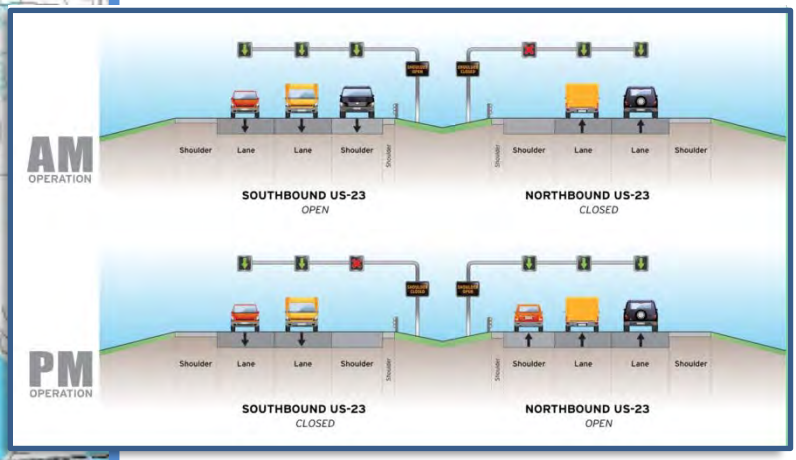
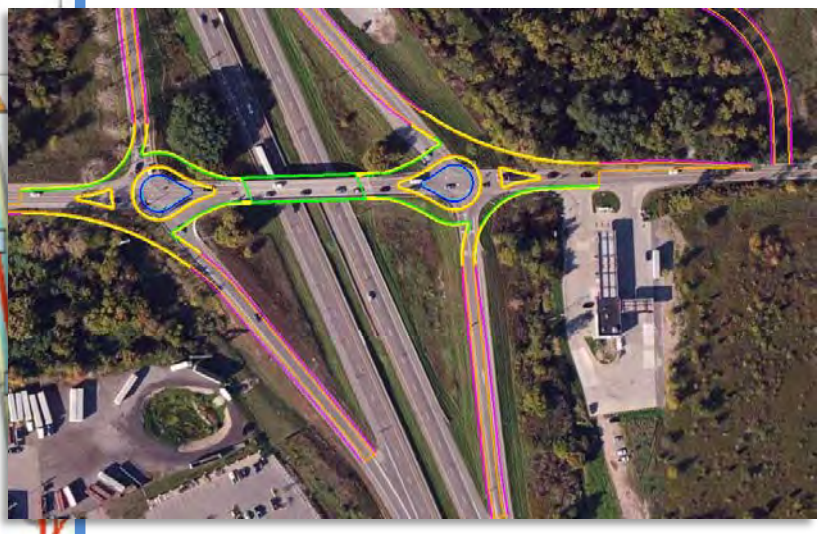


US-23 Improvements

ENVIRONMENTAL ASSESSMENT

M-14/US-23 West Interchange to Silver Lake Road
Washtenaw and Livingston Counties
JN 123214 CS 81075, 47013

January 2015



MDOT
Michigan Department of Transportation

ENVIRONMENTAL ASSESSMENT

Proposed US-23 Improvements from the West US-23/M-14 Interchange (Exit 45) North to the Silver Lake Road Interchange (Exit 55)

Green Oak Township, Livingston County and Northfield and Ann Arbor Townships, Washtenaw County, Michigan

Submitted Pursuant to 42 U.S.C. 4332(2)(c) and 49 U.S.C. 303

by the

U.S. Department of Transportation

Federal Highway Administration

and the

Michigan Department of Transportation

01/21/2015

Date of Approval

For FHWA Division Administrator

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Preface

The National Environmental Policy Act (NEPA) of 1969 requires that social, economic, and natural environmental impacts of any proposed action of the federal government be analyzed for decision-making and public information purposes. There are three classes of action. Class I Actions are those that may significantly affect the environment and require the preparation of an Environmental Impact Statement (EIS). Class II Actions (or "categorical exclusions") are those that do not individually or cumulatively have a significant effect on the environment, and do not require the preparation of an EIS or an Environmental Assessment (EA). Class III Actions are those in which the significance of impacts is not clearly established. Class III Actions require the preparation of an EA to determine the significance of impacts and the appropriate environmental document to be prepared -- either an EIS or a Finding of No Significant Impact (FONSI).

This document is an Environmental Assessment for the proposed US-23 Improvements from the west US-23/M-14 Interchange north to the Silver Lake Road Interchange in Washtenaw and Livingston Counties. It describes and analyzes alternatives, potential impacts, and the measures proposed to minimize harm to the project area. It will be distributed to the public and to various federal, state, and local agencies for review and comment. A formal public hearing on this project will be held. If review and comment by the public and interested agencies support the determination of "no significant impact", this EA will be forwarded to the Federal Highway Administration (FHWA) with a recommendation that a FONSI be issued. If it is determined that the preferred alternative will have significant impacts that cannot be mitigated, the preparation of an EIS will be required.

This document was prepared by the Michigan Department of Transportation (MDOT), in cooperation with FHWA. The study team includes representatives from the following areas within MDOT: Design, Project Planning, Real Estate, Construction and Technology, Traffic and Safety, Transportation Service Centers, and Region offices. Information contained in this EA was also furnished by other federal and state agencies, local units of government, public interest groups, and individual citizens.

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US-23 Improvements Traffic Report

1.0 DESCRIPTION OF THE PROJECT AREA

1.1 *Project Location*

US-23 freeway is a major north-south arterial that begins in Michigan at the Ohio State Line near Toledo, traverses through the cities of Ann Arbor and Flint, runs adjacent to the Lake Huron shoreline and terminates at Mackinaw City. The project corridor is a 10 mile four-lane section of US-23 within Livingston and Washtenaw Counties (Figure 1.0) from the west US-23/M-14 (tri-level) interchange (Exit 45) north to the Silver Lake Road interchange (Exit 55).

1.2 *Existing Conditions*

US-23 experiences directional heavy traffic volumes during the weekday peak commuting hours southbound (SB) in the morning (6:30 - 9AM) and northbound (NB) in the late afternoon (3:30 – 7PM). The congested traffic pattern is not a problem the rest of the day, which is evident in the level of service (LOS) for this segment. LOS is a measure that reflects the density of traffic on a roadway and ranges from LOS A, free flow condition with low traffic density, to LOS F, extremely high congestion with very high traffic density. LOS A, B, and C are considered acceptable traffic flow conditions and LOS D, E, and F reflect levels of traffic congestion. The 2015 morning SB and NB late afternoon peak traffic is LOS D to F. The predicted 2040 LOS degrades to LOS E and F. In contrast, the 2015 and 2040 off-peak level of service is LOS C. Traffic congestion conditions are directional during peak hours with dense SB traffic in the morning and NB traffic in the late afternoon.

Traffic incidents are another cause for traffic congestion in this segment. The corridor experienced 25 traffic incidents from January 2014 through mid-September 2014 with an average lane closure duration of 1 hour and 17 minutes. Mechanical failure is the typical incident with the occasional minor collision due to the bumper-to-bumper traffic experienced during the periods of congestion. These incidents and a lack of redundancy in the local road network adjacent to this segment create traffic flow delays. The lack of places for those involved in an incident to safely pull off the roadway also exacerbates traffic delays.

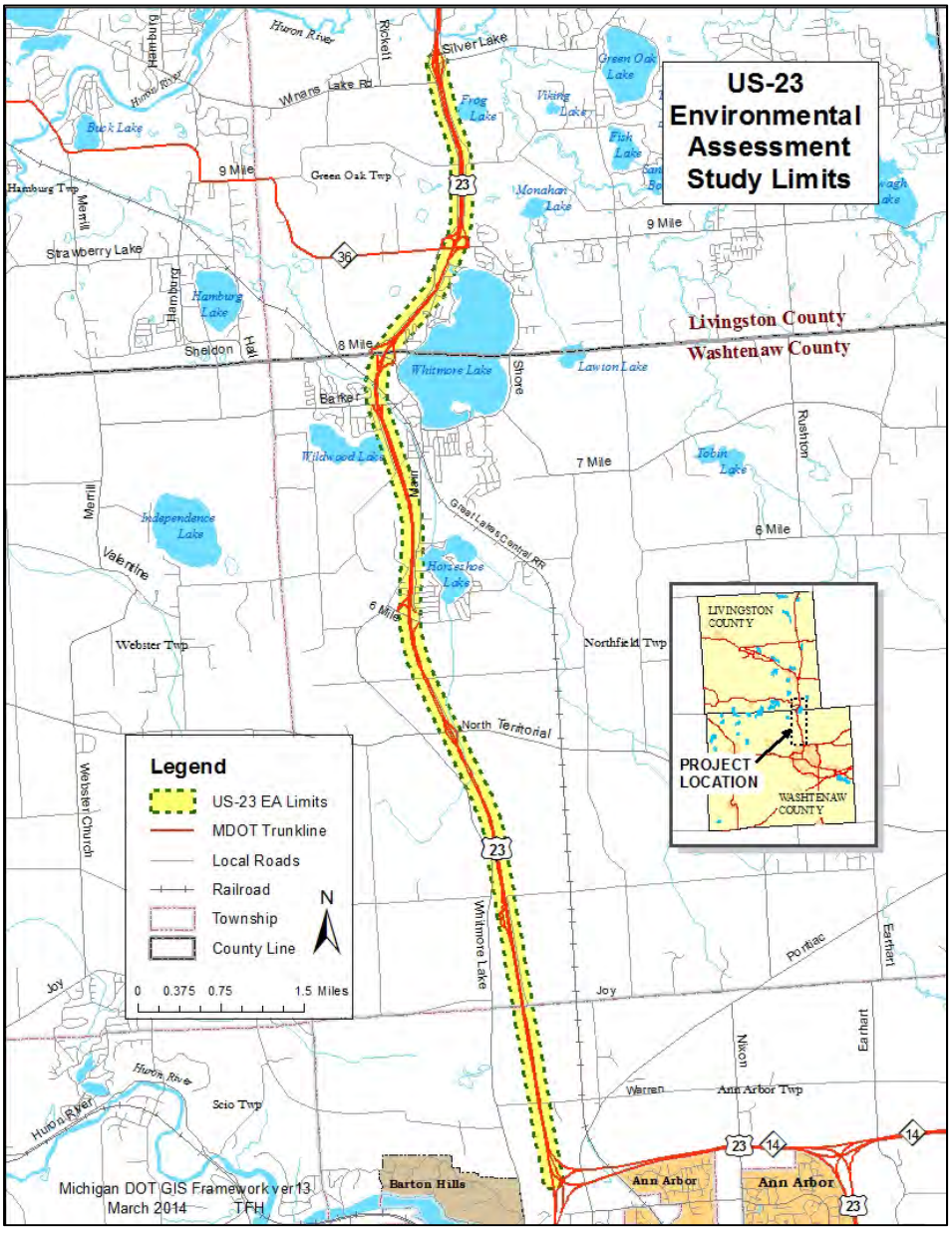
The US-23 bridges were constructed between 1957 and 1962 with a typical design life of fifty years. The National Bridge Inventory (NBI) system rates Highway bridge conditions. The NBI separately rates the bridge deck, superstructure, and substructure. Bridge rating ranges from 9, excellent condition, to 0, failed condition. A “structurally deficient” highway bridge classification occurs if the ratings of the deck, superstructure, or substructure are in "poor" condition (0 to 4 in the NBI rating scale). The bridges over US-23 at 8 Mile, 6 Mile, and North (N.) Territorial Road are determined to be structurally deficient[1]. Moreover, the N. Territorial Road bridge has been posted for weight restrictions. Facilities that are destinations for heavy-

[1]MDOT Highway Bridge Report, March 31, 2014

duty trucks are located near the N. Territorial Road bridge and interchange. These trucks must reroute to other interchanges forcing them to use less direct travel routes to access US-23 or get to their facilities. The two US-23 bridges over the railroad south of 8 Mile Road do not meet current specification for under clearance; in addition, the NB US-23 bridge is rated structurally deficient.

The on-ramps at M-36, 6 Mile, 8 Mile, N. Territorial, and Barker Roads were constructed in the 1960s when the speed limit was 60 miles per hour (mph) with lower traffic volumes. The present speed limit is 70 mph and the existing on-ramps do not provide adequate merging (accelerating) distance for traffic to safely enter onto US-23.

Figure 1.0 – Environmental Assessment Study Corridor



2.0 PURPOSE AND NEED

The purpose is to address the immediate insufficiencies of the corridor as described in the previous section by focusing on traffic safety, operational and infrastructure concerns, and the directional peak hour congestion in the US-23 corridor. The goal is to develop safe, efficient, and sustainable transportation improvements to assure that the corridor will meet the current and future highway operations with the use of state of the art traffic control measures along with improved infrastructure.

The specific needs that the project will address are:

- economically feasibility with regard to restricted funding and rapidly deteriorating infrastructure conditions;
- directional weekday (Monday – Friday) rush hour congestion (southbound morning, 6:30 – 9AM, and northbound late afternoon, 3:30 – 7PM);
- structurally deficient bridges over US-23 at 8 Mile, 6 Mile, North Territorial Roads, and US-23 bridges over state-owned railroad tracks (leased by the Great Lakes Central Railroad);
- on-ramps that are too short for adequate acceleration to safely merge into US-23 traffic at the 6 Mile Road, 8 Mile Road, Barker Road, and N. Territorial interchanges;
- inefficient traffic operations at the corridor interchanges;
- no incident management areas to safely clear and investigate accidents;
- required roadway maintenance on US-23 from the west US-23/M-14 interchange to north of the Silver Lake Road interchange; and,
- required roadway maintenance on the bridges over US-23 at Joy and Warren Roads.

The resulting action will utilize cost effective innovative technologies and methods, expedite the construction schedule, and limit travel disruption during construction.

3.0 ALTERNATIVES

3.1 *US-23 Feasibility Study*

MDOT completed a Feasibility Study in 2009 on the US-23 corridor from south of I-96 to north of the west US-23/M-14 interchange. The Feasibility Study identified both short- and long-term improvements to enhance the US-23 corridor. The intention of the study's findings contained in the planning level document were to act as a guide for investment decisions and a tool to prioritize need and projects within the corridor for the next 20 years. The following are excerpts from the Feasibility Study; the full *US-23 Feasibility Study, M-14 to I-96* is on the MDOT public website at: www.michigan.gov/mdot/0,4616,7-151-9621_11058-226949--,00.html

The study analyzed both traditional and nontraditional improvements:

- **No-Build/Baseline**
- **Local System/Operational Improvements**
- **Transit Service Options**
- **Bus Bypass Shoulders**
- **Additional General Purpose Lanes**
- **Additional High Occupancy Vehicle (HOV) Lanes**
- **Additional High Occupancy Toll (HOT) Lanes**

The Feasibility Study studied corridor opportunities such as a commuter-oriented transit service, tolling, and transit-oriented development for implementation and/or further consideration in future phases of study.

The Feasibility Study recommendations include Near-Term, Mid-Term, and Long-Term opportunities[2]. The following is text from the Feasibility Study that is relevant to this EA:

> "Near-Term Opportunities
>
> ***Deploy ITS Technologies*** along US-23 in the south segment[3] as a means to better monitor congestion and respond to incidents in the area. Non-recurring congestion was found to be a key factor in traffic issues in the corridor, and ITS could help to mitigate this factor by providing improved information to motorists and enabling faster incident clearance.
>
> ***Expand Freeway Courtesy Patrol Program*** currently utilized in MDOT's Metro Region could also help mitigate non-recurring congestion by enabling faster clearance of disabled vehicles from the roadside[4].

[2] Michigan Department of Transportation,*US-23 Feasibility Study, M-14 to I-96*, Bureau of Transportation Planning, 2009, page 88

[3] The ITS deployment for this study focuses on the operation of the ATM from M-36 to the West US-23BR/M-14 interchange.

[4] The Freeway Courtesy Patrol is now operating in the US-23 corridor.

Mid-Term Opportunities:

Replace Critical Bridges at 6 Mile Road and 8 Mile Road that are rated in "Poor" condition and are in need of replacement and would provide the horizontal clearance required for future widening of US-23.

Replace Bridges over US-23 at Warren Road, Joy Road, North Territorial Road, Barker Road, the CSX railroad and 9 Mile Road (M-36). These bridges are designed to carry two lanes of traffic in each direction only and will require lengthening to accommodate potential future widening of US-23.

Operational Improvements to all the interchanges in the study area including the lengthening of all ramp acceleration and deceleration lanes and evaluating ramp terminal operations. This would include adjusting terminal turn lanes, signal optimization and investigating the opportunity for roundabouts. Modifications to the west US-23/M-14 tri-level would improve safety and weaving deficiencies.

Long-Term Opportunities:

Mainline US-23 Reconstruction and Widening is the best long-term solution to improve the current infrastructure conditions and resolve traffic congestion issues. The widening of mainline US-23 would commence with the south segment of US-23 where traffic congestion is the greatest. Consideration should be given to the elimination of the Barker Road interchange to improve traffic flow. It is recommended that all three scenarios for capacity enhancement – Three Lane General Purpose, HOV, HOT – be carried forward for further evaluation in the environmental process, as each was found to present a viable option for improving traffic operations throughout the corridor."

The findings of the Feasibility Study were conceptual and not final. Advancing specific alternative recommendations requires environmental clearance as well as some combination of available federal, state, and local public and private funding sources to be approved, designed and implemented.

3.1.1 Conclusions

The Feasibility Study reviewed the Bus Bypass Shoulders (BBS) as a mobility opportunity. The Feasibility Study did not recommend the BBS so it was not moved forward as an alternative for this EA. However, this EA has taken the concept of the temporal use of shoulders and, along with ITS, expanded it to include all vehicles except heavy-duty trucks during the times of directional peak hour congestion. This operation is identified as an Active Traffic Management (ATM) system and is included in the third and fourth alternatives in this document.

The Three-Lane General Purpose scenario identified under the Feasibility Study's Long-Term Opportunities is not carried forward in this Environmental Assessment. This scenario is not considered in the EA because the economic impacts would be neither feasible nor prudent. According to the Feasibility Study, the cost to widen mainline US-23 in between M-14 and the

Washtenaw County line under the Three Lane General Purpose scenario is $119 million (in 2016 dollars). This cost does not include right-of-way acquisition or the cost to replace the bridges and interchanges between M-14 and M-36. The bridge and interchange replacements are estimated to cost $101 million (in 2016 dollars). The total construction cost of the Three-Lane General Purpose scenario in Washtenaw County is $220 million (in 2016 dollars). Therefore, the high cost of this alternative eliminates the Three Lane General Purpose scenario from consideration.

3.2 *North-South Commuter Rail (WALLY)*

The North-South Commuter Rail from Howell to Ann Arbor, popularly known as the WALLY (Washtenaw – Livingston Rail Line), is not an alternative in this study. However, public comments from the December 2013 and August 2014 public meetings included requests to add the WALLY as a "build alternative". This section is in response to the public comments by explaining the WALLY's relationship to this Environmental Assessment.

The US-23 Modernization EA and the WALLY are concurrent studies and are separate but complementary projects, in that, neither project alone is likely to alleviate congestion in the US-23 corridor entirely, but each concept would be part of the solution. The two studies have separate funding sources. The US-23 Modernization EA is funded entirely with State funds, but must receive FHWA approval before it can proceed to the final design and construction phases. The WALLY study funds have come from donations from the City of Howell, Washtenaw County and the Ann Arbor Downtown Development Authority for further studies of the proposed route and station sites. The Ann Arbor Area Transportation Authority (AAATA) is the designated authority with MDOT serving as its liaison for the purpose of pursuing federal and state grant and funding opportunities. The MDOT Office of Rail, Federal Highway Administration (FHWA) and the Federal Transit Authority (FTA) are among the cooperating agencies.

In 2014, the WALLY study received an FHWA Transportation and Community System Preservation (TCSP) grant and an FTA's Smart Starts (5304) grant. The TCSP is funding a Phase II detailed feasibility study, which began in late summer 2014. Phase II will establish in greater detail the overall feasibility of the North-South Commuter Rail project, including station location analysis and identifying long-term funding, operational plans, and the preliminary environmental analysis relevant to the proposed commuter rail service.

WALLY development will continue with or without US-23 development and will be required to follow the environmental clearance process as defined in the National Environmental policy Act (NEPA) after the feasibility study is complete. The separation of the US-23 Improvement EA and the WALLY Phase II study ensure both projects proceed without delay. The North-South Commuter Rail website[5] contains information on the Phase II study and provides a forum for public comment and suggestion.

[5] http://www.nsrailstudy.com/

3.3 *Alternatives' Summary*

MDOT has considered five alternatives to address the transportation infrastructure and the directional peak hour traffic congestion of the US-23 Improvements project corridor. All the Alternatives are primarily within MDOT right-of-way (ROW) except around the N. Territorial Road bridge replacement and 5 Mile Road realignment that will require some ROW. Each alternative satisfies elements of the purpose and needs of the corridor. The traffic comparative analysis of all build alternatives is in the following section.

The MDOT is implementing Intelligent Transportation Systems (ITS) statewide throughout the highway system and is part of all the alternatives listed here. The ITS will include installation of additional traffic camera locations and electronic message boards to better inform the public of travel conditions by identifying travel times to interchanges, construction dates and times, and traffic incident notification.

3.3.1 "No Build"

The No Build alternative is the baseline alternative to compare traffic and impacts with the Build Alternatives. It includes minor bridgework, ITS, and capital preventive maintenance (CPM) in the US-23 mainline from the west US-23/M-14 interchange north to the Silver Lake Road interchange and on the Joy Road and Warren Road bridges. The No Build is not considered a reasonable alternative because it does not address the functional obsolescence, operational inefficiencies, structural deficiencies of the bridges or ramps, or provide for incident management. Furthermore, it does not address the operational inefficiencies of the interchanges or relieve the directional weekday peak hour traffic congestion. The modeling of this alternative illustrates the continuation of the directional peak period congestion and deterioration of the traffic flow in this corridor through 2040.

3.3.2 Build Alternatives

3.3.2.1 *Transportation Systems Management (TSM)*:

This alternative includes the elements listed in the No Build Alternative, plus, bridge replacements at N. Territorial, 8 Mile, 6 Mile Roads and the US-23 bridges over the Great Lakes Central Railroad. The N. Territorial, 8 Mile, and 6 Mile Roads bridge replacements will be constructed to accommodate pedestrian and non-motorized travel.

The N. Territorial Road bridge replacement includes the realignment of 5 Mile Road to intersect N. Territorial Road approximately 500 feet east of the existing northbound on ramp. Roundabouts will be constructed on N. Territorial Road at the ramp termini (Figure 5.4). The park and ride lot will be removed and will be reviewed for replacement at a later date.

The TSM Alternative also includes ramp extensions and minor operational improvements at intersection terminals such as signal timing changes or storage lanes that do not require right-of-way.

This alternative does address infrastructure needs and some of the operational inefficiencies, but does not present opportunities to relieve the US-23 mainline traffic congestion due to traffic incidents and directional weekday peak hour traffic congestion.

3.3.2.2 *Ramp Metering*:

Ramp metering is the use of traffic signals, typically a signal yellow light, to control the flow of traffic entering a freeway facility. This control aims to maximize the capacity of the highway and prevent traffic flow breakdown and the onset of congestion. This alternative analysis included all the elements listed in the TSM Alternative and includes metering of the following on-ramps:

- 6 Mile Rd. On-Ramp to SB US-23 (300 feet from cross street)
- 8 Mile Rd. On-ramp To SB US-23 (381 feet from cross street)
- M-36 On-Ramp to SB US-23 (311 feet from cross street)
- M-36 On-Ramp to NB US-23 (300 feet from cross street)

Although the addition of ramp metering at these select locations did not result in significant freeway operational improvements, it is anticipated that ramp metering will have an impact on safety by reducing the number of crashes at the merge areas for these metered ramps. This alternative does address infrastructure and some of the operational inefficiencies, but does not present opportunities to relieve the US-23 mainline traffic congestion due to traffic incidents and directional weekday peak hour traffic congestion (SB: 6:30 – 9AM and PM and NB: 3:30 – 7PM).

3.3.2.3 *Active Traffic Management (ATM), Preferred Alternative*:

This Alternative includes all the elements listed in the TSM Alternative, six crash investigation sites (CIS) and an active traffic management (ATM) system. The ATM includes dynamic shoulder use from the west US-23/M-14 interchange to south of the M-36 interchange, to relieve the directional peak period traffic congestion. The southbound (SB) shoulders will only be open to traffic during the typical AM peak period of 6:30 – 9AM. The northbound (NB) shoulders will only be open to traffic during the typical PM peak period of 3:30 – 7PM. The shoulders will be restricted to passenger vehicles and light-duty trucks. The shoulders will also be available for traffic diversion in the event of mainline incidents; such as, collisions, mechanical breakdowns, or when traffic meets congestion thresholds during off-peak hours due to special event traffic or seasonal fluctuations. This Alternative requires the reconfiguration of the 8 Mile Road interchange along with its bridge replacement due to the widening of the US-23 bridges over the railroad to accommodate the dynamic shoulder use configuration. It also requires the widening of the US-23 bridges over Barker Road to accommodate the dynamic shoulder use configuration.

This alternative alleviates the stop-and-go traffic conditions that currently exist on US-23. Because of this, SB US-23 would experience some congestion near the US-23/M-14 interchange. MDOT has developed a design strategy to mitigate this congestion. MDOT is investigating a four-lane treatment that will start south of the Warren Road bridge and provide four lanes at the US-23 and M-14 split (two lanes to each roadway). The additional lane will not require any

additional right-of-way. This option could reduce the traffic congestion during the peak hours near the US-23/M-14 interchange.

This is the Preferred Alternative as it fulfills all the elements of the purpose and need and is the focus of this document. The features of the Preferred Alternative are represented in Figure 3.0 and are presented in Section 5.0.

3.3.2.4 *ATM with High Occupancy Vehicles (ATM-HOV)*:

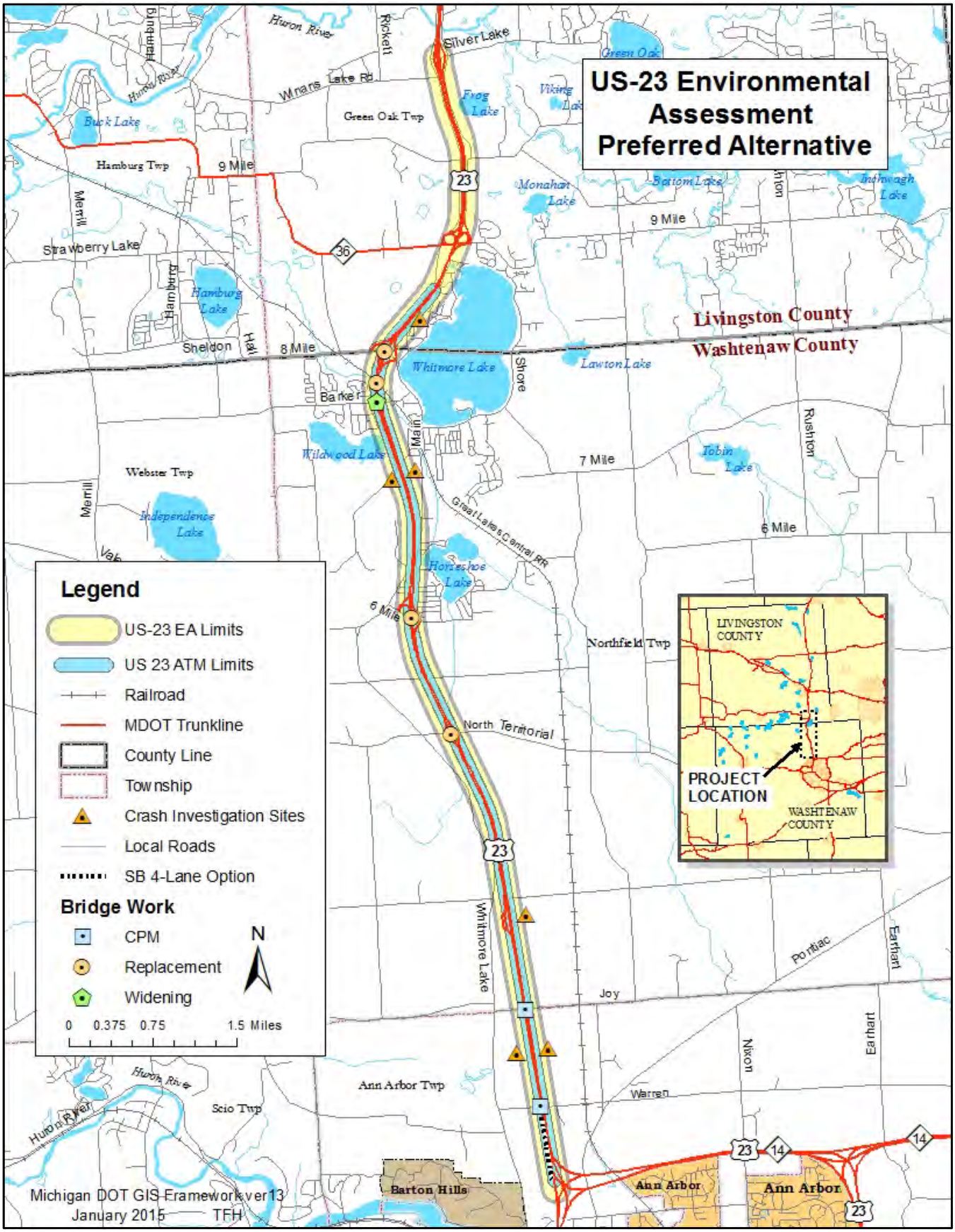
This alternative includes all the elements listed in the ATM Alternative, except the dynamic shoulder use during the periods of directional peak hour traffic would be designated an HOV lane and will only be available for passenger vehicles and small trucks with 2 or more occupants.

The HOV dynamic shoulder use has many issues with regard to enforcement and safety. The State of Michigan does not have a specific law to enforce HOV only lanes. Such lanes can be enforced under the Michigan Vehicle Code 257.642 mandating adherence to traffic control devices, such as, signage or electronic message boards restricting lane usage. The frequently asked questions associated with the FHWA pooled fund study, *HOV Lane Enforcement Handbook* (2006),[6] reported difficulty in recognizing a violating vehicle (detecting that there are 2 or more people in the vehicle) during periods of heavy traffic. The designation of the median shoulder for HOV-only during the peak periods would require that police officers enforce the managed shoulder during heavy traffic volumes to ensure its success. There is no inside shoulder with this alternative where police officers can safely pull over a vehicle for an HOV violation. Either the police officers would need to block the median shoulder lane to pull over a vehicle, which would block the flow of traffic in that lane, or they would need to signal for the violating vehicle to pull the vehicle over in the right shoulder, which would be very difficult and dangerous. Both of these situations could result in a significant reduction to the US-23 capacity during the peak period or develop unsafe situations for police officers and other drivers. Camera enforcement could improve the enforcement of HOV. However, Michigan does not have the legislation or the infrastructure and resources to support camera enforcement at this time.

The ATM-HOV Alternative does fulfill most of the elements of the purpose and need, but due to the enforcement and safety issues it is not a preferred alternative.

[6] https://hovpfs.ops.fhwa.dot.gov/hov_pfs_members/docs/projects/10/enforce_faq.pdf

Figure 3.0 – Preferred Alternative



4.0 TRAFFIC ANALYSIS

The Preferred Alternative is the focus of this section with the information taken from the accompanying *US-23 Improvements Traffic Analysis Report's* (Traffic Report). The report analyzes the traffic for all the Alternatives.

4.1 *Comparative Traffic Analysis*

The comparative traffic analysis takes into account the operational and safety issues stated in the purpose and need (Section 2.0) in making a determination on the preferred alternative.

4.2 *Peak Hour Congestion*

It is difficult to compare the overall benefits of the build alternatives by just comparing the LOS from the VISSIM simulation (see Section 5 in the Traffic Report) because each of the build alternatives shows improvements at different areas along the US-23 corridor. Therefore, the average travel time was computed (using VISSIM) for each of the alternatives to further compare the overall benefits. The travel time was set up to measure from M-14 to I-96 in order to capture any queuing that could occur along the corridor (14.7 miles southbound and 14.6 miles northbound). Table 4.0 summarizes the average travel time for each alternative.

Table 4.0 – US-23 Travel Time Summary (average minutes between M-14 and I-96)

Travel Time (M-14 to I-96)	Existing RITIS[7] /VISSIM (2015)	No-Build (2040)	TSM (2040)	Improvement	Ramp Metering	Improvement	ATM (2040)	Improvement	ATM-HOV (2040)	Improvement
SB in AM	16.8/14.8	15.8	15.7	0.6 %	15.7	.6 %	14.4	8.9 %	15.4	2.5 %
NB in PM	15.7/14.7	15.1	14.8	2.0 %	14.9	1.3 %	14.4	4.6 %	15.1	0 %

As mentioned above, the travel time from the VISSIM simulation takes into account ideal conditions. Although the VISSIM model was calibrated to match existing conditions as much as possible, the field measurements of travel time for SB US-23 in the AM and NB US-23 in the PM showed that travel times vary day to day[8]. Therefore, the travel time savings realized by each of the build alternatives is anticipated to be larger than what is shown in Table 4.0. For comparison purposes, the percent change in travel time was used as a measurement of peak hour congestion management.

The ATM alternative showed the highest percent improvement in travel time for both the AM and PM peak periods. For the AM peak, the ATM-HOV showed the second highest improvement in travel times, and for the PM peak period, the TSM alternative showed the second highest improvement in travel times.

[7] RITIS = Regional Integrated Transportation Information Software which tracks speed along the corridor

[8] Described in Section 2 of the *US-23 Improvements Traffic Analysis Report*

It is important to note that although the travel time results from VISSIM do not show large improvements in peak period travel time for the US-23 corridor, the ATM and ATM-HOV alternative are servicing more people and vehicles during the AM and PM peak. The ATM alternative shows that traffic will be diverted from other slower routes over the next twenty years (8 to 18% depending on the location and time period[9]), and the ATM-HOV alternative shows about a 5% increase in vehicular traffic (with the HOV lane carrying vehicles with 2 or more persons). Therefore, it is important to note that although the percent increase in the US-23 travel time is low, there are more people-trips benefiting from the improved travel time.

4.3 *Ramp Operation*

As indicated in the purpose and need, it is desirable to improve the operation of the ramp merge and diverge points along US-23. Tables 4.1 and 4.2 shows the LOS results of the ramp merge and diverge points for SB and NB US-23.

Although the TSM and Ramp Metering alternatives improve the operation of the ramp merge and diverges along US-23, there is not significant improvement in the ramp performance with these alternatives.

With the ATM and ATM-HOV alternatives, the median shoulder is able to carry some of the heavy US-23 traffic, which reduces the amount of traffic in the outside right lane. The VISSIM simulation shows that this creates more gaps in the mainline traffic and improves performance at the on and off-ramps.

[9] –*US-23 Improvements Traffic Analysis Report,* Appendix A-6 "Traffic Methodology"memo

Table 4.1 – VISSIM LOS Results for Ramp Operation (SB US-23 in the AM Peak Hour)

Ramp	No-Build	TSM	Ramp Metering	ATM	ATM-HOV
Exit at M-36	B	B	B	B	B
Entrance at M-36	B	B	B	B	B
Exit at 8 Mile Road	B	B	B	B	B
Entrance at 8 Mile Road	C	C	C	B	B
Entrance at Barker Road	D	C	C	B	B
Exit at 6 Mile Road	C	C	C	B	B
Entrance at 6 Mile Road	D	D	C	B	C
Exit at North Territorial Road	E	E	E	C	D
Entrance at North Territorial Road	F	F	F	E	F
SB US-23 to EB M-14	B	B	B	C	C
SB US-23 to WB M-14	B	B	B	F	F

Table 4.2 – VISSIM LOS Results for Ramp Operation (NB US-23 in the PM Peak Hour)

Ramp/Alternative	No-Build	TSM	Ramp Metering	ATM	ATM-HOV
Entrance at M-36	D	C	C	C	C
Exit at M-36 WB	C	C	C	C	C
Exit at M-36 EB	B	C	B	B	C
Entrance at 8 Mile Road	C	C	C	B	B
Exit at 8 Mile Road	B	B	B	B	B
Exit at Barker Road	C	C	C	B	B
Entrance at 6 Mile Road	D	C	C	B	B
Exit at 6 Mile Road	C	C	C	B	B
Entrance at North Territorial Road	F	D	D	B	B
Exit at North Territorial Road	D	C	D	B	B
WB M-14 to NB US-23	B	B	B	C	C
EB M-14 to NB US-23	B	B	B	B	B

4.4 *Safety*

For the TSM alternative, several improvements were made to improve the operation of the freeway and interchanges. The extension of the ramp acceleration and deceleration lengths should improve the safety at the merge and diverge areas. However, the TSM alternative does not address the stop-and-go congestion issue along US-23, and therefore, does not address the rest of the congestion related crashes near the ramps.

The Ramp Metering alternative will also have similar benefits to safety as the TSM alternative. In addition, the ramp metering should further reduce crashes associated with merging traffic at the merge areas of the metered ramps with US-23.

Both the ATM and the ATM-HOV would use the median shoulder to help relieve traffic congestion along US-23 within the study area. The VISSIM model simulation shows that with the use of the ATM shoulder during peak periods, there are more gaps and larger headways for the on-ramp traffic to merge into, which helps eliminate the slow-down due to merging traffic. In addition, the median shoulder would be used to maintain traffic during an incident, which should decrease the likelihood of secondary crashes due to traffic backups.

4.5 *Incident Management*

For the TSM and Ramp Metering alternatives, there is little to no impact to the operational conditions for incident management. Both the ATM alternative and the ATM-HOV alternative address the need to improve operations when there is an incident blocking the shoulder, or one or more lanes. With both of these alternatives, traffic would be actively managed to use the shoulder so there would be additional lanes for managing the traffic. This should improve the reliability of US-23 because of the frequency that the right shoulder is blocked on this corridor. Also, by clearing traffic more efficiently, this should result in a decrease in secondary crashes that happen in the traffic backups.

In an attempt to quantify the operational benefits of the ATM alternatives during an incident, VISSIM models were created to compare the impacts of a lane closure. For comparison purposes, a short right lane closure was modeled near the N. Territorial Rd. interchange and compared for the TSM and the ATM alternatives. The results are presented in the following table.

Table 4.3 Estimated Travel Time during an Incident (right lane closure)

Direction*	TSM with Lane Closure (minutes)	ATM with Lane Closure (minutes)	Improvement
Southbound in AM	33.9	19.1	43.7%
Northbound in PM	30.6	15.1	50.7%

*travel time is between I-96 and M-14

The results indicate that the ATM and ATM-HOV alternatives, which involve use of the median shoulder for incident management, could improve travel times by up to 50 percent during the peak periods during an incident that blocks a lane (as compared to the non-ATM alternatives).

4.6 *Interchange Operations (Intersection Analysis)*

As part of the Environmental Assessment, the interchanges within the study area were analyzed and the operations were compared for each alternative. Tables 4.4 and 4.5 summarize the AM and PM LOS results for the intersections within the interchange areas that had movements with LOS D or below or that had backups that caused other operational issues. The LOS for all other intersections is shown in Appendix A-5 of the Traffic Report.

For the TSM and Ramp Metering alternatives, there was no traffic volume change over the No-Build conditions for the intersections within the study area. The Ramp Metering alternative did not impact the intersection terminals so the results of the Ramp Metering alternative were the same as the TSM alternative.

With the ATM-HOV, the volumes changes were minor and did not have a major impact on intersection performance. For the ATM alternative, there were shifts in the traffic volume (as shown in Appendix A-2 of the Traffic Report), however, only the interchange of US-23 and N. Territorial Rd. had significant volume changes.

Because the volumes at most of the interchanges did not change significantly for the alternatives, the results between the build alternatives are very similar.

4.6.1 US-23 and North Territorial Rd. Interchange

For all the build alternatives, both the US-23 NB ramp terminal and the US-23 SB ramp terminals were changed from signalized intersections to roundabouts resulting in significant operational improvements (LOS A without significant queuing).

4.6.2 US-23 and 6 Mile Rd. Interchange

Again, for all of the build alternatives, the intersection of the US-23 NB off-ramp to 6 Mile Rd. was modified from a 2-way to a 4-way stop, which improved the operation for all of the build alternatives, especially improving the queuing on the northbound off-ramp. However, under the ATM-HOV alternative, the westbound movement drops to LOS E (but without impact to US-23 traffic). Also for the ATM-HOV alternative, the westbound movement at the southbound off-ramp operates at LOS E.

4.6.3 US-23 and 8 Mile Rd. Interchange

If the layout of the 8 Mile Rd. interchange remains with signalized control for all of the intersections, the eastbound through movement would operate at LOS E for all of the build alternatives. This eastbound movement, however, does not impact the operation of US-23. Another concept is being proposed for this interchange (for all of the build alternatives) which has roundabouts at all of these intersections. With this concept, all interchange intersections would operate at LOS A.

Table 4.4 – Comparative Intersection Level-of-Service for AM Peak Hour for All Alternatives

Alternative	Eastbound			Westbound			Northbound			Southbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
SB Ramps at Silver Lake Rd												
No Build	-	A	A	A	A	-	-	-	-	E	E	E
TSM	-	A	A	A	A	-	-	-	-	E	E	E
Ramp Metering	-	A	A	A	A	-	-	-	-	D	-	D
ATM	-	A	A	A	A	-	-	-	-	D	-	D
ATM-HOV	-	A	A	A	A	-	-	-	-	E	-	E
NB Ramps at Silver Lake Road												
No-Build	A	A	-	-	A	A	F	-	F	-	-	-
TSM	A	A	-	-	A	A	F	-	F	-	-	-
Ramp Metering	A	A	-	-	A	A	F	-	F	-	-	-
ATM	A	A	-	-	A	A	F	-	F	-	-	-
ATM-HOV	A	A	-	-	A	A	F	-	F	-	-	-
M-36 at Whitmore Lake Road												
No-Build	-	F	B	D	D	D	E	E	E	F	F	F
TSM	-	F	B	D	D	D	E	E	E	F	F	F
Ramp Metering	-	F	B	D	D	D	E	E	E	F	F	F
ATM	-	F	B	D	D	D	E	E	E	E	E	E
ATM-HOV	-	F	B	D	D	D	E	E	E	E	E	E
SB On Ramp M-36 (and Park and Ride Lot)												
No-Build	A	A	A	A	A	-	F	F	F	-	-	-
TSM	A	A	A	A	A	-	F	F	F	-	-	-
Ramp Metering	A	A	A	A	A	-	F	F	F	-	-	-
ATM	A	A	A	A	A	-	F	F	F	-	-	-
ATM-HOV	A	A	A	A	A	-	F	F	F	-	-	-
M-36 at Fieldcrest												
No-Build	A	A	-	-	A	A	-	-	-	F	-	F
TSM	A	A	-	-	A	A	-	-	-	F	-	F
Ramp Metering	A	A	-	-	A	A	-	-	-	F	-	F
ATM	A	A	-	-	A	A	-	-	-	F	-	F
ATM-HOV	A	A	-	-	A	A	-	-	-	F	-	F
8 Mile Road at Whitmore Lake Road13												
No-Build	-	F	-	-	A	C	-	-	-	D	-	B
TSM*	-	F	-	-	A	C	-	-	-	D	-	B
Ramp Metering*	-	F	-	-	A	C	-	-	-	D	-	B
ATM*	-	E	-	-	A	C	-	-	-	D	-	B
ATM-HOV*	-	E	-	-	A	C	-	-	-	D	-	B
NB Ramps at 6 Mile Road												
No-Build	A	A	-	-	A	A	F	C	C	C	-	C
TSM	B	B	-	-	C	C	B	B	B	B	-	D
Ramp Metering	B	B	-	-	C	C	B	B	B	B	-	D
ATM	B	B	-	-	C	C	B	B	B	B	-	D
ATM-HOV	B	B	-	-	E	E	B	B	B	B	-	E
North Territorial Road at Whitmore Lake												
No-Build	D	F	-	D	B	-	D	B	-	D	D	-
TSM	B	E	-	D	B	-	C	C	-	C	D	B
Ramp Metering	B	E	-	D	B	-	C	C	-	C	D	B
ATM	B	E	-	C	B	-	C	C	-	C	D	-
ATM-HOV	B	E	-	D	B	-	C	C	-	C	D	-

*This intersection was analyzed with only signal timing improvements. However, a proposed roundabout option as presented in the Environmental Assessment would operate at LOS A for all roundabouts at this interchange. The results of this analysis are presented in Appendix A-3 of the traffic report.

NOTE: "-" in table means turning operation does not exist

Table 4.5 – Comparative Intersection Level-of-Service for PM Peak Hour (2040)

Alternative	Eastbound			Westbound			Northbound			Southbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Whitmore Lake and Silver Lake Road												
No Build	-	-	-	F	-	F	-	C	C	C	C	-
TSM	-	-	-	F	-	F	-	C	C	C	C	-
Ramp Metering	-	-	-	F	-	F	-	C	C	C	C	-
ATM	-	-	-	F	-	F	-	C	C	C	C	-
ATM-HOV	-	-	-	F	-	F	-	C	C	C	C	-
NB Ramps at Silver Lake Rd.												
No-Build	A	A	-	-	A	A	F	-	F	-	-	-
TSM	A	A	-	-	A	A	F	-	F	-	-	-
Ramp Metering	A	A	-	-	A	A	F	-	F	-	-	-
ATM	A	A	-	-	A	A	F	-	F	-	-	-
ATM-HOV	A	A	-	-	A	A	F	-	F	-	-	-
M-36 at Whitmore Lake Rd.												
No-Build	F	F	B	F	F	F	C	C	C	E	E	E
TSM	F	F	B	F	F	F	C	C	C	E	E	E
Ramp Metering	F	F	B	F	F	F	C	C	C	E	E	E
ATM	F	F	B	F	F	F	C	C	C	D	D	D
ATM-HOV	F	F	B	F	F	F	C	C	C	E	E	E
NB Ramp and 6 Mile Road												
No-Build	A	A	-	-	A	A	D	F	F	F	-	F
TSM	D	D	-	-	B	B	A	C	C	B	-	A
Ramp Metering	D	D	-	-	B	B	A	C	C	B	-	A
ATM	D	D	-	-	B	B	A	C	C	B	-	A
ATM-HOV	D	D	-	-	B	B	A	C	C	B	-	A

NOTE: "-" in table means turning operation does not exist

4.6.4 Other US-23 Interchanges

For all of the other intersections at the US-23 interchanges within the study area, the operation remains the same as compared to the No-Build conditions. There are some movements that operate at LOS E or F during the peak periods. However, these movements were evaluated to ensure that the short-term operation and queuing does not interfere with the operation of US-23.

4.7 *Summary*

Table 4.6 summarizes how each alternative meets the traffic and safety related objectives of the purpose and need on a scale of low to high. As demonstrated in this table, the ATM and ATM-HOV alternatives meet these goals better than the other alternatives. The ATM and ATM-HOV alternatives meet the need of incident management and safety at a "high" level compared to the other alternatives because these alternatives allow the use of the median shoulder to manage traffic during incidents. By managing traffic incidents more efficiently, secondary crashes due to incident congestion should also be reduced. In addition, the ATM and ATM-HOV alternatives allow more people to use the US-23 corridor at an improved travel time by diverting traffic off of other slower routes (such as indirect secondary road routes).

Table 4.6 Alternative Comparison

Need for Improvement	TSM	Ramp Metering	ATM-General Purpose	ATM-HOV
Peak Hour Congestion	Low	Low	Medium	Medium
Safety	Medium	High	High	High
Ramp Operation	Medium	Medium	Medium	Medium
Incident Management	Low	Low	High	High
8 Mile, 6 Mile, and Territorial Interchanges	High	High	High	High
Other Corridor Interchanges	Low	Low	Low	Low

5.0 PREFERRED ALTERNATIVE FEATURES

5.1 *Active Traffic Management (ATM)*

The ATM includes Intelligent Transportation System (ITS) with traffic cameras and electronic message boards, and dynamic shoulder use only during the periods of directional peak period congestion. The traffic cameras will be monitored through the Southeast Michigan Traffic Operations Center (SEMTOC). Street lighting and other ITS devices and technologies that collect and disseminate traffic information in real time installed along the ATM corridor will enhance the cameras' effectiveness during low visibility periods. They will monitor the corridor for incidents that may cause traffic congestion and notify the MDOT Courtesy Patrol for public assistance for minor incidents or Michigan State Police for collisions or possible suspicious behavior.

The ATM will only use the inside median shoulders for the dynamic shoulder use during the directional peak hour congestion (SB from 6:30 – 9AM and NB from 3:30 – 7PM) with lane availability indicated by electronic signage on gantries over the roadway. The gantries will be spaced ½ to 1 mile apart. In addition, US-23 will be monitored for congestion outside those periods in the event of mainline incidents; such as, collisions, mechanical breakdowns, or when traffic meets congestion thresholds during off-peak hours due to special event traffic or seasonal fluctuations. The shoulders at those times will be available for traffic diversion. Figure 5.0 illustrate the operation of the ATM dynamic shoulder use. Figure 5.1 shows the existing US-23 lane configuration cross section and Figure 5.2 shows the proposed US-23 ATM lane configuration cross section.

Figure 5.0 – Active Traffic Management (ATM) with Dynamic Shoulder Use

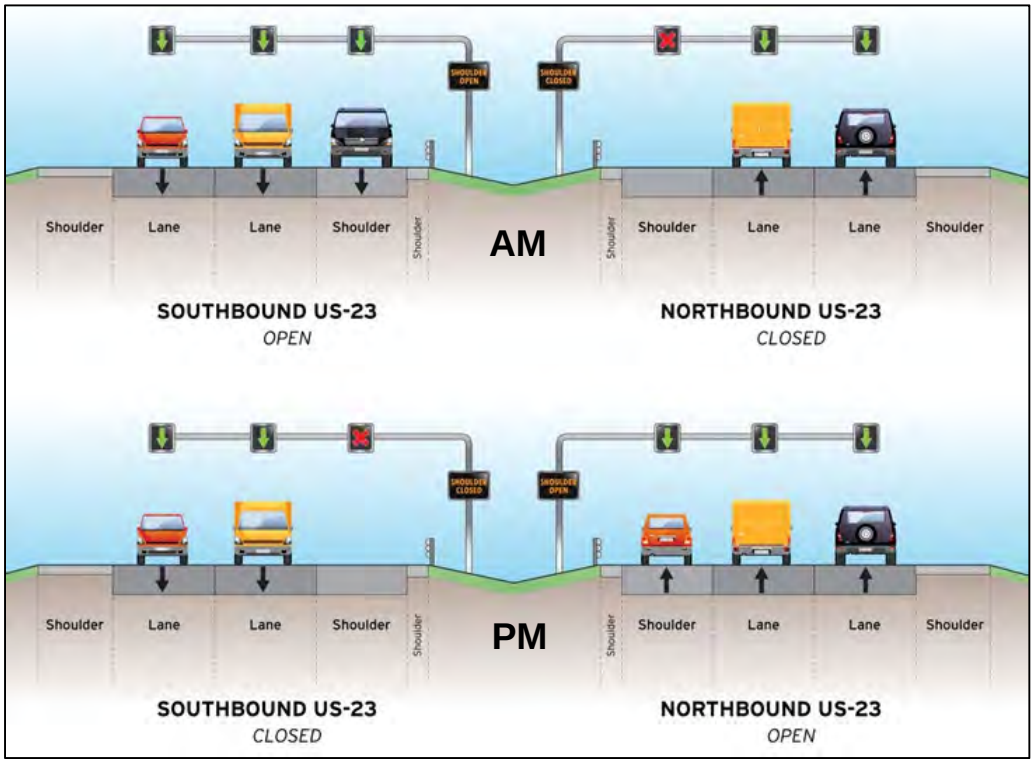
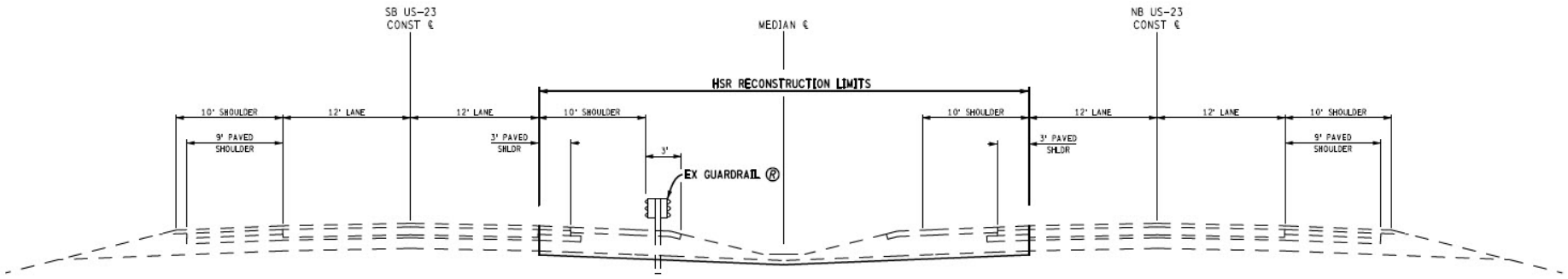


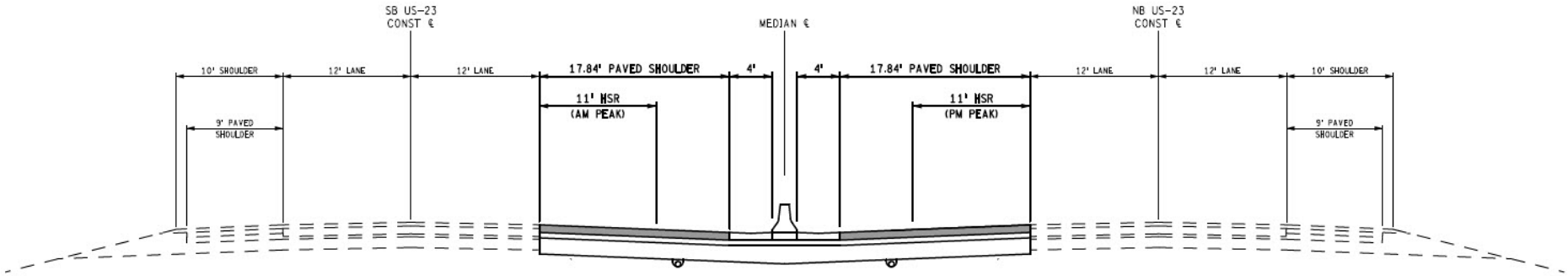
Figure 5.1 – Existing US-23 Mainline Cross Section



EXISTING TYPICAL CROSS SECTION

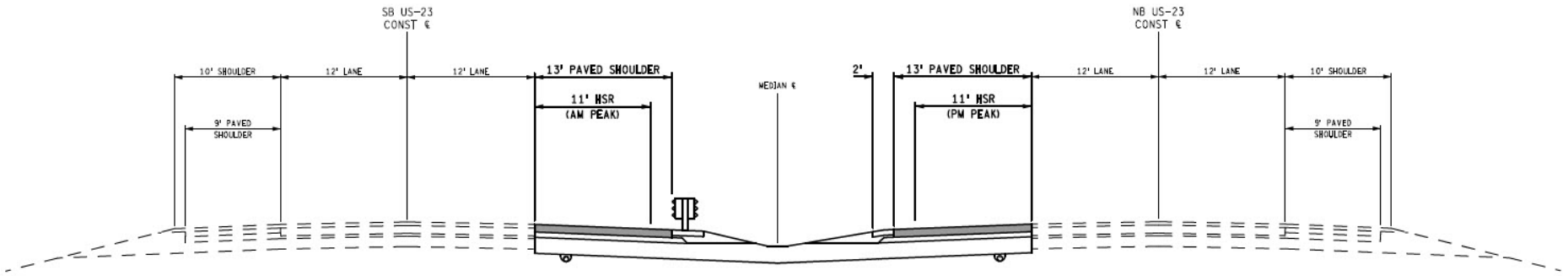
HSR : Hard Shoulder Running pavement for dynamic shoulder use

Figure 5.2 – Dynamic Shoulder Use Cross Section



PROPOSED TYPICAL CROSS SECTION

SECTION APPLIES TO:
POB TO JOY ROAD



PROPOSED TYPICAL CROSS SECTION

SECTION APPLIES TO:
JOY ROAD TO POE

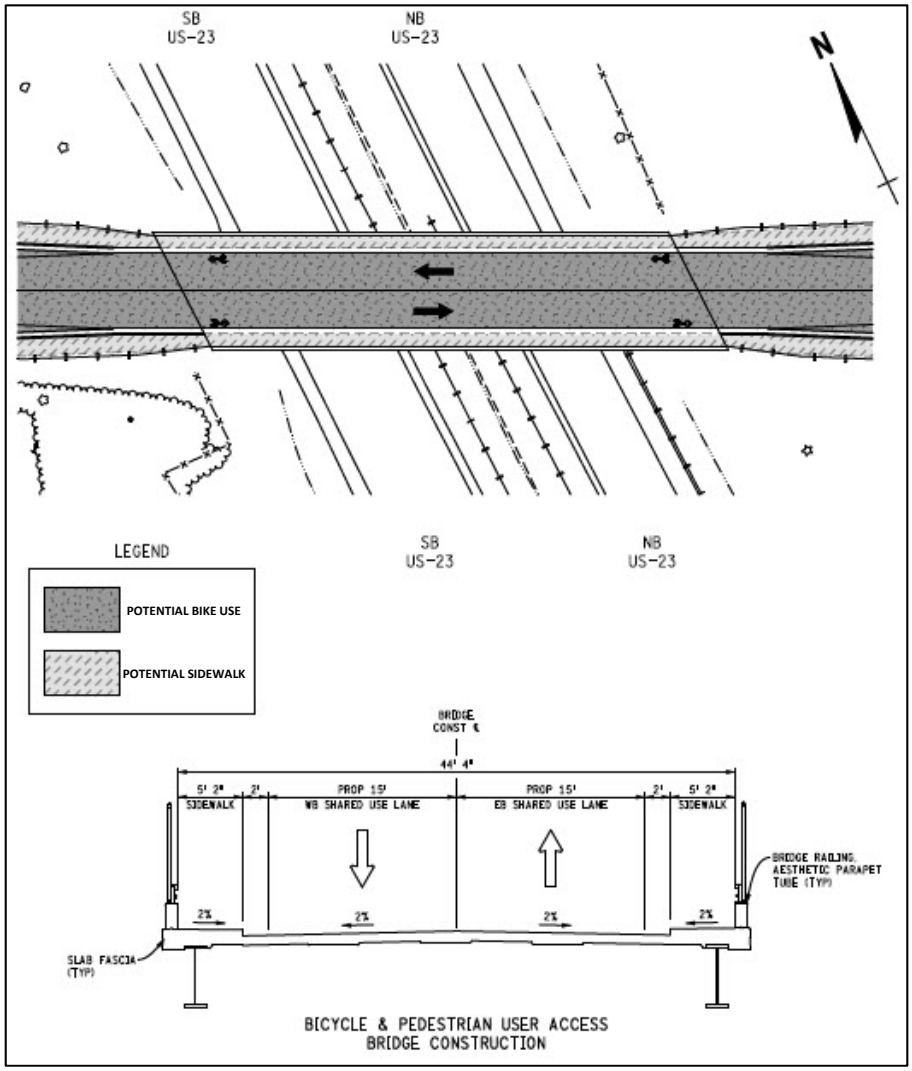
HSR : Hard Shoulder Running pavement for dynamic shoulder use

5.2 *Bridge Replacements at 8 Mile, 6 Mile, and N. Telegraph Roads*

MDOT will design the 8 Mile and 6 Mile bridge replacements with 5 foot sidewalks and sufficient road width (17 foot from centerline to curb) that bicycle travel can be accommodated either in a wide shared lane, or by separate bike path, to match whatever bicycle facilities may be provided now or in the future on the crossroad approach to the bridge. (Figure 5.3). Pedestrian and non-motorized approaches to the bridges will be the responsibility of the local governments.

MDOT is reviewing the use of an Accelerated Bridge Construction (ABC) method for these bridges by using a Self-Propelled Modular Transporter (SPMT). The bridge span is constructed close to the bridge site within MDOT ROW then transported by the SPMT, which is a track vehicle (like a small version of the vehicle that moved the Space Shuttle to its launch pad), and set in place. Traffic is maintained during construction with a detour required only during the period of bridge demolition and during the time to transport the bridge from its construction site to its final location.

Figure 5.3 – Non-Motorized/Pedestrian Access on Bridges Concept



5.2.1 North Territorial Road

Figure 5.4a illustrates the proposed configuration of N. Territorial Road bridge replacement and interchange configuration. MDOT is reviewing the use of the SPMT with the bridge replacement. Roundabouts are proposed on N. Territorial Road at the on- and off-ramps and the realignment of 5 Mile Road approximately 500 feet to the east of the US-23 NB on-ramp. The proposed bridge will have 12-foot lanes with 10-foot shoulders for future non-motorized and pedestrian access. The park and ride lot will be removed and will be reviewed for a replacement during the design phase.

Figure 5.4a – North Territorial Road Roundabout Concept

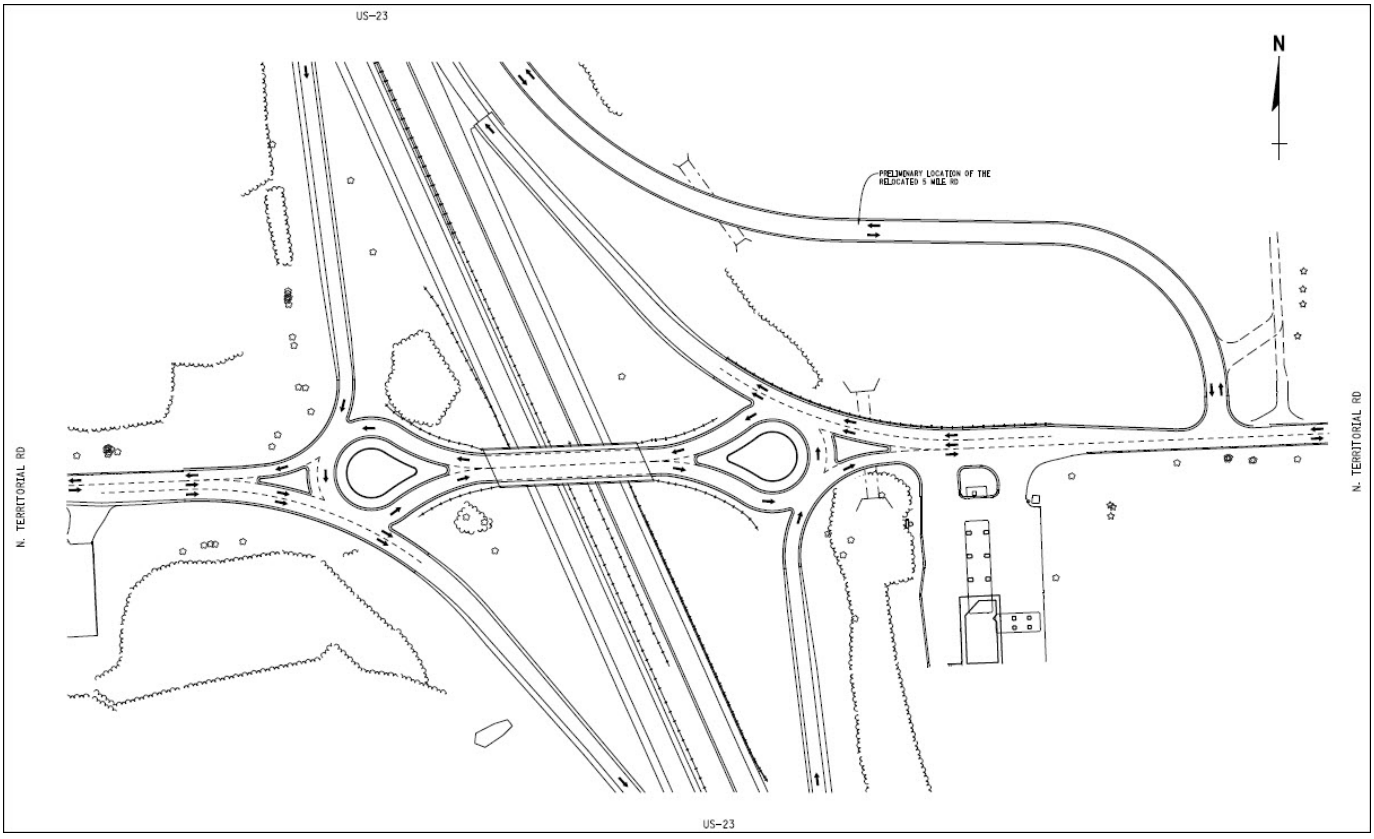
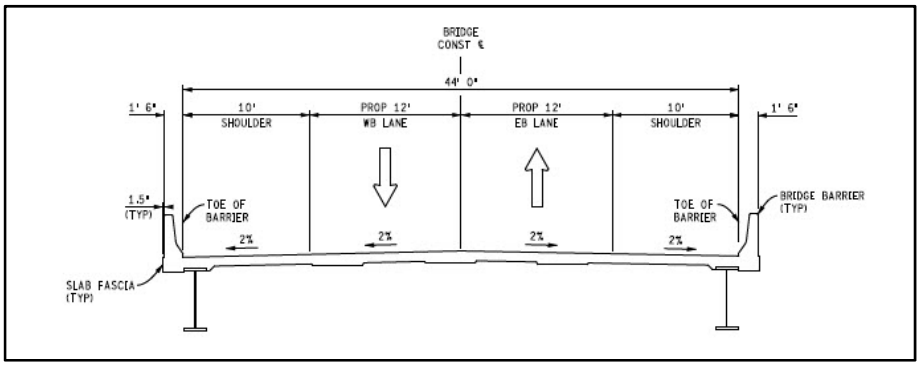


Figure 5.4b – North Territorial Road Bridge Cross Section



5.2.2 8 Mile Road

Figures 5.5a and 5.5b respectively illustrate the proposed signal controlled intersection and roundabout configuration options of the 8 Mile Road interchange. The specific option will be chosen after public comment and further design analysis. The new bridge will be realigned north of the current bridge in both options to accommodate the widened SB US-23 bridge over the railroad with the SB on-ramp and dynamic shoulder use lane. Both US-23 bridges over the railroad ("A" in graphics) will be raised to meet the current under-clearance specification.

MDOT is considering a future park and ride lot in the SW quadrant of the interchange in partnership with the Ann Arbor Area Transportation Authority (AAATA). The site is rated Low Risk for Environmental Contamination (Section 6.10) for this project, but will require a detailed analysis if the partner agencies choose to pursue this site.

Figure 5.5a – 8 Mile Road Interchange with Signaled Intersections Concept

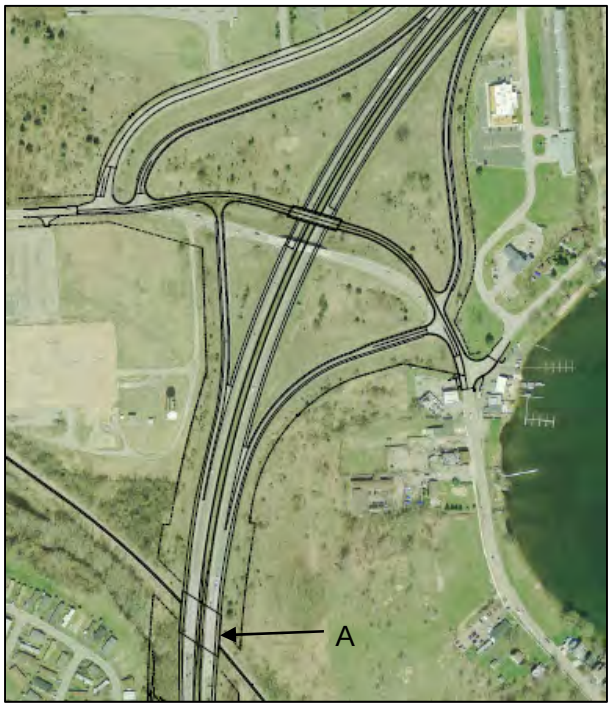
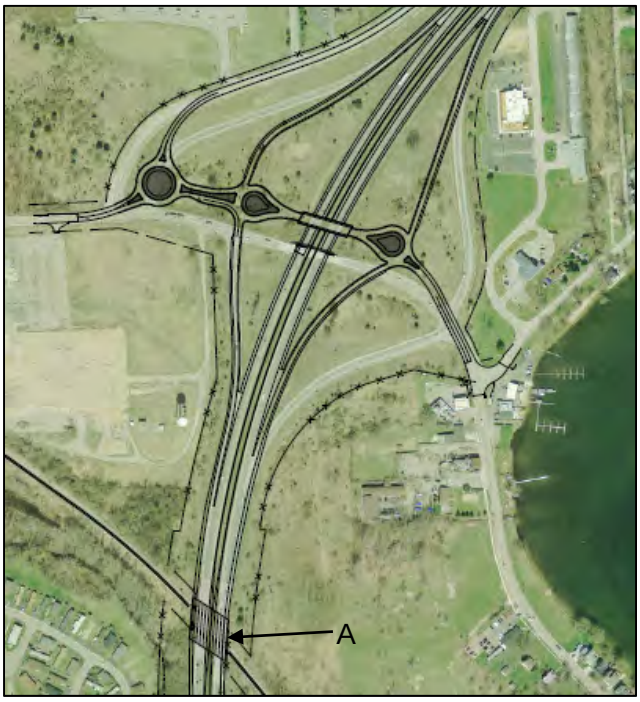


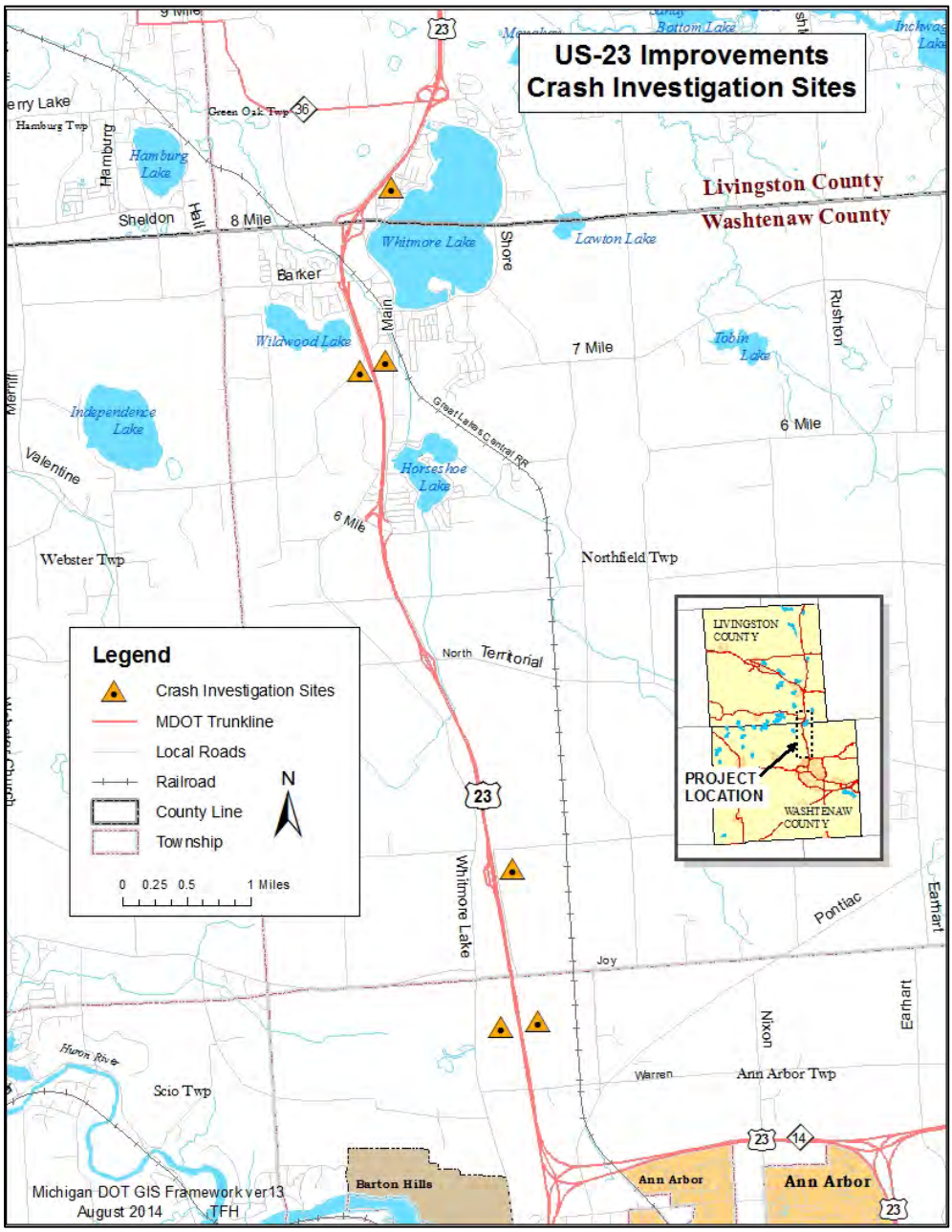
Figure 5.5b – 8 Mile Road Interchange with Roundabouts Concept



5.3 *Crash Investigation Sites (CIS)*

The crash investigation sites (CIS) provide an area off the main roadway to complete small vehicle repairs, hand out citations, or conduct crash investigations. This is an attempt to minimize the exposure to personal harm and the danger of causing additional incidents on the system. CIS are specially designated and signed areas off the mainline where motorists, law enforcement, and other public service vehicles can be temporarily located. Use of the sites are meant to reduce the congestion that is caused by stopped vehicle(s) on the roadway shoulder or in a traffic lane. The site also provides an area where troubled vehicles can pull over until the proper service or repair can be made and as a staging areas for major incidents. There are six proposed CIS along the project corridor identified in the Figure below.

Figure 5.6 – Crash Investigation Sites

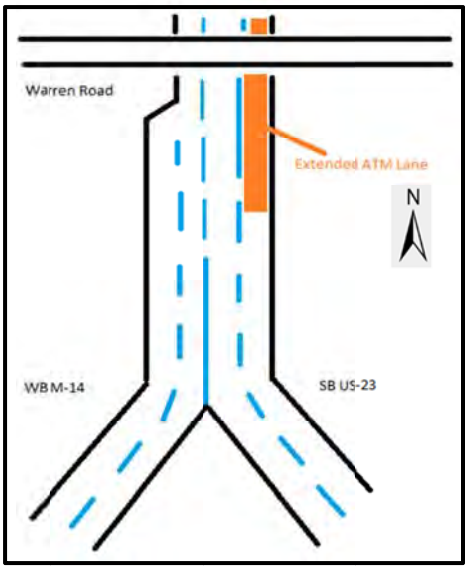


5.4 *Southbound (SB) US-23/M-14 Mitigation*

Operations along SB US-23 from the northern limits to the N. Territorial Rd. interchange improve for the Preferred Alternative as previously described in Section 4.0 - Traffic Analysis of this document and in the accompanying traffic report. However, because of this improvement in traffic flow along SB US-23, if no improvements are made at the SB US-23/M-14 interchange, the LOS on SB US-23 would worsen in this area.

Because of this drop in LOS, a mitigation treatment was developed for this area as depicted in Figure 5.7. This option would involve extending the outside ramp lane for the SB US-23 to WB M-14 ramp approximately 2500 feet and shifting the alignment of SB US-23 to match the existing alignment of the ramp lanes (see Figure 5.8 for a detailed alignment). The added outside ramp lane not required any additional right-of-way.

Figure 5.7 – SB US-23/M-14 Mitigation Configuration



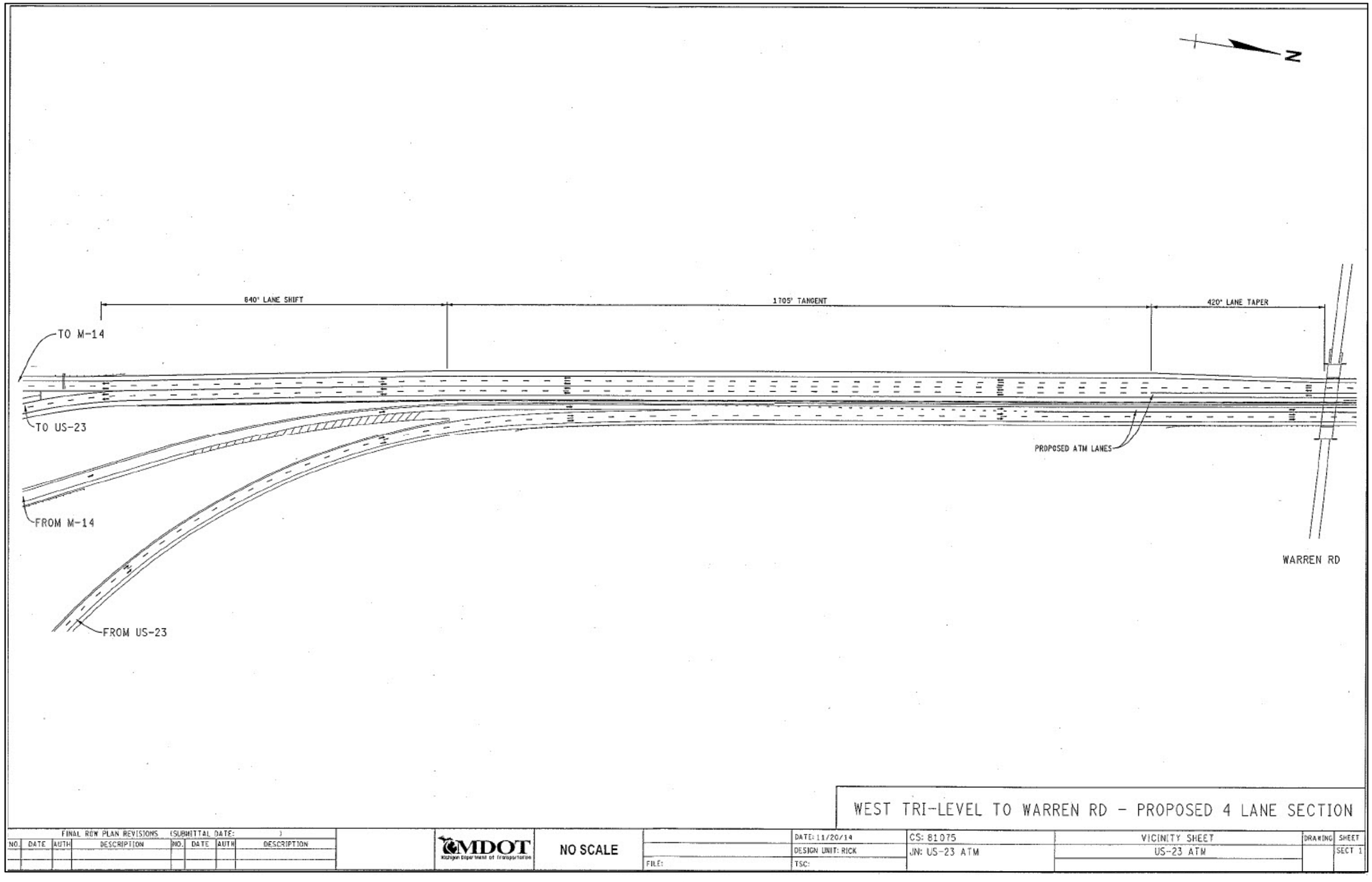
SB US-23 at the US-23/M-14 interchange with this improvement is expected to operate at acceptable LOS for both the Preferred Alternative, as shown in Table 5.1. This modification helps alleviate the backups caused by the weave movement on M-14 near Barton Drive that impedes the flow of traffic on SB US-23 just north of the M-14 interchange (the average speed will be approximately 60 mph at this location). For the ATM alternative, occasional slowdowns at the N. Territorial Rd. on-ramp would still be anticipated in the outside lane at the merge areas. However, this situation is an improvement over the No-Build conditions.

Table 5.1: VISSIM Results for SB US-23 for AM Peak Hour for ATM with US-23/M-14 Treatment (2040)

Description	Facility Type	Average Density per lane	Average Speed	LOS
SB US-23 at N. Territorial Rd.	Segment	25.60	55	C
SB US-23 Entrance Ramp at N. Territorial Rd.	Ramp	40.29	31	E
SB US-23 Between N. Territorial Rd. and Warren Rd.	Segment	26.02 (28.99*)	61 (59*)	D (D*)
SB US-23 Between Warren Rd. and M-14	Segment	25.07 (52.60*)	59 (34*)	C (F*)
SB US-23 to WB M-14	Ramp	77.89	33	F
SB US-23 to EB M-14/(SB US-23)	Ramp	25.63	61	C
WB M-14 at Barton Dr./Main St.	Weave	93.41	11	F

***indicates performance of this segment without the mitigation treatment.**

Figure 5.8 – US-23/M-14 Mitigation Detail



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6.0 AFFECTED ENVIRONMENT AND POTENTIAL IMPACTS

This section presents the results of the Social, Environmental and Economic impact analysis. The maps (Figures 6.0 - 6.3) represent the first step in their analyses. The maps illustrate some of the environmental factors analyzed in this EA. The maps represent data taken from corresponding agencies and provide a basis for field surveys. The majority of the Preferred Alternative work occurs within MDOT right-of-way. The 500-foot buffer is the extent of the environmental review where most impacts may occur.

Figure 6.0 – Environmental Constraints: North Section

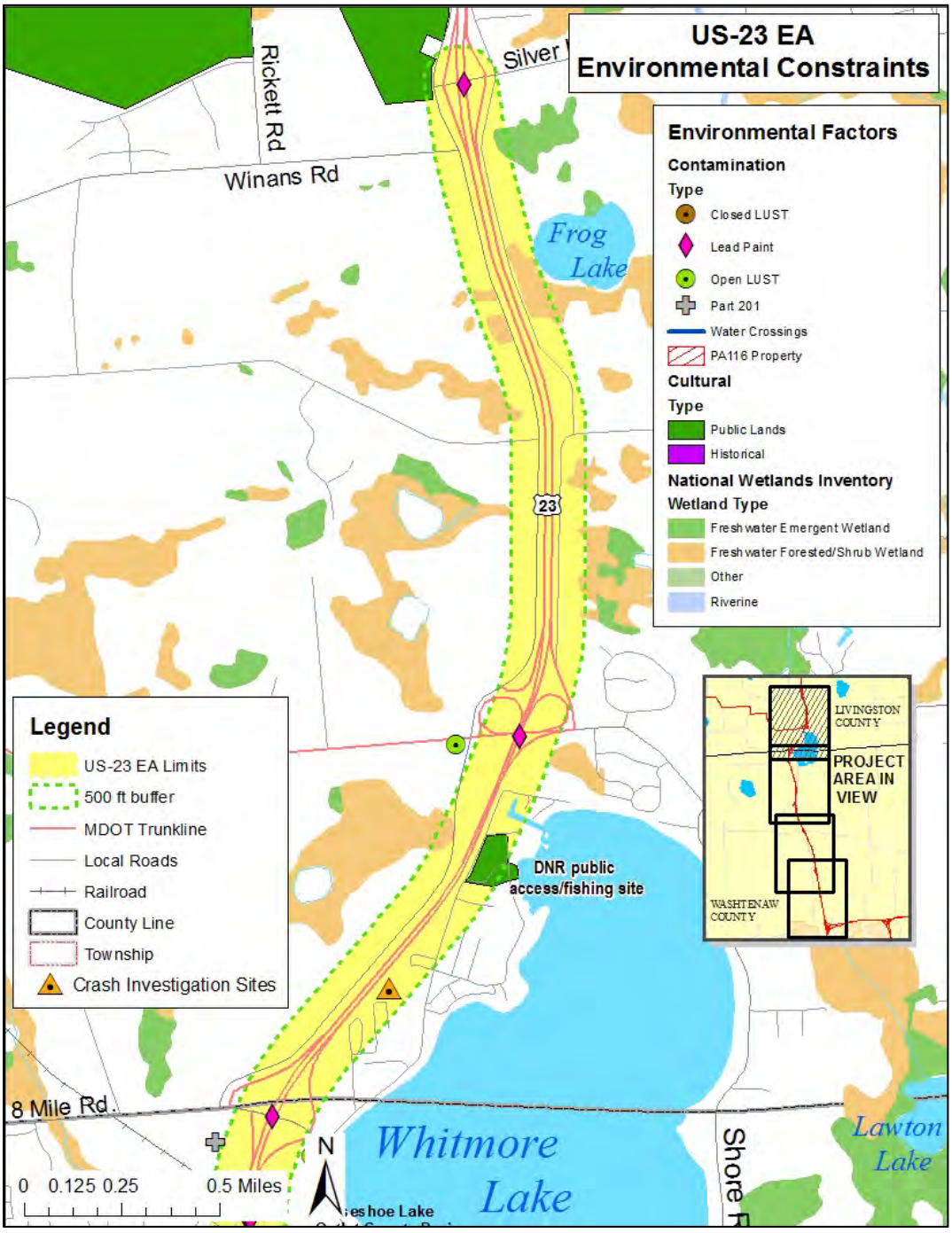


Figure 6.1 – Environmental Constraints: North Central Section

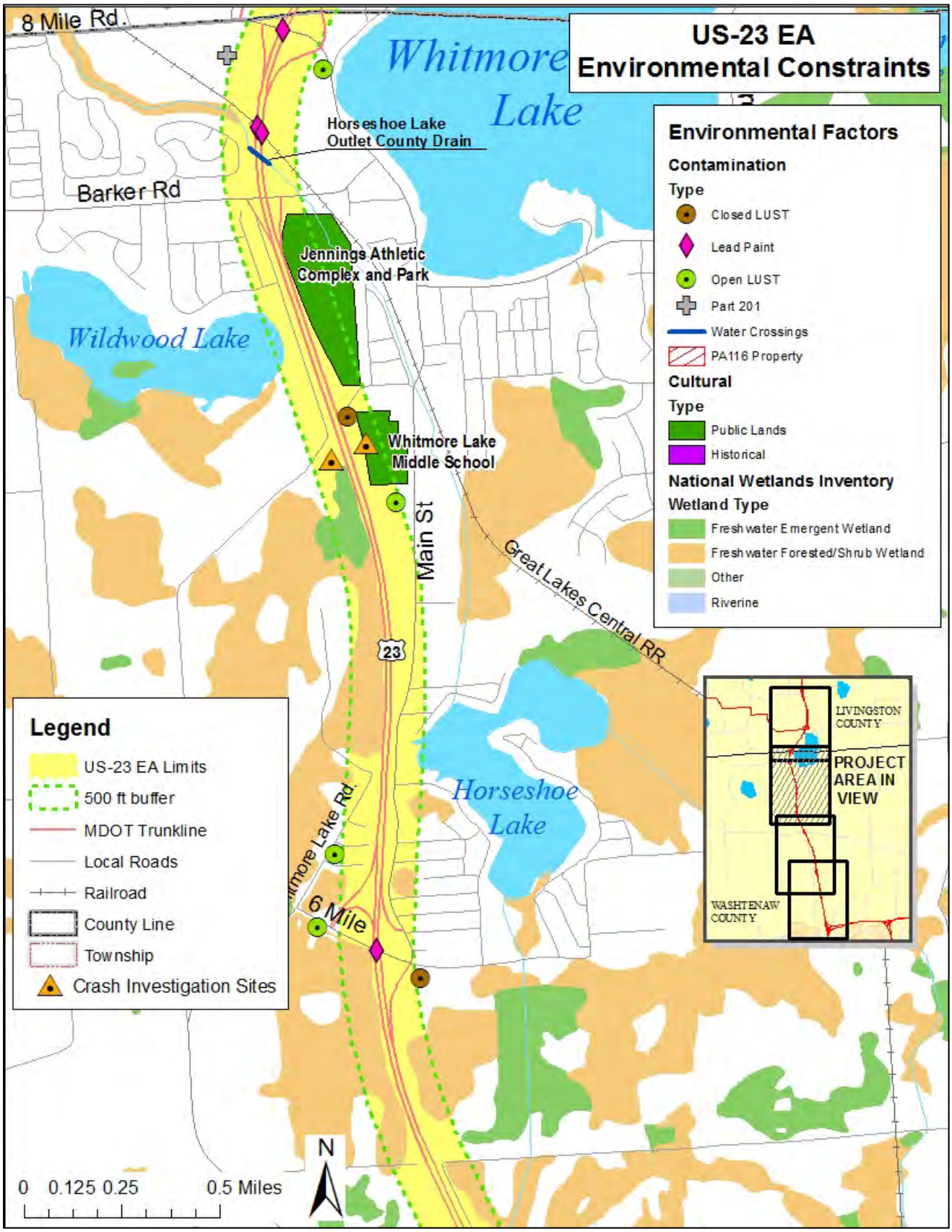


Figure 6.2 – Environmental Constraints: South Central Section

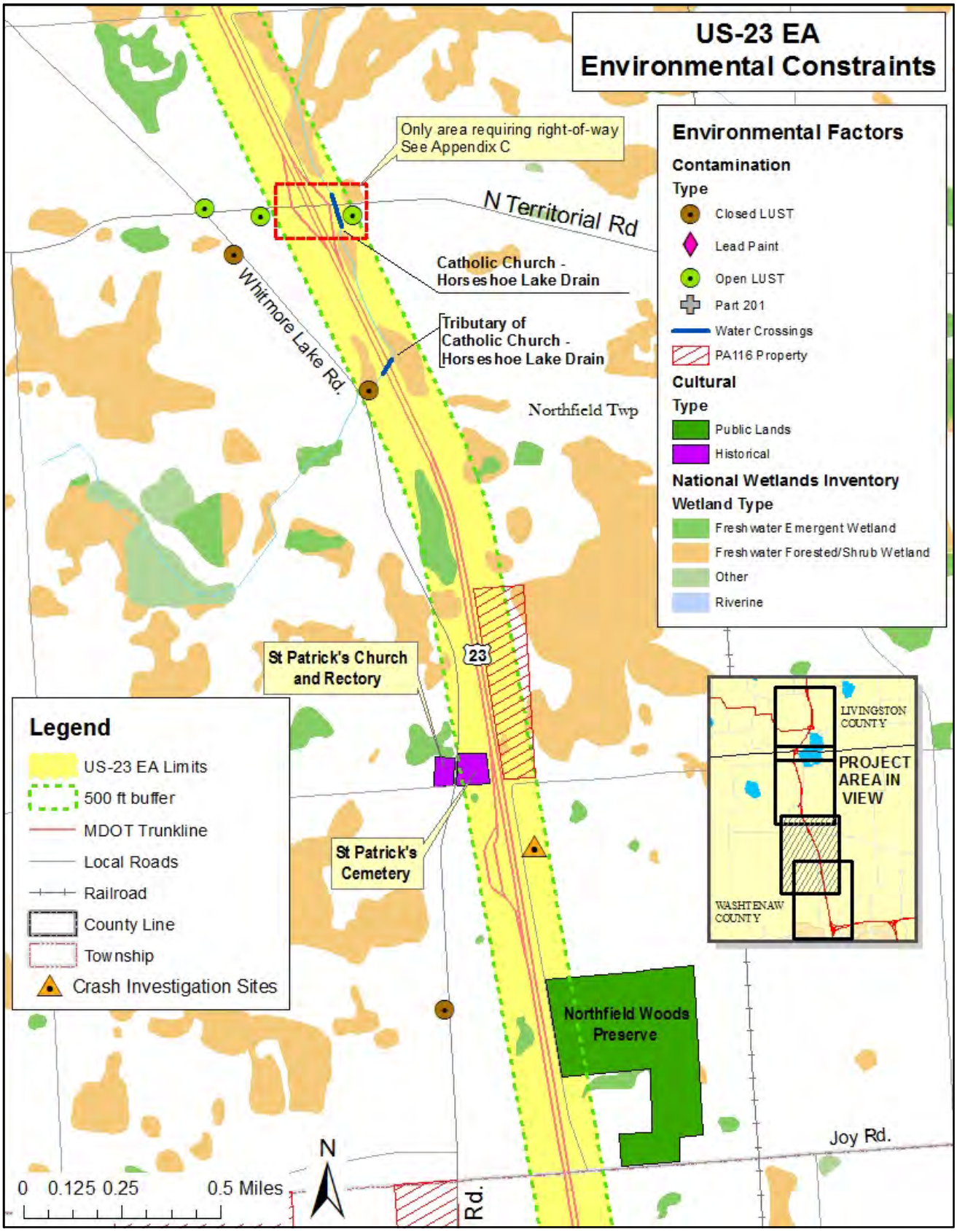
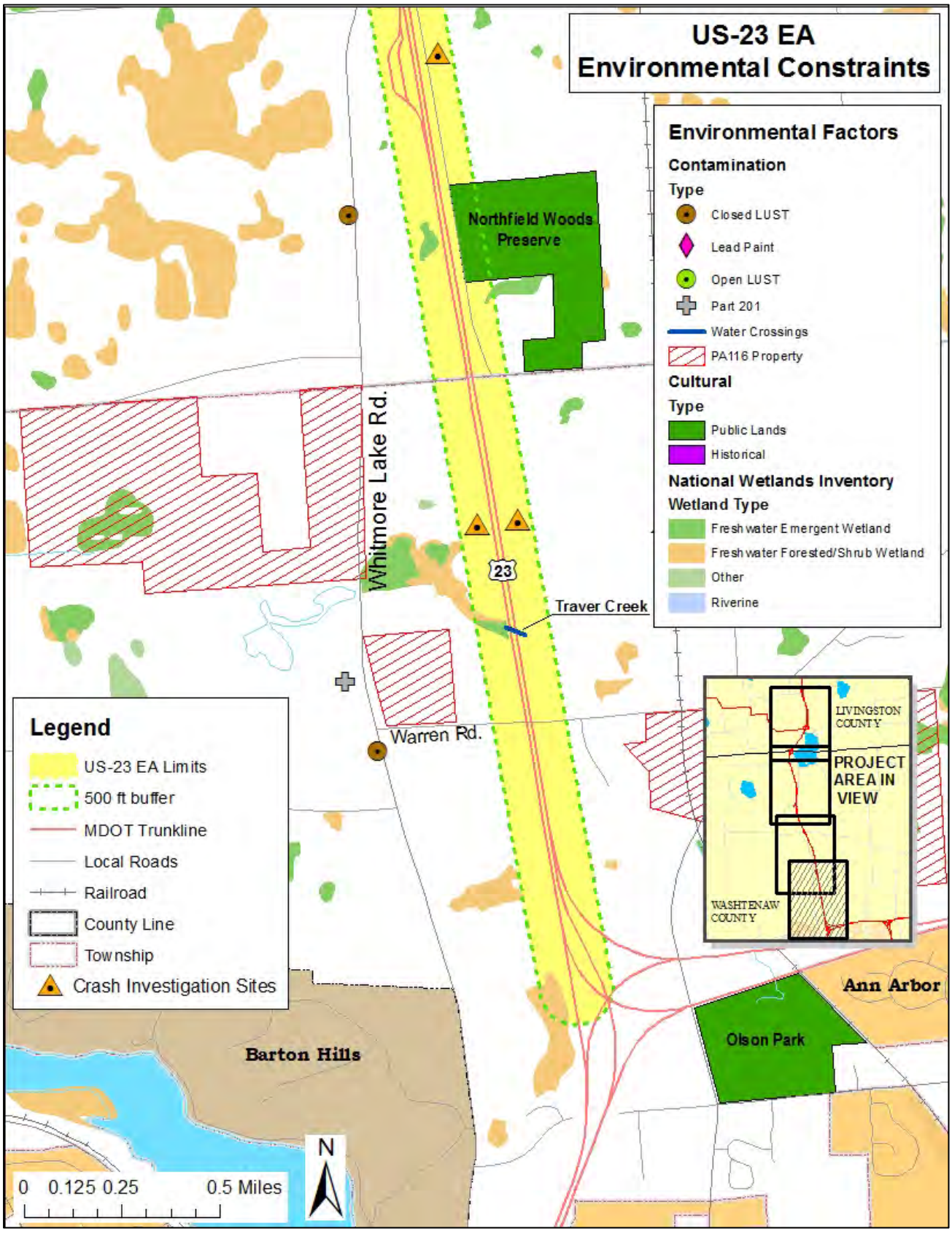


Figure 6.3 – Environmental Constraints: South Section



6.1 *Land Use Impacts*

The proposed project is located on the US-23 corridor in Livingston and Washtenaw Counties. The existing land use adjacent to the corridor in the project area consists of a broad range of land uses. They range from natural open space and agricultural to industrial and commercial retail. Current zoning and future land use plans (Figures 6.5-6.8)[10] are in place for the local jurisdictions along the route. The local units of government located north to south along the corridor include Green Oak Township in Livingston County at the northern end of the project and Northfield Township, Ann Arbor Township and the City of Ann Arbor in Washtenaw County at the south terminus of the project area. Please see Figure 1.0 - Environmental Assessment Study Corridor, for a detail of the study limits.

The land uses in Green Oak Township section of the project area include a mix of commercial, light industrial and residential uses. The area immediately adjacent to the highway is almost completely developed.

The Washtenaw County portion of the proposed project includes Northfield Township, Ann Arbor Township and the City of Ann Arbor. The land uses along this segment of corridor are more diverse than in Livingston County. The northern area of the county is made up of dense residential and industrial uses. Moving south along the corridor the land use transitions into open space and agricultural uses. As you approach the City of Ann Arbor the use then transitions back to residential and commercial uses.

The review of the current zoning maps and future land uses plans showed that the proposed project is consistent with land use patterns in the area and should have no impact on future development along the corridor. Table 6.0 presents the expected population growth within the project area. Figure 6.4 illustrates the growth data coverage area. Any new development will likely take place at the currently zoned and planned existing ramp termini. Livingston and Washtenaw Counties and City of Ann Arbor employment growth rates are included in Table 6.1 since the major employment centers are located along US-23 beyond the project limits.

Table 6.0 – US-23 EA Corridor Population Growth Rate (M-14 toSilver Lake Road)[11]

	2015	2040	Difference	Growth Rate	Annual Growth Percentage
Population	11989	12745	756	6.31%	0.25%

Table 6.1 –Employment Growth Rates[12]

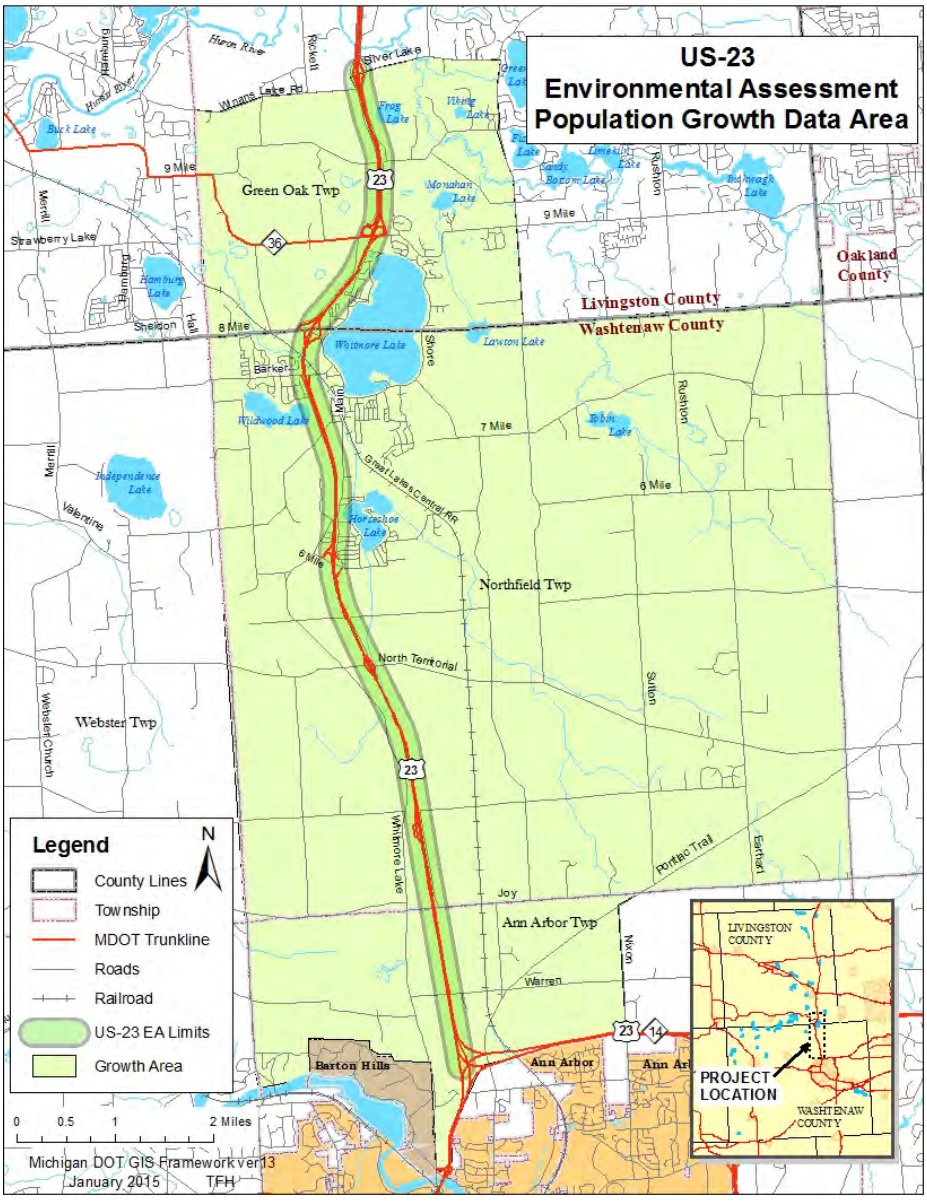
Livingston/Wastenaw Combined Growth Rates					
	2010	**2040**	**Difference**	**Growth Rate**	**Annual Growth Percentage**
Employment	305733	375382	69649	22.78%	0.91%
Ann Arbor Growth Rates					
	2010	**2040**	**Difference**	**Growth Rate**	**Annual Growth Percentage**
Employment	120588	144899	24311	20.16%	0.81%

[10] The maps are from the *US-23 Feasibility Study* (Section 3.1) with the initial information provided by the local agencies.

[11] Data approved by MDOT, SEMCOG, and WATS in a 4/16/14 teleconference

[12] Data provided by SEMCOG via http://semcog.org/Data/Apps/regional.forecast.cfm

Figure 6.4 – Population Growth Data Area



6.2 *Right-of-Way and Relocation Impacts*

The majority of the project is within existing MDOT right-of-way (ROW). Additional fee ROW of approximately 10.6 acres will be needed for the project at the N. Territorial Road interchange (Figure 6.2 with detail in Appendix C). Several grading permits may be required at six locations (1.7 acres) where the crash investigation sites will be located along US-23 from north of Warren Road to south of M-36 (Figure 5-7). Additionally, MDOT will need to grade seven driveways along N. Territorial Road, and relocate one driveway from N. Territorial Road to 5 Mile Road. Temporary ROW will be required during the construction of the US-23 bridge over the railroad. A detailed map showing the "Proposed Right-of-Way Impacts" are shown in Appendix C of this document.

All fee right-of-way will be acquired in conformance with the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.

Figure 6.5 – Livingston County Zoning

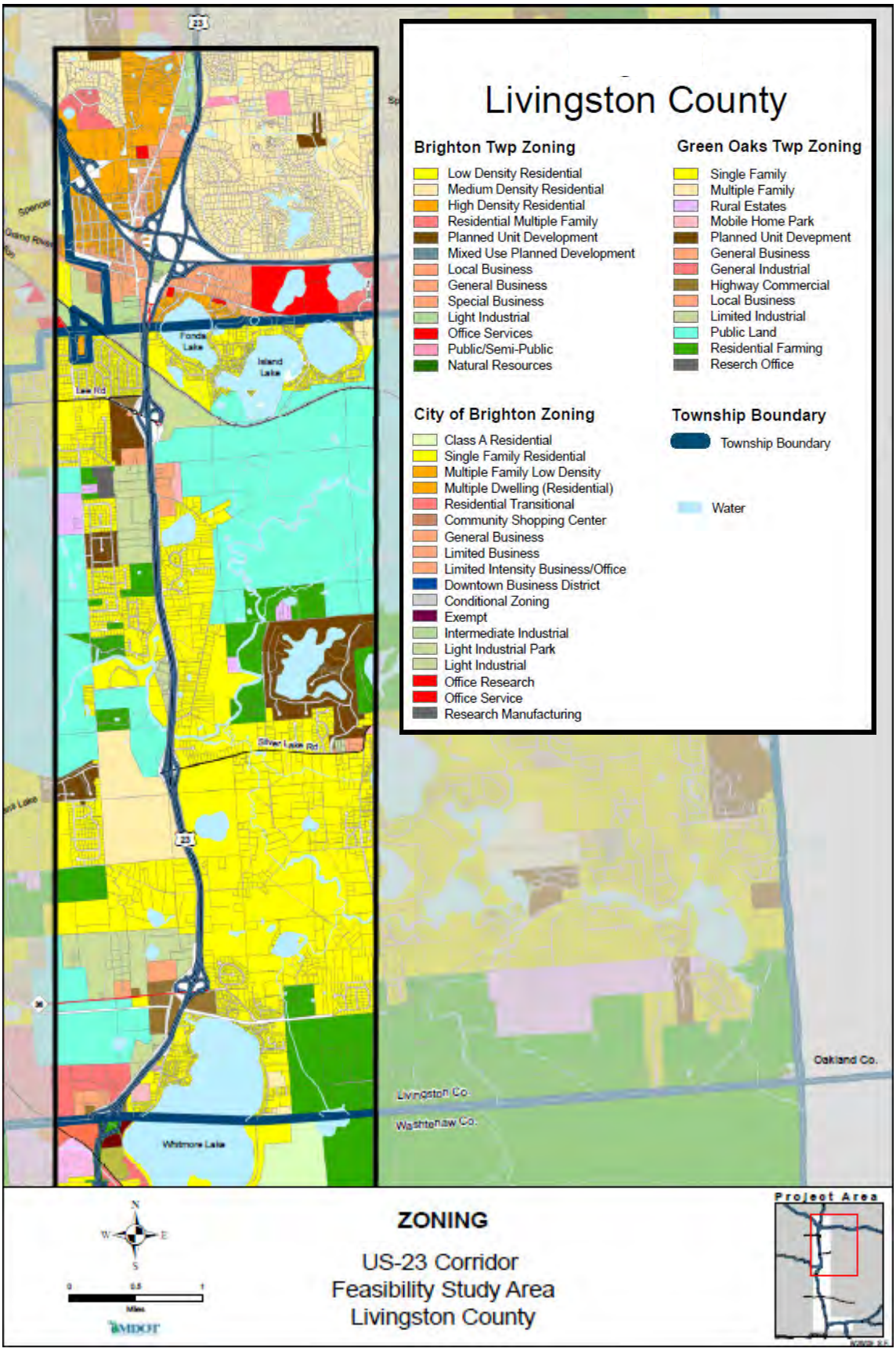


Figure 6.6 – Washtenaw County Zoning

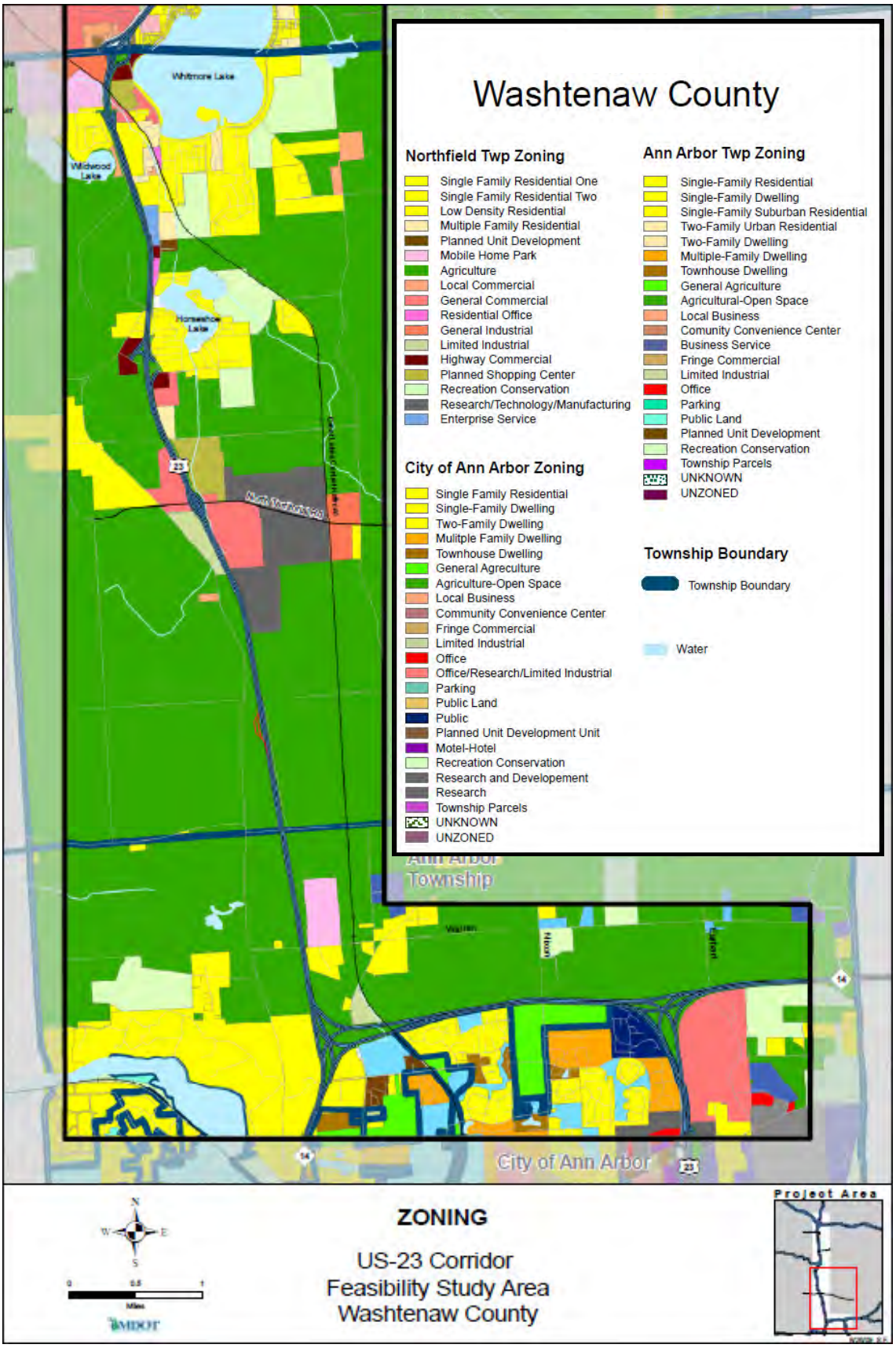


Figure 6.7 – Livingston County Future Land Use

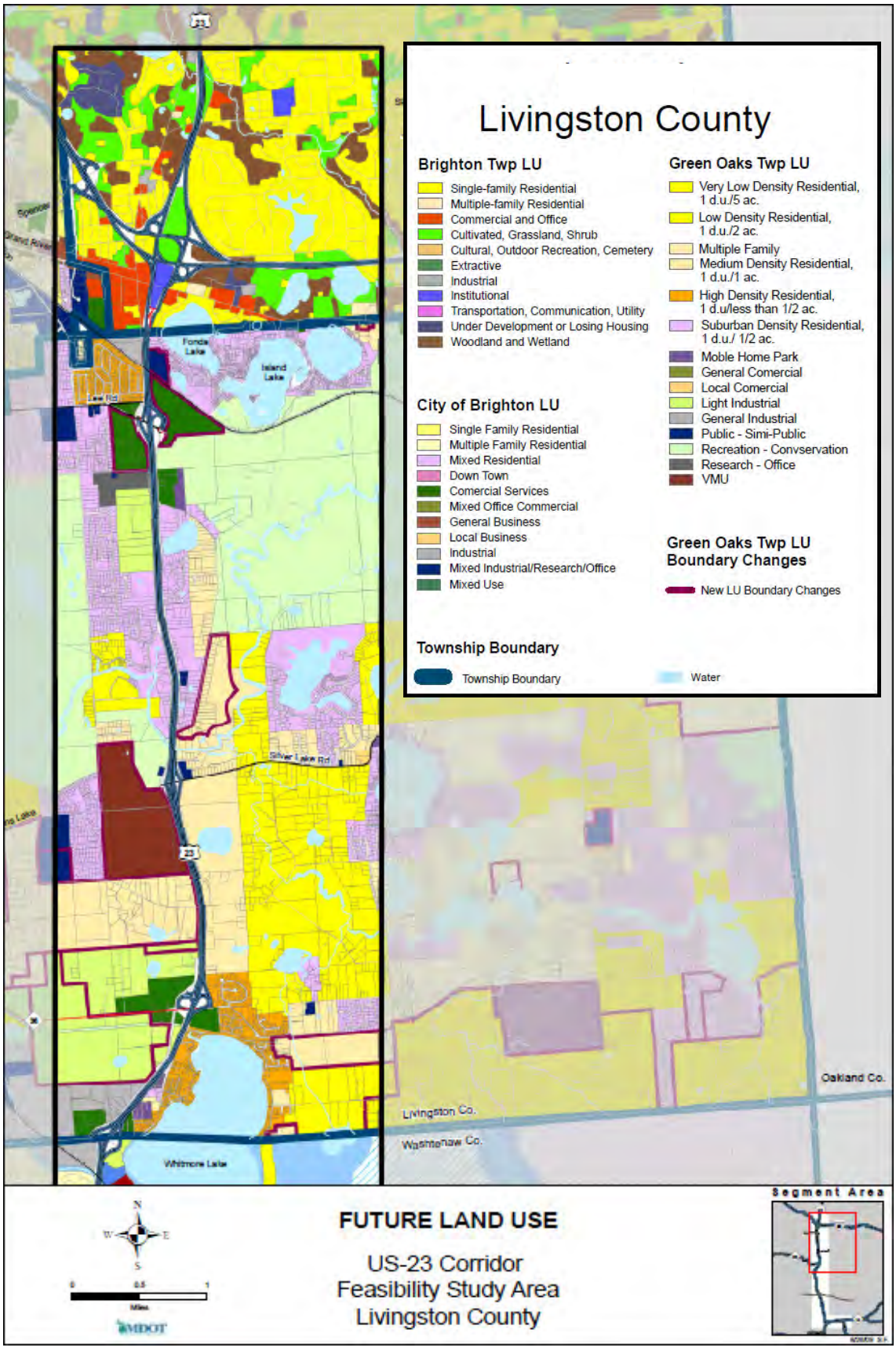
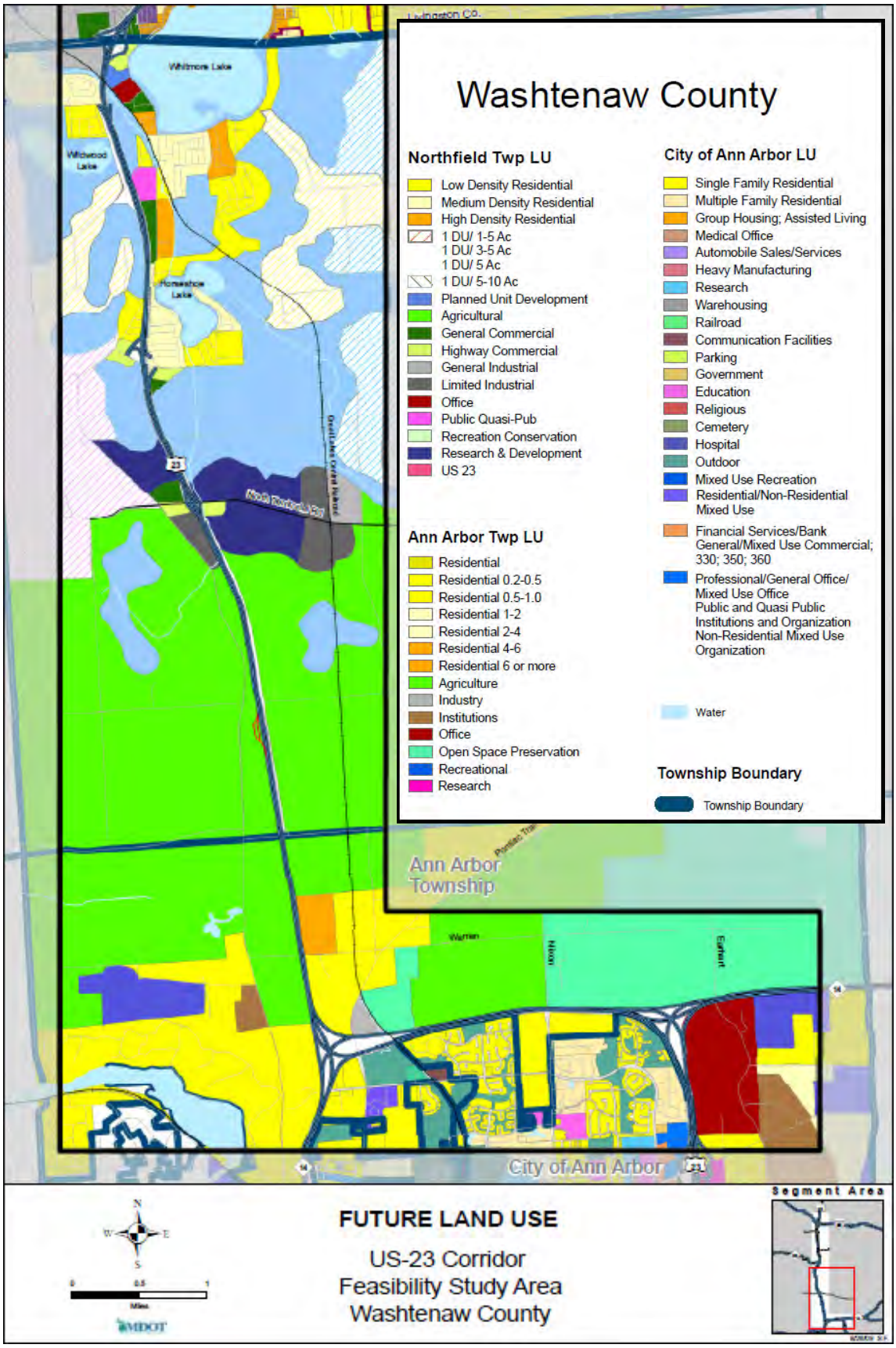


Figure 6.8 – Washtenaw County Future Land Use



6.3 *Farmland and Agriculture Impacts*

There is not expected to be any impacts associated with the U.S. Department of Agriculture 7 CFR Part 658 - Farmland Protection Policy Act (FPPA). There is expected to be right-of-way (ROW) required for the 5 Mile Road relocation to North Territorial Road. This work will take place in the northeast quadrant of the US-23/North Territorial Road interchange. The amount of ROW required may be well over one acre.

All of the property at the US-23/North Territorial Road interchange is Prime, Unique or Locally important. However, none of the parcels at the North Territorial Road interchange are zoned Agriculture or Forestry. The zoning in the NE quadrant of the interchange is General Commercial and Planned Shopping Center. There will not be any impact to Agriculture or Forestry zoned parcels. Therefore, coordination with the USDA/NRCS will not be required.

There are seven Farmland and Open Space Preservation Program, Part 361 of the Natural Resources and Environmental Protection act, 1994 Act 451(formerly known as PA116) enrolled parcels in the vicinity of the project limits (Figures 6.2 and 6.3). Of these seven parcels, only one of them is directly adjacent to the project limits. The adjacent parcel is located in Northfield Township section 29 and is on the east side of US-23. There is no anticipated fee ROW that will be required at the parcel. PA116 enrolled parcels cannot be impacted by borrow or wetland mitigation sites.

6.4 *Social and Economic Effects*

6.4.1 Social

The proposed project will not cause any long-term negative impacts on low-income, minority, ethnic, elderly, people with disabilities, or on area schools, churches, or emergency services (police, fire, ambulance). Currently, there are no non-motorized paths adjacent to US-23. However, the proposed improvements to US-23 will not preclude future opportunities for non-motorized paths along 5 Mile and 6 Mile Roads, and North Territorial Road. Any future non-motorized paths will be done in accordance with the 1990 Americans with Disabilities Act (ADA). No neighborhoods within the project area will be permanently separated from community facilities or services. Access for motorists, school buses, and emergency vehicles will be maintained during construction. MDOT will coordinate with local officials in providing updated information to assist all motorists and emergency service vehicles.

Construction on the US-23 Mainline and the replacement of three structures over US-23 is expected to last two construction seasons. During construction, traffic will be maintained on US-23; however, there may be lane closures for short periods of time on US-23. MDOT will also need to replace three bridges (North Territorial Road, 6 Mile Road, 8 Mile Road) over US-23. During the replacement of the bridges, traffic will need to be detoured to the next bridge crossing. In order to alleviate traffic back-ups and travel distances, MDOT will have at least one of the three bridges open to traffic while the other bridges are being constructed. MDOT is

replacing the US-23 bridges over the railroad and will maintain traffic on US-23 during their replacement.

The construction of the proposed project will cause temporary impacts to the businesses, community services, motorists and emergency services during the construction of the US-23 mainline and the three bridges over US-23. Thus, motorists (including emergency vehicles) will incur longer travel times and distances in reaching their destinations. Access will be maintained to area businesses and residents located on each side of the roadway during construction. The proposed maintaining traffic concept is found in Appendix B.

Mitigation measures to address these temporary impacts include: minimizing disruption of traffic in the construction area by coordinating with local agencies and the community; placing signs in all of the construction areas notifying motorists and pedestrians; require construction equipment to have mufflers in good working order and portable compressors must meet federal noise-level standards for equipment; and require contractors to use adequate dust-control measures during construction.

As part of an on-going coordination effort, MDOT will continue to coordinate with the local officials and the community in providing updated information about the proposed project, including updates on lane closures or detour routes.

6.4.2 Economics

The construction for the proposed US-23 project will likely take two years to complete the improvements on US-23 and to construct the three bridges that span over US-23. The proposed project will have no long-term effect on the local economy or tax base in the area. The proposed ATM with its dynamic shoulder use during the weekday directional peak travel times will provide a savings of approximately $145 million dollars ($30M vs. $175M) over the construction of a third general purpose travel lane. Access to area businesses and residents will be maintained during construction.

6.5 *Environmental Justice*

The purpose of Executive Order 12898 on Federal Actions to address Environmental Justice in Minority and Low-Income Populations is to identify, address, and avoid disproportionately high and adverse human health or environmental effects on minority and low-income populations.

An analysis of the U.S. Census Data (Table 6.2) along with field reviews of the project area determined that there were minority and low-income populations and non-minority population groups who reside in the townships and utilize the roadway and existing bridges in the project area. The proposed project will not require residential or commercial displacements. Fee ROW, grading permits and consent to grade driveways will only be required in front of commercial properties in the vicinity of the N. Territorial Road bridge.

Table 6.2 – Census Information

Unit of Government	Total Population[1]	Percentage of Minority Populations[2]	Percentage of Individuals below the poverty level[2]	Percentage of individuals who may be Limited In English Proficiency (LEP)[2]
Green Oak Township	17,476	3.3%	5.0%	3.5%
Northfield Township	8,245	4.6%	5.6%	3.4%
Ann Arbor Charter Township	4,361	23.9%	5.0%	28.5%
Livingston County	180,967	3.3%	6.3%	4.1%
Washtenaw County	344,791	25.5%	14.6%	14.3%
State of Michigan	9, 883,640	21%	16.3%	9.0%

[1] U.S. Census Bureau. 2010 Census Data

[2] U.S. Census Bureau. 2008-2012 American Community Survey

The proposed reconstruction of the roadway and replacement of the three bridges will not cause a disproportionately high and adverse human health or environmental effects on minority and low-income populations. However, the proposed project will cause temporary impacts to the residents, businesses, community services, motorists, and emergency services during the construction phase of this project. Signed detour routes for motorists and emergency vehicles will be needed for two years. Motorists and emergency service providers can expect traffic delays and traveling further distances to reach their destination.

Although there are temporary impacts that will affect minority and low-income populations and non-minority population groups, the proposed project will provide benefits to minority and low-income populations as well as non-minority population groups after the construction is completed. The proposed project will help alleviate traffic backups and delays on US-23 by improve traffic flow and adding an ATM lane on US-23.

As part of public outreach, MDOT held a public information meeting inviting residents, local officials and the public to the meeting to learn more about the project. Approximately 77 people attended the meeting held in August 2014. Almost everyone who attended the meeting supported the project; however, there were individuals who wanted the ATM lane to become a permanent third lane. Unfortunately, the existing width of the roadway including the median does not allow for a third lane without having to replace the entire roadway and all structures.

There was another concern about traffic back-ups at US-23 and M-36, once the ATM lane is added. MDOT will continue to monitor traffic after the ATM is opened to traffic.

MDOT did not receive any requests to have translation services at the public information meeting or to have brochures or other materials translated into another language. If MDOT does receive a request for translation services during subsequent phases of this project, MDOT will make translation services available.

Although the proposed project will not displace or cause disproportionate effects on minority and low-income populations within the project area, a continuing effort will be made to identify any additional impacts that may have a disproportionately high and adverse effect on minority and low-income population groups during subsequent phases of this project. If additional impacts are identified, every effort will be made to actively involve the impacted groups in the project development process.

6.6 *Pedestrian and Non-motorized Travel*

There are no existing pedestrian/non-motorized facilities on or approaching the bridges being replaced at 6 Mile, 8 Mile, and N. Territorial Roads. The existing bridges respectively have paved shoulders that are 3 feet 9 inches, 3 feet 5 inches, and 2 feet 8 inches. The Washtenaw Area Transportation Study's (WATS) *Non-Motorized Plan for Washtenaw County* (2006) lists the N. Territorial Road for bicycle access in the "Future Bike Improvements" table (Table 11, page 49). Moreover, the comments received at the December 12, 2013 and August 14, 2014 public meetings suggested that the 8 Mile Road and 6 Mile Road bridges also be designed with pedestrian and non-motorized facilities. MDOT will design these bridge replacements with 15 foot shared use lanes with 2-foot offsets allowing for bicycle travel, and 5 foot sidewalks (Figure 5.3). Pedestrian and non-motorized approaches to the bridges will be the responsibility of the local governments.

6.7 *Parks and Recreation – 4(f) Properties*

No impacts are anticipated to any public recreational property protected under Section 4(f) of the Department of Transportation Act. Several public recreational properties have been identified directly adjacent to and near the proposed project limits (Figures 6.0-6.3):

1. Huron Meadows Metro Park is located on the west side of US-23, north of Winans Lake Road
2. DNR public access/fishing site is located on the east side of US-23, south of 9 Mile Road (at Whitmore Lake)
3. Whitmore Lakes Public Schools and Jennings Athletic Complex and Park property is located on the east side of US-23 from south of Baker to south of Jennings Road

4. Northfield Woods Preserve is located on the east side of US-23, north of Joy Road

And just outside the project limits:

5. Olson Park is located on the south side of M-14/US-23, east side of Pontiac Trail
6. Island Lake State Recreation Area is located on the east side of US-23, north of Silver Lake Rd (north of the map's extent in Figure 6.0)

The preferred alternative does not include ROW, grading permits, easements or consents to grade from any of the properties described above. Access to all public recreational properties will be maintained during construction. In addition, construction staging and storage is prohibited at any public recreational property.

6.8 *Effects on Air Quality*

6.8.1 Project Conformity

The Clean Air Act (CAA) as amended in 1990 requires transportation project conform with the approved state implementation plan. The CAA states in Section 176(c)(1):

> Conformity to an implementation plan means -
> (A) conformity to an implementation plan's purpose of eliminating or reducing the severity and number of violations of the national ambient air quality standards and achieving expeditious attainment of such standards; and
> (B) that such activities will not-
> (i) cause or contribute to any new violation of any standard in any area;
> (ii) increase the frequency or severity of any existing violation of any standard in any area; or
> (iii) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

The US Environmental Protection Agency (EPA) has designated the project area in attainment/maintenance for the 1997 8-hour ozone and 1997 Annual fine particulate matter ($PM_{2.5}$) standards, and the 2006 24-hour $PM_{2.5}$ standard. The EPA repealed the ozone standard for transportation conformity purposes effective on July 20, 2013.

The Preferred Alternative is in the process to be included in the Southeast Michigan Council of Governments (SEMCOG) 2040 Regional Transportation Plan and 2014-2017 Transportation Improvement Plan.

The project or Preferred Alternative is not one of local air quality concern as defined by EPA under 40 CFR 93.123(b)(1). The project does not involve the construction of a permanent

general purpose lane. In addition, the 2013 MDOT Sufficiency Report[13] of the proposed project corridor shows the highest roadway section within the project corridor with an annual average daily traffic (AADT) of 65,000 with a 5,200 Commercial AADT (8% of the total AADT). These traffic numbers are below the level of significance as presented in EPA's *Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (November 2013). No microscale air quality analysis is required under 40 CFR 51 and 93.

6.8.2 Mobile Source Air Toxics (MSAT)

The Preferred Alternative has no potential for meaningful MSAT effects. The AADT as stated in the previous paragraph and the predicted traffic volumes for 2040 will increase no more than 17.9%[14] above the No Build Alternative. The projected ATM 2040 AADT is 77,900 given the previously stated traffic information. These levels remain below the 140K – 150K AADT FHWA threshold[15] for a project of air quality concern for MSAT. The ATM will allow the free flow of traffic on the mainline during the directional peak periods and reduce the concentration of emissions. Free flow traffic conditions will continue outside of the peak periods. In addition, regardless of the actions taken, emissions will likely be lower than the present levels in the design year as a result of EPA's national control programs that are projected to reduce the annual MSAT emissions by over 80% between 2010 and 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, vehicle miles traveled (VMT) growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great that MSAT emissions in the study area are likely to be lower in the future.

6.8.3 Greenhouse Gas (GHG)/Climate Change

There is general scientific agreement that greenhouse gas (GHG) emissions are contributing to a long-term warming trend of the earth. The climate impacts of GHG emissions are global in nature. Analyzing how a transportation project in an EA might vary in its relatively small contribution to a global problem will not better inform decisions. Further, due to the interactions between elements of the transportation system as a whole, project level emissions analysis would be less informative than one conducted at regional, state, or national levels. FHWA does present some operational strategies for projects through Transportation System Management (TSM) that can help, however small, reduce GHG emissions.

The preferred alternative will incorporate some effective TSM strategies suggested by FHWA to aid in the reduction of GHG emissions. TSM refers to a set of strategies that largely aim to reduce GHG emissions by reducing congestion, primarily by improving transportation system capacity and efficiency. TSM strategies may also address a wide range of other externalities

[13] A Sufficiency Report is an annual statewide evaluation of the conditions and operation of the state trunkline (highway) system and some of the items it includes are: pavement conditions, number of lanes, and traffic characteristics.

[14] MDOT, *US-23 Envronmental Assessment Draft Traffic Report*, January 8, 2015, pg. 29

[15] FHWA Memorandum, *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA*, December 6, 2012

associated with driving such as pedestrian/driver safety, efficiency, congestion, travel time, and driver satisfaction. Some TSM strategies are designed to reduce total and systemic congestion and improve system-wide efficiency, while other strategies target particularly problematic areas where improvements could greatly affect congestion, safety, efficiency, and GHG emissions. The TSM strategies in the Preferred Alternative include:

- Traffic signal optimization at the interchanges
- Incident management, including active traffic management (ATM) to control the directional peak hour congestion; intelligent transportation systems (ITS) to inform the traveling public of travel times and traffic conditions; and crash investigation sites (CIS) to remove disabled vehicles from the mainline and allow free flow of traffic
- Roundabouts at the N. Territorial Road and possibly at the 8 Mile Road interchanges
- Resurfacing roads through capital preventive maintenance (CPM) along the mainline and on the Joy Road and Warren Road bridges

The construction period is of relatively short duration. Therefore, construction mitigation is not required (40 CFR93.123(c)(5)). However, exposure to diesel exhaust by construction workers, and those nearby a construction site can have serious health implications. Several measures may be taken that include strategies that reduce engine activity or reduce emissions per unit of operating time. Construction equipment should be kept clean, tuned-up, and in good operating condition. MDOT's Standard Construction Specification Sections 107.15(A) and 107.19 would apply to control fugitive dust during construction and cleaning of haul roads. All MDOT vehicles and equipment must follow MDOT Guidance #10179 (2/15/2009) *Vehicle and Equipment Engine Idling*.

6.9 *Noise Impacts*

The noise analysis presents the existing and future acoustical environment at various receptors located along the project locations in the US-23 corridor. The determination of noise abatement measures and locations is in compliance with the Federal Highways Administration's (FHWA's) *Procedures for Abatement of Highway Traffic Noise and Construction Noise* as presented in the Code of Federal Regulations, Title 23 Part 772 (23 CFR 722), and the Michigan Department of Transportation (MDOT): *Highway Noise Analysis and Abatement Handbook, July 2011*. The MDOT: *Highway Noise Analysis and Abatement Handbook* is in compliance with the *State Transportation Commission Policy 10136 Noise Abatement*, dated July 31, 2003.

The Preferred Alternative includes the construction of two enhanced median (inside) shoulders for traffic flow (called dynamic shoulder use) during directional peak congestion periods, southbound (SB) in the morning and northbound (NB) in the evening. The FHWA determined that the Preferred Alternative requires a noise abatement analysis because the shoulders will be used on regularly scheduled times as travel lanes during peak hour times and are considered new travel lanes. The addition of new travel lanes fits under the definition of a Type I project under 23 CFR 772.5 and such projects are required to undergo a noise analysis. Moreover, under the Type I definition: "(8) If a project is determined to be a Type I project under this definition then the entire project area as defined in the environmental document is a Type I

project" which means the noise analysis will also cover the capital improvement section (CPM) north of the ATM to the Silver Lake Road interchange.

The main elements of the noise abatement analysis are included in this section. A detailed noise analysis report accompanies this Environmental Assessment.

6.9.1 Basic Acoustic Concepts

Noise can be described as unwanted sound that may interfere with communication, or may disturb the community. Three characteristics of noise have been identified as being important to analyzing the subjective community response to noise: intensity, frequency, and the time-varying characteristics of the noise.

Intensity is a measure of the magnitude or energy of the sound, and is directly related to pressure level. The human ear is capable of sensing a wide range of pressure levels. Pressure levels are expressed in terms of a logarithmic scale with units called decibels (dB). As the intensity of a noise increases, it is judged to be more annoying.

The decibel scale is a logarithmic representation of the actual sound pressure variations. The manner in which the logarithmic nature of sound is perceived as loudness, and the accompanying change in traffic volumes is depicted in the following table.

Table 6.3 – Logarithmic Nature of Sound

Change in Leq (1h) Sound Level	Relative Loudness in the Natural Environment
+/- 3 dB(A)	Barely Perceptible Change
+/- 5 dB(A)	Readily Perceptible Change
+/- 10 dB(A)	Considered Twice or Half as Loud

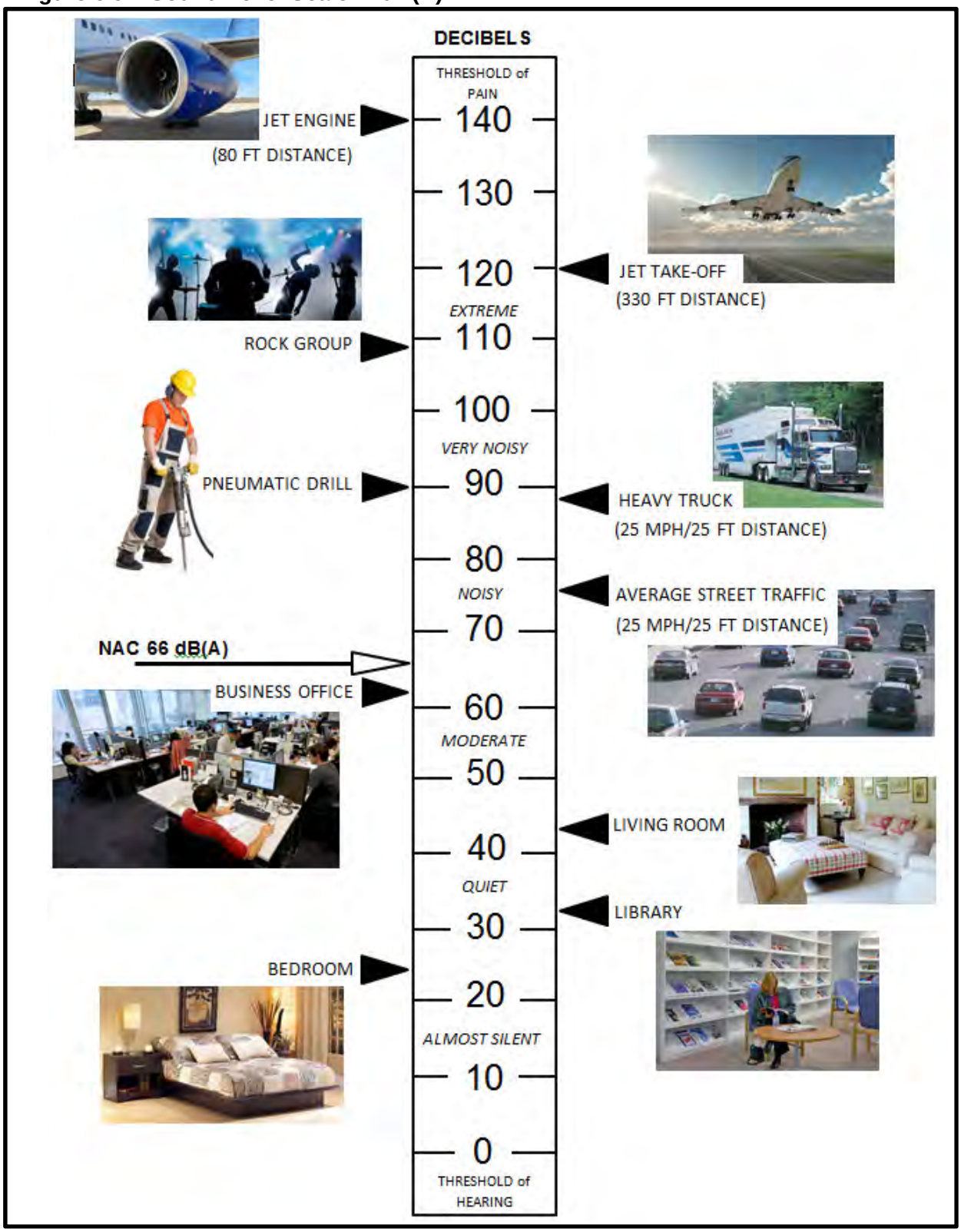
Frequency is a measure of the tonal qualities of sound. The spectrum of frequencies provides the identity of a sound. People are most sensitive to sounds in the middle to high frequencies; therefore, higher frequencies tend to cause more annoyance. This sensitivity led to the use of the A-weighted sound level, which provides a single number measure that weighs different frequencies of the frequency spectrum in a manner similar to the sensitivity of the human ear. Thus, the A-weighted sound level in decibels (dB(A)) provides a simple measure of intensity and frequency that correlates well with the human response to environmental noise.

It is necessary to use a method of measure that will account for the time-varying nature of sound when studying environmental noise. The equivalent sound pressure level (Leq) is defined as the continuous steady sound level that would have the same total A-weighted sound energy as the real fluctuating sound measured over a given period. As a result, the three characteristics of noise combine to form a single descriptor (Leq in dB(A)) that helps to evaluate human response to noise and has been chosen for use in this study. The time period used to determine noise levels is typically one hour and uses the descriptor Leq(1h).

Traffic noise at a receiver is influenced by the following major factors: distance from the traffic to the receiver, volume of traffic, speed of traffic, vehicle mix, and acoustical shielding. Tire sound levels increase with vehicle speed but also depend upon road surface, vehicle weight,

tread design and wear. Change in any of these can vary noise levels, however, average tire and pavement conditions are assumed in the noise prediction model. At lower speeds, especially in trucks and buses, the dominant noise source is the engine and exhaust.

Figure 6.9 – Sound Level Scale in dB(A)



6.9.2 Federal Regulations and Guidance

FHWA's *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, 23 CFR 772, requires the following during the planning and design of a highway project.

1) Identification of highway traffic noise impacts;
2) Examination of potential abatement measures;
3) Gather public input approval for reasonable and feasible abatement measures;
4) Incorporation of reasonable and feasible highway traffic noise abatement measures into the highway project;
5) Coordination with local officials to provide helpful information on compatible land use planning and control; and
6) Identification and incorporation of necessary measures to abate construction noise

The highway traffic noise impact identification process involves a review of the existing land use activity categories that parallel the highway corridor and determining existing and future noise levels within those areas. Existing land use of developed lands is identified by inspecting aerial photography and performing site reconnaissance. Highway traffic noise analyses are also performed for undeveloped lands when they are considered permitted developments.

After the existing and proposed land uses are established, the existing noise levels are determined based on a noise model validation process that compares modeled noise levels to actual measured noise levels. The existing noise environment is determined by gathering noise measurements and concurrent site and traffic information. The FHWA mandates the use of the most recent version of the Traffic Noise Model® (TNM) software be used to construct these models. The noise model must predict noise levels that are within 3 dB(A) of the actual levels in order to be considered valid. Future design year traffic is applied to a model that has been validated for the existing condition to estimate future 2033 noise levels.

The FHWA Noise Abatement Criteria (NAC), which is presented in 23 CFR 772, establishes the noise abatement criteria for various land uses, and is presented in Table 6.4. A traffic noise impact is defined as a future noise level that approaches or exceeds the NAC; or a future noise level that creates a substantial noise increase over existing noise levels. An approaching noise level is defined as being at least 1 dB(A) less than the noise level value listed in the NAC for Activity Category A through E. The FHWA allows states to define a substantial noise increase as an increase of anywhere between 5 and 15 dB(A).

Table 6.4

FHWA Noise Abatement Criteria (NAC)[16]

Hourly A-Weighted Sound Level in Decibels (dB(A))

Activity Category	Activity Criteria[17]		Evaluation Locator	Activity Description
	Leq(h)[18]	L10(h)[19]		
A	57	60	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B[20]	67	70	Exterior	Residential
C[18]	67	70	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools , television studios, trails, and trail crossings
D	52	55	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E[18]	72	75	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F
F	----	----	----	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	----	----	----	Undeveloped lands that are not permitted

[16] MDOT identifies a significant noise impact as a 10 dBA increase between the existing and predicted design year sound levels, or a measured or modeled noise level 1 dBA less than the NAC standard.

[17] Either Leq(h) or L10(h) (but not both) may be used on a project. MDOT uses Leq(h). The Leq(h) and L10(h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.

[18] Leq is the equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with Leq(h) being the hourly value of Leq.

[19] L10 is the sound level that is exceeded 10% of the time (90th percentile) for the period under consideration, with L10 being the hourly value of L10.

[20] Includes undeveloped lands permitted for this activity category

6.9.3 State Rules and Procedures

MDOT's Highway Noise Analysis and Abatement Handbook is the State's tool for implementing 23 CFR 772, which was discussed in Section 4.2. The Highway Noise Analysis and Abatement Handbook expands on 23 CFR 772 by refining definitions and establishing milestones within the design phase for the completion of noise impact analysis and mitigation development.

The MDOT Highway Noise Analysis and Abatement Handbook includes the following definitions:

Common Noise Environment (CNE): A group of receptors within the same Activity Category (Table 6.4) that are exposed to similar noise sources and levels; traffic volumes, traffic mix, and speed; and topographic features. Generally, common noise environments occur between two secondary noise sources such as interchanges, intersections, and cross roads.

Noise Impact: A substantial noise increase or a predicted design year noise level that is 1 dB(A) less, equal to, or greater than the NAC level.

Substantial Noise Increase: A 10 dB(A) or greater increase between the existing noise level and the design year predicted noise level.

Benefited Receptor: A receptor that receives a 5 dB(A) or greater insertion loss as a result of a proposed noise barrier.

Feasible Noise Barrier: A barrier that has no construction impediments, meets safety requirements for the traveling public, and provides at least 5 dB(A) noise reduction at 75% of the impacted receptors.

Reasonable Noise Barrier: A barrier:

- with a preliminary construction cost that is not more than 3% above the allowable cost per benefited receptor unit (ACPBU) of $44,187 (year 2014).
- that reduces design year traffic noise by 10 dB(A) for at least one benefited receptor and provide at least a 7 dB(A) reduction for 50% or more of the benefited receptor sites.
- that is approved by a majority of the benefitting residents and property owners during final design phase.

Permitted Development: Any presently undeveloped lands that have received a building permit from the local township or city.

Dwelling Unit Equivalent (DUE): A dwelling unit (residence) counts as one receptor. A DUE is the equivalent receptor count for public areas such as parks, schools, libraries and churches (FHWA Activity Categories NAC C and D) and is determined based on the number of employees and attendees, and the frequency of use.

6.9.4 FHWA Traffic Noise Model (TNM)

TNM is FHWA's computer program for highway traffic noise prediction and analysis. The use of the most recent TNM software, or any other model determined by the FHWA to be consistent with the methodology of the FHWA TNM, is a mandatory requirement for all traffic noise related projects under 23 CFR 772.9. The following parameters are used in this model to calculate an hourly Leq at a specific receiver location:

- Distance between roadway and receiver;
- Relative elevations of roadway and receiver;
- Hourly traffic volumes by classification;
- Vehicle speeds;
- Ground absorption;
- Weather conditions; and
- Topographic features, including retaining walls and berms.

Hourly traffic volumes have been divided into five vehicle classifications: automobiles (A); medium trucks (MT); heavy trucks (HT); Buses (B); and Motorcycles (M). Each vehicle class is defined by the *FHWA Traffic Noise Model, User's Guide, (February 1998); TNM v2.5 Update Sheet, Technical Manual: Part 1* as follows:

- Automobiles – all vehicles with two axles and four tires, includes passenger vehicles and light trucks, less than 9,900 pounds.
- Medium trucks – all vehicles having two axles and six tires, vehicle weight between 9,900 and 26,400 pounds.
- Heavy trucks – all vehicles having three or more axles, vehicle weight greater than 26,400 pounds.
- Buses – all vehicles designed to carry more than nine passengers.
- Motorcycles – all vehicles with two or three tires and an open-air driver/passenger compartment.

6.9.5 Noise Impact and Abatement Analysis

6.9.5.1 *Field Measurement and TNM Comparison*

The project corridor was divided based on like land use and identified as common noise environments (CNE) to facilitate the analysis of highway noise. The CNE and field measurement sites are illustrated in Figure 6.10 and in detail in the Appendix F maps. A minimum fifteen minute measurement were taken at each site, during peak and off-peak traffic periods. The measurements were conducted in accordance with FHWA and MDOT guidelines using an integrating sound level analyzer. Table 6.5 presents the data collected at the eleven (11) field measurement sites.

Figure 6.10 – Common Noise Environments and Field Measurement Sites

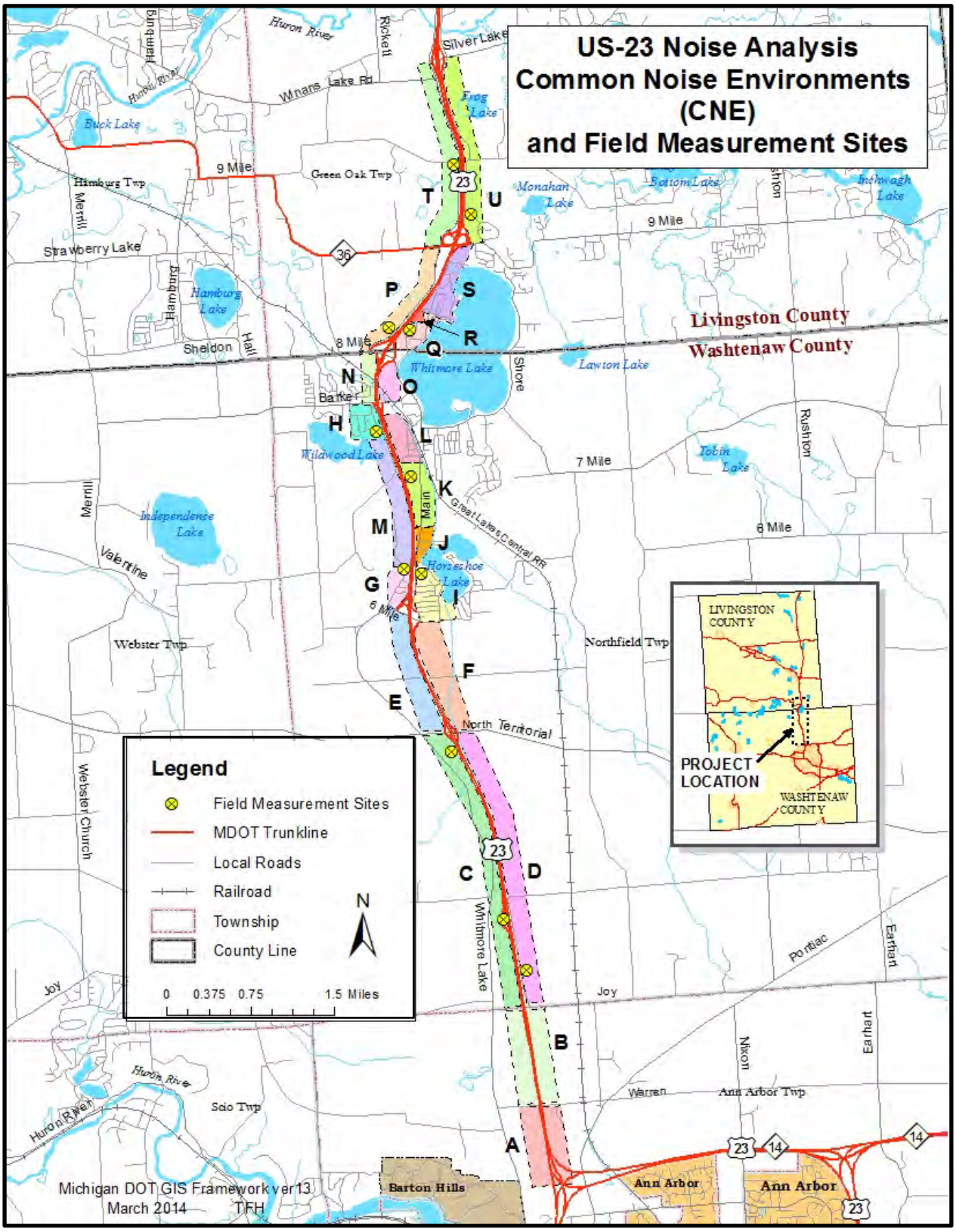


Table 6.5 – Measured Existing Noise Levels during Peak Traffic

Field Site ID	Site Description (Distance From The Outside Edge of the Shoulder)	Date	Start Time	Duration (min)	Traffic[1]						Measured Noise Level, dB(A) L_{eq}
					Roadway, Directions[2,3]	Autos	Medium Trucks	Heavy Trucks	Buses	Motor-cycles	
1	At the Spicer Rd / Whitmore Lake Rd intersection (50 ft)	7/22/14	7:00 AM	20	US-23, NB US-23, SB	395 1073	17 18	60 40	1 3	4 2	79
2	At the Jennings Rd / Wildwood Lake Dr intersection (63 ft)	7/22/14	7:35 AM	15	US-23, NB US-23, SB	378 715	15 18	49 32	0 1	4 2	72
3	Whitmore Lake Public School (68 ft)	7/22/14	8:00 AM	15	US-23, NB US-23, SB	367 592	20 20	42 29	0 1	0 2	73
4	At the Shady Beach / Main St intersection (43 ft)	7/22/14	8:25 AM	15	US-23, NB US-23, SB	343 531	26 7	34 28	1 0	3 4	77
5	At the Coyle Rd / Winter Ln intersection (66 ft)	7/22/14	8:50 AM	25	US-23, NB US-23, SB	525 854	30 18	81 69	1 3	6 5	71
6	Northern parking lot for Best Western hotel (55 ft)	7/22/14	5:35 PM	15	US-23, NB US-23, SB	762 564	13 13	37 39	2 1	7 7	77
7	Behind Tractor Supply Co. (56 ft)	7/22/14	5:00 PM	15	US-23, NB US-23, SB	654 357	11 9	24 26	0 2	4 1	74
8	SB US-23 Rest Area (220 ft)	7/22/14	4:20 PM	20	US-23, NB US-23, SB	1029 543	28 11	28 42	0 1	6 3	66
9	North of 9 Mile Rd on Fieldcrest Dr (30 ft)	7/23/14	7:00 AM	15	US-23, NB US-23, SB	306 793	8 13	56 23	0 0	1 4	78
10	Across from Site 6 (45 ft)	7/23/14	7:25 AM	20	US-23, NB US-23, SB	598 969	17 24	50 27	0 1	0 3	77
11	At the park entrance north of Joy Rd (62 ft)	7/23/14	8:10 AM	15	US-23, NB US-23, SB	331 777	19 15	40 39	1 0	1 2	77

Vehicle counts classifications are according to Section 6.9.4 of this report.
Vehicle speeds for US-23 are 70 mph.
Vehicle traffic on the roadways that are adjacent to the US-23 Right-of-Way was insignificant.

TNM was used to compare the field measurements to the model using the traffic count information. Comparing the modeled noise levels to the measured noise levels validates the TNM model for use on the specific project. Traffic counts were taken concurrently with the noise measurements at all of the sites and used in the model. All the modeled data compared within 3 dB(A) of the measured levels, which satisfies the MDOT requirement for validating noise measurements. The site-by-site comparison is presented in Table 6.6.

Table 6.6 - Comparison of Measured and Modeled Noise Levels

Field Site ID	Noise Level, dB(A) L_{eq} (1h)		Difference in Noise Level, dB(A) L_{eq} (1h) (Modeled Minus Measured)
	Measured	Modeled	
1	79	80	+1
2	72	74	+2
3	73	74	+1
4	76	77	+1
5	69	71	+2
6	76	77	+1
7	75	74	-1
8	66	66	0
9	77	78	+1
10	77	77	0
11	75	77	+2

6.9.5.2 *Impact Analysis*

Impact analysis is a computer modeling exercise using TNM to determine if the build alternative will result in future noise impacts on the relevant Activity Categories listed in Table 6.4. Receptor sites and characteristics, existing loudest hour traffic numbers[21] and speed, and roadway alignment are also input into TNM. TNM uses this information to calculate the existing peak hour noise levels. The future peak hour traffic and alternative alignment are input into TNM to predict the future sound levels. Existing and future traffic volumes are listed in Tables 6.7 – 6.10. The existing and predicted sound levels are compared and impacts are identified using the definition in the previous section.

Eight-hundred-sixty-three (863) receiver locations were included in the noise model. These receivers represent frequently used outdoor areas at the residential properties, commercial properties, cemeteries, churches, and parks that are within 500 feet of the outside edge of pavement. All of the receivers that were included in the model represent existing sites.

[21] Impacts are measured during the one-hour period where the worst-case noise levels are expected to occur. This may or may not be the peak hour of traffic. That is, higher traffic volumes can lead to higher congestion and lower operating speeds. Since higher speeds lead to higher noise emissions from motor vehicles, the worst-case noise levels may occur in hours with lower volumes and higher speeds.

Table 6.11 shows the number of impacted sites within each CNE. The maps illustrating the receptor locations and corresponding tables can be found in Appendix F.

Table 6.7 - Existing 2015 Traffic Volumes (AM Peak)

Roadway Segment[1]	Volumes by Vehicle Type[2]				
	Autos	Medium Trucks	Heavy Trucks	Buses	Motor-cycles
NB - M-14 to Territorial Road	1337	41	163	3	4
SB - M-14 to Territorial Road	3416	43	127	2	7
NB - Territorial Road to 6 Mile Road	1422	44	173	3	4
SB - Territorial Road to 6 Mile Road	3357	43	125	2	6
NB - 6 Mile Road to Barker Road	1451	45	177	3	4
SB - 6 Mile Road to Barker Road	2045	32	130	3	5
NB - Barker Road to 8 Mile Road	1422	44	173	3	4
SB - Barker Road to 8 Mile Road	1994	31	127	3	5
NB - 8 Mile Road to 9 Mile Road	1529	47	186	3	4
SB - 8 Mile Road to 9 Mile Road	2114	33	134	3	5
NB - 9 Mile Road Silver Lake Road	1536	48	187	3	4
SB - 9 Mile Road Silver Lake Road	2124	33	135	3	5

1) Minor streets within the US-23 were assumed to have an insignificant effect on the number of noise related impacts.
2) Volume distribution based on a traffic study performed by MDOT.

Table 6.8 - Existing 2015 Traffic Volumes (PM Peak)

Roadway Segment[1]	Volumes by Vehicle Type[2]				
	Autos	Medium Trucks	Heavy Trucks	Buses	Motor-cycles
NB - M-14 to Territorial Road	3358	36	114	3	7
SB - M-14 to Territorial Road	3618	47	137	2	7
NB - Territorial Road to 6 Mile Road	3630	39	123	3	8
SB - Territorial Road to 6 Mile Road	3618	46	134	2	7
NB - 6 Mile Road to Barker Road	3630	39	123	3	8
SB - 6 Mile Road to Barker Road	2204	34	140	3	5
NB - Barker Road to 8 Mile Road	3485	37	118	3	8
SB - Barker Road to 8 Mile Road	2149	34	137	3	5
NB - 8 Mile Road to 9 Mile Road	3467	37	117	3	8
SB - 8 Mile Road to 9 Mile Road	2278	36	145	3	6
NB - 9 Mile Road Silver Lake Road	3450	37	117	3	8
SB - 9 Mile Road Silver Lake Road	2289	36	146	3	6

1) Minor streets within the US-23 were assumed to have an insignificant effect on the number of noise related impacts.
2) Volume distribution based on a traffic study performed by MDOT.

Table 6.9 - Future 2040 Traffic Volumes (AM Peak)

Roadway Segment[1]	Volumes by Vehicle Type[2]				
	Autos	Medium Trucks	Heavy Trucks	Buses	Motor-cycles
NB - M-14 to Territorial Road	1441	45	176	3	4
SB - M-14 to Territorial Road	3681	47	137	2	7
NB - Territorial Road to 6 Mile Road	1533	48	187	3	4
SB - Territorial Road to 6 Mile Road	3618	46	134	2	7
NB - 6 Mile Road to Barker Road	1564	48	191	3	4
SB - 6 Mile Road to Barker Road	3397	43	126	2	6
NB - Barker Road to 8 Mile Road	1533	48	187	3	4
SB - Barker Road to 8 Mile Road	3261	41	121	2	6
NB - 8 Mile Road to 9 Mile Road	1647	51	201	3	5
SB - 8 Mile Road to 9 Mile Road	2739	35	102	2	5
NB - 9 Mile Road Silver Lake Road	1656	51	202	3	5
SB - 9 Mile Road Silver Lake Road	2383	30	88	2	5

1) Minor streets within the US-23 were assumed to have an insignificant effect on the number of noise related impacts.
2) Volume distribution based on a traffic study performed by MDOT.

Table 6.10 - Future 2040 Traffic Volumes (PM Peak)

Roadway Segment[1]	Volumes by Vehicle Type[2]				
	Autos	Medium Trucks	Heavy Trucks	Buses	Motor-cycles
NB - M-14 to Territorial Road	3619	39	123	3	8
SB - M-14 to Territorial Road	2117	33	135	3	5
NB - Territorial Road to 6 Mile Road	3912	42	133	3	9
SB - Territorial Road to 6 Mile Road	2160	34	137	3	5
NB - 6 Mile Road to Barker Road	3912	42	133	3	9
SB - 6 Mile Road to Barker Road	2204	34	140	3	5
NB - Barker Road to 8 Mile Road	3756	40	127	3	8
SB - Barker Road to 8 Mile Road	2149	34	137	3	5
NB - 8 Mile Road to 9 Mile Road	3737	40	127	3	8
SB - 8 Mile Road to 9 Mile Road	2278	36	145	3	6
NB - 9 Mile Road Silver Lake Road	3718	40	126	3	8
SB - 9 Mile Road Silver Lake Road	2289	36	146	3	6

1) Minor streets within the US-23 were assumed to have an insignificant effect on the number of noise related impacts.
2) Volume distribution based on a traffic study performed by MDOT.

Table 6.11 – Number of Impcated Sites within Each CNE

Activity Description			2015	2040
CNE Area A	–	Residential	0	0
CNE Area B	–	Residential	0	0
CNE Area C	–	Mixed Use	1	1
CNE Area D	–	Residential	0	0
CNE Area E	–	Residential	1	1
CNE Area F	–	Mixed Use	0	0
CNE Area G	–	Residential	16	15
CNE Area H	–	Residential	13	13
CNE Area I	–	Residential	8	6
CNE Area J	–	Residential	10	10
CNE Area K	–	Mixed Use	1	0
CNE Area L	–	Residential	33[1]	33[1]
CNE Area M	–	Residential	3	3
CNE Area N	–	Residential	14	12
CNE Area O	–	Commercial	0	0
CNE Area P	–	Commercial	0	0
CNE Area Q	–	Residential	0	0
CNE Area R	–	Residential	8	9
CNE Area S	–	Residential	23[2]	24[2]
CNE Area T	–	Mixed Use	1	2
CNE Area U	–	Residential	5	6

[1]Includes twenty-eight (28) Dwelling Unit Equivalent receivers

[2]Includes seven (7) Dwelling Unit Equivalent receivers

6.9.5.3 Abatement Analysis

The first step in conducting an abatement analysis is to identify potential noise barrier locations near areas with multiple impacted receptors. The barriers are then drawn in TNM along the corridor adjacent to impacted receptors. The modeled barrier lengths and heights are adjusted to optimize noise abatement for impacted receptors. Some receptor locations that were not impacted may benefit from the abatement. The total number of benefiting units for each barrier is considered in the feasibility and reasonableness determination. The feasibility and reasonableness definitions are in Section 6.9.3. Abatement must meet both the feasibility and reasonableness criteria for FHWA and MDOT approval and recommendation. The list of the modeled noise barriers are in Tables 6.12a and 6.12b. Table 6.13 presents the feasibility and reasonableness factor analysis for each barrier. Appendix F has the noise barrier location maps and benefiting unit tables.

Table 6.12a - Evaluated Noise Barriers

Noise Barrier ID	Locations	Existing L_{eq} (1hr) Noise Levels, dB(A)	Range of Future L_{eq}(1hr) Noise Levels, dB(A)		Noise Reduction (dB(A))	Barrier Characteristics	
			w/o Barrier	With Barrier		Length (ft)	Avg. Ht. (ft)
NB-C	Along the western Right-of-Way line between 5000 ft and 5600 ft south of North Territorial Rd at the impacted receiver	56-68	55-68	55-68	0-4	600	18.00
NB-E	Along the western Right-of-Way line 300 ft north and south of 5 Mile Rd	55-68	53-69	53-64	0-5	700	13.57
NB-G	Along the western Right-of-Way line between 1000 ft and 2200 ft north of 6 Mile Road	55-75	55-75	54-67	0-12	1200	13.25
NB-H	Along the western Right-of-Way line from the SB US-23 on-ramp at Barker Rd (Jennings Rd) to a point 250 ft south of Wildwood Lake Dr.	50-70	49-70	48-69	0-10	1000	15.10
NB-I	Along the eastern Right-of-Way line from the NB US-23 on-ramp at 6 Mile Rd (Main St) northerly for 700 ft and from a point 250 ft south of Shady Beach Str northerly for 700 ft	50-70	50-69	47-64	0-7	1400	13.71
NB-J	Along the eastern Right-of-Way line from a point 500 ft south of Greenland Ave northerly to a point 650 ft north of Schrum Dr	56-72	54-71	52-65	1-10	1500	14.07

Table 6.12b - Evaluated Noise Barriers (Continued)

Noise Barrier ID	Locations	Existing L_{eq} (1hr) Noise Levels, dB(A)	Range of Future L_{eq}(1hr) Noise Levels, dB(A)		Noise Reduction (dB(A))	Barrier Characteristics	
			w/o Barrier	With Barrier		Length (ft)	Avg. Ht. (ft)
NB-L	10 ft west of the eastern Right-of-Way line from Barker Rd southerly to a point 500 ft south of the Jennings Athletic Complex and Park	52-76	52-76	51-64	0-15	3100	11.47
NB-M	Along the western Right-of-Way line from a point 450 ft south of Wildwood Lake Dr southerly for 2200 ft	55-71	54-72	54-64	0-10	2200	14.36
NB-N	Along the western Right-of-Way line from the Barker Rd bridge northerly to the railroad bridge	55-68	54-67	50-66	1-10	800	20.46
NB-R	Along the eastern Right-of-Way line from the earth berm west of Heidelberg Rd northerly to a point 600 ft north of Cappy Ln	49-74	49-74	49-71	0-10	2000	11.1
NB-T	Along the western Right-of-Way line from a point 2100 ft north of 9 Mile Rd to a point 2700 ft north of 9 Mile Rd.	53-68	53-68	53-65	0-4	600	16.00
NB-U	Along the eastern Right-of-Way line from the NB on-ramp at 9 Mile Rd (Fieldcrest Dr) northerly for 900 ft	56-71	55-71	55-67	0-10	900	24.44

Table 6.13 - Noise Barrier Feasibility and Reasonableness

Noise Barrier ID	Number of Attenuated Locations					Cost [1]	Cost / Benefited	Feasible (Y/N)	Reasonable (Y/N)
	≥10 dB(A)	≥ 7 dB(A)		≥5 dB(A) (Benefited Receivers)					
		#	% of Benefited	#	% of Impacted				
NB-C	0	0	0%	0	0%	$486,000	-	N	N
NB-E	0	0	0%	1	100%	$427,500	$427,500	Y	N
NB-G	5	8	62%	13	80%	$715,500	$55,050	Y	N
NB-H	1	7	88%	8	61%	$679,500	$85,950	N	N
NB-I	0	1	17%	6	80%	$864,000	$144,00	Y	N
NB-J	1	6	67%	9	80%	$949,500	$105,500	Y	N
NB-L[3]	8	16	61%	26	76%	$1,620,000	$62,600	Y	N
NB-M	1	3	75%	4	100%	$1,422,000	$355,500	Y	N
NB-N	1	4	40%	10	50%	$690,750	$69.075	N	N
NB-R[2, 3]	6	14	58%	24	80%	$733,500	$41,625	Y	Y
NB-T	0	0	0%	0	0%	$432,000	-	N	N
NB-U	1	1	33%	3	100%	$990,000	$330,00	Y	N

[1] Based on $45.00 per square feet

[2] Includes a portion of receivers in CNE S

[3] Includes DUE receivers: NB-L = 28 impacted, NB-R = 7 impacted. See Noise Analysis Report for DUE determinations

6.9.6 Conclusions

The above table presents the modeled barrier analysis results to determine their feasibility and reasonableness. Modeled noise barriers NB-C, NB-H, NB-N, and NB-T had less than the required 75% of impacted receiving a 5 dB(A) noise reduction and did not meet the feasibility requirements. Barriers NB-C, NB-E, NB-G, NB-H, NB-I, NB-J, NB-L, NB-M, NB-N, NB-T and NB-U did not meet the reasonableness criteria. NB-C, NB-E, NB-I, and NB-T did not receive the required 10 dB(A) future noise reduction for at least one receiver. NB-C, NB-E, NB-I, NB-N, NB-T and NB-U had less than the required 50% of benefiting units receiving at least a 7 dB(A) noise reduction. Barriers NB-C, NB-E, NB-G, NB-H, NB-I, NB-J, NB-L, NB-M, NB-T and NB-U exceed the $44, 187 plus 3% ($45,313) allowable cost per benefiting unit.

The results show that one barrier, NB-R, satisfies the MDOT feasible and reasonableness criteria, and is the recommended noise abatement.

6.10 *Environmental Contamination*

A Project Area Contamination Survey (PACS), also known as a Phase I Environmental Site Assessment, was performed to determine if known or potential sites of environmental contamination exist that could affect the project's design, cost, or schedule, and to meet the requirements of Part 201 of the Michigan Natural Resources and Environmental Protection Act (NREPA), 1994 PA 451, as amended. The PACS included a review of Michigan Department of Environmental Quality (DEQ) files, interviews, and a site investigation.

The PACS identified three known and one potential site of environmental contamination within or adjacent to the proposed project area:

- two active gasoline stations located in the southwest and southeast quadrants of the US-23 and Territorial Road Interchange;
- a former industrial facility located in the southwest quadrant of US-23 and 8 Mile Road;
- and potential contaminated soil that may contain polynuclear aromatic hydrocarbons (PNA) and metals at the Great Lakes Central Railroad crossing located south of the US-23 and 8 Mile Road Interchange.

No environmental contamination issues were identified with any proposed real estate acquisition.

6.10.1 Mitigation

If excavation activities are to occur within the vicinity of the above noted known and potential contaminated sites, an estimate for contaminated soil removal, and the Special Provision for Non-Hazardous Contaminated Material Handling and Disposal, should be included in the final plan package. In addition, the Special Provision for Asbestos Removal and Disposal should be included in the project package in anticipation of encountering asbestos conduits on bridges. All contaminated media must be handled and disposed of appropriately in accordance with state and federal regulations.

6.11 *Wetlands*

State and federal laws and regulations (Federal Executive Order 11990 and Part 303 of Michigan Public Act 451 of 1994) protect wetlands and require that road construction avoid affecting wetlands when prudent and feasible. If impacts to a wetland are unavoidable, impacts must be minimized and mitigated by replacing lost acreage as closely as possible to and within the same watershed as the impacted wetland.

The project will be conducted within the existing ROW with the exception of the newly acquired ROW at North Territorial Road where 5 Mile Road will be relocated. This new stream crossing will not impact wetlands. No impacts to wetlands have been identified within the project limits.

6.12 *Water Quality*

6.12.1 Background

The Huron River Watershed is an approximately 900 square mile basin within Ingham, Jackson, Livingston, Monroe, Oakland, Washtenaw, and Wayne Counties. It contains 10 Metroparks, two-thirds of all southeast Michigan's public recreational lands, and many county and city parks. The Huron River supplies drinking water to approximately 150,000 people and supports an excellent smallmouth bass fishery. The Huron River is the only designated Scenic River in southeast Michigan, and the Michigan Department of Natural Resources (MDNR) designated 27 miles of the Huron and three of its tributaries as "Country-Scenic" River under the Natural Rivers Act. The Huron River Watershed is further split into 29 "Creeksheds" or sub-watersheds. (Huron River Watershed Council, hrwc.org). This project is within "Upper Huron" and the northern part of the "Middle Huron" portions of the Huron River Watershed.

The Upper Huron is a 545 square mile area that includes the headwaters of the Huron River and several of its tributaries upstream of Portage Lake, constituting 60% of the Huron River Watershed (Huron River Watershed Council, hrwc.org). The majority of the US-23 ATM project is within this portion. The Upper Huron is characterized by both urban and agricultural lands and is experiencing intense development pressure. The Middle Huron Watershed contains 40 miles of the main stem of the Huron River with a drainage area of 217 square miles. Land cover in the Middle Huron includes urban and sub-urban residential, commercial and industrial uses, low density residential and grasslands/old agricultural fields, forested lands, and scattered wetlands primarily in the northern and western fringes (Lawson et al. 2011).

6.12.2 Legal Requirements

Federal - *Federal Water Pollution Control Act* (FWPCA), as amended (33 U.S.C. 1251 et seq; the "Federal Act"). The FWPCA provides the statutory basis for the NPDES permit program and the basic structure for regulating the discharge of pollutants from point sources to waters of the United States. Section 402 of the FCWA specifically requires EPA to develop and implement the NPDES program.

State - *Michigan Act 451*, Public Acts of 1994, as amended (the "Michigan Act"), Parts 31, and Michigan Executive Orders 1991-31, 1995-4 and 1995-18. MDOT has a statewide MS-4 designation and is authorized to discharge from the separate storm water drainage system operated by the Michigan Department of Transportation under NPDES Permit No. MI0057364. Part 91, Soil Erosion and Sedimentation Control, of PA451 - *Natural Resources and Environmental Protection Act* (NREPA) provides for the control of soil erosion and protects adjacent properties and the waters of the state from sedimentation.

6.12.3 Water Quality Impacts

6.12.3.1 *TMDLs and Impaired Uses.*

Total Maximum Daily Loads (TMDLs) are required by the FCWA for water bodies that do not meet Water Quality Standards (WQS). A TMDL is developed by determining the maximum daily load of a pollutant that a water body can assimilate and still meet the WQS. MDOT's statewide MS-4 permit requires that the MDOT shall develop, implement, and enforce storm water management programs designed to reduce the discharge of pollutants to the maximum extent practicable, to protect the designated uses of the waters of the state, to protect water quality, and to satisfy the appropriate state and federal water quality requirements. If a water body has a TMDL, the maximum extent practicable includes the development, implementation, and enforcement of storm water controls designed to meet the responsibilities established by the TMDL. The MDOT Storm Water Management Program requires implementation of Best Management Practices (BMPs) to comply with the minimum measures identified in the permit and any TMDLs if applicable.

This project falls within three TMDL areas:

- Strawberry Lake TMDL was developed due to excess phosphorus loading from point and nonpoint sources in the Middle Huron River Watershed and covers the entire project area.
- Ford/Belleville Lakes TMDL was developed due to excess phosphorus loading from point and nonpoint sources.
- Geddes Pond (Huron River) TMDL is for E. coli and both Ford/Belleville Lake and Geddes Pond (Huron River) TMDLs include the southern terminus of the project up to 650 feet north of Joy Road.

In compliance with MDOT's 2015 National Pollution Discharge Elimination System (NPDES) permit, measures to avoid, minimize, and mitigate water quality impacts are compatible with the long term goals for water quality for the Huron River Watershed.

The 2011 revised Watershed Management Plan for the Huron River in the Ann Arbor-Ypsilanti Metropolitan Area (Middle Huron) outlines quantitative and qualitative steps to restore and protect the integrity of water quality and quantity of the Middle Huron River system (Lawson et al. 2011). The long-term goals of the plan are:

- Reduce flow variability
- Reduce nonpoint source loading and reduce soil erosion and sedimentation
- Protect and mitigate loss of natural features for Stormwater treatment and wildlife habitat
- Increase public awareness and involvement in protecting water resources
- Gain broad implementation of watershed management plan and associated plans, and
- Continue monitoring and data collection for water quality, water quantity and biological indicators

The Huron Chain of Lakes Watershed Management Plan (Huron Chain of Lakes Steering Committee 2015) includes Strawberry Lake and has similar long term goals as listed above. Additionally, the Strawberry Lake Phosphorus Management Plan's (Livingston Watershed Advisory Group, 2011) goal is to:

1. Restore and protect the water quality of the area with the goal of attaining the Total Maximum Daily Load for Strawberry Lake.

Reducing sediment loading from post construction Stormwater will help in achieving these goals.

6.12.3.2 *Post-Construction Impacts*

The preferred alternative will result in a slight increase in impervious surface which will increase the volume and flow rates of runoff from the roadway and sediment loads to surface waters.

6.12.4 Mitigation Measures

To meet the goals of the TMDLs, stormwater will be treated for 80% sediment removal using appropriate Best Management Practices (BMPs) before it enters any surface waters. BMPs will also be used to reduce flow rates and volume to minimize potential erosion issues.

MDOT shall phase out illicit connections to storm sewers, along with most previously permitted storm sewer discharges and replaced with connections to sanitary sewers with adequate pretreatment to the maximum extent practicable. All disturbed sewer lines will be addressed in accordance with local ordinances. Beyond all these items, all other Michigan Department of Community Health (MDCH), local health department and MDEQ requirements designed to protect surface and groundwater quality will be met.

6.12.4.1 *Soil Erosion and Sedimentation Control During Construction.*

MDOT will control accelerated sedimentation caused by construction before it enters the Huron River Watershed or leaves the right-of-way by the placement of temporary or permanent erosion and sedimentation control measures. MDOT has developed a series of standard erosion control items to be included on design plans to prevent erosion and sedimentation. The design plans will describe the erosion controls and their locations. The following is a partial listing of general soil erosion and sedimentation control measures that will be carried out in accordance with permit requirements.

Restrict work in the water channels during periods of seasonally high water, except as necessary to prevent erosion. Restrict work in the stream from March 1 through June 30 to protect fisheries in sensitive streams.

Provide adequate sedimentation controls around the shore work areas to provide the necessary protection for mussels, fish, and other aquatic life forms.

Protect road fill side slopes, ditches, and other raw areas draining directly into the surface waters with riprap (up to three feet above the ordinary high water mark), sod, seed and mulch, or other measures, as necessary to prevent erosion.

Stabilize and vegetate areas disturbed by construction activities within five days after final grading has been completed. Where it is not possible to permanently stabilize a disturbed area, appropriate temporary erosion and sedimentation controls will be implemented. All temporary controls will be maintained until permanent soil erosion and sedimentation controls are in place and functional.

The contractor shall have the capability to perform seeding and mulching at locations within 150 feet of any streams or drains within 24 hours of being directed to perform such work by the project engineer.

Protect the natural vegetative growth outside the project's slope stake line from removal or siltation. Natural vegetation, in conjunction with other sedimentation controls, provides filtration of runoff not carried in established ditches.

Prevent the tracking of material onto local roads and streets. If material is tracked onto roads or streets, it shall be removed by the Contractor.

6.13 *Floodplains and Hydraulics*

Federal laws and regulations require MDOT to determine whether a proposed project would encroach upon any floodway or affect any floodplain (23 CFR 650 and Executive Order 11998). Floodplain analysis must determine whether the project creates or increases a hazard to people or property and whether there is an impact on natural and beneficial floodplain values. These values include fish, wildlife, plants, open space, natural beauty, scientific study, outdoor recreation, agriculture, aquaculture, forestry, natural moderation of floods, water quality maintenance and groundwater recharge.

A new structure to carry 5 Mile Road over the Catholic Church Horseshoe Lake drain will have approximately the same dimensions as the N. Territorial Road culvert and no harmful effect will occur based upon modeling of the structure and surrounding features. The existing culvert under North Territorial Road will be replaced with a design having no harmful effect based upon additional hydraulics analysis.

The existing twin 6′ by 10′ culverts that carry the Horseshoe Lake Outlet Drain under at the US-23 bridges over the railroad will be extended approximately 10 feet on each side due to the widening of the highway bridges. A hydraulic assessment is in process where the results will affect the final culvert design to ensure no harmful effects will occur.

6.14 *Wild and Scenic Rivers or State Designated Natural Rivers*

The Wild and Scenic Rivers Act of 1968 prohibits federal support for actions, such as the construction of dams or other instream activities that would diminish the river's free flow or outstanding resource values. Similarly, the goal of Michigan's Natural Rivers Program, formerly known as the Natural River Act and now known as Part 305 of Public Act 451 of 1994, is to preserve and enhance a river's value for a variety of reasons including aesthetics, free-flowing condition, recreation, boating, water conservation, floodplain and fisheries and wildlife habitat.

There are no waterways that fall under the Wild and Scenic Rivers Act of 1968 or under the State of Michigan Part 305 of Public Act 451 of 1994.

6.15 *Stream and Drain Crossings*

The project includes four stream crossings in Washtenaw County. One crossing is located in Section 5 of Ann Arbor Township and three are located in Northfield Township in sections 6 and 20. There are no mapped floodplains for stream crossings within the project limits.

US-23 crosses over the upper reach of Traver Creek (Figure 6.3) in Section 5 of Ann Arbor Township. The existing 36″ cross culvert will not be affected by the project as the crossing is enclosed as it crosses the ROW.

A crossing of the Catholic Church Horseshoe Lake drain in Section 20 of Northfield Township is located within the interchange of US-23 and North Territorial Road (Figure 6.2). The existing 9′9″x 6′7″ metal plate arch culvert located under North Territorial Road on the east side of the interchange will be replaced with an 8′ x 14′ box culvert. A hydraulic analysis shows this structure is adequately sized and this culvert will remain in place. A new crossing with an 8′ x 14′ box culvert will be located 467 feet north of the North Territorial Road culvert to carry the relocated Five Mile Road to a new connection to North Territorial Road.

US-23 crosses over a tributary of Catholic Church Horseshoe Lake drain (Figure 6.2) in Section 20 of Northfield Township. The existing 60″ cross culvert will not be impacted by the project as the crossing is enclosed as it crosses the ROW.

US-23 crosses over Horseshoe Lake Outlet Drain (Figure 6.1) in Section 6 of Northfield Township, Washtenaw County; this stream is known as Horseshoe Creek in Livingston County. The 6′ x 10′ twin culvert lies between Barker Road on the south and the US-23 railroad bridge to the north. The existing twin culvert will be extended approximately 10 feet on each side. Flow will be maintained in one of the culverts while the other culvert is extended.

6.16 *Fish and Wildlife*

The project corridor is located north of the City of Ann Arbor and ends north of the village of Whitmore Lake in a fragmented landscape consisting of agricultural land, deciduous woodlots, and areas devoted to business and residential land use. Preserved natural land is present in Northfield Township (section 32) where the approximately 80-acre Northfield Woods Preserve is located directly east of the US-23 ROW.

General wildlife surveys were conducted in conjunction with searches for threatened and endangered species. An area within one half mile each side of the ROW was used to collect information on animal communities that could be influenced by the project. A total of 52 vertebrate species were documented during five days of survey, with a total of four amphibians, three reptiles, three mammals, and 42 birds observed. Additional observations added 25 additional bird species to the species list (Wolinski, unpublished observations 2006 to 2013); most associated with the open water of Whitmore Lake. None of these species are listed as a species of special conservation concern by the state of Michigan.

A Great Blue Heron colony consisting of five active nests was found west of US-23 at the Six Mile Road interchange in Northfield Township (section 18). The colony is located about 560 feet west of the ROW and is not documented in the current MNFI database.

Stick nests of the Osprey (*Pandion haliaetus*), a species of special concern, are located on two cell towers along the project corridor- Whitmore Lake Road at Joy Road and at Eight Mile Road west of US-23, both in Washtenaw County.

Inspection of the stream bottom downstream of the North Territorial Road culvert to the location of the proposed new Five Mile Road crossing revealed a generally sandy, unconsolidated bottom with some woody debris accumulation along sections of the stream bank. Clear flowing water approximately 12 to 18-inches deep was found on all of the dates observations were conducted. The stream is shaded by trees and shrubs along most its length at this location. No fish or mussels were observed in this reach of the stream, though the Green Frog (*Rana calmitans*) was found on the shoreline in a wetland pocket along the east shoreline in an open area north of the proposed road crossing.

6.16.1 Migratory Birds

Completed site inspections of bridges were completed within the corridor as part of the general wildlife survey work. Use of two structures by migratory birds was found at the Barker Road bridges and at the railroad bridge south of Eight Mile Road.

No impact will occur as long as the provisions of the Migratory Bird Treaty Act regarding nest removal are followed when swallows or other migratory birds are present. The Special Provision for Migratory Bird Protection will be part of the final plan package and implemented during construction. Please contact the MDOT Wildlife Ecologist if you have any questions.

6.17 *Threatened and Endangered Species*

6.17.1 General Information

Endangered and threatened species are officially protected by the State of Michigan's Natural Resources and Environmental Protection Act, Act 451 of the Public Acts of 1994, Part 365; and the Federal Endangered Species Act of 1973, as amended. An endangered species (E) under the Acts is defined as being in danger of extinction throughout all or a significant portion of its range. A threatened species (T) under the Acts is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Special concern species (SC) are not afforded legal protection under the Acts, but are of concern because of declining or relict populations within Michigan or are species for which more information is needed.

6.17.2 Potential Species in Corridor

The Michigan Natural Features Inventory (MNFI), Natural Heritage Database (NHD) and the U.S. Fish and Wildlife Service (USFWS) endangered species map were consulted in order to determine the potential for listed species within the project corridor. The following state listed species were located within 1.0 mile of the proposed project corridor. The three federally listed animals are known to potentially exist within the county.

Table 6.14 - Species Survey Timeline

Common Name	Scientific Name	Listing Status*	Survey Date
PLANTS			
Small white lady's-slipper	*Cypripedium candidum*	State T	Mid May-MidJune
Goldenseal	*Hydrastis Canadensis*	State T	May-August
Square sedge	*Carex squarrosa*	State SC	June
Dwarf hackberry	*Celtis tenuifolia*	State SC	All year
Clinton's bulrush	*Scirpus clintoni*	State SC	June-July
Purple twayblade	*Liparis liliifolia*	State SC	June-Aug
Prairie white indigo	*Baptisia lacteal*	State SC	July-August
Canadian milk vetch	*Astragalus canadensis*	State T	July-August
Willow aster	*Aster praealtus*	State SC	August-September
ANIMALS			
Eastern Massasauga	*Sisturus catenatus catenatus*	Fed C	Apr-May Aug-Sep
Indiana Bat	*Myotis sodalist*	Fed E	May-August
Northern Long-eared Bat	*Myotis septentrionalis*	Fed C	May-August

* E = Endangered, T = Threatened, SC = Special Concern, C - Candidate

6.17.3 Flora Review

During 2014, four separate field surveys were conducted in an effort to determine the presence/absence of listed plant species within the project limits. The field surveys were conducted on May 29, July 9, August 20, and September 5. These investigations focused on the best survey windows for each species in an effort to determine their existence. These dates also provided a wide survey window throughout the entire growing season to assure that any listed species present would be observed. Due to the cold and wet spring that we encountered during 2014, the first survey was delayed till the end of May.

Within the corridor, much of the right-of-way (ROW) is mowed and maintained yearly. This leaves a thick sod composed of typical ROW grasses that is unsuitable for most listed plant species. Each of the species listed above will be discussed individually below in regards to their preferred plant community and its availability within the project corridor.

Small white lady's slipper - This species prefers prairie fens or other alkaline ground water fed sites, which are not present in the project corridor. The woodland edges seen throughout the corridor are maintained as wet ditches and contain some native grasses. These areas were all surveyed for the species and it was not located.

Goldenseal – This species prefers pockets of rich, shady, mesic southern forests often slopes with little herbaceous growth. Most of the suitable habitat for this species falls just outside MDOT ROW and is located on private property on the west side of the highway in the middle of the project corridor. Since the ROW is cut and devoid of all large trees, the ROW fence represents the edge of this plant community. Since these areas receive much more daylight and a true forest canopy does not exist within MDOT ROW, most areas are unsuitable for the species.

Square Sedge - This species is typically located in floodplain forests, along the lower river bottoms, seasonally wet pools, dry-mesic forests, successional wetlands and pastures. As noted above, most of the mesic wetlands and floodplain communities fall outside MDOT's ROW and all wet ditches and water crossings were surveyed for this species.

Dwarf hackberry - This species prefers open and early successional communities and is often seen at woodland edges and along the tops of backslopes associated with transportation ROW's. This species has a great deal of potential habitat within the corridor however; it was not located during any of the field surveys.

Clinton's bulrush - This species prefers wet to mesic prairies in Lower Michigan. This community is not present specifically within the corridor however; lower quality wetlands and mowed ditches were surveyed for the species consistent with Small white lady's slipper and Square sedge.

Purple twayblade - This species prefers deciduous forests, brushy thickets and mesic floodplain forests. These communities are present predominantly in the middle of the proposed project where the ROW edges are dominated by forested uplands and wetlands. Suitable habitat for this species is also located at the southern end of the project where thickets dominate the ROW edges. These areas were the targets for this species during field surveys.

Prairie false indigo - This species prefers prairies, savannas and open woodland edges. Habitat for this species exists throughout the corridor from the open grassy ROW to the edge of the woodlands associated with over half of this project. There is also a specific record from 1990 located just northeast of the carpool lot located at the southern end of the corridor. These areas were surveyed extensively but the species and old record were not located.

Canadian milk vetch - This species occurs in a variety of communities including oak barrens, moist openings over limestone, wet ground and sandy lakeshores. Most of these habitats do not exist within the corridor with the exception of the existing ditches and a small oak savanna located east of the highway in the middle of the project. This small savanna remnant is located on school property and will not be impacted by the proposed project. The remaining wet ditches were surveyed along with the other species and this species was not located.88

Willow Aster - This species is primarily found in fields, thickets, weedy successional openings and remnant lake plain prairies. While the first three community types are present within the corridor, the lake plain prairie is not. Most of the suitable habitat for this species is located at the north end of the corridor; however, this is all mowed and maintained on a yearly basis to the ROW fence.

6.17.4 Fauna Review

A record for the Federal Candidate species Eastern Massasauga (*Sisturus catenatus catenatus*) from section 20 of Northfield Township dated 1986 is about 0.56 mile from the ROW limits. Suitable foraging habitat is located as close as 0.25 mile to the ROW. There are no other records of listed Federal or state species near the project limits.

Tree removals associated with the project will occur mainly at the proposed relocation of Five Mile Road north of North Territorial Road. This 3.32 acre wooded area holds trees that are greater than 3-inches in diameter and are located directly adjacent to the Catholic Church Horseshoe Lake drain. These trees could offer suitable habitat for listed bat species, specifically Indiana Bat (*Myotis sodalis*) and Northern Long-eared Bat (*Myotis septentrionalis*).

An inspection of the area found no suitable roost or maternity trees for Indiana Bat, and with a heavy, dense understory and margins, little access for Northern Long-eared Bat. The stream corridor and field edge offer some utility as a travel corridor and offer some value as foraging habitat; though wooded areas away from the ROW offer superior roosting and foraging habitat for both species. Given these observations, this wooded area would be considered of very low

quality and it is expected that bats would not occupy this small wooded fragment. Cutting of trees in this area should be minimized to the greatest extent possible to conserve general wildlife habitat.

6.17.5 Conclusion

During the field surveys, no state or federally listed T/E/SC plant or animal species were located within the proposed project corridor. Based upon this review, no further field surveys or coordination with the Michigan Department of Natural Resources or the U.S. Fish and Wildlife Service is required. A Michigan Endangered Species Permit and/or USFWS Section 7 consultation is not required for this project.

6.18 *Coastal Zones Resources*

Coastal management in Michigan is part of a nationwide federal-state partnership established under the Coastal Zone Management Act (CZMA) of 1972. Coastal management means achieving a balance between natural resources preservation and economic development along our Great Lakes coasts.

This project is outside of the Coastal Zone Management Boundary. Federal consistency review is not required.

6.19 *Cultural Resources*

MDOT must comply with Section 106 of the National Historic Preservation Act of 1966, as amended, and Section 4(f) of the Department of Transportation Act of 1966, by identifying all properties eligible for listing on the National Register of Historic Places within the Area of Potential Effect (APE) for the project. The APE, always established in consultation with the State Historic Preservation Office (SHPO), represents the maximum area potentially affected by the project.

The National Register of Historic Places is the official list of the historic places worthy of preservation across the United States. The Nation Park Service, a part of the U.S. Department of the Interior, administers the National Register. To qualify for listing on the National Register, properties must be at least fifty years old and meet one of the following criteria:

- Be associated with a significant event;
- Be associated with the life of a significant person;
- Embody the distinctive characteristics of a type, period or method of construction; or represent the work of a master; or
- Have yielded or may be likely to yield historic or prehistoric information.

Amendments to the Historic Preservation Act in 1992 protect properties having traditional religious or cultural importance to Native Americans.

6.20 *Historic and Archaeological Resources*

6.20.1 Historic

No historic properties will be affected by the proposed project based on a consultation meeting with the State Historic Preservation Office (SHPO) on July 28, 2014. No effect is anticipated at the one historic above ground resource within the project limits, namely the St Patrick's Cemetery, which is adjacent to the Northfield Church/Isom Rest Area. St Patrick's Church and Rectory are outside of the Area of Potential Effect for the proposed scope of work.

6.20.2 Archaeological

MDOT conducted an archaeological survey during June and July of 2014. One archaeological site, assigned site number 20WA443 by the State Archaeologist, was identified. MDOT determined, in consultation with the SHPO on September 11, 2014 that site 20WA443 is not eligible for listing on the National Register of Historic Places. Therefore, no archaeological properties will be affected by the proposed project. MDOT also consulted, on behalf of FHWA, with the twelve federally recognized Indian Tribes of Michigan. A copy of MDOT's consultation letter can be found in Appendix D.

6.20.3 Traditional Cultural and Religious Properties

MDOT conducted research to determine if any Traditional Cultural and/or Religious Properties are present within the study area. MDOT determined, in consultation with the SHPO on September 11, 2014, that no such properties are known to be present. However, no such study can be completed without input from the twelve federally recognized Indian Tribes of Michigan. To that end, MDOT contacted each Tribe in writing; a copy of that letter can be found in Appendix D.

6.21 *Indirect Impacts and Cumulative Effects*

CEQ regulations implementing NEPA define indirect effects as those that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air, water, and other natural systems, including ecosystems (40 CFR 1508.8(b)).

CEQ regulations define cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). Thus, cumulative effects include the direct and indirect impacts of a project together with the impacts from reasonably foreseeable future actions of other projects.

Direct and indirect impacts of the proposed project, as well as other, past current or reasonably foreseeable projects near the US-23 corridor within the study area, are relevant for review of cumulative effects. Other local projects not related to the corridor could also contribute to cumulative effects on a resource.

6.21.1 Indirect Impacts

The potential for other development or other changes to the existing land use or the environment potentially induced by the proposed project was assessed. The potential indirect impacts include further development of land in the vicinity of the interchanges along US-23 and land adjacent to the US-23 corridor within the project study area. The direct impacts on each resource were considered, and the likelihood of the proposed project to induce additional indirect changes was considered.

6.21.2 Cumulative Effects

The cumulative effects assessment considered projects that could incrementally affect the existing environment along with the proposed project. The information reviewed for this EA included, other transportation projects, known or planned residential and commercial developments. Coordination with local and regional planning agencies took place to acquire information for these potential types of developments. The effects of past actions were also included as part of the cumulative effect analysis.

The Washtenaw Area Transportation Study (WATS) 2040 Long Range Plan does not indicate any local transportation projects in the vicinity that would have an effect on the US-23 corridor. All of the local transportation projects that are planned in the area are preservation projects and would not change the operations of the US-23 corridor. The traffic growth rate was developed with the use of the WATS and SEMCOG model and assesses and incorporates the 2040 forecast year transportation network for the Washtenaw County and SEMCOG area.

With all the social, economic and environmental factors examined and considered in the review of the Indirect Impacts and Cumulative Effects for this project it is determined that the project will only have temporary impacts and will ultimately improve the flow of people, goods and services throughout the corridor.

6.22 *Maintaining Traffic during Construction*

6.22.1 US-23 Mainline

As such the maintain traffic concept for mainline requires that all lanes be open during peak hours with a single lane allowed at night and off-peak. This concept attempts to minimize the congestion associated with the construction and impacts to local stakeholders.

Stage 1 involves a nighttime single lane closure to upgrade the outside shoulders. Detours and daytime work would be impractical for this stage as there are no suitable detour routes for US-23. Any peak hour lane closures result in far too much delay to local stakeholders.

Stage 2 consists of shifting traffic to the newly upgraded outside shoulders and constructing the new pavement for the Active Traffic Management system. No peak hour lane closures or detours of US-23 will be permitted.

6.22.2 Bridges

Several bridges over U-23 we be reconstructed as a part of the project. These bridges will maintain a minimum of one lane of traffic at all times. Utilizing directional detours, access can be maintained for all roadway users. The local bridges over US-23 that will be replaced include N. Territorial, 6 Mile, and 8 Mile Roads. N. Territorial and 6 Mile road will be constructed on the existing alignment. The 8 Mile Road replacement is anticipated to be constructed north of the existing bridge.

MDOT is considering the use of Accelerated Bridge Construction (ABC) methods to minimize the impacts to motorists at all bridge replacements as stated in Section 5.2.

The US-23 bridges over Barker Road will be widened on the median side to accommodate the ATM. This will be coordinated with the mainline road improvements while maintaining two lanes of traffic in each direction.

The US-23 bridges over the Great Lakes Central Railroad are anticipated to be replaced as part of the project. The bridge replacement will be staged in three stages to maintain four lanes of traffic during peak hours at this location and use an ABC method called a bridge slide. A bridge slide entails building the new span next to the old span, temporarily diverting traffic onto the new span while the old span is demolished. The new span is then slid into place where the old span was located. The MDOT M-50 bridge replacement is an example of a bridge slid and can be viewed through this link: https://www.youtube.com/watch?v=Pa1audos1Uk.

Stage 1: A temporary roadway will be constructed east of the NB roadway with a temporary bridge over the railroad.

Stage 2: NB traffic will be shifted to the temporary roadway. SB traffic will be shifted to the old southbound roadway. The old NB roadway at this point will be reconstructed to accommodate two lanes in each direction.

Stage 3: All US-23 Traffic will be maintained on the newly constructed SB US-23. The old northbound bridge will be removed and the permanent bridge footings and substructure will be constructed. The permanent bridge deck which was constructed in Stage 1 will be slid onto the NB US-23 substructure and the roadway will be reconstructed. NB traffic will then be placed into their original lanes.

Short duration full detours are preferred for the construction of the ramp extensions. Directional signage will detour drivers during these brief construction periods. Throughout all stages message boards, signs, and website updates will be used to notify drivers of detours, delay, and alternate routes. The US-23 Maintaining Traffic Concept for the EA is located in Appendix B.

6.23 *Permits*

Proposed construction activities may involve the need for permits in several areas. Impacts on bodies of water such as lakes, streams, drains, and wetlands may require permits under:

State:

- PA 451, Natural Resources and Environmental Protection Act, 1994, as amended
- Part 31, Water Resources Protection of Act 451
- Part 55, Air Pollution Control of Act 451
- Part 301, Inland Lakes and Streams of Act 451

Federal:

- Sections 401 and 404 of the Federal Water Pollution Control Act of 1972.
- Water Quality Act Section 402 National Pollutant Discharge Elimination System (NPDES) storm water permit under the Clean Water Act of 1972 as amended.
- Executive Order 11990

Parts 31 and 301 are administered by the Michigan Department of Environmental Quality (MDEQ). A Part 31 Water Resources Protection Permit (which is reviewed and issued with the Part 301 application) is needed to place fill material within any part of a floodplain with a drainage area of 2 square miles or greater. A Part 301 Inland Lakes and Streams Permit is required for any work below the ordinary high water mark of any inland lake, stream or drain including the placement of a permanent or temporary crossing, culvert or bridge, haul road, or construction access pad.

Section 401 requires certification from the state's water quality agency (MDEQ) to ensure that the discharge of dredged or fill material complies with the provisions of the Federal Water Pollution Control Act.

Water Quality Act Section 402 requires a National Pollutant Discharge Elimination System Storm Water discharge permit for construction projects which involve earth disturbance of five acres or greater. Permit application requirements include the name of receiving water, identification of soil erosion controls during construction, and identification of measures to control pollutants in storm water discharges that occur after construction has been completed. The intent of these requirements is to reduce impacts on water quality during and after construction of the project.

Executive Order 11990 states that when federal funds are used on a project, impacts on any wetland (regardless of size) will require that no "Prudent or Feasible Alternative" exists that would eliminate or reduce impacts on that wetland.

Final mitigation measures proposed in areas requiring the above permits will be developed in consultation with the appropriate resource agencies, and will be included in the permit application.

6.24 *Construction Impacts and Measures to Minimize during Construction*

The goal of project mitigation is to preserve, to the greatest extent possible, existing neighborhoods, land use, and natural resources, while improving transportation. Although some adverse impacts are unavoidable, MDOT through the project development, design, environmental, and construction processes, takes precautions to protect as many social and environmental systems as possible. Specific project mitigation items being considered at this time can be found in the Project Mitigation Summary Green Sheet located at the end of this section. A Final Green Sheet will be prepared and included in the project Finding of No Significant Impact (FONSI). The Green Sheet may be modified during the final design, right-of- way or construction phases of this project.

Construction activities, which include the general mitigation measures listed below, are those contained in the 2012 MDOT Standard Specifications for Construction. These measures include:

1. The contractor shall locate all active underground utilities prior to starting work, and shall conduct his operations in such a manner as to ensure that those utilities not requiring relocation will not be disturbed. Relocated utilities may be temporarily interrupted for short time periods.

2. Accelerated erosion and sedimentation caused by highway construction will be controlled before it enters a water body or leaves the highway right-of-way by placing temporary or permanent soil erosion and sedimentation control measures. MDOT has developed a series of standard erosion/sedimentation control items to be included on design plans to prevent erosion and sedimentation. The design plans will describe the soil erosion and sedimentation controls and their locations.

3. All regulations on the MDEQ governing disposal of solid wastes must be complied with. When surplus or unsuitable material is to be disposed of outside the right-of-way, the contractor shall obtain and file with MDOT written permission from the owner of the property on which the material is to be placed. If federal funds are used for this project, Executive Order 11990 states that no surplus or unsuitable material is to be temporarily or permanently disposed of in any public or private wetland area,

regardless of size. In addition, no surplus or unsuitable material is to be temporarily or permanently disposed of in any watercourse or floodplain.

4. Disruption of traffic in the construction area will be minimized to the greatest extent possible. Although the control of all construction-related inconveniences is not possible, motorist and pedestrian safety will be ensured by signing all construction areas. All lane closures, traffic shifts, short term detours, and changed travel patterns will be clearly marked. Access will be maintained to adjacent properties during construction to the extent possible.

5. The contractor must comply with all federal, state, and local laws and regulations governing the control of air pollution. During the construction of the project, the contractor will be responsible for adequate dust-control measures so as not to cause detriment to the safety, health, welfare, or comfort of any person, or cause damage to any property, residence or business. All bituminous and Portland cement concrete proportioning plants and crushers must meet the requirements for the rules of Part 55 Air Pollution Control, of Act 451, Natural Resource and Environmental Protection.

Design plans will be reviewed by MDOT prior to contract letting in order to incorporate any additional social, economic, or environmental protection items. The construction site will be reviewed to ensure that the mitigation measures proposed are carried out, and to determine if additional protection is required. More mitigation measures may be developed if additional impacts are identified. Specific mitigation items are listed in the Project Mitigation Summary Green Sheet and will be included on the design plans, project proposal, and permit applications.

The final mitigation package will be reviewed by MDOT representatives, in cooperation with concerned state, federal, and local agencies. Some changes in the early mitigation concepts discussed in this document may be required when design begins or when in- depth soil borings are taken and analyzed. These mitigation concepts will be implemented to the greatest extent possible. Where changes are necessary, they will be designed and field reviewed before permits are applied for and construction begins. Changes may also be necessary during the construction phase, but they will reflect the early mitigation intent.

Project Mitigation Summary (Green Sheet)
For the Preferred Alternative

January 16, 2015

Environmental Assessment

Proposed US-23 Improvements
From the West US-23/M-14 Interchange North 10.2 Miles to
Silver Lake Road in Green Oak, Northfield, and Ann Arbor Townships,
Livingston and Washtenaw Counties, Michigan

This Project Mitigation Summary "Green Sheet" contains project specific mitigation measures being considered at this time. An updated "Green Sheet" will be prepared and included in the Finding of No Significant Impact (FONSI) for this project. These mitigation items may be modified during the final design, right-of-way acquisition, or construction phases of this project.

I. Social and Economic Environment

A. *Relocations and Access to Residential and Commercial Properties* - This project will require 10.6 acres of additional fee ROW for the N. Territorial Road interchange reconfiguration and 5 Mile Road realignment. Grading permits (1.7 acres) may be required at the six locations where crash investigation sites (CIS) will be located along US-23. Construction easements will be required for access through private property to build the barrier along the ROW. A consent-to-grade driveways permit will also be required on this project. Access to adjacent residential and commercial properties will be maintained during construction. All fee ROW will be acquired in conformance with the federal Uniform Relocation Assistance and Real Properties Acquisition Policies Act of 1970, as amended.

B. *Noise Impacts* – The Michigan Department of Transportation noise abatement analysis has identified one feasible and reasonable noise barrier location along the project corridor. The noise barrier will be located on the east side of US-23 from north of the US-23 on ramp at Eight Mile Road northerly to Dort Drive. The new noise wall will be approximately 2000 feet long with an average height of 11 feet and will provide noise abatement for 24 residences and a private school. The barrier will be concrete post and panel constructed 2 to 3 feet inside MDOT ROW along the ROW line. Grading permits (10 feet) will be required on the residential side of the ROW. An engineering level noise abatement analysis will be completed on the warranted abatement measure to ensure it meets final design phase feasibility and reasonableness criteria. If during final design these conditions have substantially changed, the abatement measures might not be provided. A final decision of the installation and aesthetics of the abatement measures(s) will be made upon

completion of the project's final design and the Context Sensitive Design process. A meeting to discuss the noise wall aesthetics will be offered to all affected property owners.

C. *Recreational Properties* – There are four recreational properties directly adjacent to the proposed project and two other recreational properties just outside of the project limits. The Contractor shall not park any vehicles or store any equipment or materials on any public recreational property. Access to the recreational properties must be maintained at all times during construction. The "Special Provision for Construction Staging Areas" will be included in the project proposal.

D. *Air Quality Impacts* – The construction period is of short duration and construction mitigation is not required. However, several voluntary measures may be implemented by the Contractor to reduce engine activity or reduce emissions per unit of operating time. Construction equipment should be kept clean, tuned-up, and in good operating condition. MDOT's Standard Construction Specification Sections 107.15(A) and 107.19 would apply to control fugitive dust during construction and cleaning of haul roads. All MDOT vehicles and equipment must follow MDOT Guidance #10179 (2/15/2009) Vehicle and Equipment Engine Idling.

II. Natural Environment

A. *Stream Crossings* – There are four stream culverts within Washtenaw County on this project. US-23 crosses over the upper reaches of Traver Creek through a 36" cross culvert. There is no median inlet and this stream will not be impacted by the construction of the US-23 ATM.

A tributary of the Catholic Church Horseshoe Lake County Drain crosses US-23 through a 60" cross culvert. The culvert does not have a median inlet and will not be impacted by the construction of the US-23 ATM.

The Catholic Church Horseshoe Lake Drain is carried under North Territorial Road in a 9'9" by 6'7" plate arch culvert which will be replaced with an 8' by 14' box culvert. A new 8' by 14' culvert crossing of the Catholic Church Horseshoe Lake Drain will be required for the relocated 5 Mile Road to the north. A staging plan will be developed to maintain stream flow during culvert replacements except for short periods of time required to place culvert sections.

The existing twin 6' by 10' culverts that carry the Horseshoe Lake Outlet Drain under US-23 between Barker Road and the US-23 railroad bridge to the north will be extended approximately 10 feet on each side. The drain flow will be maintained in one of the culverts while the other culvert is extended.

B. *Agricultural Land* – There are seven parcels of land enrolled in the Act 451, Part 361, Farmland and Open Space Preservation (old PA 116), within the project area but only one parcel is directly adjacent. These properties are not expected to be impacted by any type of ROW acquisition or grading permits. The Special Provision (SP) for PA 451, Part 361 (formerly PA 116) enrolled properties will be included in

the project proposal. This SP states "No borrow shall be taken from the PA 116 enrolled properties and no disposal of excess or unsuitable material will be allowed on these properties".

C. *Wetlands* – No wetlands have been identified within the US-23 ROW within the project limits. Soil erosion and sedimentation controls will be implemented to protect adjacent wetlands outside of MDOT ROW.

D. *Floodplains* - Culvert sizes will be reviewed (and increased if necessary) in the design phase following completion of the hydraulic and scour analysis's to ensure that culverts are able to pass the 100 year storm event without increasing backwater elevations.

E. *Water Quality* - Best Management Practices (BMP's) will be used to treat storm water when designing the US-23 drainage systems. BMP's such as routing road and bridge runoff through vegetated swales prior to discharge into project water courses will be included in this project. BMP's will also be used to reduce flow rates and volume to minimize potential erosion issues.

F. *Wildlife Resources* - The "Special Provision for Migratory Bird Protection" will be set up on this project and be implemented during construction to avoid impacts to nesting birds for the proposed widening at the Great Lakes Central railroad overpass south of 8 Mile Road and also the bridge at Barker Road.

III. Hazardous/Contaminated Materials

A. *Environmental Contamination* - The Project Area Contamination Survey (PACS) identified three known and one potential site of environmental contamination within or adjacent to the proposed project area: two active gasoline stations located in the southwest and southeast quadrants of the US-23 and Territorial Road Interchange; a former industrial facility located in the southwest quadrant of US-23 and Eight Mile Road; and potential contaminated soil that may contain Polynuclear Aromatic Hydrocarbons (PNA's) and metals at the Great Lakes Central Railroad crossing located south of the US-23 and Eight Mile Road Interchange. No environmental contamination issues were identified with any proposed real estate acquisition.

If excavation activities are to occur within the vicinity of the above noted known and potential contaminated sites, an estimate for contaminated soil removal, and the Special Provision for Non-Hazardous Contaminated Material Handling and Disposal, should be included in the final plan package. In addition, the Special Provision for Asbestos Removal and Disposal should be included in the project package in anticipation of encountering asbestos conduits on bridges. All contaminated media must be handled and disposed of appropriately in accordance with state and federal regulations.

IV. Construction

A. *Maintaining Traffic* – Both lanes of US-23 traffic in each direction will be kept open during peak hours and a single lane is allowed at night and during off peak hours. Traffic on US-23 ramps may be closed for short periods of time during reconstruction. Traffic on local roads where bridges (North Territorial, 8 Mile, and 6 Mile) will be replaced will be detoured over local roads to adjacent bridges crossing US-23. At least one local road bridge will be open while the other two are being replaced. Throughout all stages, message boards, signs, and website updates will be used to notify drivers of detours, lane closures, traffic shifts, and changed travel patterns. MDOT will coordinate with local officials to provide updated project information to assist all motorists including emergency vehicles (police, fire, and ambulance), school buses, and public transit.

B. *Soil Erosion/Sedimentation Control* - Strict soil erosion and sedimentation controls will be set up and maintained during construction.

C. *Construction Noise and Vibration*- Construction noise will be minimized by measures such as requiring construction equipment to have mufflers, that portable compressors meet federal noise-level standards for that equipment, and that all portable equipment be placed away from or shielded from sensitive noise receptors if at all possible. All local noise ordinances will be adhered to unless otherwise granted exception by the responsible municipality.

   To document potential vibration damage from construction activities, residential structure foundation surveys will be offered in areas where vibration impacts could occur. Structures within 150 to 200 feet of construction operations such as bridge/pavement removal or piling/steel sheeting installation will be identified during final design. Vibration impacts are not anticipated at this time.

D. *Construction Permits* - Permits under Act 451, Parts 31 (Water Quality and Floodplains) and 301 (Inland Lakes and Streams) will be required from the MDEQ for this project. Coverage under the National Pollutant Discharge Elimination System (NPDES), which is administered by the MDEQ, is also required.

E. *Railway Coordination* – During design and construction of this project; MDOT will coordinate with the Great Lakes Central Railroad regarding the widening of the US-23 structure over the railway.

7.0 PUBLIC INVOLVEMENT AND AGENCY COORDINATION

7.1 *Public Involvement*

A public hearing will be conducted on the proposed project after the EA document is distributed to the public. The hearing will allow citizens and local agencies an opportunity to review and provide comment on specific aspects of the project. A copy of the EA document will be available at public agencies for review prior to the public hearing date.

Public information meetings were held on December 12, 2013 and August 14, 2014 at the Northfield Township Hall. The December meeting introduced the project along the corridor between the M-14/I-94 and Silver Lake Road interchanges. Approximately 230 residents, users and agency representatives attended the meetings. The open-house-style meeting featured a presentation illustrating the elements of the proposed project, including the introduction of the active traffic management (ATM) concept. The public provided verbal and written comments during the meeting. MDOT shared the presentation and other related information on the public web site at http://www.michigan.gov/mdot/0,4616,7-151-9621_11058-316825--,00.html. Based on input from the public meeting, MDOT consulted with FHWA to reduce the length of the proposed project corridor by moving the southern limits of the study to the west US-23/M-14 interchange. FHWA and MDOT determined that an Environmental Assessment would be required for the revised corridor. The department updated the website and announced the holding of a second public meeting.

The August public meeting also followed the open-house/presentation format. The brief presentation provided an update on the progress made since the previous public meeting, including the decision to prepare an EA and the need for public comments to help guide the development of the various elements. Approximately 80 members of the public and interested agencies attended the meeting and provided several comments, all of which the study team reviewed and considered in preparation of the EA document.

7.2 *Agency Coordination*

Early coordination letters were sent to Federal, State and local agencies as well as interested organizations seeking comment on the proposed project. Copies of the early coordination letter and responses are included in Appendix A.

8.0 PROJECT COSTS

The following are the US-23 Improvements preliminary engineering and construction costs projected in fiscal year 2016 funds:

Active Traffic Management (ATM), M-14/US-23 to south of M-36: $29,540,000

Intelligent Transportation System (ITS), M-14/US-23 to south of M-36: $14,000,000

Bridge replacements at 6 Mile, 8 Mile and N. Territorial Roads: $14,017,000

Bridge replacements of US-23 bridge over the railroad: $4,639,047

Widening of US-23 bridge over Barker Road: $639,483

Northbound and southbound on-ramp extensions: $6,305,000

US-23 CPM, M-14/US-23 to Silver Lake Road: $6,440,000

CPM on the Joy Road and Warren Road bridges: $602,000