The City of Sterling Heights 2008 Master Road Plan Update

Final Report

Submitted to:

city of STERLING HEIGHTS

The City of Sterling Heights
40555 Utica Road
Sterling Heights, Michigan 48311

Submitted by:

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PB 100 YEARS ®

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1. Executive Summary

The last City of Sterling Heights Transportation Master Plan was completed in 1998. Since that report was finalized, a number of recommendations have been constructed, including: the 18½ Mile Road connection to M-53, the 18 ½ Mile and Van Dyke Road Roundabout, the widening of Ryan Road and Maple Lane Road.

The purpose of this report is to determine new roadway recommendations based on the previous 1998 Plan and projected 2030 traffic forecasts. The 2008 Transportation Master Plan reviewed existing roadway conditions and utilized the Southeast Michigan Council of Governments (SEMCOG) 2030 travel demand forecasting model. The model uses socio-economic information, such as number of households and jobs, in the region to predict travel patterns on area roadways.

To determine roadway recommendations for the City of Sterling Heights, the existing and future 2030 roadway conditions were used to determine a set of preliminary recommendations. From that set of recommendations, short-term recommendations (within the next five to seven years) were determined. These short-term recommendations are:

- Widen Utica Road to 5 lanes between Valiant Drive and Schoenherr Road
- Build 18 Mile Road as 3 lanes between Clinton River Road and Schoenherr Road
- Widen 18 Mile Road to 5 lanes between Mound Road and Van Dyke Avenue
- Widen 18 Mile Road to 5 lanes between Ryan Road and Mound Road

With these recommendations, the overall VHT would decrease by ten (10) hours. The estimated cost would be approximately $10.644 Million in 2007 dollars.

The mid-term recommendations, within the next seven to fifteen years, for the City of Sterling Heights are:

- Build 18 Mile Road as 3 lanes between Schoenherr Road and Hayes Road
- Widen Mound Road to 8 lanes between 17 Mile Road and 18 1/2 Mile Road
- Widen 18 Mile Road to 5 lanes between Dequindre Road and Ryan Road
- Widen Dequindre to 5 lanes between 19 Mile Road and M-59 Road
- Widen 19 Mile Road to 5 lanes between Mound and Merrill and widen to 3 lanes Merrill to Van Dyke (1EB / 2WB)

With these recommendations, the overall VHT would decrease by an additional five (5) hours. The estimated cost would be approximately $13.28 Million in 2007 dollars.

There are three different sets of long-term recommendations, depending on whether a bridge would be built over the Clinton River along 18 Mile Road, 19 Mile Road, or not at all.

The long-term recommendations *without* a bridge are:

- Widen 18 Mile Road to 5 lanes between Van Dyke Avenue and Utica road
- Widen 18 Mile Road to 5 lanes between Clinton River Road and Schoenherr Road
- Widen 17 Mile Road between Dodge Park Road and Schoenherr Road
- Widen 19 Mile Road to 5 lanes between Dequindre Road to Ryan Road
- Widen Dequindre to 5 lanes between 18 Mile Road to 19 Mile Road

With these recommendations, the overall VHT would decrease by an additional 3.4 hours. The estimated cost would be approximately $17.264 Million in 2007 dollars.
By building a 19 Mile Road bridge over the Clinton River the overall VHT would decrease by 7.3 hours at a cost of approximately $15.298 Million in 2007 dollars.

By building an 18 Mile Road bridge over the Clinton River the overall VHT would decrease by 6.6 hours at a cost of approximately $16.485 Million in 2007 dollars.

Building a bridge over the Clinton River over either 18 Mile Road or 19 Mile Road in the long-term is recommended to decrease east-west congestion within the City of Sterling Heights. However, a more detailed study is recommended to research more detailed construction costs of both options, right-of-way acquisitions that would be necessary, and the environmental impacts that building a bridge would have on the community.

2. Existing Conditions

This section of the report describes the existing roadway network within the City of Sterling Heights, including roadway lineages, functional classification, traffic volumes, and levels of service (LOS). The existing roadway condition will be evaluated based on these criteria.

2.1 Roadway Improvements since last Plan

The last plan was the 1998 Transportation Plan and a number of improvements have been constructed. The biggest success on improving traffic conditions within the City in recent years is the 18½ Mile Road and Van Dyke Roundabout. The roundabout was opened in December 2004 and became a very attractive alternative route for those seeking to avoid the congestion and delays on Mound Road and on 18 Mile Road. Other proposed roadway improvement projects that have been completed since the last plan are listed below:

- 19 Mile Road from Ryan Road to Mound Road – widened from 2 lanes to 4 lanes
- 19 Mile Road from Schoenherr to Hayes – widened from 2 lanes to 5 lanes
- Ryan Road from 18 Mile Road to M-59 – widened from 2 lanes to 4 lanes
- Maple Lane from 15 Mile Road to Volpe Road – widened from 2 lanes to 4 lanes
- Clinton River Road from Schoenherr to Saal – widened from 2 lanes to 4 lanes

2.2 Roadway Functional Classification

The Federal Highway Administration has developed a means of classifying roads by distinguishing between the services they provide. The City of Sterling Heights uses the National Functional Classification (NFC) to describe the types of services for all public roads within the City. The roadway classifications include freeways, principal arterials, minor arterials, collectors, and local roads. Figure 2-1 illustrates the roadway functional classification within the City of Sterling Heights.

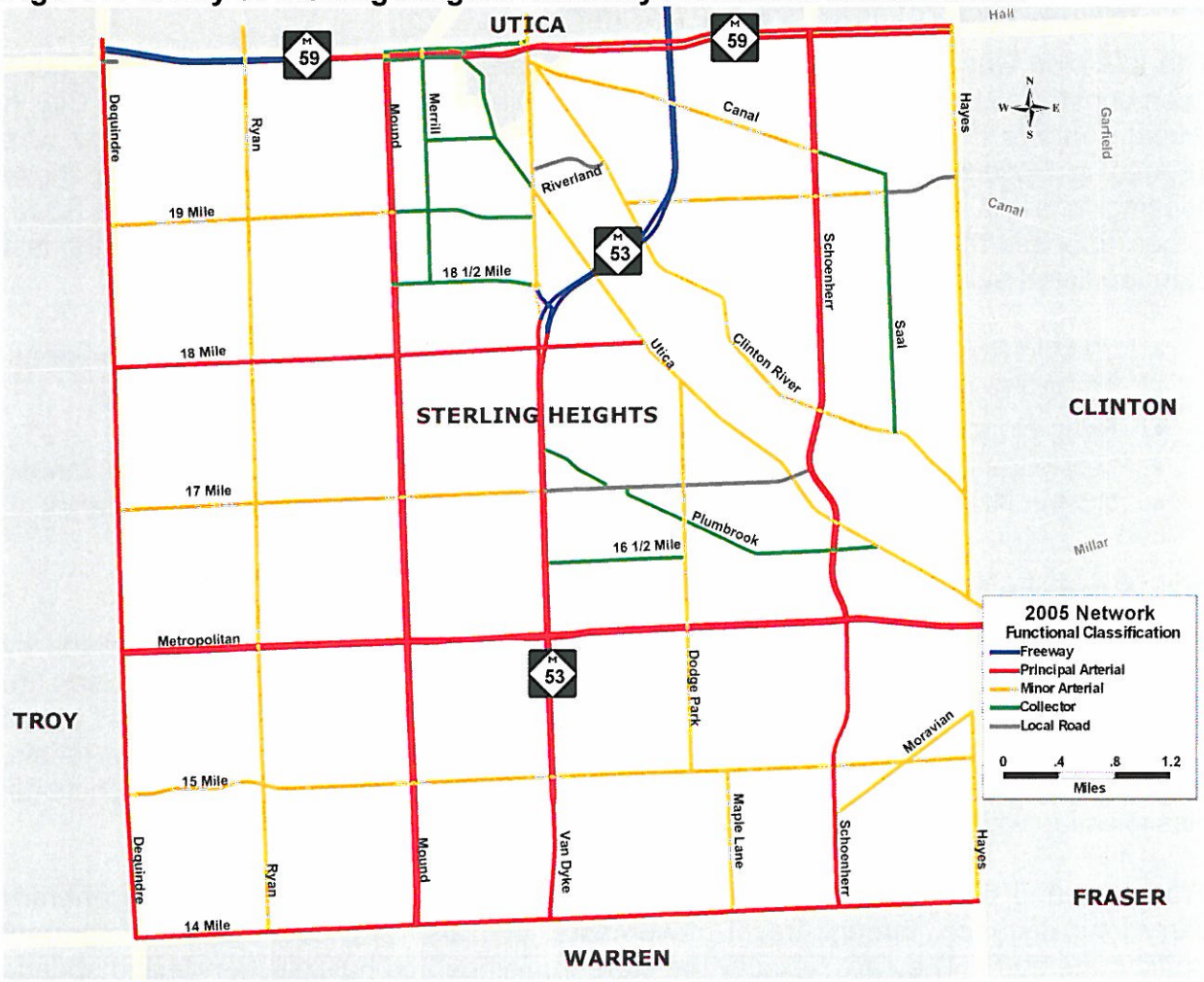
Freeways and principal arterials are at the top of the NFC system, as they generally carry long distance, through-travel movements, and also provide access to important traffic generators. They are typically the state trunklines and have higher design speeds than other roads and often have multiple lanes. Examples of major principal arterials within or around the City are M-59, M-53, Van Dyke Avenue, Mound Road, Schoenherr Road, and Metropolitan Parkway (16 Mile Road).

Minor arterials are similar in function to principal arterials, except they carry trips of shorter distance and to lesser traffic generators. Examples of minor arterials in the City of Sterling Heights are 15 Mile Road, 17 Mile Road, 19 Mile Road, Ryan Road, and Utica Road.

Collectors generally provide more access to property than do arterials, and fulfill the function of collecting local traffic and distribute to the arterial system for longer trips. Examples of this in the City are: 16½ Mile Road, Saal Road, and Plumbrook Road.

Local roads primarily provide access to property. There are not many local roads shown in the SEMCOG model network. Examples of this are generally residential streets such as Riverland Road, and the portion of 17 Mile Road between Van Dyke and Schoenherr.

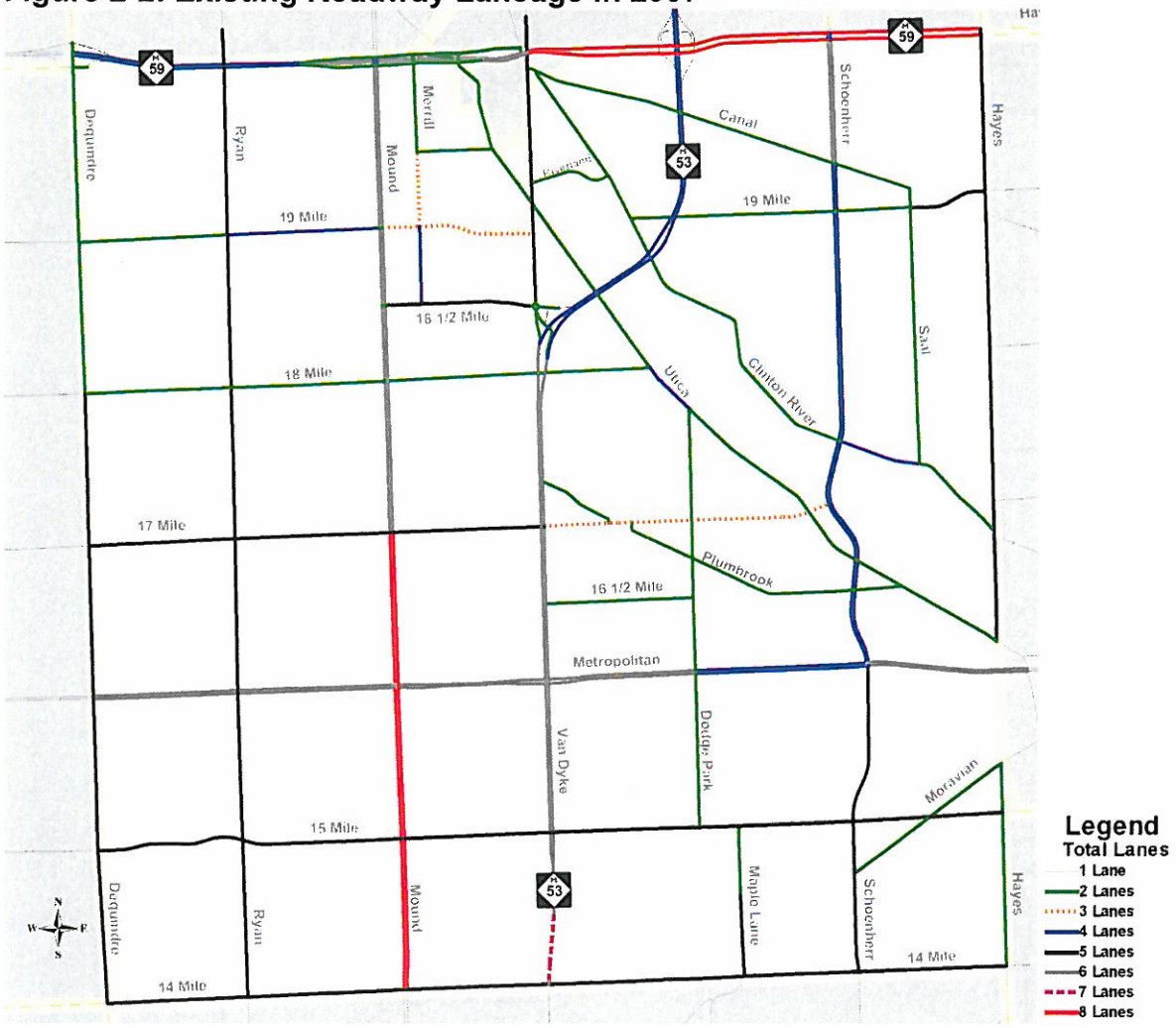
Figure 2-1: City of Sterling Heights Roadway Functional Classification



2.3 *Existing Roadway Laneage*

Typically, the higher the functional classification is of a roadway, the greater the number of lanes and the larger the traffic volumes. Within the City of Sterling Heights, principal arterials typically vary between four and eight travel lanes; minor arterials vary between two to four travel lanes. Collector roadways have between two and four lanes and local roads usually only have two lanes. Figure 2-2 depicts the existing number of lanes along each roadway within the City of Sterling Heights.

Figure 2-2: Existing Roadway Laneage in 2007

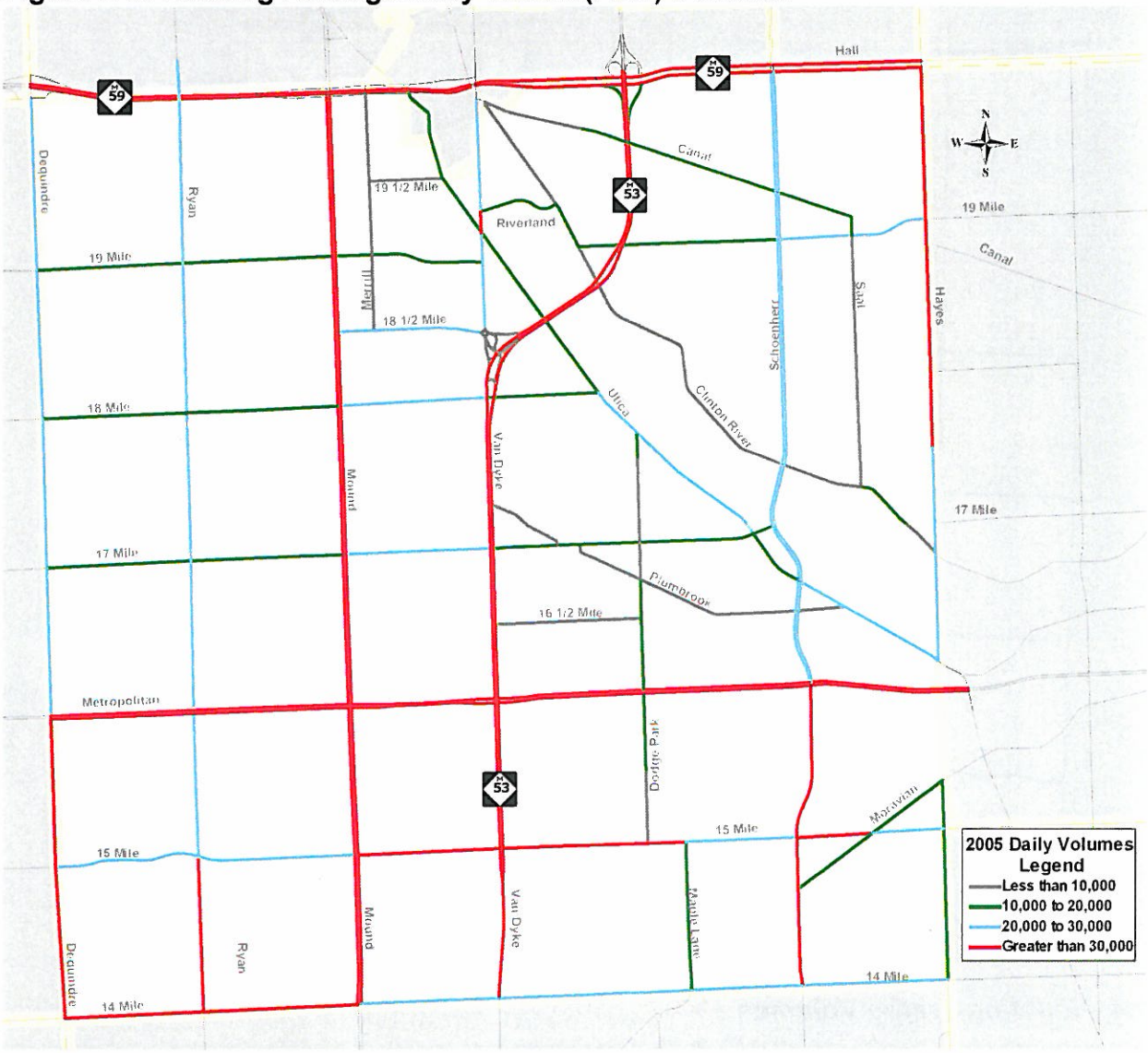


2.4 *Existing Traffic Volumes*

Traffic Volumes within the City of Sterling Heights are typically consistent with functional classification, with higher classification roadways typically carrying higher traffic volumes. Figure 2-3 summarizes the average daily traffic (ADT) volumes in the City. The ADT volumes were a collection of traffic counts collected from SEMCOG and the City. SEMCOG maintains a traffic count inventory using counts from the Michigan Department of Transportation (MDOT) as well as local municipalities. For those roadways which did not have a traffic count, the ADT volumes were taken from the 2005 SEMCOG model.

The actual ADT volumes passing through the 18½ Mile and Van Dyke Roundabout is almost 50,000 vehicles in 2006. Northbound and westbound entrances carried about 10,000 vehicles, and southbound and eastbound entrances carried about 14,000 vehicles.

Figure 2-3: Existing Average Daily Traffic (ADT) Volumes



The primary north-south roadways within the center of the City are Mound Road, M-53, and Van Dyke Avenue. These corridors varied between a total of four-lane to eight-lane roadways. Mound Road has eight lanes between 14 Mile Road and 17 Mile Road then narrows to six lanes between 17 Mile Road and M-59. Mound Road carries approximately 40,000 to 80,000 vehicles per day. It is the highest traveled roadway within the City. M-53 and Van Dyke Avenue split after 18 ½ Mile Road. Van Dyke Avenue runs in parallel with Mound Road and it carries roughly 30,000 to 50,000 vehicles per day. M-53 carries approximately 70,000 vehicles within the City. Beside these primary corridors connecting Warren and Shelby townships, Schoenherr Road is another highly used north-south roadway. Although it only has two way lanes in each direction, it carries about 30,000 to 40,000 vehicles daily.

The primary east-west roadways within the center of City are Metropolitan Parkway (16 Mile Road), followed by 15 Mile Road, 17 Mile Road and 18 Mile Road. Metropolitan

Parkway alone carries 30,000 to 50,000 vehicles daily and 15 Mile Road carries about 20,000 to 30,000 vehicles. In addition, M-59 is the northern boundary of the City of Sterling Heights and carried over 100,000 vehicles. 14 Mile Road is the southern boundary of the City and carried around 25,000 vehicles.

2.5 Existing Traffic Congestion

Congestion along roadways is often determined by comparing ADT volumes to the capacity of the roadway often called the Volume-to-Capacity (V/C) ratio. Roadway capacity is typically dictated by the functional classification and the number of travel lanes. In general, the V/C ratio provides a common measure of the severity of congestion. If the volume exceeds the approximate roadway capacity, then congestion is likely.

The Transportation Handbook, by the Institute of Transportation Engineers (ITE) states that "roadway capacity represents the maximum number of vehicles that can pass a given point during a specified time period with reasonable expectancy under prevailing traffic and environmental conditions." The V/C ratio indicates how the roadway is operating. The V/C can be equated to a level of service (LOS) which is another way of evaluating the roadway system. There are six levels of service, a condition as perceived by users of the roadway system. Level of service is similar to a grading scale where LOS A represents uncongested conditions and LOS F represents a breakdown in traffic flow. The table below provides definitions for the V/C ratio and level of service.

Table 2-1: Volume-to-Capacity Level of Service Definitions

Level of Service	Description	V/C Ratio
F	Total breakdown, stop-and-go operation. Vehicles are arriving at a greater rate than they can discharge. Vehicles experience brief periods of movement followed by stoppages.	1.0 and Greater
E	Severe congestion. Operations are at or near capacity and are quite unstable.	0.9-1.0
D	Significant congestion. The ability to maneuver is severely restricted because of congestion. Travel speed begins to be reduced by increasing volumes.	0.8-0.9
C	Light congestion; occasional backups. The ability to maneuver within the traffic stream is affected by the presence of other vehicles.	0.7-0.8
B	Very light congestion. Travel speeds tend to be the same as in LOS A, but drivers have slightly less freedom to maneuver.	0.6-0.7
A	Uncongested operations. The operation of vehicles is virtually unaffected by the presence of other vehicles.	Less Than 0.6

Source: ITE Transportation and Traffic Engineering Handbook

The level of service categories were further combined into four categories for this project:

- Little or No Congestion: LOS A, B, and C (V/C <0.80)
- Light Congestion: LOS D (V/C 0.80 to 0.90)
- Moderate Congestion: LOS E (V/C 0.90 to 1.0)
- Heavy Congestion: LOS F (V/C >1.0)

The congested routes which have a V/C ratio of 0.80 and greater are color-coded on the following maps. Figures 2-4 and 2-5 illustrate the existing (2005) roadway congestion levels during AM Peak and PM peak periods within the City.

Approximately 65% of the roadways within the City experience little or no congestion during AM peak hours, while 10% of the roadways experience severe congestion. During the PM peak hour, approximately 30% of the roadways within the study area experience little or no congestion, while 18% experience severe congestion. The PM peak hour experiences a slightly higher level of congestion.

As illustrated in the figures, moderate and severe congestions are anticipated along several of the corridors within the City. The major congested corridors include Mound Road, Schoenherr Road, Metropolitan Parkway, and 18 Mile Road.

The Volume-to-Capacity (V/C) ratio is a method to determine the amount of congestion. Another method is to determine the amount of miles that are being driven in the City in the existing and future year. This measure of effectiveness is referred to as vehicle-miles-of-travel (VMT). VMT are summarized as the number of vehicles on a roadway segment multiplied by the length of that segment. VMT usually increase as roadways are widened. As roadways are widened they do attract more vehicles as their capacity increases. A similar method is to determine the amount of time that is being traveled in the study area in the existing and future year. This method is referred to as vehicle-hours-of-travel (VHT). VHT are the number of vehicles on a roadway segment and the total accumulated time the vehicles spent on that segment. Based on the origins and destinations of the vehicles in the system, the SEMCOG model keeps track of VMT and VHT for each roadway segment in their network.

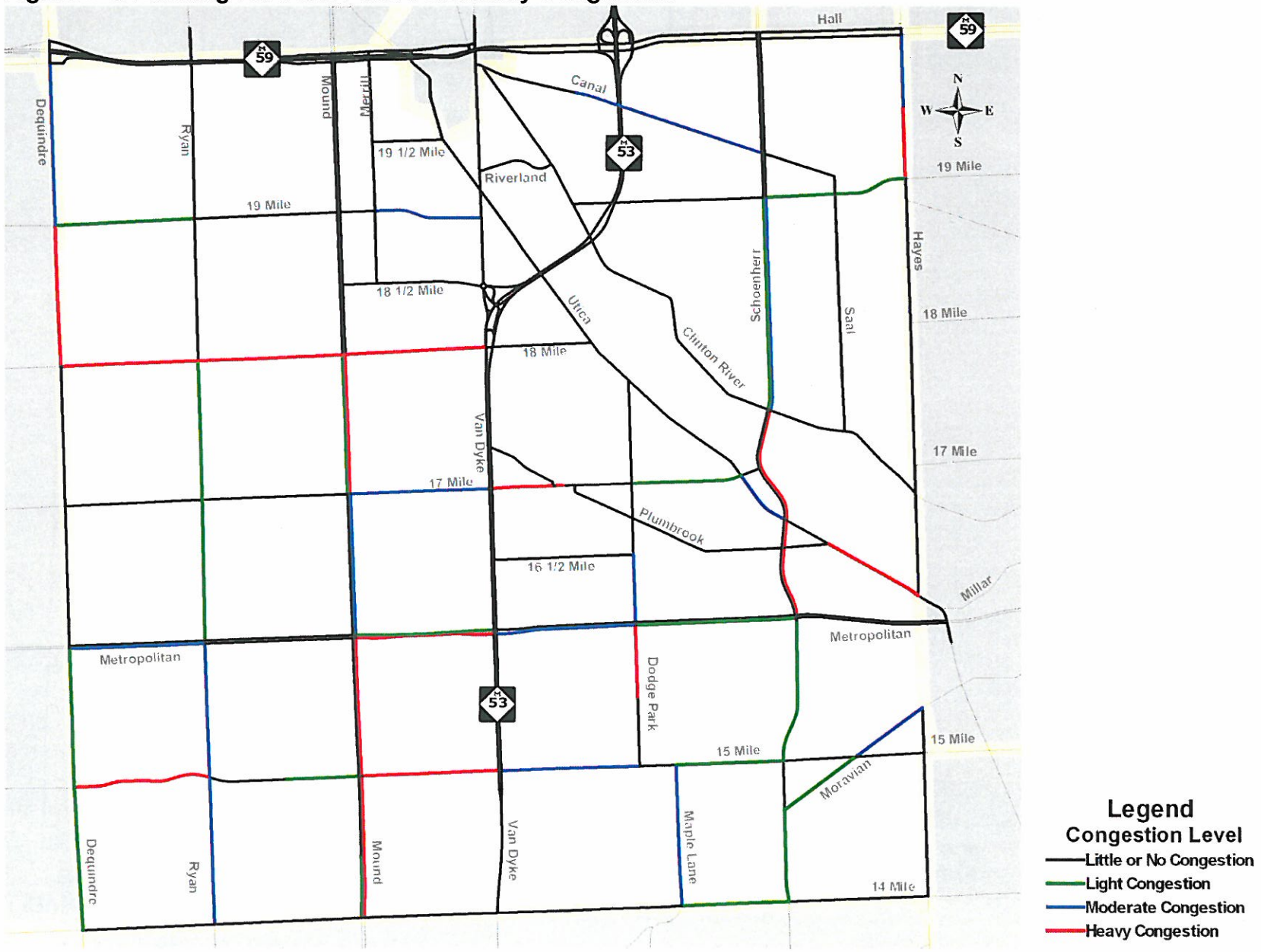
The table below summarizes the vehicle–miles-traveled (VMT) and the vehicle–hours-traveled (VHT) within the City of Sterling Heights.

Table 2-2: Existing 2005 VMT/VHT

Year	*Daily*	
	VHT	*VMT*
2005 Existing	238	22,690

Figure 2-4: Existing AM Peak Period Roadway Congestion

Figure 2-5: Existing PM Peak Period Roadway Congestion



3. Future Conditions

The purpose of a transportation master plan is to not only determine how the roadways are operating today, but also how the roadways will be operating in the future. This allows agencies to determine which roadways may need to be improved sooner than other roadways. This chapter of the report will review how the roadways in the future are expected to operate and how that determination was made.

3.1 Methodology

In order to determine how the roadways will be functioning in the future, a computerized software package was used to predict travel patterns and volumes for the year 2030. These travel demand forecasting models use socio-economic information, such as number of households and jobs in each area, to predict the number of trips in a region. Travel demand models are macroscopic regional planning tools. The macroscopic models look at the "big picture" and do not contain detailed information, such as the local street system (residential streets). The freeways and arterial roadways are contained in these regional models.

Within the southeast Michigan region, the Southeastern Michigan Council of Governments (SEMCOG) develops and maintains the travel demand forecasting model. The SEMCOG model is a seven county regional model for southeast Michigan that includes Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne counties. The model also takes into account trips made to Windsor, Ontario and Sarnia, Ontario and other outlying areas of the region. The future year model includes projects identified in SEMCOG's Transportation Improvement Program (TIP). The model also includes all major roadways in the region classified as collector or higher.

A base year model was developed, which uses socio-economic information for the year 2005. The 2005 base year model results are then compared to actual 2005 traffic volumes to determine how well the model is predicting volumes along major roadways. This comparison found that some roadways within Sterling Heights were higher than actual volumes and other roadways were lower than actual volumes. The actual traffic volumes were from the SEMCOG website, the Michigan Department of Transportation, and were also provided by the City of Sterling Heights. The Existing Conditions chapter of this report details the traffic volumes for the year 2005. Through this validation process, speeds along some of the roadways (such as Mound Road and Van Dyke Avenue) were adjusted such that the model more accurately predicted actual volumes.

The SEMCOG model is broken into four time periods with a 24-hour day: morning, mid-day, evening, and night. The morning, or AM, time period represents the two-hour morning rush hour between 7-9 AM and the evening, or PM, time period represents the three-hour evening rush hour between 3-6 PM. These are the two time periods that were analyzed very closely for the Sterling Heights Transportation Master Plan Update.

Once the 2005 base year model has been validated using existing counts, the future 2030 model can be used to determine future year AM and PM peak period congestion.

3.2 Future 2030 Socio-Economic Information

Since travel demand forecasting models use socio-economic information to generate the number of trips in the region, it is important that this data is accurate within the model. The table below summarizes the socio-economic information for Macomb County and the City of Sterling Heights for the years 2005 and 2030 based on the 2035 SEMCOG Forecast.

Table 3-1: 2005 and 2030 Socio-Economic Information

Type	Sterling Heights			Macomb County		
	2005	2030	Percent Change	2005	2030	Percent Change
Population	128,435	137,465	7%	829,765	906,485	9%
Households	49,305	56,655	15%	334,315	380,125	14%
Employment	67,130	66,360	-1%	380,965	393,280	3%

It is expected that the population will increase within the City of Sterling Heights by 9,000 or 7%, while the number of household will increase by 7,350 or 15%. The employment is expected to decrease slightly from 2005 to 2030. Within Macomb County, the population is expected to increase by 9% and the households by 14%. However, the employment within Macomb County is expected to increase. It should be noted that the population increase within Macomb County is expected to occur mostly north of the city of Sterling Heights, while the number of jobs is expected to increase more in the southern half of Macomb County. This means that traffic growth within Sterling Heights may be larger than just the population growth within the city due to the trips coming from north of the city to access jobs south of the city.

3.3 Future 2030 No-Build Roadway Conditions

The first step in determining the future roadway congestion in the year 2030 is to prepare the 2030 roadway network for the model. The current 2030 roadway network for the City of Sterling Heights already has programmed improvements that were approved in the previous 1998 Master Road Plan. These improvements included widening parts of 19 Mile Road and Mound Road. All of the previously recommended improvements were removed from the 2030 network and the network was made to be like today. This roadway network is considered the 2030 No-Build Roadway network, since no roadways were widened or built for the future.

This 2030 No-Build network along with the 2030 socio-economic information was run to determine future 2030 roadway volumes and congestion. Figure 3-1 illustrates the expected AM peak period roadway congestion for the year 2030 if no changes were made to the existing roadway network. Figure 3-2 illustrates the expected PM peak period roadway congestion for the year 2030.

Figure 3-3 illustrates the percentage of congested roadways in the AM and PM peak periods within Sterling Heights. Approximately 24-percent of the roadways within and directly adjacent to Sterling Heights will be heavily congested in the AM peak period, and 23-percent will be heavily congested in the PM peak period.

The following roadways are expected to be heavily congested in both the AM and PM peak periods:

- Mound Road between 17 Mile Road and 18½ Mile Road
- 18 Mile Road between Dequindre Road and Van Dyke Avenue
- Metropolitan Parkway
- Schoenherr Road
- M-59 / Hall Road
- 19 Mile Road between Mound Road and Van Dyke Avenue
- 17 Mile Road between Mound Road and Plumbrook Road
- M-53 / Van Dyke Avenue

There were some roadways that are actually expected to decrease in congestion over the next 25 years. This is primarily due to shifts in population, households, and employment within the model. Generally, travel trends within the Sterling Heights area found that there are heavy westbound and southbound flows in the AM peak period and heavy eastbound and northbound flows in the PM peak period. This follows the current trends, so it is not predicted to change in the future. Within the northwest portion of Sterling Heights, the number of trips decreased overall which caused the congestion to decrease by 2030.

Figure 3-1: 2030 No-Build AM Peak Period Congestion

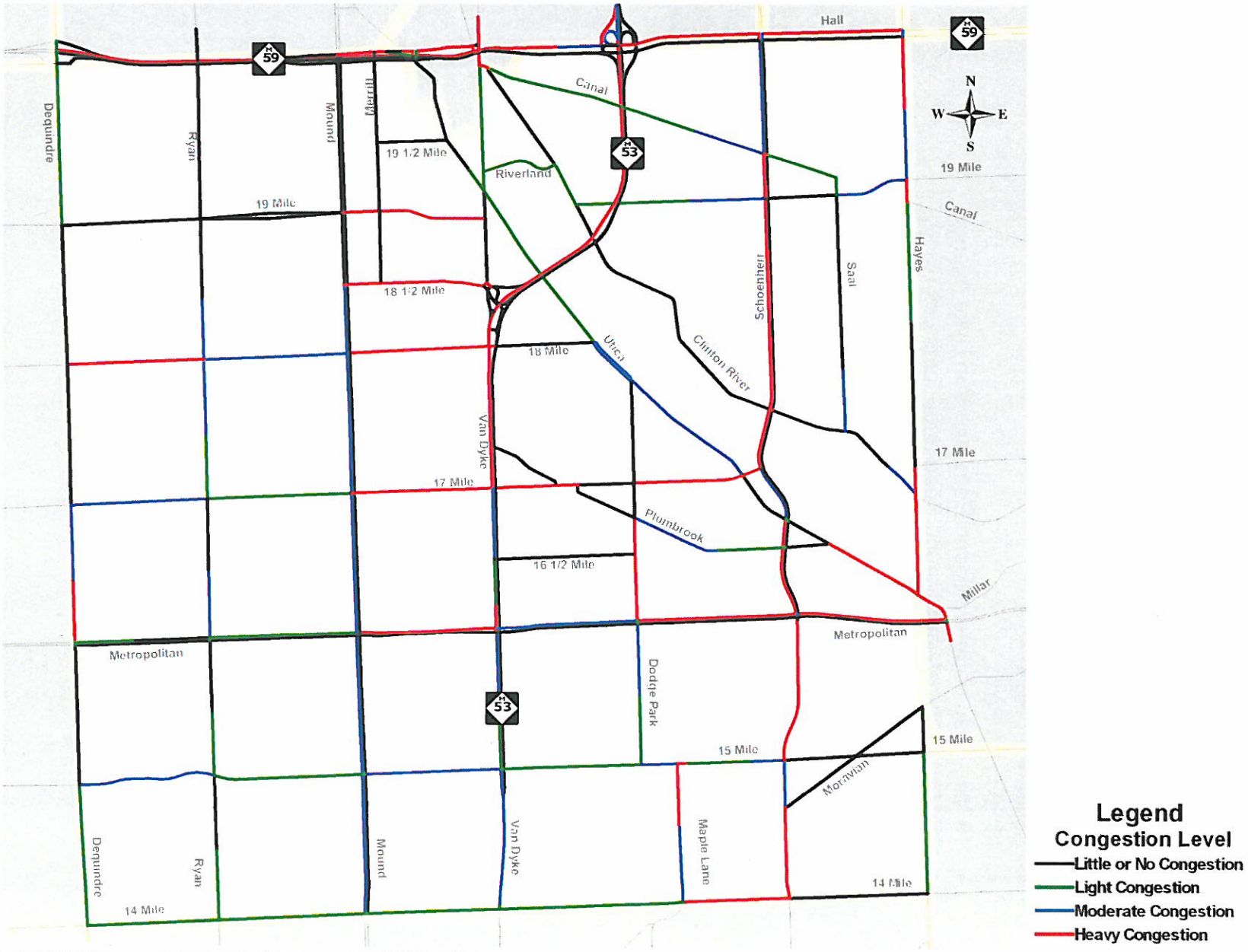


Figure 3-2: 2030 No-Build PM Peak Period Congestion

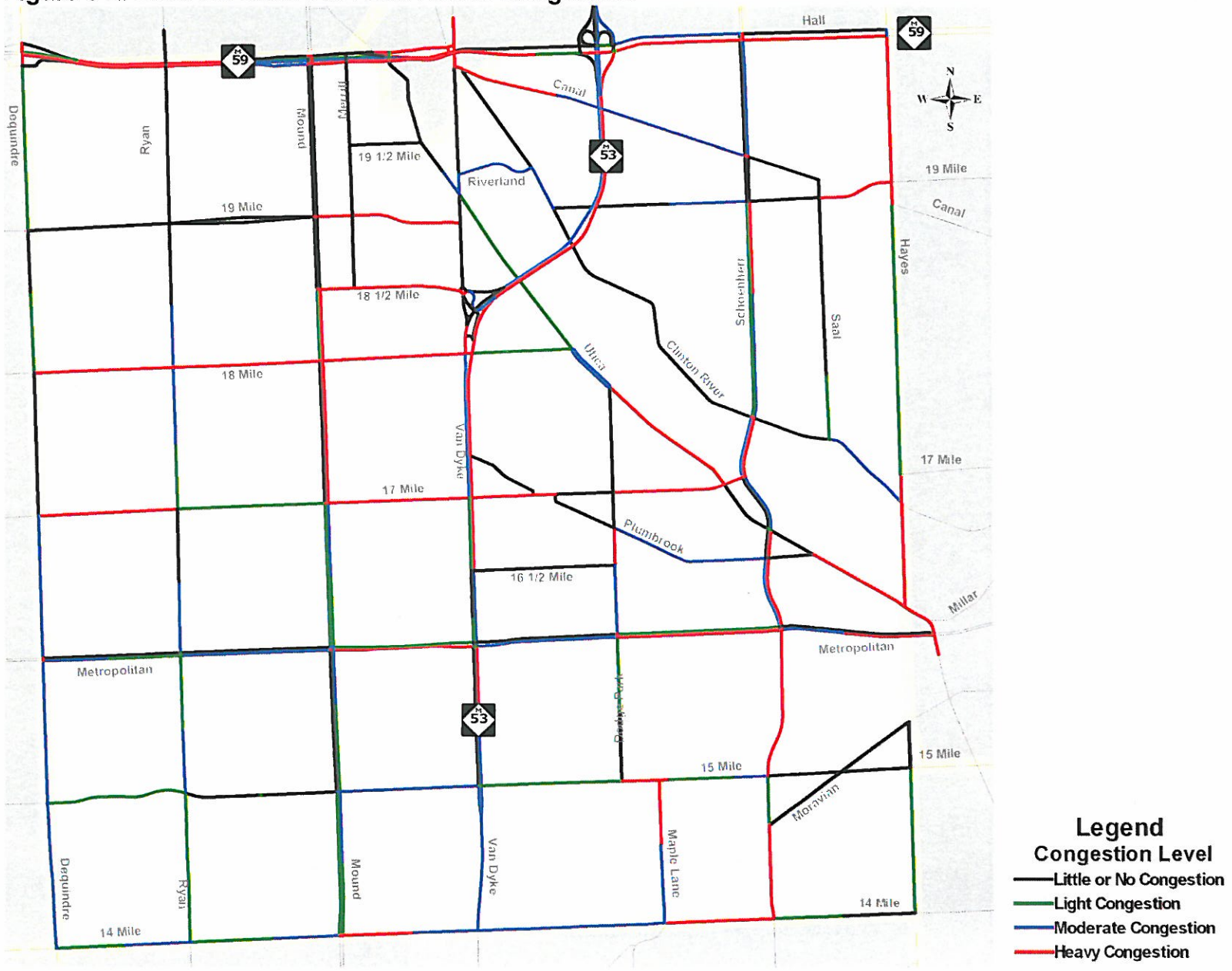


Figure 3-3: Percentage of Congested Roadways

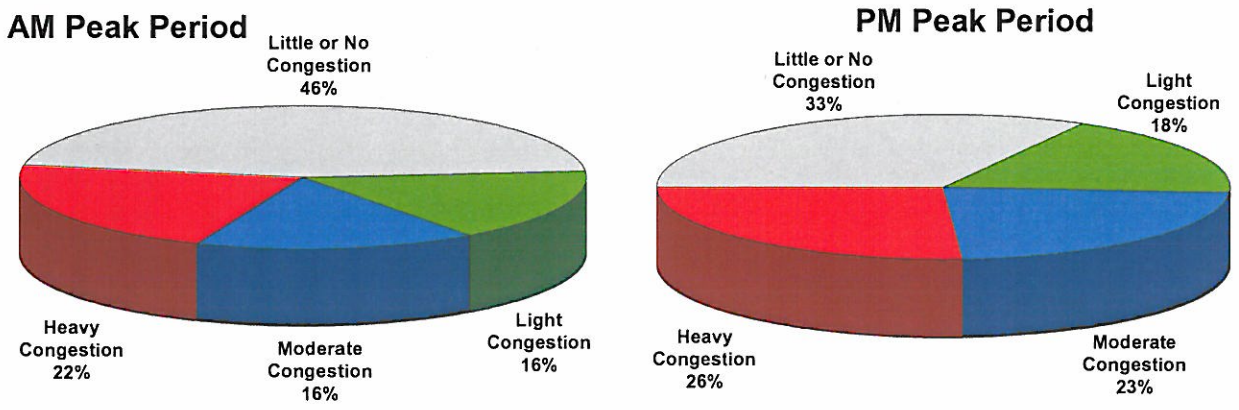


Table 3-2 summarizes the increase in vehicle-miles-travelled (VMT) and vehicle-hours-travelled (VHT) from 2005 to 2030. Due to the increase in the number of trips the VHT increased by 34% and the VMT increased by 8%. The VMT did not increase as much as the VHT since the roadways are already near capacity in 2005 and merely tipped over capacity by 2030.

Table 3-2: Future 2030 No-Build VMT/VHT

Year	*Daily*	
	VHT	*VMT*
2005 Existing	238	22,690
2030 No-Build	320	24,480
Percent Change	34%	8%

4. Alternatives Analysis

A set of roadway improvements were identified based on the existing deficiencies identified in Chapter 2 of this report, as well as future 2030 No-Build Conditions, the previous plan recommendations, and meetings with the City of Sterling Heights staff. Since this is a City of Sterling Heights Plan, roadways that are under the jurisdiction of the Michigan Department of Transportation (MDOT) were not tested. These roadways are Van Dyke Avenue (M-53) and Hall Road (M-59). However, roadways under the jurisdiction of the Road Commission of Macomb County (RCMC) were tested; these include Mound Road and 18 Mile Road. Dequindre Road is under the jurisdiction of both RCMC and the Road Commission of Oakland County (RCOC) since it is on the county border. In addition, roadways that have limited right-of-way or have been determined that they will not be widened further have not been tested, these include Schoenherr Road, Metropolitan Parkway, 14 Mile Road and 15 Mile Road. Below is a list summarizing the roadway improvements that were tested using the SEMCOG travel demand forecasting model. These roadway improvements are listed in alphabetical order:

- Widen 17 Mile Road to 5 lanes between Van Dyke Avenue to Plumbrook Road
- Widen 17 Mile Road to 5 lanes between Plumbrook Road to Dodge Park
- Widen 17 Mile Road to 5 lanes between Dodge Park and Schoenherr Road
- Widen 18 Mile Road to 5 lanes between Dequindre Road to Ryan Road
- Widen 18 Mile Road to 5 lanes between Ryan Road to Mound Road
- Widen 18 Mile Road to 5 lanes between Mound Road and Van Dyke Avenue
- Widen 18 Mile Road to 5 lanes between Van Dyke Avenue to Utica Road
- Build 18 Mile Road as 5 lanes over the Clinton River
- Build 18 Mile Road as 3/5 lanes between Clinton River Drive to Hayes Road
- Widen 19 Mile Road to 5 lanes between Dequindre Road to Ryan Road
- Widen 19 Mile Road to 3/5 lanes between Mound Road to Van Dyke Avenue
- Widen 19 Mile Road to 5 lanes from Clinton River Drive to Schoenherr Road
- Build 19 Mile Road as 5 lanes over the Clinton River
- Widen Dequindre Road to 5 lanes between 18 Mile Road to 19 Mile Road
- Widen Dequindre Road to 5 lanes between 19 Mile Road to M-59
- Widen Mound Road to 8 lanes between 17 Mile Road to 18 1/2 Mile Road
- Widen Utica Road to 5 lanes between Valiant Drive to Schoenherr Road
- Widen Utica Road to 5 lanes between Valiant Drive to Hayes Road
- Widen Dodge Park Road from Metropolitan Parkway to Utica Road
- Build Van Dyke Road as a 4-lane boulevard between 18½ Mile Road to M-59

The next section of the report describes the methodology for testing each of the roadway improvements.

4.1 Methodology

Typically, roadway improvements are grouped and tested together to determine one set of improvements for the next 25 years. Instead of this methodology, a different methodology was developed in order to determine short-, mid-, and long-term

recommendations for the City of Sterling Heights. To determine the short-term recommendations, all the roadway improvements listed in the previous section were tested individually and compared to determine which roadway may have the highest congestion and therefore highest need of widening in both the existing and future year conditions. The top roadway improvements were then grouped into the short-term recommendations. These short-term recommendations were then all coded into the model and then the remaining roadway improvements were once again tested individually to determine the mid-term recommendations. Once the mid-term recommendations were determined, both the short- and mid-term recommendations were coded into the model and the remaining roadway improvements were tested individually again to determine long-term recommendations. This iterative process takes into account roadways being widened over time and travel patterns that may shift due to the roadway widening.

It is important to be able to compare the test results of the model for each of the roadway improvements. The output of the travel demand forecasting model provides information such as volume and speed on each roadway. Typically, once a roadway gets widened, and if it was congested before, the speed on the roadway will increase. In addition to the speed increasing, the volume on the roadway will typically also increase. It is fine if the volume increases on a roadway, as long as the speed does not decrease. So, in order to compare alternatives, a comparison of volumes and speed are conducted. The way to compare is to calculate the number of vehicles that travel within the City of Sterling Heights and the amount of time that those vehicles are traveling with the City. The measure for calculating the number of vehicles is called the Vehicle-Miles-Traveled (VMT) and the amount of time is called Vehicle-Hours-Traveled (VHT). As stated before, it is fine if the VMT increases as long as the VHT decreases with each alternative tested. ***The more that VHT decreases, the better the alternative.***

In addition, the construction cost of each alternative was determined and then used to determine the highest increase in VHT per dollar of construction. This determined how cost effective each alternative was. ***The higher the VHT per dollar, the better the alternative.*** Chapter 6 of this report details how the construction cost of each alternative was determined.

4.2 Phase I – Determine Short-term Recommendations

The first phase tested each of the roadway improvements individually within the SEMCOG travel demand forecasting model. Table 4-1 summarizes the results of the AM and PM peak period models for each improvement. For each improvement the difference in VMT and VHT for the AM and PM peak periods are shown from the 2030 No-Build. The first row of the table has the results for the 2030 No-Build network.

The cost of each alternative is shown in the table and the VHT per dollar is also shown. The table is sorted by the highest VHT/Dollar and shown in the Rank column. The 2005 and 2030 levels of service for each roadway segment is also shown in the table.

Table 4-1: Phase I Results

Improvement	*VHT*	*VMT*	*Cost**	*VHT/Dollar*	*2005 Congestion*	*2030 Congestion*	*Rank*
2030 No-Build	319.8	24,480					
Widen 19 Mile Road to 5 lanes between Mound and Merrill and widen to 3 lanes Merrill to Van Dyke (1EB / 2WB)	-9.9	-76	$3.1	3.19	A-C	F	1
Widen 19 Mile Road to 5 lanes between Mound and Merrill	-2.5	6	$1.125	2.19	A-C	F	2
Widen 18 Mile Road between Mound and Van Dyke	-8.0	-1	$3.849	2.07	F	F	3
Widen Utica Road to 5 lanes between Valiant to Schoenherr	-5.5	-27	$3.28	1.68	E	F	4
Build 18 Mile Road as 2 lanes between Clinton River and Hayes	-4.4	-232	$2.947	1.49	**	**	5
Build 18 Mile Road as 2 lanes between Clinton River and Schoenherr	-3.9	-161	$2.7	1.46	**	**	6
Widen 18 Mile Road between Ryan to Mound	-4.9	11	$3.362	1.46	F	F	7
Build 18 Mile Road as 5 lanes between Clinton River and Schoenherr	-5.6	-147	$4.3	1.31	**	**	8
Widen 17 Mile Road between Dodge Park to Schoenherr	-4.5	28	$3.544	1.26	D	F	9
Widen 19 Mile Road to 5 lanes between Dequindre to Ryan	-3.1	-70	$3.503	0.90	D	A-C	10
Widen 18 Mile Road between Dequindre to Hayes (with bridge)	-18.8	-109	$40.673	0.46	A-F	C-F	11
Build 18 Mile Road as 5 lanes between Clinton River and Hayes	-8.0	-249	$11.547	0.70	**	**	12
Widen Utica Road to 5 lanes between Valiant to Hayes	-3.3	10	$5.535	0.60	E-F	F	13
Build 18 Mile Road as 5 lanes between Schoenherr and Hayes	-3.9	-71	$7.247	0.54	**	**	14
Widen Dodge Park to 5 lanes between Metropolitan Parkway to Utica	-3.3	57	$7.675	0.44	A-E	A-F	15
Build 18 Mile Road as 2 lanes between Schoenherr and Hayes	-1.8	-64	$4.575	0.39	**	**	16
Widen 19 Mile Road to 5 lanes between Mound and Merrill and widen to 3 lanes Merrill to Van Dyke (2EB / 1WB)	-1.1	-26	$3.1	0.35	E	F	17
Widen Dequindre to 5 lanes between 18 Mile to M-59	-2.0	14	$6.924	0.29	E-F	D	18
Widen Utica Road to 5 lanes between Schoenherr to Hayes	-1.1	10	$3.977	0.27	F	F	19
Widen 19 Mile Road between Dequindre to Schoenherr (with bridge)	-9.9	-76	$29.681	0.33	A-E	A-F	20
Widen 18 Mile Road between Dequindre to Hayes (without bridge)	-12.5	-165	$24.388	0.51	A-F	C-F	21

Improvement	*VHT*	*VMT*	*Cost**	*VHT/Dollar*	*2005 Congestion*	*2030 Congestion*	*Rank*
Widen 19 Mile Road to 5 lanes from Clinton River to Schoenherr	-1.1	-2	$6.655	0.16	A-C	A-C	22
Widen 18 Mile Road between Dequindre to Ryan	-0.4	17	$2.66	0.15	F	F	23
Widen 17 Mile Road to 5 lanes between Van Dyke to Plumbrook	-1.4	54	$9.722	0.15	F	F	24
Widen 18 Mile Road between Dequindre to Utica	-10.9	16	$12.841	0.85	A-F	C-F	25
Widen 17 Mile Road to 5 lanes between Van Dyke and Dodge Park	-1.2	88	$11.362	0.11	F	F	26
Improve Van Dyke to 4 lane boulevard between 18 1/2 Mile to M-59	-0.5	78	$8.193	0.06	A-C	A-E	27
Widen Mound Road to 8 lanes between 17 Mile Road to 18 1/2 Mile Road	-0.1	-5	$2.196	0.05	C-F	F	28
Widen 18 Mile Road between Van Dyke to Utica	0.2	18	$2.97	***	A-C	D	***
Widen Dequindre to 5 lanes between 18 Mile to 19 Mile	1.7	30	$4.3	***	F	D	***
Widen Dequindre to 5 lanes between 19 Mile to M-59	0.2	24	$2.624	***	E	D	***

**Cost is in Millions of 2007 U.S. Dollars*
***Congestion could not be determined since roadway does not exist*
****VHT/Dollar was not calculated due to an increase in VHT*

Since these are results for 2030 roadway conditions only, it is important to keep in mind the existing year congestion. So, to determine short-term recommendations, existing and future year roadway congestion was also taken into account. Table 4-1 indicates the Ranks of the roadway improvements based on the highest VHT/Dollar. The table also shows whether the roadways were congested in the existing and future year. The short-term recommendations below are based on the highest ranked alternatives that are congested today.

Since these are results for 2030 roadway conditions only, it is important to keep in mind the existing year congestion. So, to determine short-term recommendations, existing and future year roadway congestion was also taken into account. Table 4-1 indicates the Ranks of the roadway improvements based on the highest VHT/Dollar. The table also shows whether the roadways were congested in the existing and future year. The short-term recommendations below are based on the highest ranked alternatives that are congested today.

Based on the Phase I Results, the following Short-Term Recommendations were made:

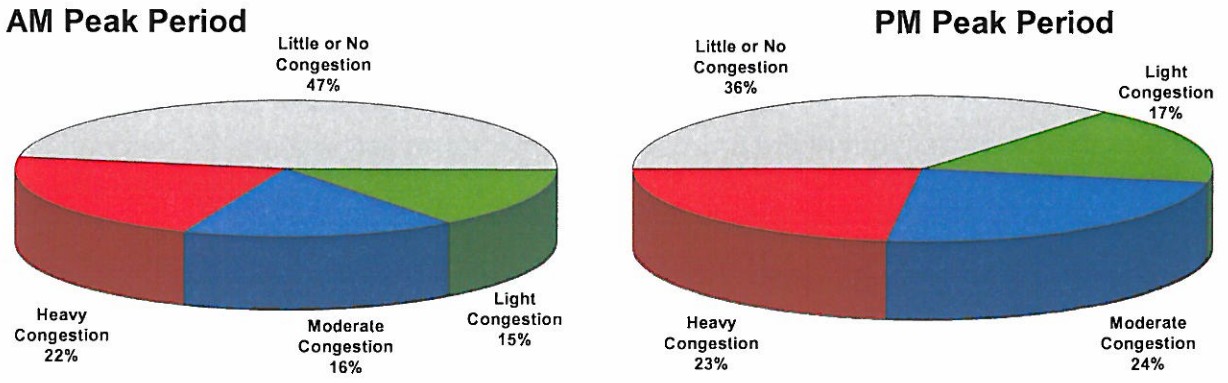
- Build 18 Mile Road as 3 lanes between Clinton River Road and Schoenherr Road
- Widen 18 Mile Road between Mound Road and Van Dyke Avenue
- Widen 18 Mile Road between Ryan Road and Mound Road
- Widen Utica Road from Valiant Drive to Schoenherr Road

The widening of 19 Mile Road between Mound Road and Van Dyke Avenue was not chosen as a short-term recommendation since there is little to no congestion now. This roadway improvement would be more suited to a mid- or long-term improvement based on further analysis.

It should be noted that building a bridge over the Clinton River on 18 Mile Road and 19 Mile Road were also tested. The results showed that building the 18 Mile Road bridge over the Clinton River would have the best overall VHT improvement as well as most cost effective. Since more preliminary studies and design would need to be done to build the 18 Mile Road bridge (i.e. environmental studies, design, and funding), this would be more of a mid- to long-term recommendation.

Figure 4-1 illustrates the percentage of congestion in Sterling Heights with the short-term improvements implemented by 2030.

Figure 4-1: Percentage of Roadway Congestion with Short-Term Improvements



From the 2030 No-Build, the percentage of roadways with little or no congestion increased in the AM peak hour from 46% to 47% and in the PM peak hour increased from 33% to 35%.

4.3 Phase II – Determine Mid-term Recommendations

In order to determine the mid-term recommendations, the recommendations from the Phase I results were input in the SEMCOG travel demand forecasting model and various roadway improvements were once again tested individually. Table 4-2 summarizes the results from the Phase II analysis.

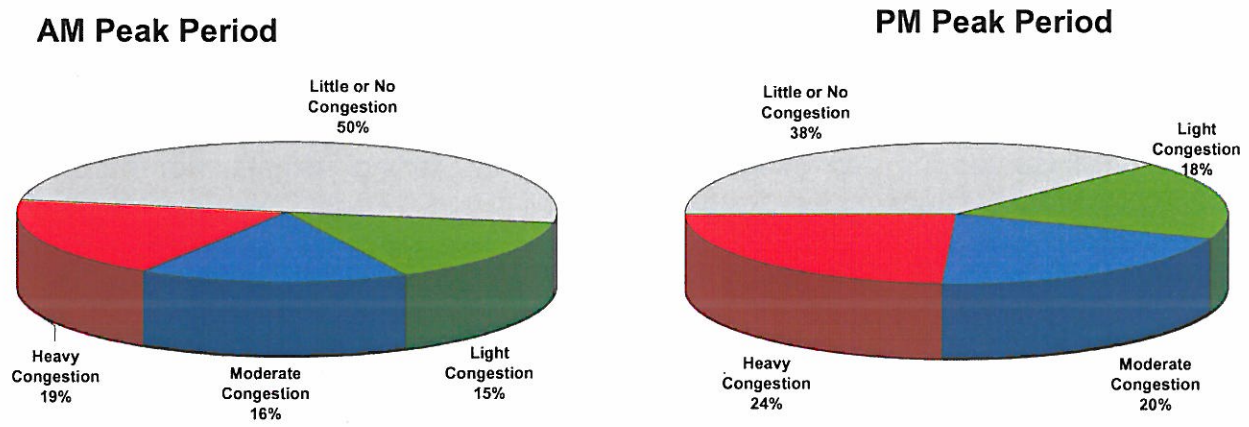
Once again, the results from model testing were also compared to existing and future year congestion. These were ranked to determine the mid-term recommendations. The table below summarizes the ranking.

Based on these results, the following mid-term recommendations were made:

- Build 18 Mile Road as 3 lanes between Schoenherr and Hayes
- Widen Mound Road to 8 lanes between 17 Mile Road to 18 1/2 Mile Road
- Widen 18 Mile Road to 5 lanes between Dequindre to Ryan
- Widen Dequindre to 5 lanes between 19 Mile to M-59
- Widen 19 Mile Road to 5 lanes between Mound and Merrill and widen to 3 lanes Merrill to Van Dyke (1EB / 2WB)

Figure 4-2 illustrates the percentage of congestion in Sterling Heights with the mid-term improvements implemented by 2030.

Figure 4-2: Percentage of Roadway Congestion with Mid-Term Improvements



Like the short-term recommendation results, the mid-term recommendations continued to increase the percentage of roadways with little or not congestion in both the AM and PM peak periods, from 46% to 50% and from 33% to 38%, respectively.

Table 4-2: Phase II Results

Improvement	*VHT*	*VMT*	*Cost**	*VHT/Dollar*	*2005 Congestion*	*2030 Congestion*	*Rank*
2030 No-Build	319.8	24,480					
Widen 19 Mile Road to 5 lanes between Mound and Merrill	-9	-152	$1.125	7.87	A-C	F	1
Build 18 Mile Road as 3 lanes between Schoenherr and Hayes	-13	-275	$2.7	4.86	**	**	2
Widen Mound Road to 8 lanes between 17 Mile Road to 18 1/2 Mile Road	-10	-120	$2.196	4.35	C-F	F	3
Widen 18 Mile Road between Dequindre to Ryan	-11	-128	$2.66	4.06	F	F	4
Widen Dequindre to 5 lanes between 19 Mile to M-59	-10	-148	$2.624	3.72	E	D	5
Widen 19 Mile Road to 5 lanes between Mound and Merrill and widen to 3 lanes Merrill to Van Dyke (1EB / 2WB)	-11	-158	$3.1	3.63	A-C	F	6
Widen 18 Mile Road to 5 lanes between Clinton River and Schoenherr	-10	-169	$2.947	3.40	**	A-C	7
Widen 18 Mile Road between Van Dyke to Utica	-9	-137	$2.97	3.13	A-C	D	8
Build 18 Mile Road as 5 lanes between Schoenherr and Hayes	-13	-258	$4.3	3.04	**	**	9
Widen Utica Road to 5 lanes between Schoenherr to Hayes	-10	-128	$3.977	2.56	F	F	10
Widen Dequindre to 5 lanes between 18 Mile to 19 Mile	-11	-153	$4.3	2.47	F	D	11
Widen 17 Mile Road between Dodge Park to Schoenherr	-8	-111	$3.544	2.24	D	F	12
Build 18 Mile Road as 5 lanes between Clinton River and Hayes	-13	-248	$7.247	1.83	**	**	13
Widen 19 Mile Road to 5 lanes from Clinton River to Schoenherr	-12	-191	$6.655	1.74	A-C	A-C	14
Widen Dodge Park to 5 lanes between Metropolitan Parkway to Utica	-12	-190	$7.675	1.58	A-E	A-F	15
Widen Dequindre to 5 lanes between 18 Mile to M-59	-10	-142	$6.924	1.51	E-F	D	16
Widen 19 Mile Road to 5 lanes between Dequindre to Ryan	-5	-80	$3.503	1.48	D	A-C	17
Widen 19 Mile Road to 5 lanes between Mound and Merrill and widen to 3 lanes Merrill to Van Dyke (2EB / 1WB)	-4	-70	$3.1	1.29	A-C	F	18
Widen 17 Mile Road to 5 lanes between Van Dyke to Plumbrook	-12	-128	$9.722	1.21	F	F	19
Improve Van Dyke to 4 lane boulevard between 18 1/2 Mile to M-59	-8	-160	$8.193	1.02	A-C	A-E	20
Widen 17 Mile Road to 5 lanes between Van Dyke and Dodge Park	-11	-117	$11.362	0.95	F	F	21
Build 18 Mile Road as 5 lanes over Clinton River	-14	-164	$16.49	0.87	**	**	22
Build 18 Mile Road as 5 lanes over Clinton River, Build 18 all	-16	-264	$19.36	0.84	**	**	23

**Cost is in Millions of 2007 U.S. Dollars*

***Congestion could not be determined since roadway does not exist*

4.4 Phase III – Determine Long-term Recommendations

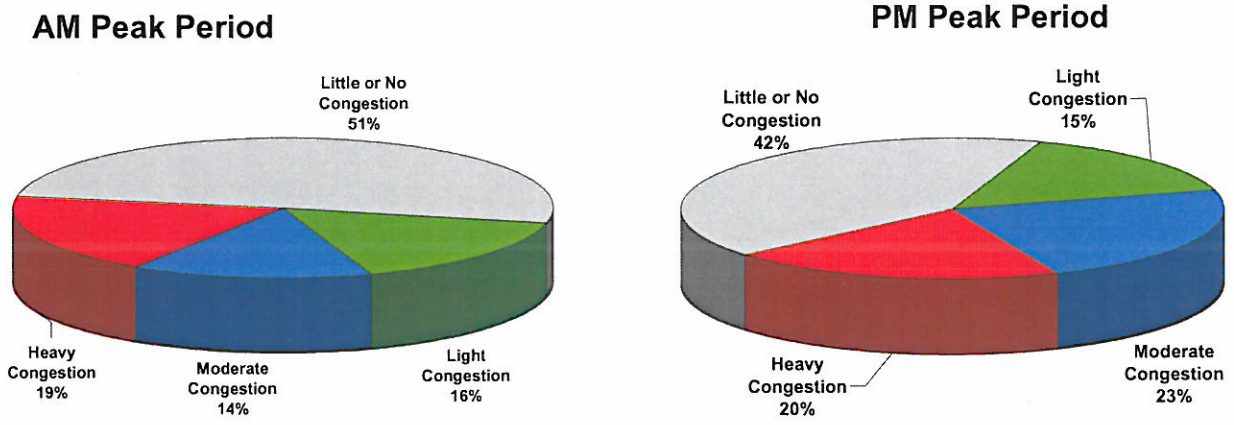
Much like the Phase II analysis to determine the mid-term recommendations, the long-term recommendations will be determined based off of the Phase II results. The recommendations from the Phase I and II results were input in the SEMCOG travel demand forecasting model and various roadway improvements were once again tested individually. A bridge over the Clinton River was tested along 18 Mile Road, as well as along 19 Mile Road. Table 4-3 summarizes which roadway alternatives were tested and the results.

The table is ranked according to VHT/Dollar also includes the existing and future year congestion. Based on the results from the model run and existing and future roadway congestion, the following roadway recommendations would be made:

- Widen 18 Mile Road to 5 lanes between Van Dyke to Utica
- Widen 18 Mile Road to 5 lanes between Clinton River and Schoenherr
- Widen 17 Mile Road between Dodge Park to Schoenherr
- Widen 19 Mile Road to 5 lanes between Dequindre to Ryan
- Widen Dequindre to 5 lanes between 18 Mile to 19 Mile

Figure 4-3 illustrates the percentage of congestion in Sterling Heights with the long-term improvements without a bridge implemented by 2030.

Figure 4-3: Percentage of Roadway Congestion with Long-Term Improvements without a Bridge



Like the mid-term recommendation results, the long-term recommendations continued to increase the percentage of roadways with little or not congestion in both the AM and PM peak periods, from 50% to 51% and from 38% to 42%, respectively.

Additional analysis was conducted to compare what long-term recommendations would be made if a bridge was built over the Clinton River either on 18 Mile Road or 19 Mile Road.

Table 4-3: Phase III Results

Improvement	*VHT*	*VMT*	*Cost**	*VHT/Dollar*	*2005 Congestion*	*2030 Congestion*	*Rank*
2030 No-Build	319.8	24,480					
Widen 18 Mile Road between Van Dyke to Utica	-17	-155	$2.97	5.64	A-C	D	1
Widen 18 Mile Road to 5 lanes between Clinton River and Schoenherr	-16	-160	$2.947	5.56	**	A-C	2
Widen 17 Mile Road between Dodge Park to Schoenherr	-18	-159	$3.544	5.07	D	F	3
Widen 19 Mile Road to 5 lanes between Dequindre to Ryan	-16	-150	$3.503	4.67	D	A-C	4
Widen Dequindre Road to 5 lanes between 18 Mile to 19 Mile	-17	-166	$4.3	4.05	F	D	5
Widen 18 Mile Road to 5 lanes between Schoenherr and Hayes	-16	-153	$4.3	3.78	**	D	6
Widen Utica Road to 5 lanes between Schoenherr to Hayes	-15	-143	$3.977	3.76	F	F	7
Widen Dodge Park to 5 lanes between Metropolitan Parkway to Utica	-18	-160	$7.675	2.38	A-E	A-F	8
Improve Van Dyke to 4 lane boulevard between 18 1/2 Mile to M-59	-18	-205	$8.193	2.19	A-C	A-E	9
Build 18 Mile Road to 5 lanes between Clinton River and Hayes	-16	-148	$7.247	2.19	**	A-D	10
Widen 19 Mile Road to 5 lanes from Clinton River to Schoenherr	-14	-153	$6.655	2.12	A-C	A-C	11
Widen 17 Mile Road to 5 lanes between Van Dyke to Plumbrook	-18	-130	$9.722	1.83	F	F	12
Widen 17 Mile Road to 5 lanes between Van Dyke and Dodge Park	-17	-137	$11.362	1.46	F	F	13
Build 19 Mile Road as 5 lanes over Clinton River	-23	-311	$15.598	1.44	**	**	14
Build 18 Mile Road as 5 lanes over Clinton River	-22	-144	$16.485	1.32	**	**	15
Build 19 Mile Road as 5 lanes over Clinton River, widen 19 Mile Road between Van Dyke and Schoenherr	-25	-325	$22.253	1.14	**	**	16
Build 18 Mile Road as 5 lanes over Clinton River, widen 18 Mile Road between Van Dyke and Utica	-22	-79	$19.36	1.12	**	**	17
Build 18 Mile Road as 5 lanes over Clinton River, widen 18 Mile Road between Van Dyke and Schoenherr	-22	-96	$22.207	1.00	**	**	18
Build 18 Mile Road to 5 lanes over Clinton River, widen all of 18 Mile Road	-22	-85	$26.407	0.82	**	**	19

**Cost is in Millions of 2007 U.S. Dollars*
***Congestion could not be determined since roadway does not exist*

4.4.1 Building a 19 Mile Road Bridge over the Clinton River

As indicated above, Phase III showed that a bridge over the Clinton River along 19 Mile Road was not as cost effective as other alternatives. However, this section will test if a bridge were built over the Clinton River on 19 Mile Road, how that would change the Long-term Recommendations. Each roadway alternative was run with a 5-lane bridge along 19 Mile Road over the Clinton River. Table 4-4 below summarizes the results.

Table 4-4: Difference of 2030 Roadway Improvements with a 19 Mile Road Bridge

Improvement	*VHT*	*VMT*	*Cost*	*VHT/Dollar*	*Rank*
2030 No-Build	319.8	24,480			
Build a 5 lane 19 Mile Road bridge over the Clinton River	-23	-311	$15.298	1.47	
Widen 19 Mile Road to 5 lanes between Van Dyke to Utica	-23	-313	$16.031*	1.44	1
Widen 17 Mile Road between Dodge Park to Schoenherr	-24	-317	$18.842*	1.25	2
Widen Utica Road to 5 lanes between Schoenherr to Hayes	-23	-358	$19.275*	1.21	3
Widen Dequindre to 5 lanes between 18 Mile to 19 Mile	-23	-309	$19.598*	1.16	4
Widen 19 Mile Road to 5 lanes between Dequindre to Ryan	-21	-302	$18.801*	1.11	5
Widen 19 Mile Road to 5 lanes from Clinton River to Schoenherr	-24	-321	$21.953*	1.07	6
Widen Dodge Park to 5 lanes between Metropolitan Parkway to Utica	-22	-293	$22.973*	0.95	7
Improve Van Dyke to 4 lane boulevard between 18 1/2 Mile to M-59	-22	-305	$23.491*	0.943	8
Widen 17 Mile Road to 5 lanes between Van Dyke to Plumbrook	-23	-277	$25.02*	0.939	9
Widen all of 19 Mile Road	-24	-320	$26.189*	0.91	10
Widen 17 Mile Road to 5 lanes between Van Dyke and Dodge Park	-24	-249	$26.66*	0.90	11

**Cost includes building the 19 Mile Road bridge over the Clinton River*

The recommendations *with* the bridge along 19 Mile Road over the Clinton River:

- Widen 19 Mile Road to 5 lanes between Van Dyke to Utica
- Widen 17 Mile Road to 5 lanes between Dodge Park to Schoenherr
- Widen Utica Road to 5 lanes between Schoenherr to Hayes

It should be noted that none of the additional improvements are as cost effective as just building the bridge over the Clinton River along 19 Mile Road. However, these additional improvements further reduce the overall VHT in the study area.

4.4.2 Building an 18 Mile Road Bridge over the Clinton River

As indicated above, Phase III showed that a bridge over the Clinton River along 18 Mile Road was not as cost effective as other alternatives. However, this section will test if a bridge were built over the Clinton River on 18 Mile Road, how that would change the Long-term Recommendations. Each roadway alternative was run with a 5-lane bridge along 18 Mile Road over the Clinton River. Tables 4-5 summarizess the results.

Table 4-5: Difference of 2030 Roadway Improvements with an 18 Mile Road Bridge

Improvement	*VHT*	*VMT*	*Cost*	*VHT/Dollar*	*Rank*
2030 No-Build	319.8	24,480			
Build 18 Mile Road Bridge as 5 lanes over Clinton River	-22	-144	$16.485	1.32	
Widen 18 Mile Road to 5 lanes between Clinton River and Schoenherr	-24	-147	$19.432*	1.22	1
Widen 17 Mile Road between Dodge Park to Schoenherr	-23	-122	$20.029*	1.17	2
Widen 18 Mile Road between Van Dyke and Utica	-22	-79	$19.555*	1.11	3
Widen 18 Mile Road to 5 lanes between Schoenherr and Hayes	-23	-133	$20.785*	1.09	4
Widen 19 Mile Road to 5 lanes between Dequindre to Ryan	-22	-144	$19.988*	1.09	5
Widen Utica Road to 5 lanes between Schoenherr to Hayes	-22	-144	$20.462*	1.07	6
Widen Dequindre to 5 lanes between 18 Mile to 19 Mile	-21	-98	$20.785*	1.03	7
Widen Dodge Park to 5 lanes between Metropolitan Parkway to Utica	-24	-137	$24.16*	1.00	8
Widen 18 Mile Road between Van Dyke and Schoenherr	-22	-96	$22.502*	0.99	9
Improve Van Dyke to 4 lane boulevard between 18 1/2 Mile to M-59	-23	-123	$24.678*	0.92	10
Widen 17 Mile Road to 5 lanes between Van Dyke to Plumbrook	-22	-87	$26.207*	0.84	11
Widen 17 Mile road to 5 lanes between Van Dyke and Dodge Park	-23	-93	$27.847*	0.81	12
Widen all of 18 Mile Road	-22	-85	$26.802*	0.81	13

**Cost includes the building of the 18 Mile Road bridge over the Clinton River*

The recommendations *with* the bridge along 18 Mile Road:

- Widen 18 Mile Road to 5 lanes between Clinton River and Schoenherr
- Widen 17 Mile Road between Dodge Park to Schoenherr
- Widen 18 Mile Road between Van Dyke and Utica

Again, it should be noted that the additional improvements are not as cost effective as just building the bridge along 18 Mile Road over the Clinton River. However, building these additional improvements does reduce the overall VHT in the study area.

4.4.3 Comparison of Long-Term Recommendation Alternatives

There were several long-term alternatives analyzed based on whether a bridge would be built over the Clinton River and if it was, would it be along 18 Mile Road or 19 Mile Road. This section of the report compares each of the alternatives and determines which alternative may be the most cost effective and which one may have the best overall delay savings regardless of cost. These long-term recommendations were input into the SEMCOG model, and Tables 4-6 and 4-7 summarize the results.

Table 4-6: Comparison of 2030 Long-Term Recommendations

Improvement	*VHT*	*VMT*
2030 No-Build	319.8	24,480
Long-Term Recommendations without Bridge • Widen 18 Mile Road to 5 lanes between Van Dyke to Utica • Widen 18 Mile Road to 5 lanes between Clinton River and Schoenherr • Widen 17 Mile Road between Dodge Park to Schoenherr • Widen 19 Mile Road to 5 lanes between Dequindre to Ryan • Widen Dequindre to 5 lanes between 18 Mile to 19 Mile	301.2	24,337
Long-Term Recommendations with only 18 Mile Road Bridge	298.0	24,335
Long-Term Recommendations with only 19 Mile Road Bridge	297.3	24,169
Long-Term Recommendations with 18 Mile Road Bridge and further options • Widen 18 Mile Road to 5 lanes between Clinton River and Schoenherr • Widen 17 Mile Road between Dodge Park to Schoenherr • Widen 18 Mile Road between Van Dyke and Utica	298.2	24,393
Long-Term Recommendations with 19 Mile Road Bridge and further options • Widen 19 Mile Road to 5 lanes between Van Dyke to Utica • Widen 17 Mile Road to 5 lanes between Dodge Park to Schoenherr • Widen Utica Road to 5 lanes between Schoenherr to Hayes	296.0	24,163

Table 4-7: Difference of Long-Term Alternatives

Improvement	*Flow*	*VHT*	*VMT*	*Cost*	*VHT/Dollar*	*Rank*
2030 No-Build	8,487	319.8	24,480			
Long-Term Recommendations without Bridge • Widen 18 Mile Road to 5 lanes between Van Dyke to Utica • Widen 18 Mile Road to 5 lanes between Clinton River and Schoenherr • Widen 17 Mile Road between Dodge Park to Schoenherr • Widen 19 Mile Road to 5 lanes between Dequindre to Ryan • Widen Dequindre to 5 lanes between 18 Mile to 19 Mile	-55	-18.6	-143	$17.264	1.08	3
Long-Term Recommendations with only 18 Mile Road Bridge	-73	-21.8	-145	$16.485	1.32	2
Long-Term Recommendations with only 19 Mile Road Bridge	-89	-22.5	-311	$15.298	1.47	1
Long-Term Recommendations with 18 Mile Road Bridge and further options • Widen 18 Mile Road to 5 lanes between Clinton River and Schoenherr • Widen 17 Mile Road between Dodge Park to Schoenherr • Widen 18 Mile Road between Van Dyke and Utica	-56	-21.6	-87	$26.046	0.83	5
Long-Term Recommendations with 19 Mile Road Bridge and further options • Widen 19 Mile Road to 5 lanes between Van Dyke to Utica • Widen 17 Mile Road to 5 lanes between Dodge Park to Schoenherr • Widen Utica Road to 5 lanes between Schoenherr to Hayes	-93	-23.8	-317	$23.552	1.01	4

The most cost effective long-term alternative is to build a bridge over the Clinton River along 19 Mile Road. The next highest is to build a bridge over the Clinton River along 18 Mile Road. If a bridge was not built, there are still long-term recommendations that would improve the overall VHT with the City.

It should be noted that the cost estimate to build either bridge over the Clinton River along 18 Mile Road or 19 Mile Road did not include right-of-way acquisition. This could significantly increase the price of either of these alternatives. If the right-of-way acquisition along 19 Mile Road is over $1.5M, then it is more cost effective to build the bridge on 18 Mile Road.

If cost was not a factor, the best alternative would still be to build the bridge over the Clinton River along 19 Mile Road with the other additional improvements.

5. Recommendations

This chapter of the report will summarize the short-, mid-, and long-term recommendations for the City of Sterling Heights.

5.1 Short-Term Recommendations

The short-term recommendations, within the next five to seven years, for the City of Sterling Heights are:

- Widen Utica Road to 5 lanes between Valiant Drive to Schoenherr Road
- Build 18 Mile Road as 3 lanes between Clinton River Road and Schoenherr Road
- Widen 18 Mile Road to 5 lanes between Mound Road and Van Dyke Avenue
- Widen 18 Mile Road to 5 lanes between Ryan Road and Mound Road

With these recommendations, the overall VHT would decrease by ten (10) hours. The estimated cost would be approximately $10.644 Million in 2007 dollars.

5.2 Mid-Term Recommendations

The mid-term recommendations, within the next seven to fifteen years, for the City of Sterling Heights are:

- Build 18 Mile Road as 3 lanes between Schoenherr and Hayes
- Widen Mound Road to 8 lanes between 17 Mile Road to 18 1/2 Mile Road
- Widen 18 Mile Road to 5 lanes between Dequindre to Ryan
- Widen Dequindre to 5 lanes between 19 Mile to M-59
- Widen 19 Mile Road to 5 lanes between Mound and Merrill and widen to 3 lanes Merrill to Van Dyke (1EB / 2WB)

With these recommendations, the overall VHT would decrease by an additional five (5) hours. The estimated cost would be approximately $13.28 Million in 2007 dollars.

5.3 Long-Term Recommendations

There are three different sets of long-term recommendations, depending on whether a bridge would be built over the Clinton River along 18 Mile Road, 19 Mile Road, or not at all.

The long-term recommendations *without* a bridge are:

- Widen 18 Mile Road to 5 lanes between Van Dyke to Utica
- Widen 18 Mile Road to 5 lanes between Clinton River and Schoenherr
- Widen 17 Mile Road between Dodge Park to Schoenherr
- Widen 19 Mile Road to 5 lanes between Dequindre to Ryan
- Widen Dequindre to 5 lanes between 18 Mile to 19 Mile

With these recommendations, the overall VHT would decrease by an additional 3.4 hours. The estimated cost would be approximately $17.264 Million in 2007 dollars.

By building a 19 Mile Road bridge over the Clinton River the overall VHT would decrease by 7.3 hours at a cost of approximately $15.298 Million in 2007 dollars.

By building an 18 Mile Road bridge over the Clinton River the overall VHT would decrease by 6.6 hours at a cost of approximately $16.485 Million in 2007 dollars.

Building a bridge over the Clinton River over either 18 Mile Road or 19 Mile Road in the long-term is recommended to decrease east-west congestion within the City of Sterling Heights. However, a more detailed study is recommended to research more detailed construction costs of both options, right-of-way acquistions that would be necessary, and the environmental impacts that building a bridge would have on the community.

6. Construction Costs

This chapter will review the cost estimates that were used in the alternatives analysis.

6.1 Cost Estimate Methodology

Most of the roadway improvements that were tested using the SEMCOG model involved widening 2-lane roadways to 5-lane roadways. Existing 2-lane roadways are roads that have one travel lane in each direction. A 5-lane roadway would have two travel lanes in each direction with a continuous center-lane left-turn only lane. The following cost estimates were used based on information obtained from the Road Commission of Macomb County (RCMC):

Table 5-1: Construction Costs

Type of Construction	*Cost*
5-Lane Concrete Roadway	$4.1 Million per mile
Add 1 Lane to existing Boulevard	$650,000 per mile per lane
4-Lane Concrete Boulevard	$4.9 Million per mile
2-Lane Concrete Roadway	$1.2 Million per mile
2-Lane Asphalt Bituminous	$650,000 per mile overlay; $800,000 per mile reconstruct
5-Lane Asphalt Bituminous	$1 Million per mile overlay; $3.6 Million per mile reconstruct
4-Lane Asphalt Bituminous Boulevard	$800,000 per mile overlay; $3.4 Million per mile reconstruct
5-Lane Short-Span Bridge (<30 feet)	$200,000 per bridge
Long-Span Bridge (>30 feet)	$100 per square foot
Traffic Signal Replacement	$100,000 per intersection

These are construction costs only and do not include engineering design or construction engineering. These construction costs include building the roadway with curb, gutter, utility relocation, any ditch/drainage work, and sidewalks on both sides of the roadway. The costs shown above are for both widening and new construction. The new construction of a roadway that was not there before would most likely be somewhat less since there would not be the demolition cost, however, it was left as the same as reconstruction. The cost estimates for each recommendation did not include right-of-way acquisition. These costs outlined in Table 5-1 were used to determine the cost for each roadway recommendation.

6.2 Cost Estimates

Table 5-2 below summarizes the cost estimates for all the roadway alternatives that were tested using the forecasting model

Table 5-2: Roadway Alternative Costs

Roadway Alternative	*Length of Roadway**	*Roadway Cost***	*Structure / Signal Cost*	*Total Cost***
Widen 17 Mile Road to 5 lanes between Van Dyke to Plumbrook	0.42	$1.722	8,000,000	$9.722
Widen 17 Mile road to 5 lanes between Van Dyke and Dodge Park	0.82	$3.362	8,000,000	$11.362
Widen 17 Mile Road between Dodge Park to Schoenherr	0.84	$3.444	$100,000	$3.544
Widen 18 Mile Road between Dequindre to Ryan	0.60	$2.460	$200,000	$2.66
Widen 18 Mile Road between Ryan to Mound	0.82	$3.362	-	$3.362
Widen 18 Mile Road between Mound and Van Dyke	0.89	$3.649	$200,000	$3.849
Widen 18 Mile Road between Van Dyke to Utica	0.70	$2.870	$100,000	$2.97
Build 18 Mile Road as 3 lanes between Clinton River and Schoenherr	0.67	$1.675	$200,000	$1.875
Build 18 Mile Road as 3 lanes between Schoenherr and Hayes	1.00	$2.500	$200,000	$2.7
Build 18 Mile Road as 5 lanes between Clinton River and Schoenherr	0.67	$2.747	$200,000	$2.947
Build 18 Mile Road as 5 lanes between Schoenherr and Hayes	1.00	$4.100	$200,000	$4.3
Widen 19 Mile Road to 5 lanes between Dequindre to Ryan	0.83	$3.403	$100,000	$3.503
Widen 19 Mile Road to 5 lanes between Mound and Merrill	0.25	$1.025	$100,000	$1.125
Widen 19 Mile Road to 5 lanes between Mound and Merrill and widen to 3 lanes Merrill to Van Dyke	1.00	$2.900	$200,000	$3.1
Widen 19 Mile Road to 5 lanes from Clinton River to Schoenherr	1.27	$5.207	$1,450,000	$6.655
Widen Dequindre to 5 lanes between 18 Mile to 19 Mile	1.00	$4.100	$200,000	$4.3
Widen Dequindre to 5 lanes between 19 Mile to M-59	0.64	$2.624	-	$2.624
Widen Dodge Park to 5 lanes between Metropolitan Parkway to Utica	1.75	$7.175	$500,000	$7.675
Widen Mound Road to 8 lanes between 17 Mile Road to 18 1/2 Mile Road	1.42	$1.846	$350,000	$2.196
Widen Utica Road to 5 lanes from Valiant to Schoenherr	0.80	$3.28	-	$3.28
Widen Utica Road to 5 lanes between Schoenherr to Hayes	0.97	$3.977	-	$3.977
Widen Utica Road to 5 lanes between Valiant to Hayes	1.35	$5.535	-	$5.535

Roadway Alternative	Length of Roadway*	Roadway Cost**	Structure / Signal Cost	Total Cost**
Improve Van Dyke to 4 lane boulevard between 18 1/2 Mile to M-59	1.57	$7.693	$500,000	$8.193
Build a 18 Mile Road bridge as 5 lanes over the Clinton River	0.85	$3.485	$13,000,000	$16.485
Build a 19 Mile Road bridge as 5 lanes over the Clinton River	0.53	$2.173	$13,100,000	$15.298

**Length is in miles **Cost is in Millions of 2007 Dollars*

Widen 17 Mile Road to 5 lanes between Van Dyke Avenue to Plumbrook Road

A section of 17 Mile Road between Van Dyke Avenue and Plumbrook Road is already five lanes, however, the whole section is not 5 lanes. Figure 5-1 illustrates which part of 17 Mile Road is already 5 lanes, which includes a bridge over a stream. It was assumed that the section that is already 5 lanes would not need to be reconstructed and only the two-lane portion would be reconstructed. However, the two-lane portion between the 5-lane portion and Van Dyke Avenue currently has a drain along the southern side of the roadway. A cost estimate of approximately $7,900,000 has been completed by the City of Sterling Heights in order to cover the drain to widen the roadway. This amount has been added to the cost to widen the roadway. The signal at 17 Mile Road and South Plumbrook Road would also need to be replaced due to the widening of 17 Mile Road.

Figure 5-1: 17 Mile Road between Van Dyke Avenue and Plumbrook Road

Widen 17 Mile Road between Dodge Park Road and Schoenherr Road

Currently, 17 Mile Road in this section is primarily three-lanes and widens out at Utica Road and ends at Schoenherr Road. It appears from the aerials that there is adequate right-of-way to add one additional lane in each direction. There are no major structures in the section to rebuild. The signals at Utica Road and Schoenherr Road would be adequate if no right-turn lanes are added. The signal at Dodge Park would need to be updated.

Widen 18 Mile Road between Dequindre Road and Ryan Road

Part of 18 Mile Road in this section is already five lanes, but narrows down to two lanes just east of Westmont Circle. There is currently a culvert where it narrows down to five lanes. However, the culvert appears wide enough from aerial photography that it could accommodate a five-lane widening. Since it appears that the culvert may be wide enough, a cost of $200,000 to reinforce the culvert was added to the construction cost. Figure 5-3 illustrates the culvert on18 Mile Road between Dequindre Road and Ryan Road. 18 Mile Road does widen back out at Ryan Road, therefore the signal at the major intersections do not need to be updated. There is one signalized intersection at Gulliver Drive that would need to be updated.

Figure 5-2: 18 Mile Road between Dequindre Road and Ryan Road

Widen 18 Mile Road between Ryan Road to Mound Road

18 Mile Road between Ryan Road and Mound Road is currently two lanes and widens out at the intersections with Ryan Road and also at Mound Road. The signals at both of these major intersections would not need to be updated and there are no other signalized intersections in this section.

Widen 18 Mile between Mound Road and Van Dyke Avenue

18 Mile Road in this section is all 2-lanes, except at the intersections of Mound Road and Van Dyke Avenue where it widens out to five lanes. There is a section of 18 Mile Road which goes over a stream with a fairly short span.

Widen 18 Mile Road between Van Dyke Avenue to Utica Road

18 Mile Road in this section is primarily two lanes and has residential homes both on the north and south sides of the road. Right-of-way in this section could be an issue for a few properties on the north side of the roadway. There are no major structures in this section. The intersection with Van Dyke Avenue would need to be widened, however, the signal would most likely not need to be updated since the intersection is already wide. The signal at the intersection with Utica Road would need to be updated.

Build 18 Mile Road between Clinton River Road and Hayes Road

This section of roadway does not currently exist. Further study should be done to determine if the roadway should be two-lanes or up to five-lanes. It appears from the aerial that a 120-foot right-of-way does exist in this section, which can accommodate up to five lanes of travel. It was assumed that any major structures would need to be built in this section. There would most likely need to be signals placed at the intersections of Clinton River Road, Schoenherr Road, and Saal Road. The signal at Hayes Road would need to be updated.

Build 18 Mile Road Bridge over the Clinton River between Utica Road and Clinton River Road

Currently, this section of roadway does not exist. Figure 5-3 illustrates this area in more detail. The right-of-way currently exists within Dodge Park to extend 18 Mile Road. For the cost estimate it was assumed that 18 Mile Road would be realigned with Utica slightly north of the existing intersection location. Most likely Utica Road would need to be rebuilt and raised at the intersection with 18 Mile Road. A structure would be built to go over the Clinton River and it is suggested that it continue over most of the park. 18 Mile Road would be at grade at Clinton River Road. The length shown in yellow is approximately 0.85 miles and it was assumed that half of that would be structure. A new signal would be needed at Utica Road and at Clinton River Road. A two-lane bridge structure with sidewalks on both sides would be approximately 40-feet wide and a four-lane bridge structure with sidewalks would be approximately 64-feet wide. The cost of this bridge was estimated at $200 per square foot due to the higher complexity of the bridge.

Figure 5-3: Possible 18 Mile Road Bridge

Widen 19 Mile Road between Dequindre Road and Ryan Road

19 Mile Road between Dequindre Road and Ryan Road is currently two lanes. The intersection with Dequindre Road would need to be widened to accommodate the five lanes and the signal would most likely need to be updated. The intersection with Ryan Road is already widened and the signal would not need to be updated.

Widen 19 Mile Road between Mound Road and Van Dyke Avenue

19 Mile Road between Mound Road and Van Dyke Avenue is currently two lanes. The intersections with Mound Road would need to be widened to accommodate the five lanes and the signal would most likely need to be updated. There is a signal at Merrill Road that would need to be updated. The right-of-way between Merrill Road and Van Dyke Avenue is very limited, therefore, a three-lane option was viewed as more practical in this section instead of the five-lane option.

Widen/Build 19 Mile Road between Van Dyke Avenue and Utica Road

This section of roadway is currently residential in nature and would need to be realigned with the current intersection of 19 Mile Road at Van Dyke Avenue. In addition, the road would need to be widened to accommodate the additional traffic and the higher roadway classification. It appears that there could be some right-of-way issues along the southern side of the roadway. The signal at the Van Dyke intersection would need to be updated and a new signal would most likely need to be installed at Utica Road.

Figure 5-4: 19 Mile Road between Van Dyke Avenue and Utica Road

Build 19 Mile Road bridge over the Clinton River

Currently, this section of roadway does not exist. Figure 5-5 illustrates this area in more detail. In order for the bridge to be built over the Clinton River for 19 Mile Road, the roadway between Van Dyke Avenue and Utica Road would need to be widened. There is currently a house located on the eastern side of Utica Road where the roadway would need to be built. The intersection of Utica Road and 19 Mile Road would continue to be at-grade. It was estimated that a 1,000 foot long bridge would be built to span the Clinton River. A four-lane bridge structure would be approximately 64-feet side and the cost was estimated at $200 per square foot due to the higher complexity of the bridge.

The distance along 19 Mile Road between Utica Road and Clinton River Road is approximately 0.53 miles. There appears from the aerial to be a foot bridge in the vicinity of the proposed location of a new bridge. There also may be some right-of-way issues on the west side of Clinton River Road at the intersection of 19 Mile Road. The signal at the intersection of Clinton River Road and 19 Mile Road would need to be updated.

Figure 5-5: Possible 19 Mile Road bridge over the Clinton River

Widen 19 Mile Road between Clinton River Road and Schoenherr Road

19 Mile Road in this section is two lanes and has residential homes on both north and south sides of the roadway. M-53 runs north-south over 19 Mile Road just east of Clinton River.

Figure 6-6: 19 Mile Road underneath M-53

A four lane roadway may be able to be built underneath the existing M-53 bridge structures without shoulders and with a sidewalk on only one side in order to minimize cost. To rebuild the bridge structures, the cost would be approximately $1.8 million. The pier to pier span length is approximately 130 feet and the width is 48 feet. An additional 24 foot minimum would need to be added to each span.

Right of way between Clinton River Road and Gainsley Drive appears to be wide enough with the exception of one dwelling unit. However, there are many driveways off of 19 Mile Road. 19 Mile Road east of Gainsley Drive may have some right-of-way issues on the south side of the roadway. The intersection of 19 Mile Road with Gainsley Drive is signalized. The roadway does widen out to five lanes just west of Schoenherr Road.

Widen Dequindre Road between 18 Mile Road and 19 Mile Road

This section of roadway is under the jurisdiction of the Road Commission for Oakland County and the Road Commission of Macomb County. It is currently a two-lane roadway. The signalized intersections with 18 Mile Road and 19 Mile Road would need to have new signals installed and analyzed further to determine if right-turn only lanes would be needed.

Widen Dequindre Road between 19 Mile Road and M-59

Dequindre Road between 19 Mile Road to just south of Beaumont Hospital is two lanes. Between Beaumont Hospital and M-59, Dequindre Road is five lanes. Given that part of this section is already five lanes, only part of this section would actually need to be widened. The intersection of Dequindre Road at 19 Mile Road would have been already widened during the mid-term construction, so the cost was excluded as part of this analysis. There are no major structures along this section and no signals would need to be updated. It does not appear from the aerial that there would be any significant right-of-way costs.

Widen Utica Road between Valiant Drive and Schoenherr Road

Currently, Utica widens out to five lanes at the intersections with 17 Mile Road and Schoenherr Road. Additional analyses would need to be conducted to determine if the right-turn lanes should be added for Utica Road or if the existing configuration would be adequate. It does not appear from aerial photography that there would be right-of-way impacts and there are no structures in this segment. The signals would most likely not need to be updated since the intersections are already widened out. However, if right-turn lanes were added, then the signal would need to be updated.

Widen Utica Road between Schoenherr Road and Hayes Road

Currently, Utica widens out to five lanes at Schoenherr Road and Hayes Road. The road is two lanes between the intersections, but has some bypass lanes near minor roadway intersections. There are not any major bridge crossings in this section.

Widen Mound Road between 17 Mile Road and 18 1/2 Mile Road

Mound Road narrows from an eight-lane boulevard to a six-lane boulevard just north of 17 Mile Road. North of 18 Mile Road, Mound Road crosses a stream and there are currently two bridges with very short spans. It was estimated that Mound Road in this section could be widened by simply adding another lane to each side of the boulevard and keeping the existing boulevard. This would lower the cost of construction. In addition, the cost of replacing the two bridges over the stream would be somewhat

lower due to the short span of the existing bridge. Figure 5-7 illustrates the location of the bridges on Mound Road just north of 18 Mile Road.

Figure 5-7: Bridge locations on Mound Road north of 18 Mile Road

Appendix A:

2030 AM and PM Peak Period Congestion Levels for Short-, Mid-, and Long-Term Recommendations

Figure A-1: 2030 AM Peak Period Congestion with Short-Term Recommendations

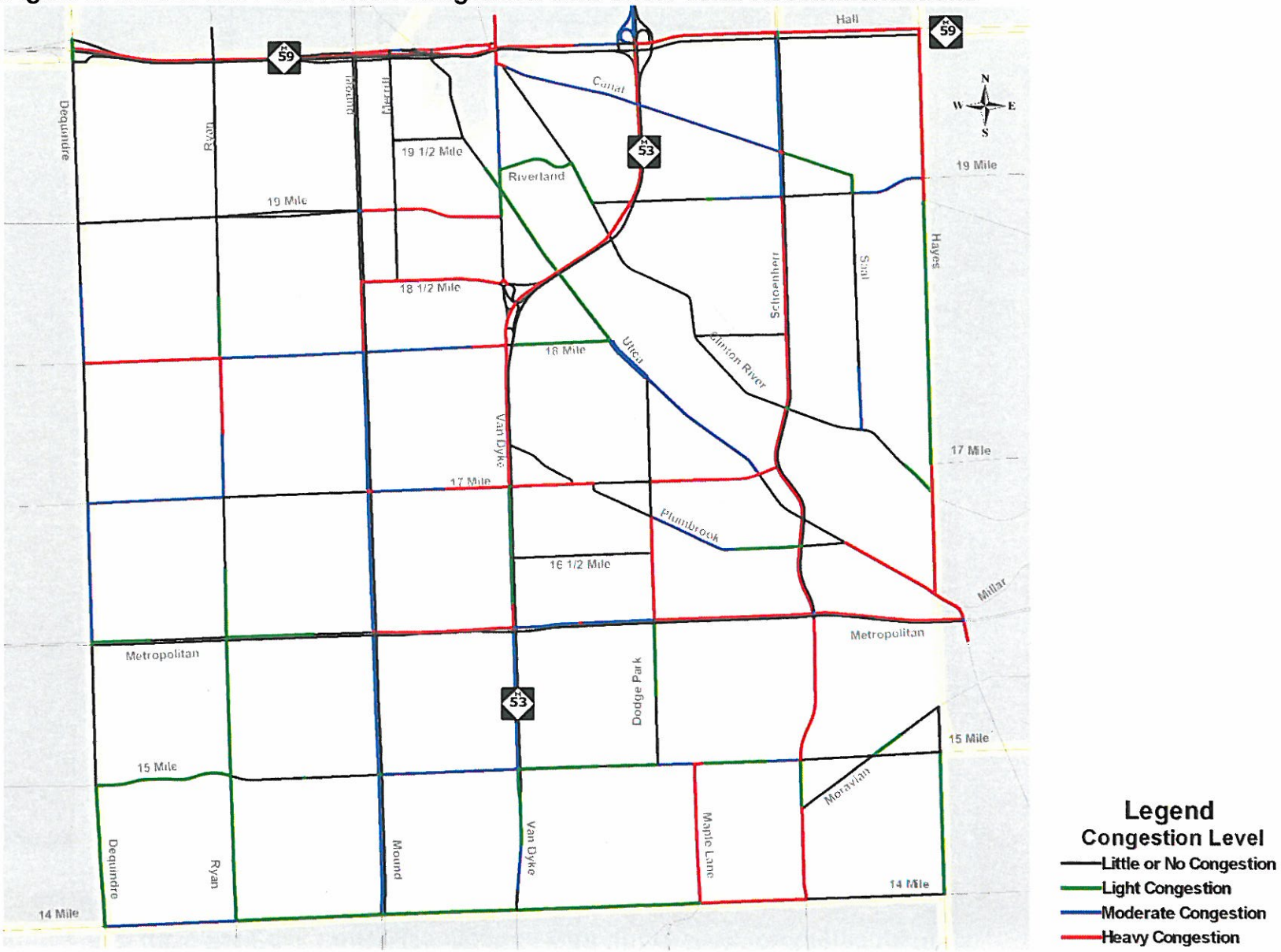


Figure A-2: 2030 PM Peak Period Congestion with Short-Term Recommendations

Figure A-3: 2030 AM Peak Period Congestion with Mid-Term Recommendations

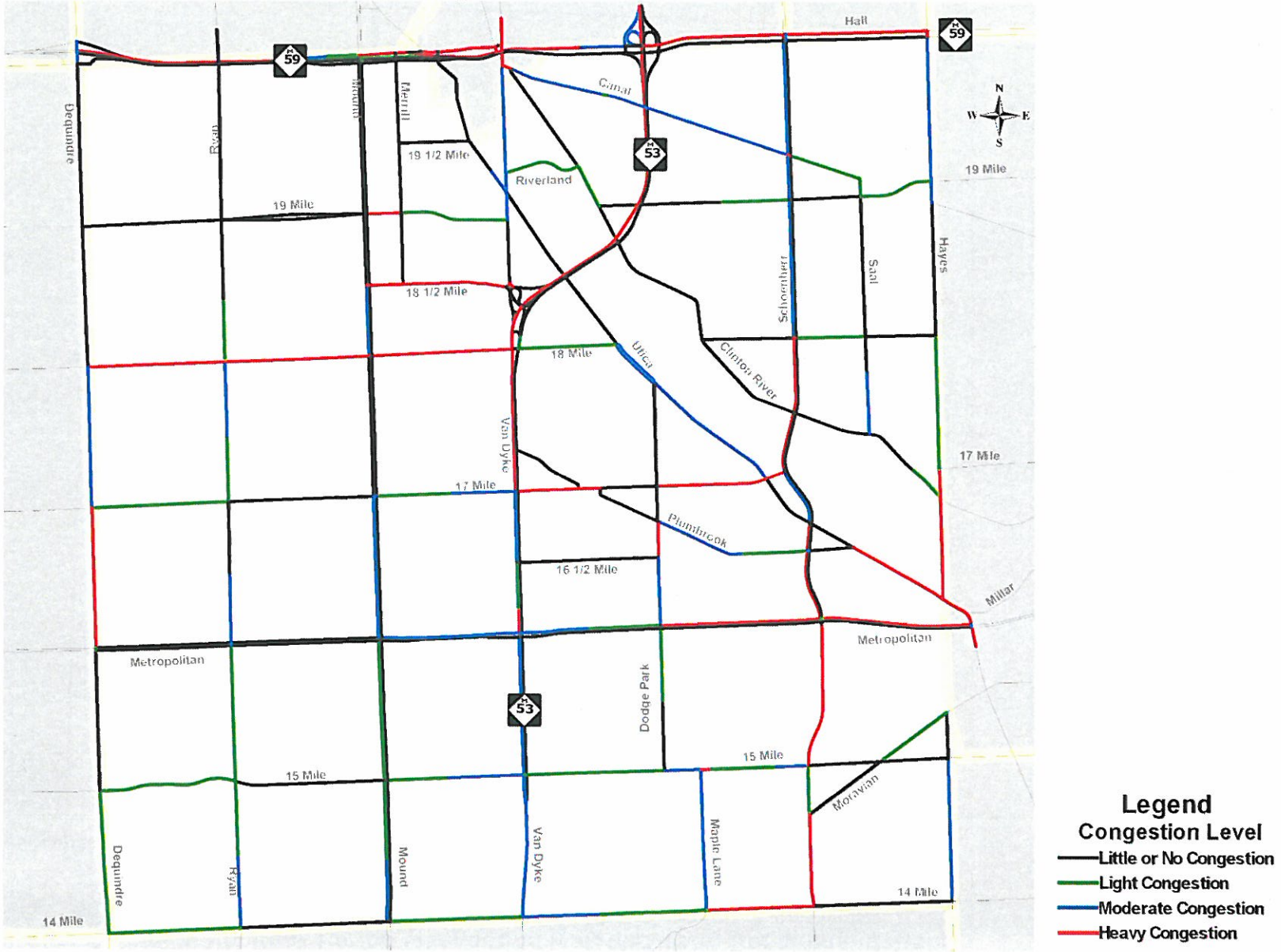


Figure A-4: 2030 PM Peak Period Congestion with Mid-Term Recommendations

Figure A-5: 2030 AM Peak Period Congestion with Long-Term Recommendations without Bridge

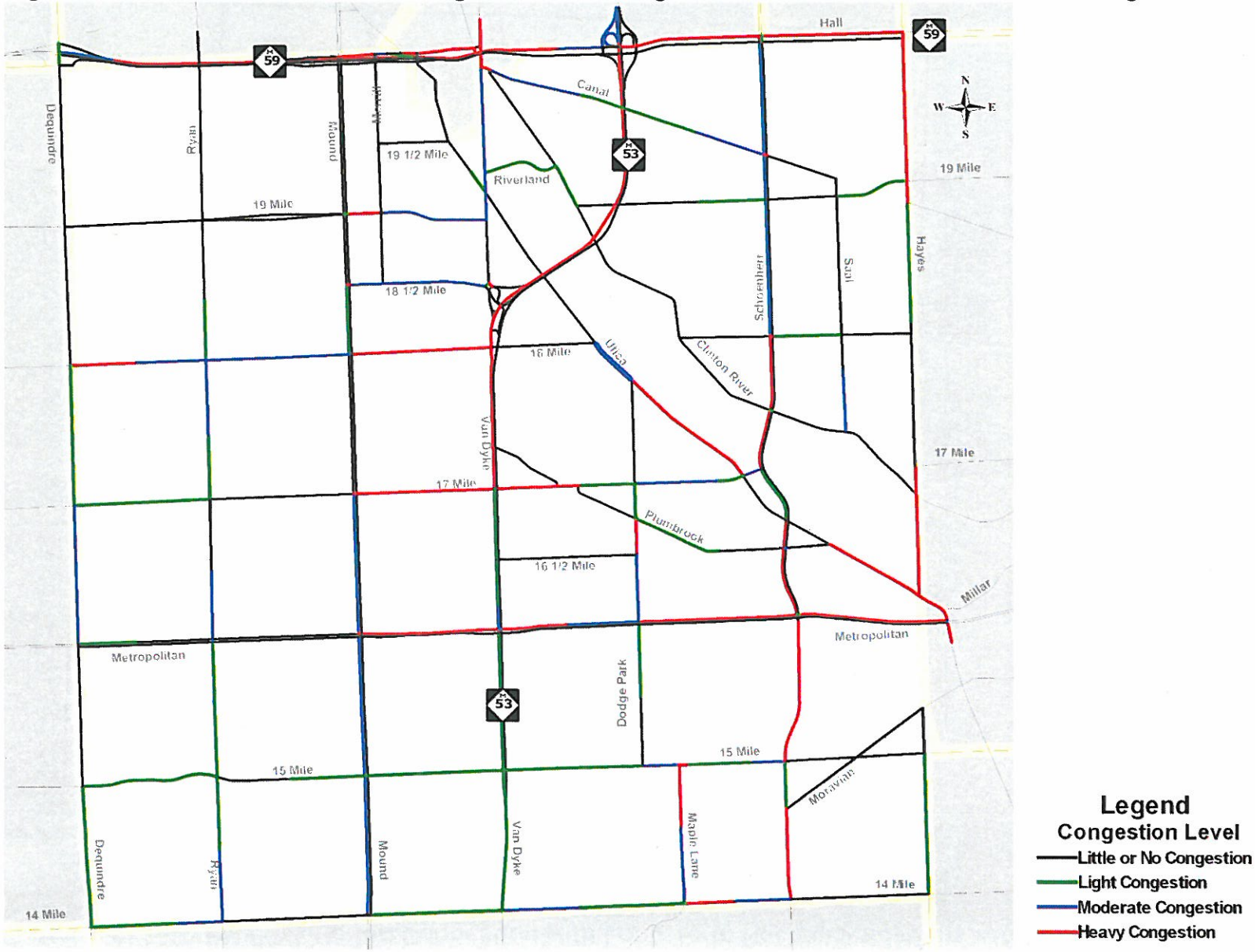


Figure A-6: 2030 PM Peak Period Congestion with Long-Term Recommendations without Bridge

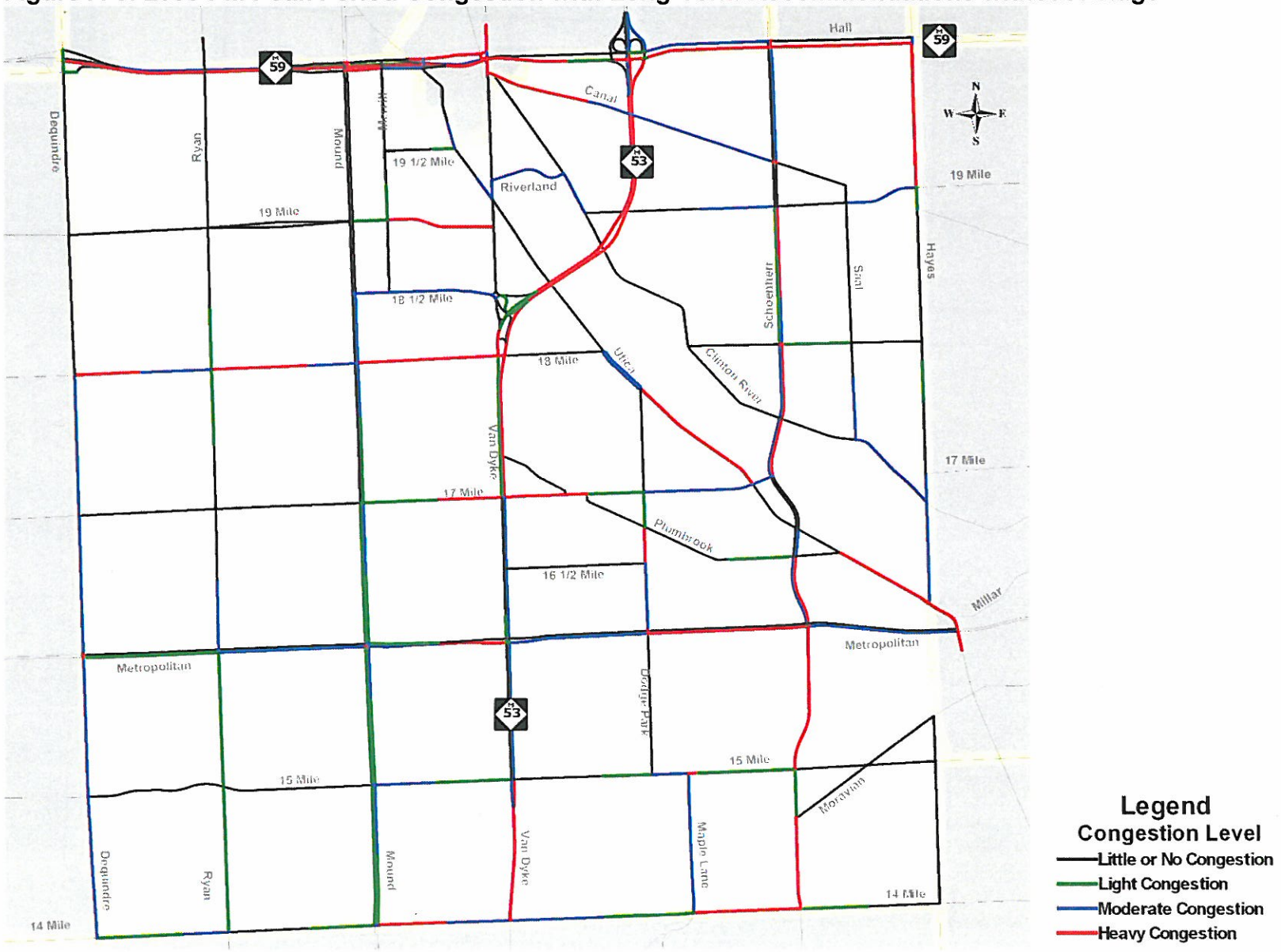


Figure A-7: 2030 AM Peak Period Congestion with Long-Term Recommendations with 19 Mile Road Bridge

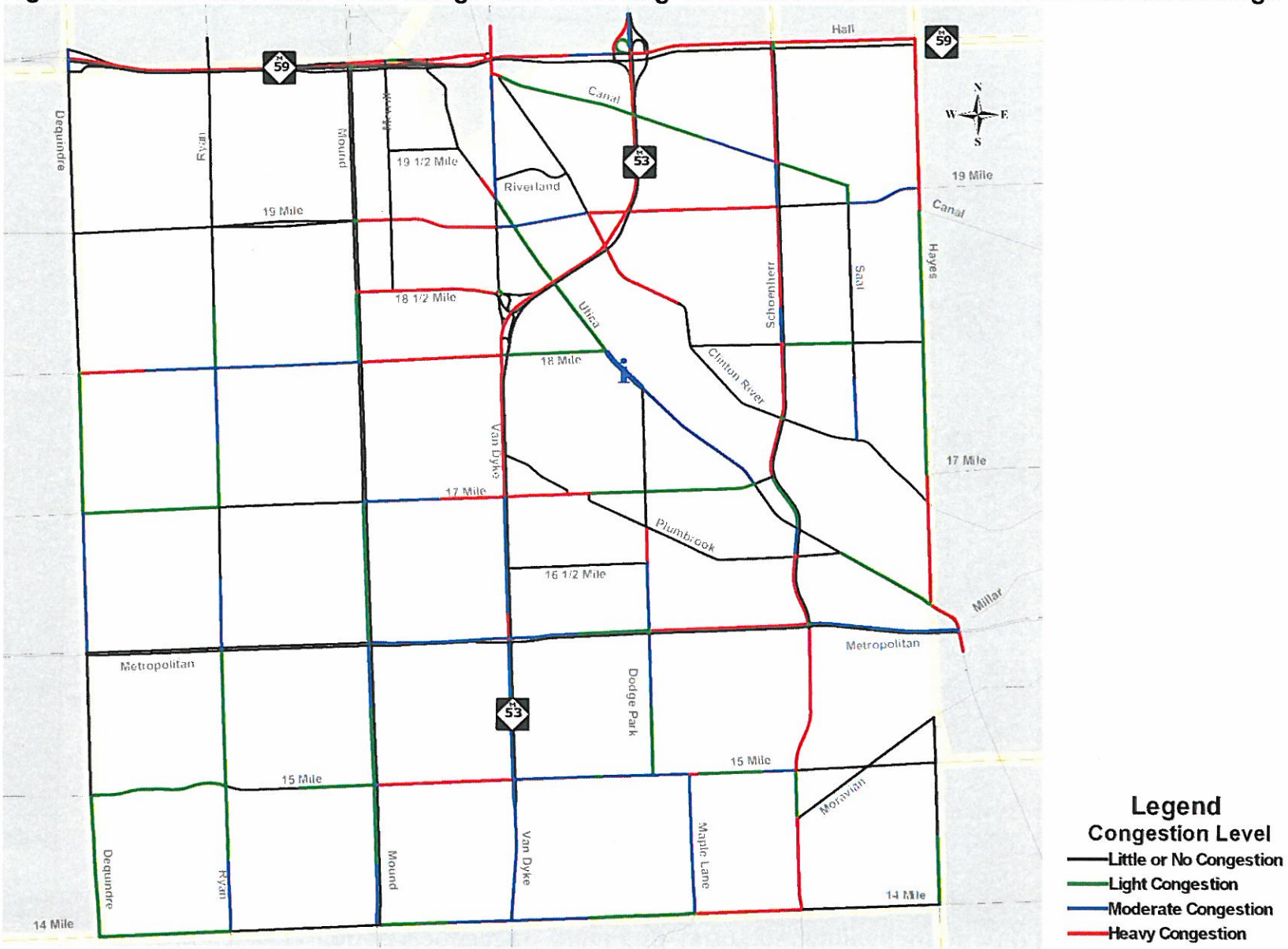


Figure A-8: 2030 PM Peak Period Congestion with Long-Term Recommendations with 19 Mile Road Bridge

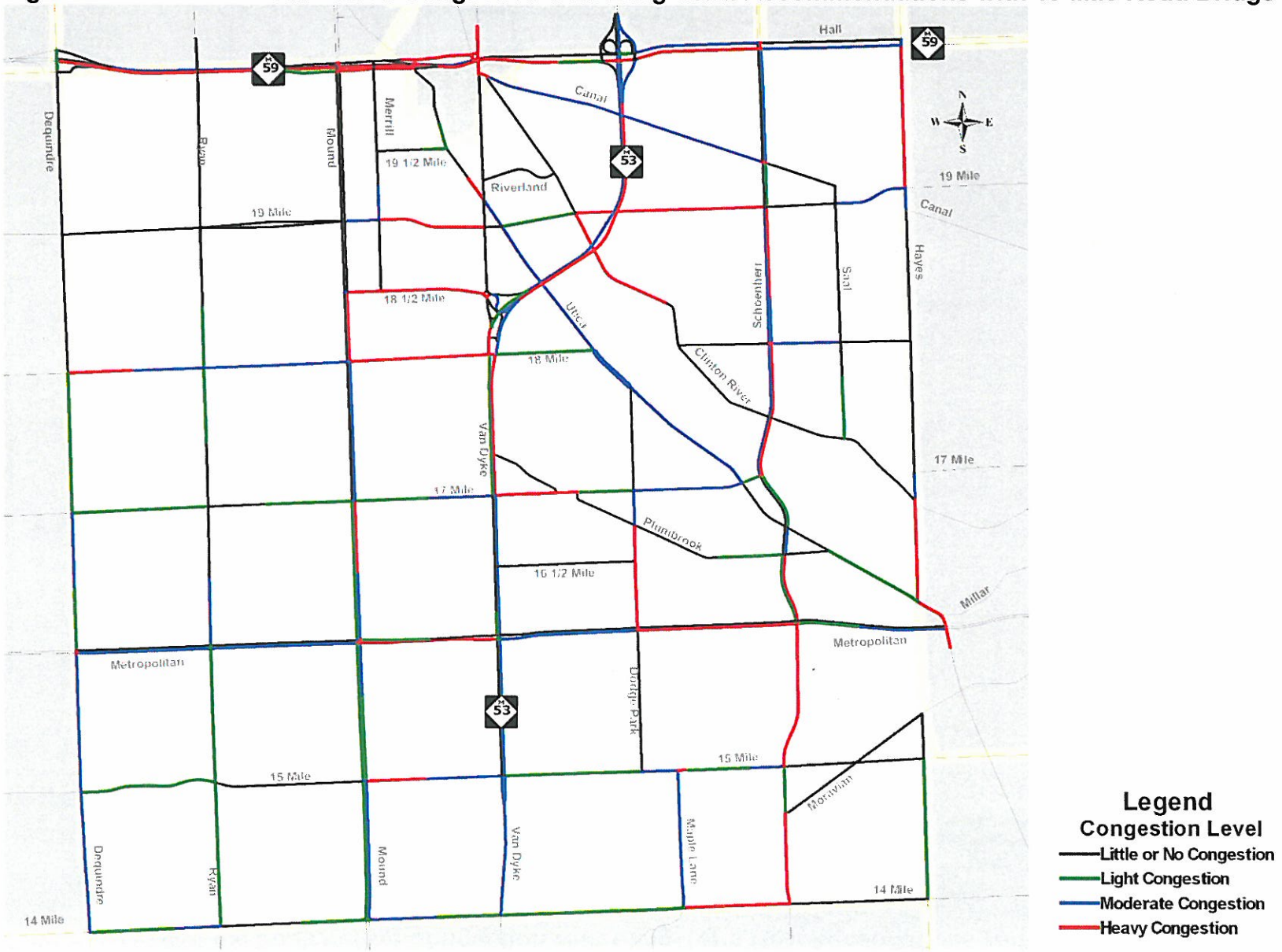


Figure A-9: 2030 AM Peak Period Congestion with Long-Term Recommendations with 18 Mile Road Bridge

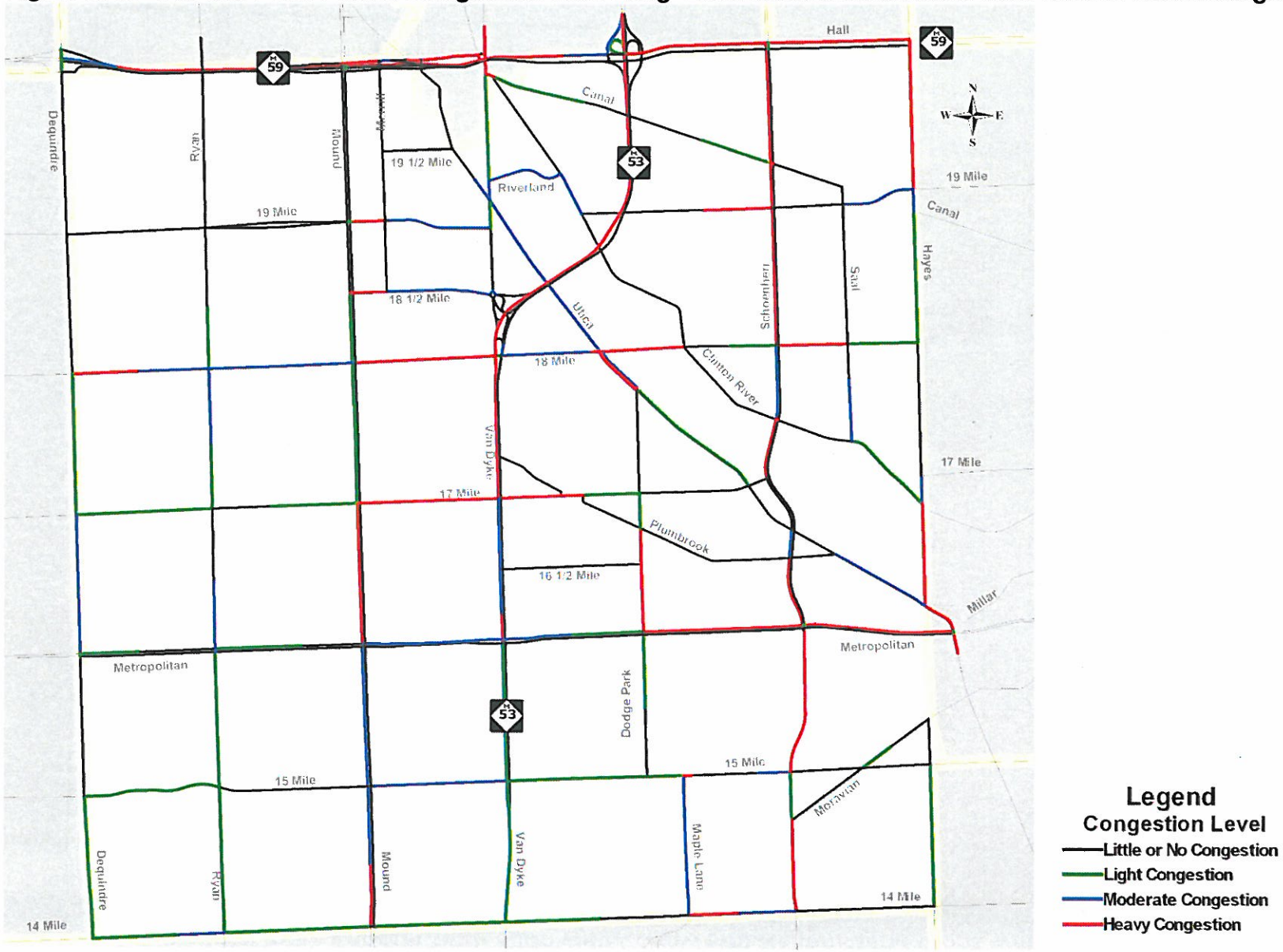
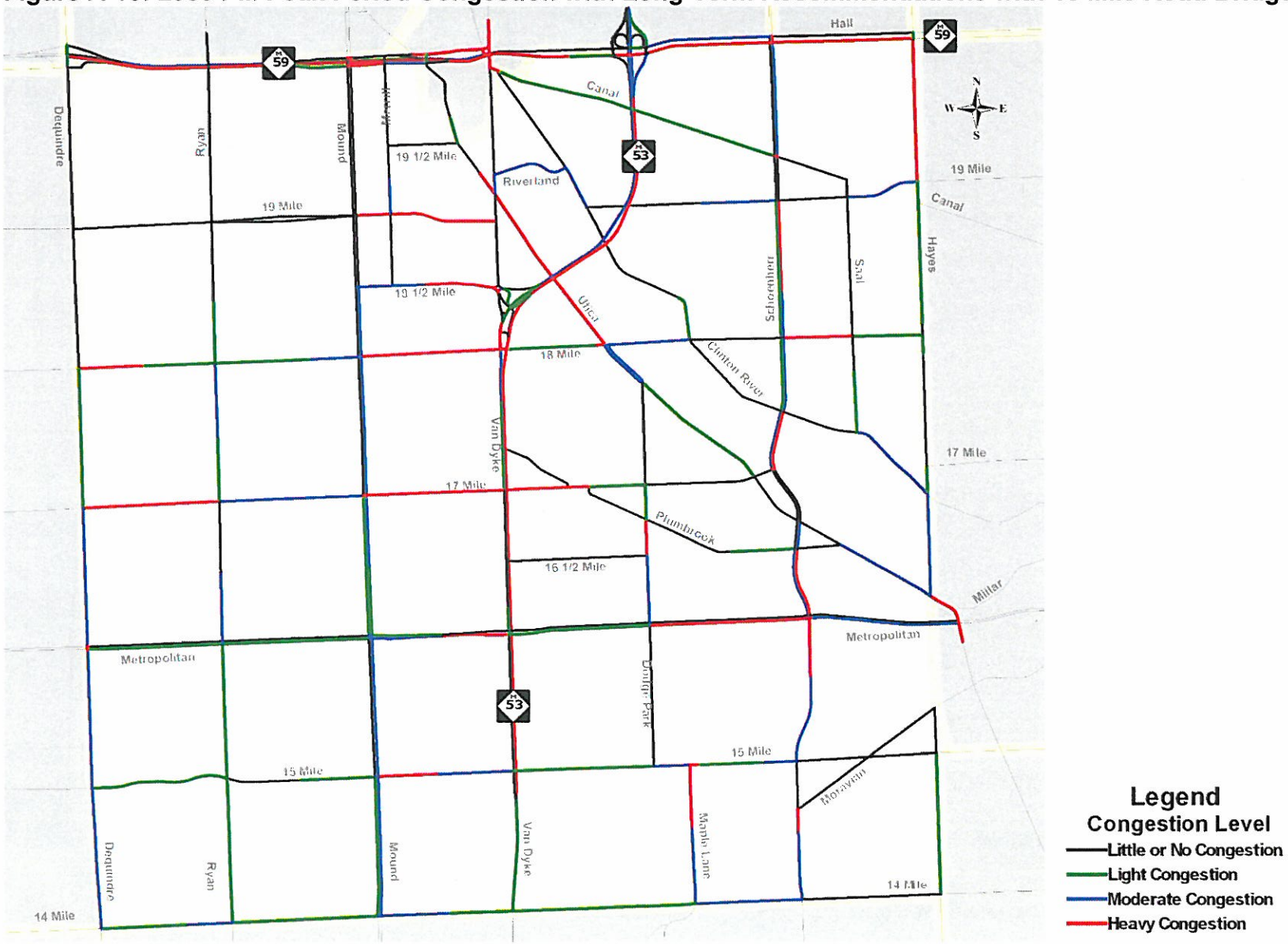


Figure A-10: 2030 PM Peak Period Congestion with Long-Term Recommendations with 18 Mile Road Bridge



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