WARRANT MET: Traffic Signal Warrant Met
 MITIGATION RECOMMENDED:

EXISTING OR NEAR TERM:

Option 1

- Install Traffic Signal with left turn lanes on all legs
- Realign or close north leg (parking lot entrance)
- Install countdown pedestrian signals, high visibility crosswalks
- Interconnect with McClellan Avenue and Sugarloaf Avenue intersections
- Approximate Construction Cost – \$170,000

Option 2

- Construct Roundabout
- Approximate Construction Cost – \$750,000

2030 / LONG TERM:

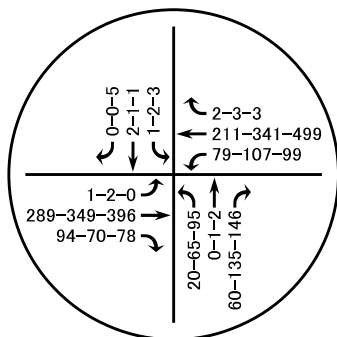
- No additional improvements recommended

ADDITIONAL STUDIES RECOMMENDED:

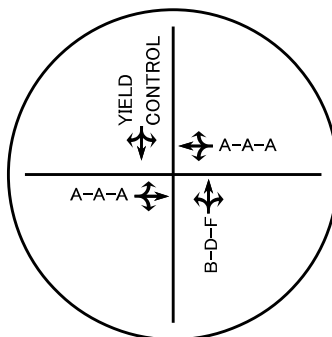
- None

These preliminary construction costs have been estimated based on limited investigations. It is possible that these costs may change once more detailed engineering design is undertaken. Therefore, these estimates should only be used for general planning purposes (i.e., they are not recommended for use in programming capital funding). Costs are for construction only and do not include engineering fees or right-of-way acquisition cost.

EXISTING PEAK HOUR TURNING MOVEMENT VOLUMES

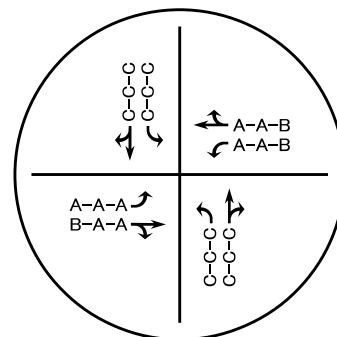


EXISTING PEAK HOUR LEVEL OF SERVICE



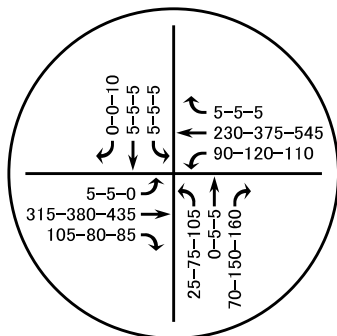
OVERALL LEVEL OF SERVICE:
 AM: A (2.3 sec. of delay)
 Mid-Day: A (6.3 sec. of delay)
 PM: C (20.7 sec. of delay)

EXISTING PEAK HOUR LEVEL OF SERVICE WITH MITIGATION *

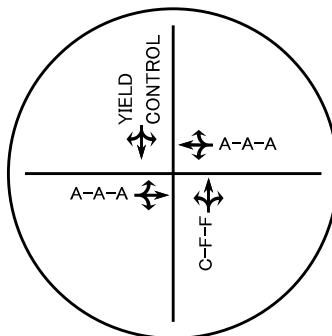


OVERALL LEVEL OF SERVICE:
 AM: A (8.6 sec. of delay)
 Mid-Day: B (7.9 sec. of delay)
 PM: B (11.6 sec. of delay)

2030 NO BUILD PEAK HOUR TURNING MOVEMENT VOLUMES

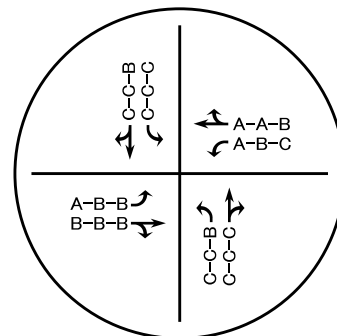


2030 NO BUILD PEAK HOUR LEVEL OF SERVICE



OVERALL LEVEL OF SERVICE:
 AM: A (2.7 sec. of delay)
 Mid-Day: B (11.4 sec. of delay)
 PM: D (47.0 sec. of delay)

2030 PEAK HOUR LEVEL OF SERVICE WITH MITIGATION *



OVERALL LEVEL OF SERVICE:
 AM: B (10.7 sec. of delay)
 Mid-Day: B (13.8 sec. of delay)
 PM: B (15.4 sec. of delay)

* Based on Signalized Intersection



CITY OF MARQUETTE TRAFFIC STUDY

FIGURE 5F
 EXISTING TRAFFIC (2013)
 MITIGATION
 RECOMMENDATIONS

LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



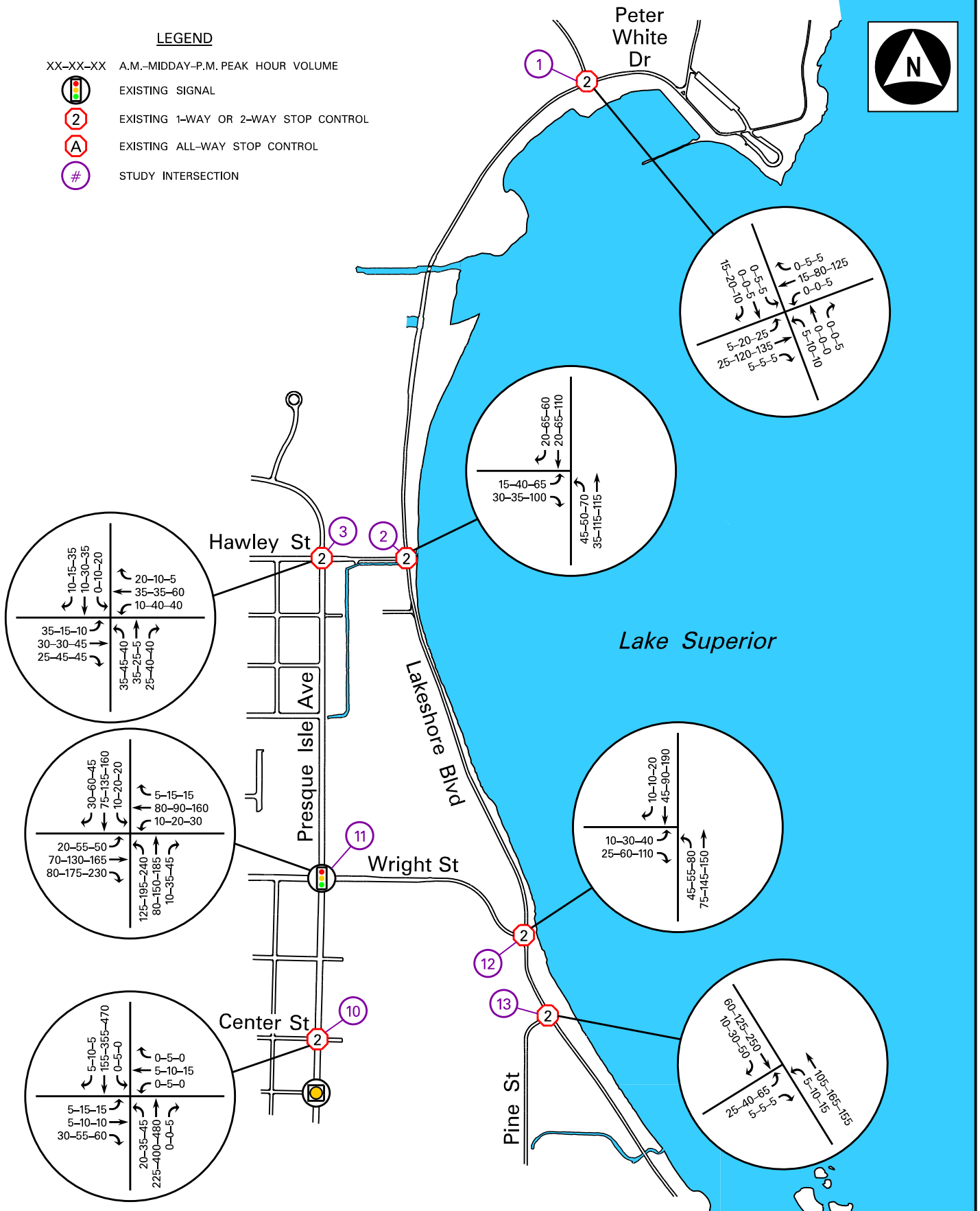
EXISTING 1-WAY OR 2-WAY STOP CONTROL



EXISTING ALL-WAY STOP CONTROL



STUDY INTERSECTION



LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



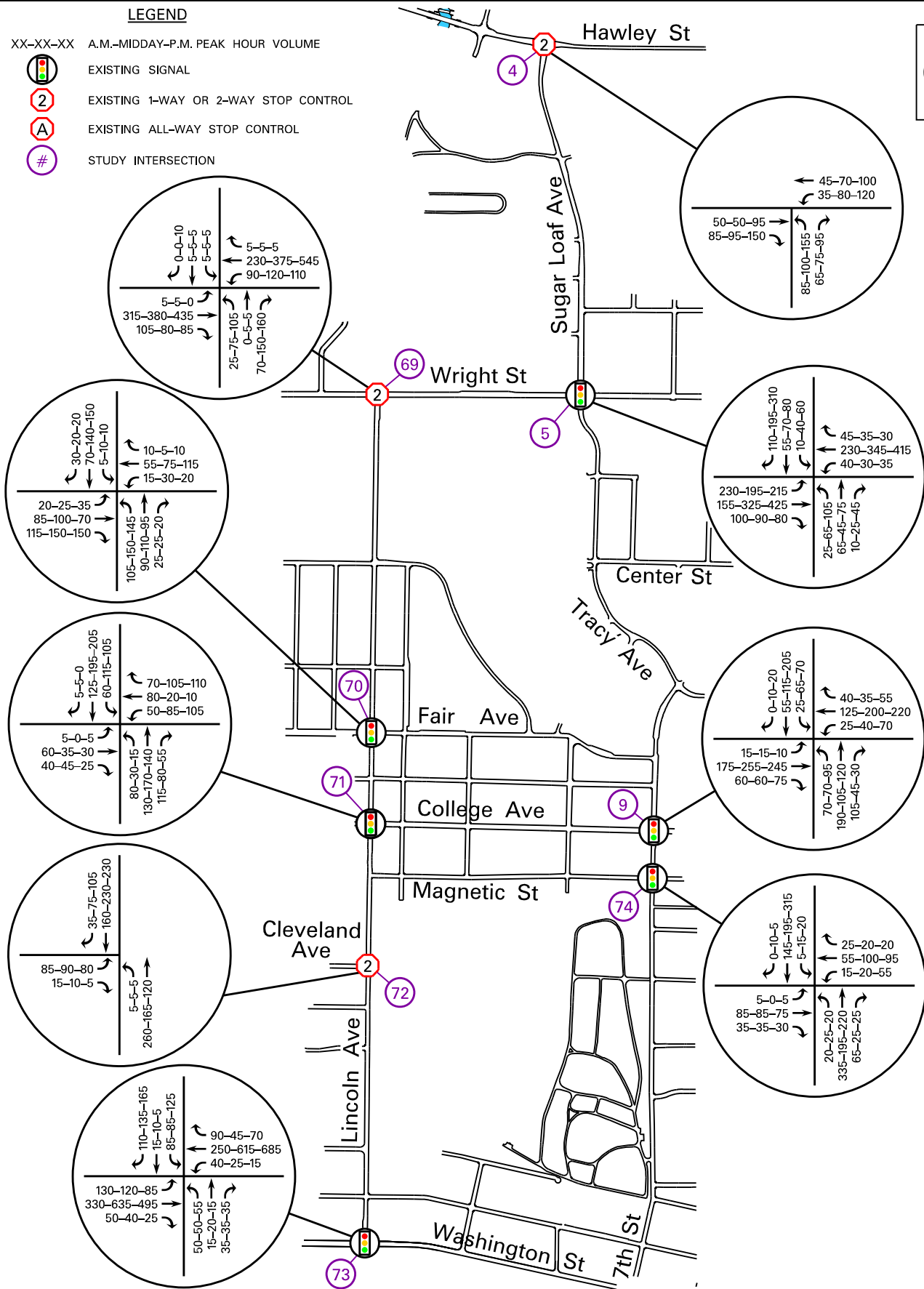
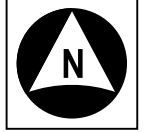
EXISTING 1-WAY OR 2-WAY STOP CONTROL



EXISTING ALL-WAY STOP CONTROL

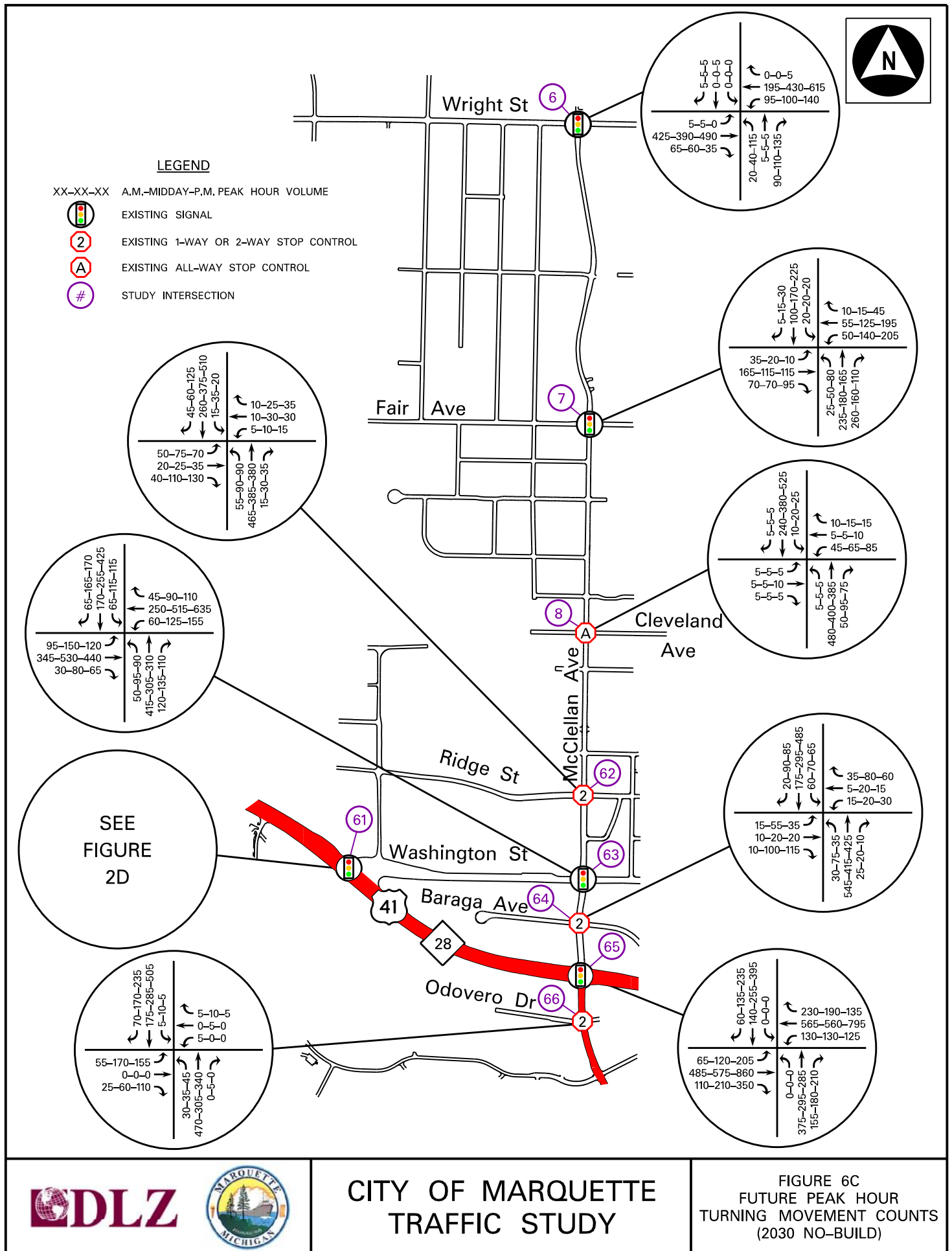


STUDY INTERSECTION



CITY OF MARQUETTE TRAFFIC STUDY

FIGURE 6B
FUTURE PEAK HOUR
TURNING MOVEMENT COUNTS
(2030 NO-BUILD)



LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



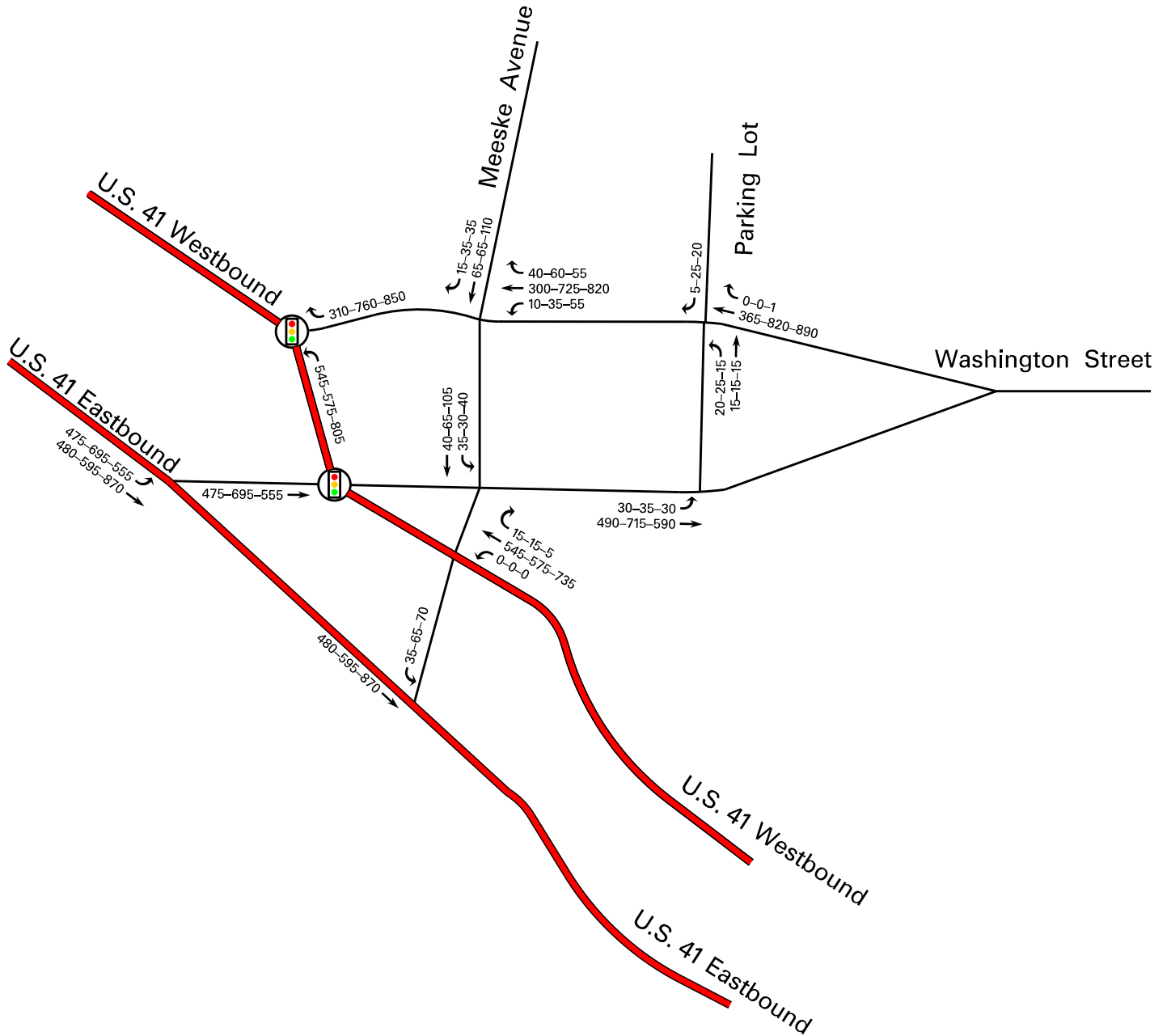
EXISTING 1-WAY OR 2-WAY STOP CONTROL



EXISTING ALL-WAY STOP CONTROL



STUDY INTERSECTION



LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



EXISTING YELLOW FLASHER SIGNAL



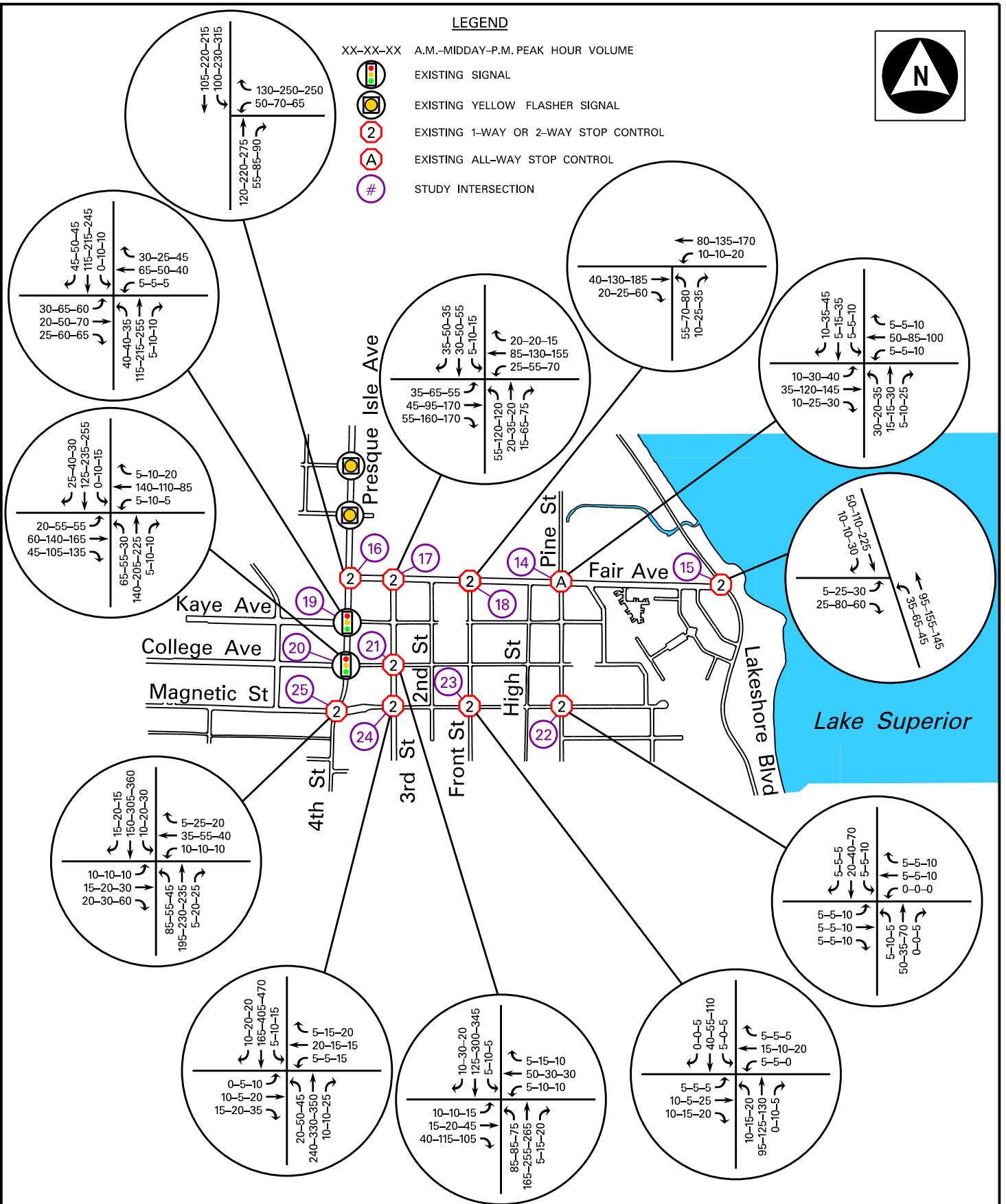
EXISTING 1-WAY OR 2-WAY STOP CONTROL



EXISTING ALL-WAY STOP CONTROL



STUDY INTERSECTION



LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



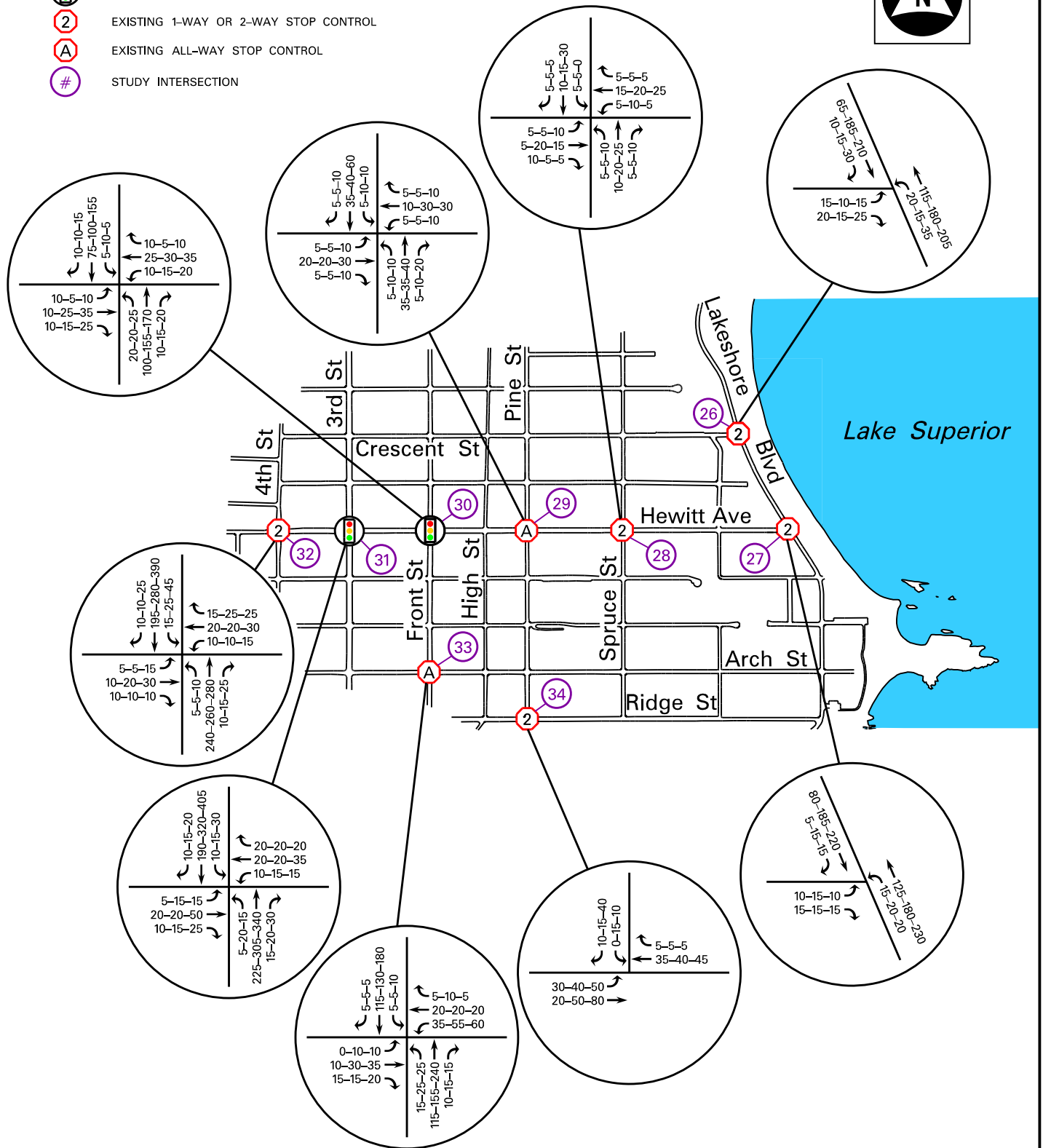
EXISTING 1-WAY OR 2-WAY STOP CONTROL



EXISTING ALL-WAY STOP CONTROL



STUDY INTERSECTION



LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



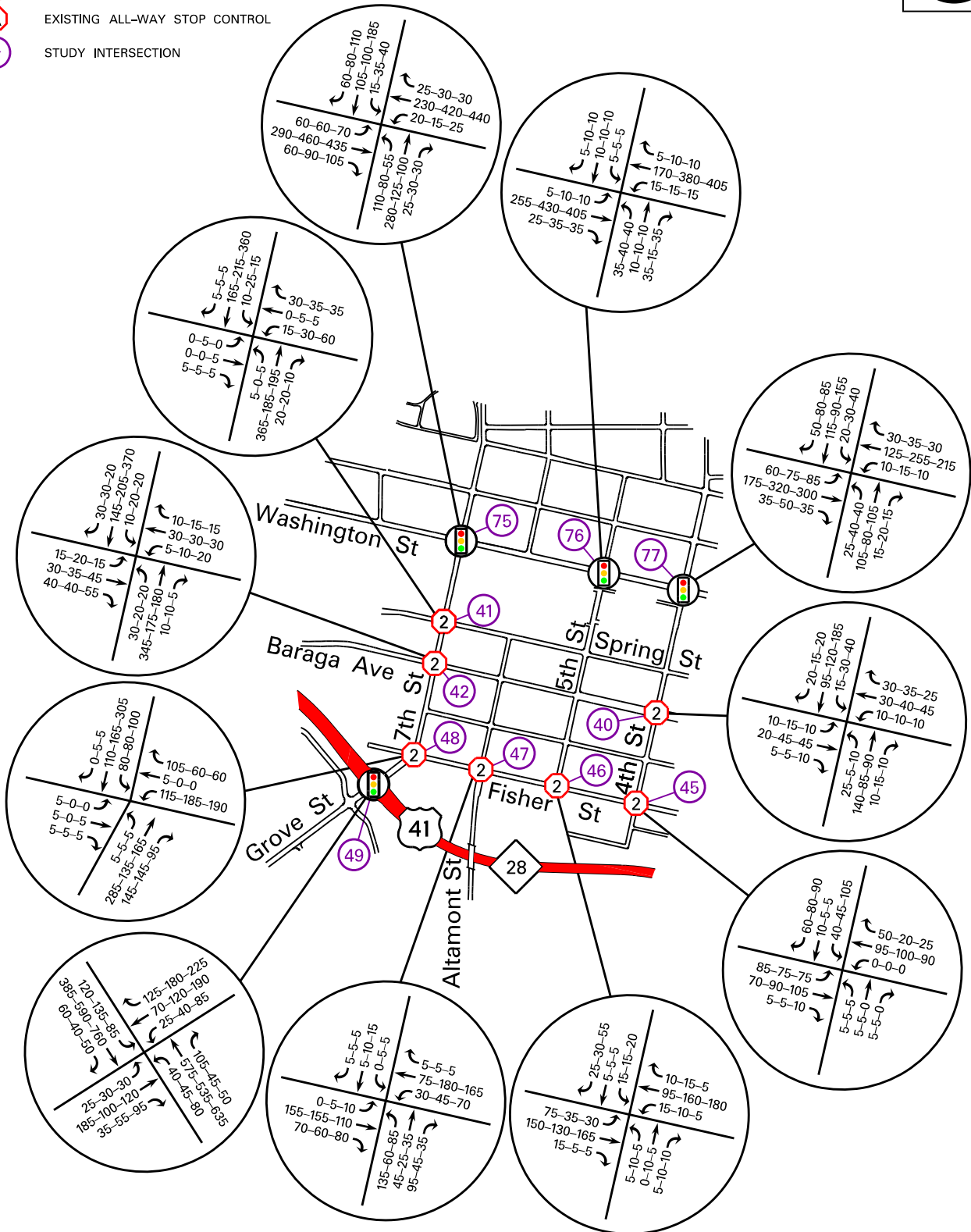
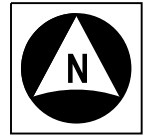
EXISTING 1-WAY OR 2-WAY STOP CONTROL



EXISTING ALL-WAY STOP CONTROL



STUDY INTERSECTION



CITY OF MARQUETTE TRAFFIC STUDY

FIGURE 6G
FUTURE PEAK HOUR
TURNING MOVEMENT COUNTS
(2030 NO-BUILD)

LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



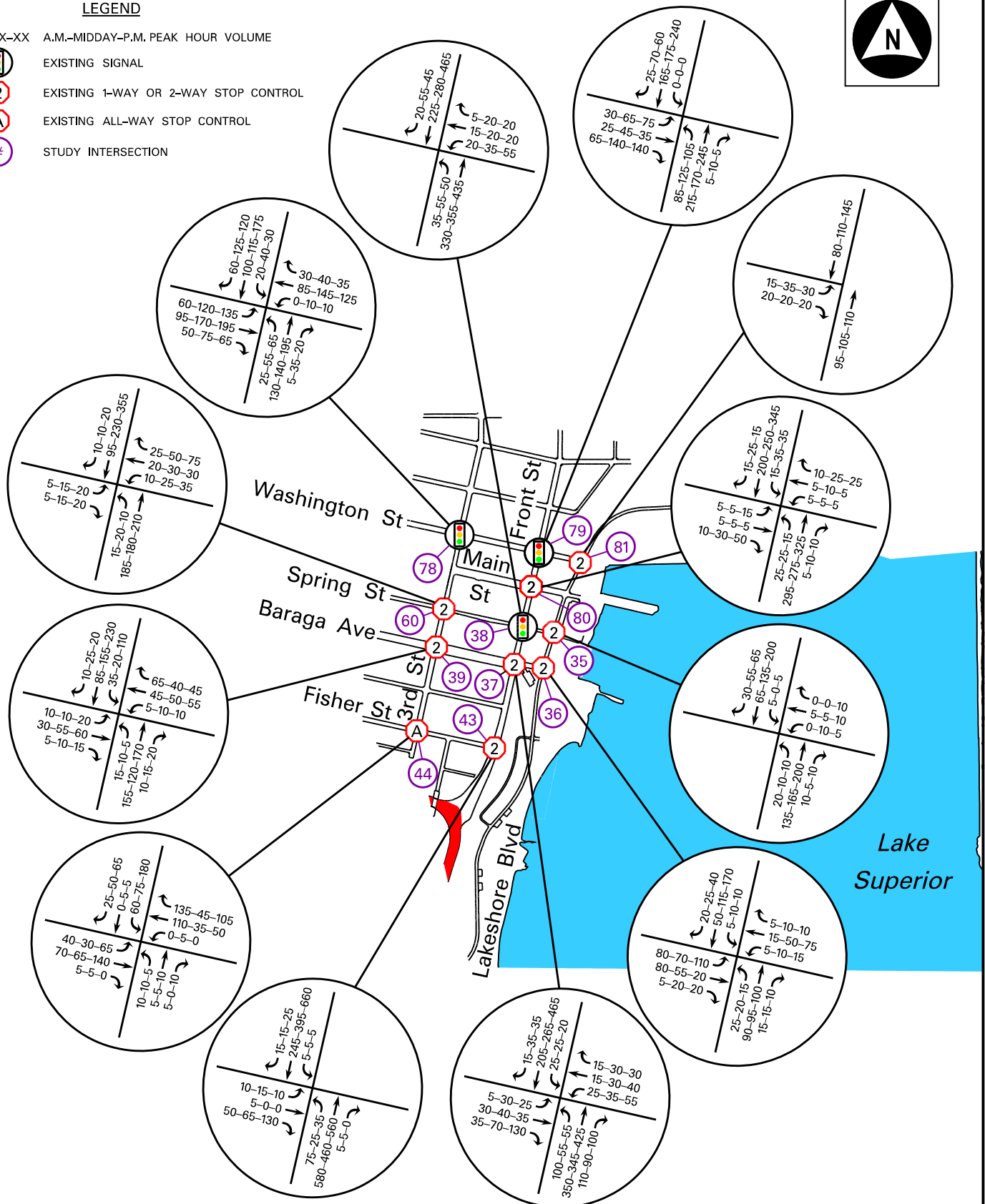
EXISTING 1-WAY OR 2-WAY STOP CONTROL



EXISTING ALL-WAY STOP CONTROL



STUDY INTERSECTION



LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



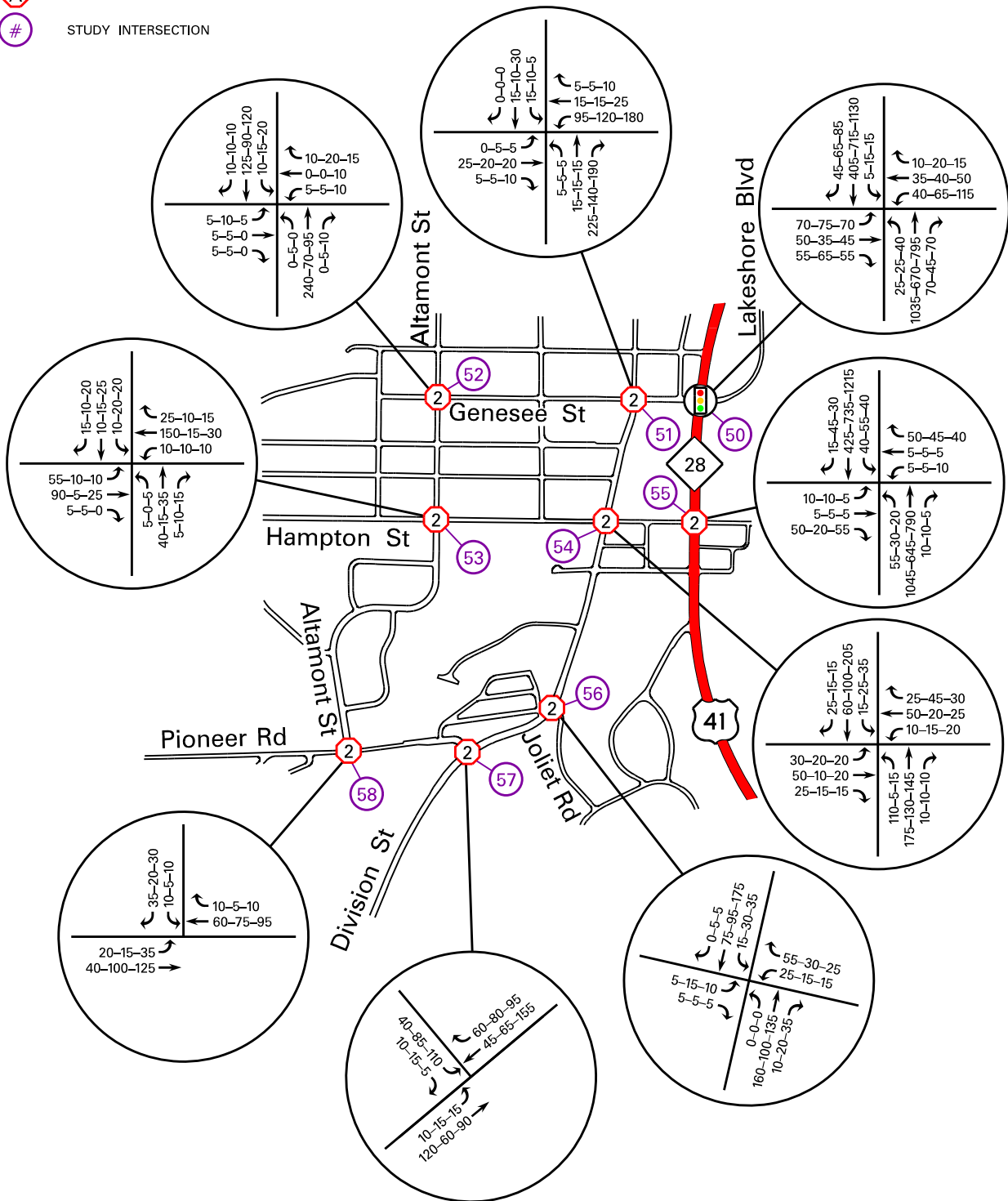
EXISTING 1-WAY OR 2-WAY STOP CONTROL



EXISTING ALL-WAY STOP CONTROL



STUDY INTERSECTION



LEGEND

XX-XX-XX A.M.-MIDDAY-P.M. PEAK HOUR VOLUME



EXISTING SIGNAL



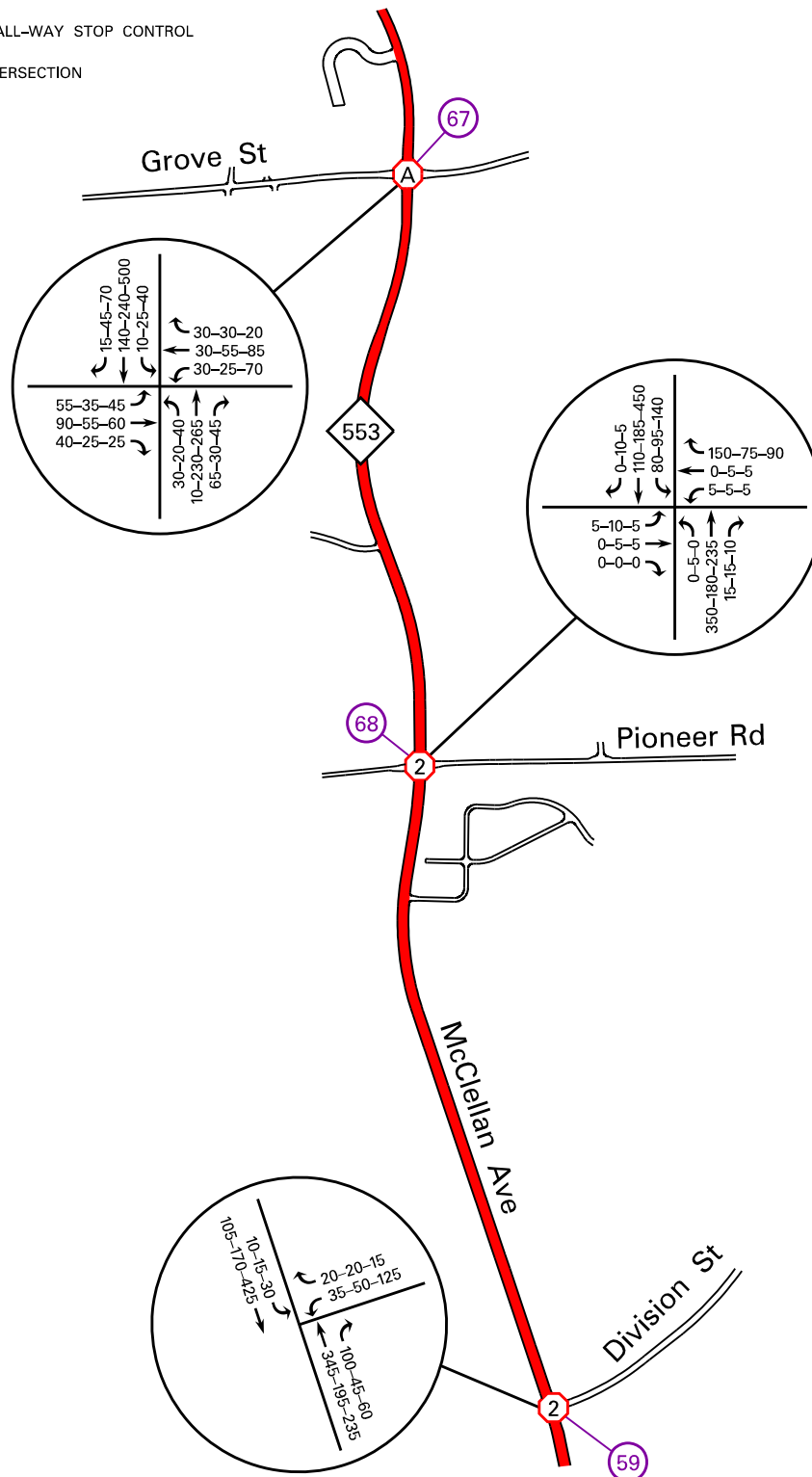
EXISTING 1-WAY OR 2-WAY STOP CONTROL

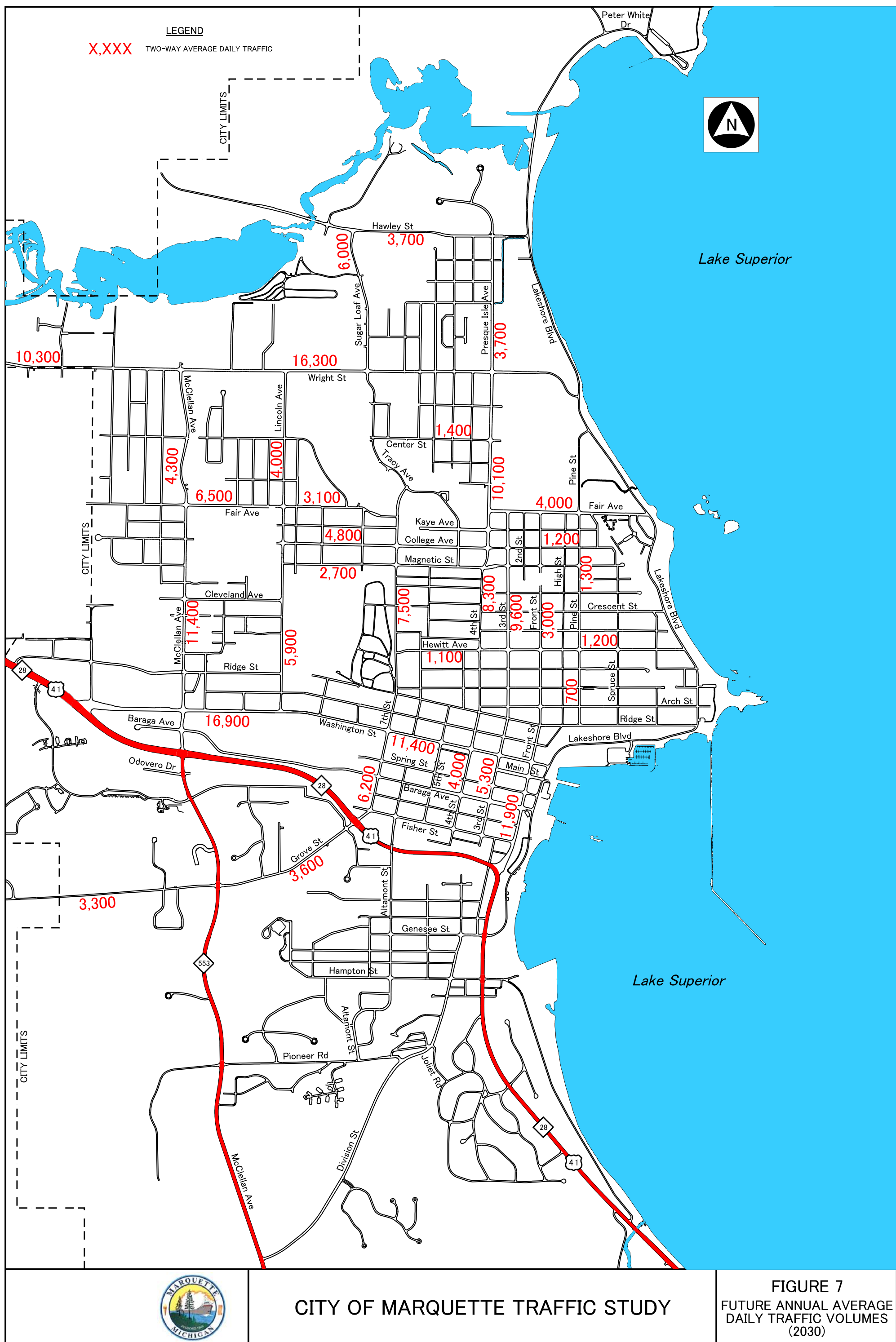


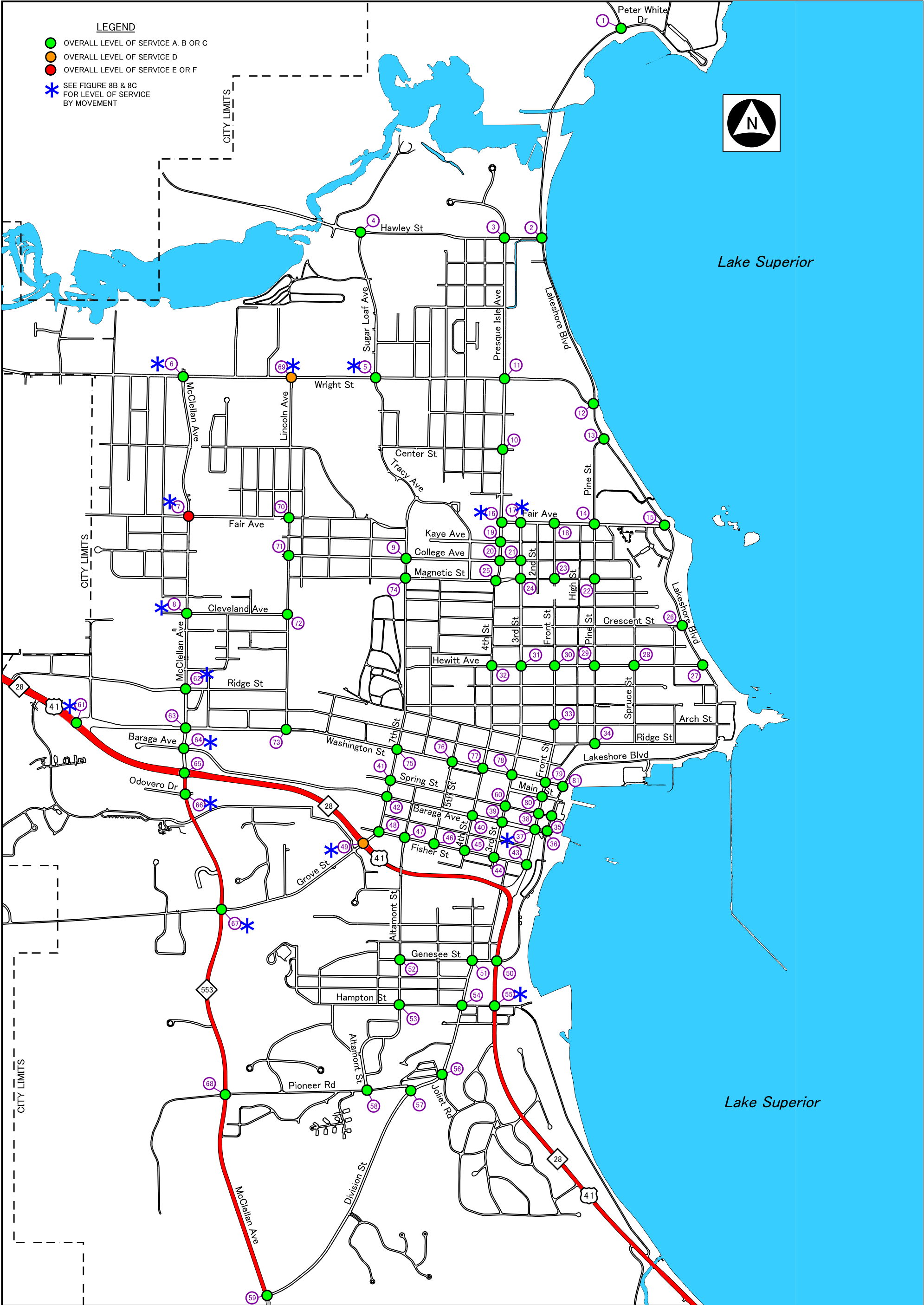
EXISTING ALL-WAY STOP CONTROL



STUDY INTERSECTION

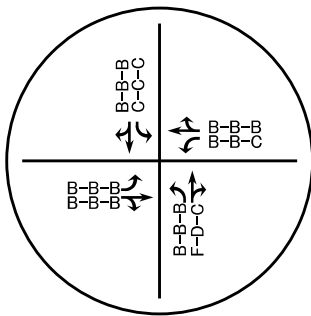




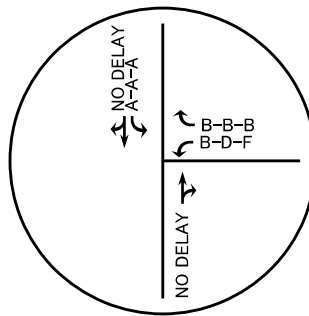


LEGEND

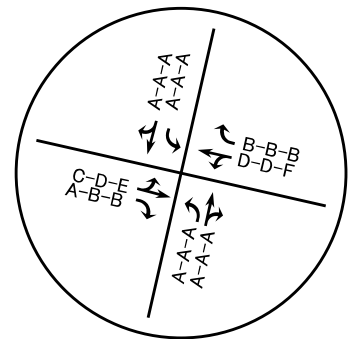
X-X-X A.M.-MIDDAY-P.M. LEVEL OF SERVICE
 * LEVEL OF SERVICE CALCULATED USING HCM 2000



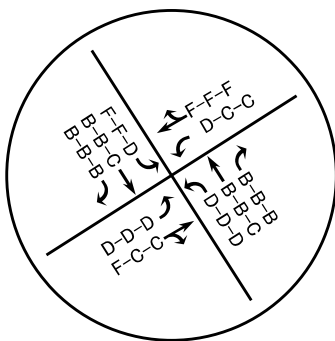
7 McClellan Ave & Fair Ave
 OVERALL LOS F-C-B



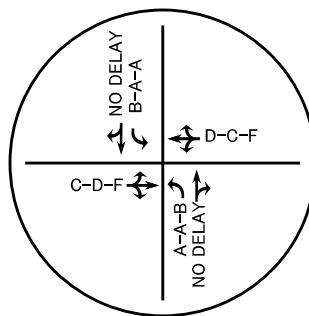
16 Presque Isle Ave & Fair Ave
 OVERALL LOS A-A-A



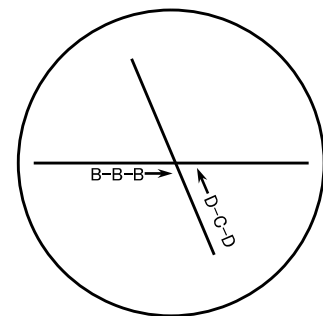
37 Front St & Baraga Ave
 OVERALL LOS A-A-B



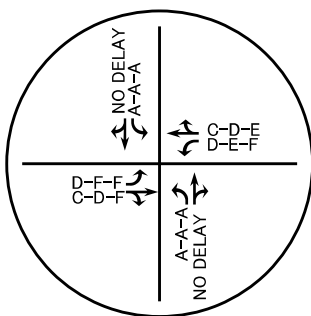
49 U.S. 41 & Grove St
 OVERALL LOS D-D-D



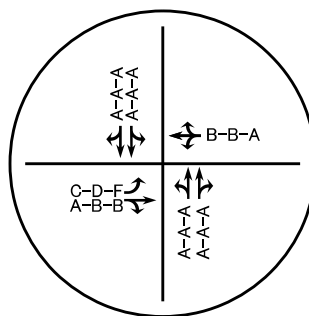
55 U.S. 41 & Hampton St
 OVERALL LOS A-A-A



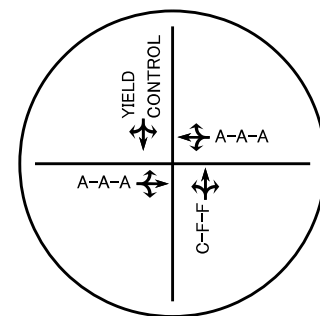
61 U.S. 41 & Washington St (SE) *
 OVERALL LOS C-C-C



62 McClellan Ave & Ridge St
 OVERALL LOS A-A-B



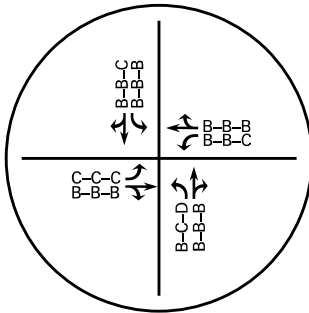
66 O'Dovero Drive & McClellan Ave
 OVERALL LOS A-A-A



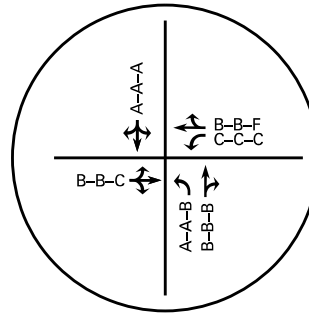
69 Lincoln Ave & Wright St
 OVERALL LOS A-B-D

LEGEND

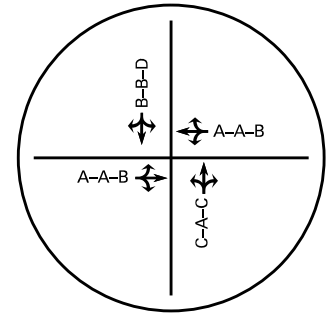
X-X-X A.M.-MIDDAY-P.M. LEVEL OF SERVICE
 * LEVEL OF SERVICE CALCULATED USING HCM 2000



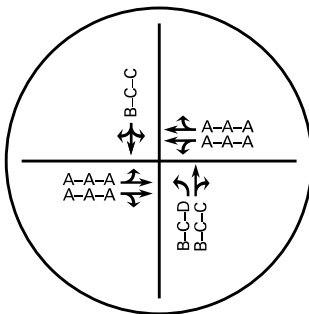
5 Sugarloaf Ave & Wright St
 OVERALL LOS B-B-C



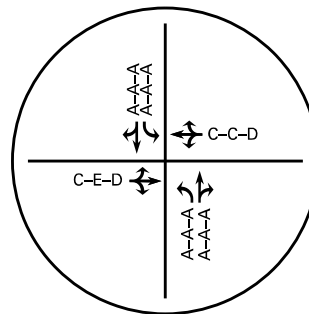
6 McClellan Ave & Wright St
 OVERALL LOS B-B-C



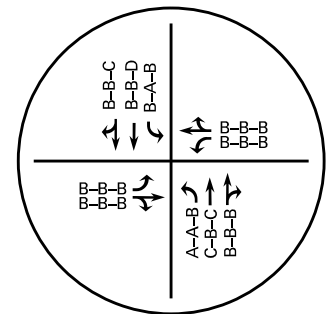
8 McClellan Ave & Cleveland St
 OVERALL LOS B-B-C



17 Third St & Fair Ave
 OVERALL LOS A-A-A



64 McClellan Ave & Baraga Ave
 OVERALL LOS A-A-B



67 Grove St & McClellan Ave
 OVERALL LOS B-B-B

LOCATION: 6 – McClellan Avenue and Wright Street

EXISTING TRAFFIC CONTROL: Traffic Signal

SIGNAL OR ALL-WAY STOP WARRANT MET: Existing Traffic Signal

MITIGATION RECOMMENDED:

EXISTING OR NEAR TERM:

- Retime Traffic Signal
- Interconnect with adjacent signals to provide traffic progression
- Approximate Construction Cost – \$35,000

2030 /LONG TERM:

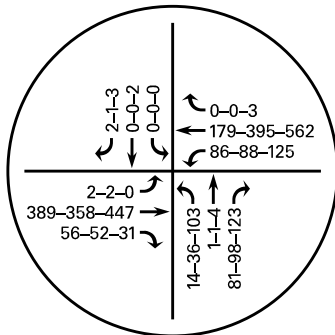
- No additional improvements recommended

ADDITIONAL STUDIES RECOMMENDED:

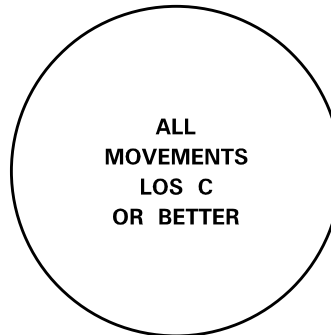
- None

These preliminary construction costs have been estimated based on limited investigations. It is possible that these costs may change once more detailed engineering design is undertaken. Therefore, these estimates should only be used for general planning purposes (i.e., they are not recommended for use in programming capital funding). Costs are for construction only and do not include engineering fees or right-of-way acquisition cost.

EXISTING PEAK HOUR TURNING MOVEMENT VOLUMES

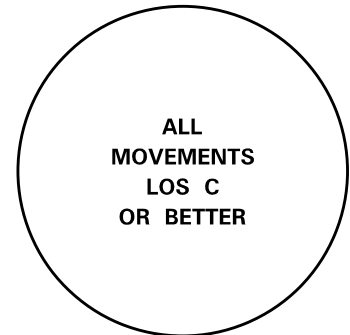


EXISTING PEAK HOUR LEVEL OF SERVICE



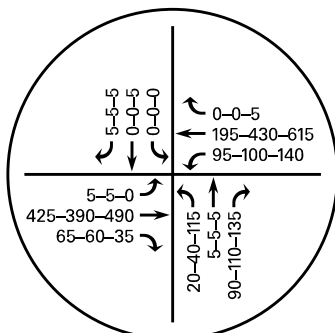
OVERALL LEVEL OF SERVICE:
AM: B (14.0 sec. of delay)
Mid-Day: B (15.5 sec. of delay)
PM: C (23.9 sec. of delay)

EXISTING PEAK HOUR LEVEL OF SERVICE WITH MITIGATION

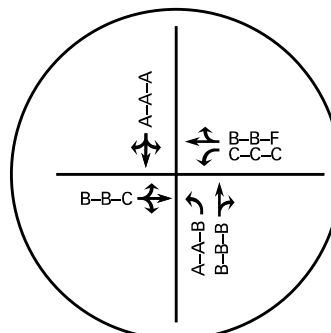


OVERALL LEVEL OF SERVICE:
AM: A (9.4 sec. of delay)
Mid-Day: A (7.8 sec. of delay)
PM: A (9.0 sec. of delay)

2030 NO BUILD PEAK HOUR TURNING MOVEMENT VOLUMES

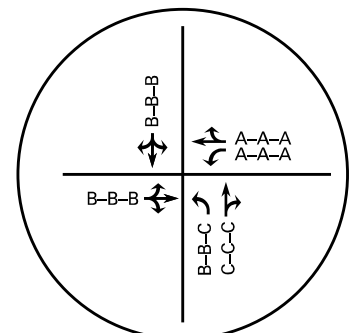


2030 NO BUILD PEAK HOUR LEVEL OF SERVICE



OVERALL LEVEL OF SERVICE:
AM: B (14.9 sec. of delay)
Mid-Day: B (16.3 sec. of delay)
PM: C (24.2 sec. of delay)

2030 PEAK HOUR LEVEL OF SERVICE WITH MITIGATION



OVERALL LEVEL OF SERVICE:
AM: A (9.5 sec. of delay)
Mid-Day: A (8.3 sec. of delay)
PM: A (9.9 sec. of delay)



**CITY OF MARQUETTE
TRAFFIC STUDY**

**FIGURE 9A
FUTURE TRAFFIC (2030)
MITIGATION
RECOMMENDATIONS**

LOCATION: 55 – U.S. 41 and Hampton Street
EXISTING TRAFFIC CONTROL: Stop Sign
SIGNAL OR ALL-WAY STOP WARRANT MET: None Met

MITIGATION RECOMMENDED:

EXISTING OR NEAR TERM:

- None required

2030 /LONG TERM:

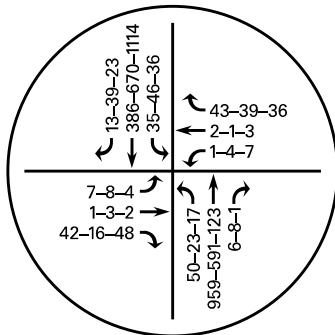
- Geometric improvements do not improve Level of Service

ADDITIONAL STUDIES RECOMMENDED:

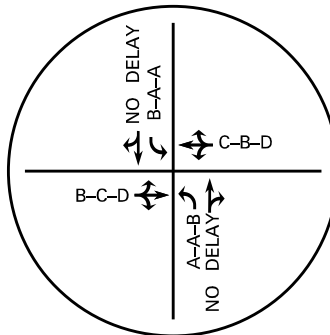
- Evaluate impacts of restricting Hampton Street movements to right-in /right-out only

These preliminary construction costs have been estimated based on limited investigations. It is possible that these costs may change once more detailed engineering design is undertaken. Therefore, these estimates should only be used for general planning purposes (i.e., they are not recommended for use in programming capital funding). Costs are for construction only and do not include engineering fees or right-of-way acquisition cost.

EXISTING PEAK HOUR TURNING MOVEMENT VOLUMES



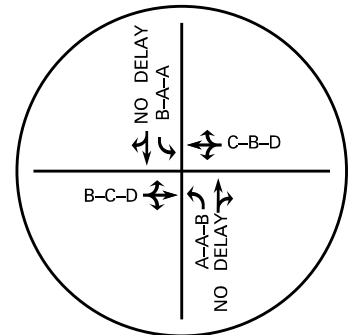
EXISTING PEAK HOUR LEVEL OF SERVICE



OVERALL LEVEL OF SERVICE:

AM: A (1.5 sec. of delay)
 Mid-Day: A (1.3 sec. of delay)
 PM: A (1.7 sec. of delay)

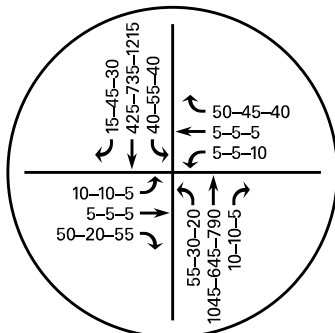
EXISTING PEAK HOUR LEVEL OF SERVICE WITH MITIGATION



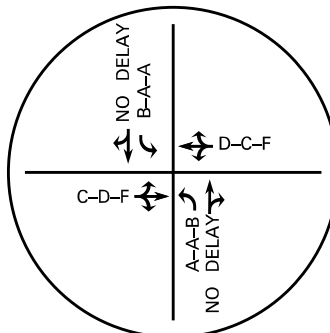
OVERALL LEVEL OF SERVICE:

AM: A (1.5 sec. of delay)
 Mid-Day: A (1.3 sec. of delay)
 PM: A (1.7 sec. of delay)

2030 NO BUILD PEAK HOUR TURNING MOVEMENT VOLUMES



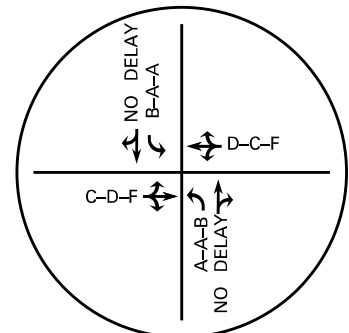
2030 NO BUILD PEAK HOUR LEVEL OF SERVICE



OVERALL LEVEL OF SERVICE:

AM: A (2.4 sec. of delay)
 Mid-Day: A (1.9 sec. of delay)
 PM: A (3.3 sec. of delay)

2030 PEAK HOUR LEVEL OF SERVICE WITH MITIGATION



OVERALL LEVEL OF SERVICE:

AM: A (2.4 sec. of delay)
 Mid-Day: A (1.9 sec. of delay)
 PM: A (3.3 sec. of delay)



**CITY OF MARQUETTE
 TRAFFIC STUDY**

**FIGURE 9B
 FUTURE TRAFFIC (2030)
 MITIGATION
 RECOMMENDATIONS**

