



**FINAL** 

Planning and Environmental Linkages Study Report

November 2023



# Notice

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## **Executive Summary**

The Michigan Department of Transportation (MDOT) is conducting a Planning and Environmental Linkages (PEL) study for Eastbound (EB) M-14 and Barton Drive (Dr) Interchange. The goal of the study is to identify acceptable and cost-effective improvements to the geometry of the EB M-14 and Barton Dr onand off-ramps to enhance safety and reliability.

A PEL study identifies transportation issues, along with environmental concerns, on a specific corridor. These studies help make planning decisions regarding the development and prioritization of transportation improvements that are adopted or incorporated by reference during the National Environmental Policy Act (NEPA) process.

#### **Background Information**

The M-14 freeway provides a connection between the Ann Arbor and Detroit metropolitan areas. The M-14 and Barton Dr interchange was originally built in 1960. This beltway was to be an extension of Huron Parkway (Pkwy) that ultimately connected to a new interchange northeast of the existing Barton Dr interchange.

In 1989, the City of Ann Arbor decided not to complete the roadway extension due to public controversy, and the full interchange for the area was never built.

The city published a comprehensive study to relocate the interchange in 2002; the outcome of the study recommended closing the EB ramps to allow only emergency vehicle access. However, when the Northeast Ann Arbor Transportation Plan was adopted in 2006, the recommendation was not included, MDOT concurred, and the interchange remained open.

In 2019, MDOT acquired an additional right-of-way (ROW) parcel adjacent to the eastbound M-14 onramp. In 2021, six crashes involving large trucks occurred in the vicinity of the interchange along M-14. One of the crashes resulted in a fuel spill, contaminating the Huron River; in 2019, a truck crash resulted in



a fatality. On May 3, 2021, in response to these crashes, the Ann Arbor City Council requested that MDOT investigate improvements.

#### Why is the Project Needed?

Information about the issues in the study area, showing the data collected and analyzed is in the Existing Conditions Report (Attachment A). The information shows that the interchange contains roadway deficiencies, leads to increased crashes, and that there is high public concern about safety and the community and environmental impacts.

• MDOT determined that a high rate of crashes in the vicinity of the interchange is due to conflicts between vehicles that exit and enter the eastbound lanes at the interchange.

• The public has voiced concerns over the safety of the interchange and the frequency of crashes.

• Roadway deficiencies exist where the older design of the freeway does not meet modern standards. In addition, the design was intended to be temporary until construction of the new interchange for the planned Huron Pkwy extension (approximately 600 feet north).

#### What is the Purpose of the Project?

The M-14 and Barton Dr interchange project seeks to improve the safety and operations of the eastbound ramps and the surrounding transportation system, while minimizing impacts to the natural environment, adjacent properties, and the traveling public through the corridor. The project will endeavor to meet the following goals:

- Reduce the crash risk in the area
- Improve the traffic operations in and around the interchange
- Address speed differentials on EB M-14 near the interchange
- Stay within existing limited access ROW, to the extent practical
- Maintain bicycle and pedestrian facility connectivity under M-14
- Simplify the maintenance of traffic during construction
- Minimize future maintenance costs
- Avoid or minimize impacts to adjacent public parks, the community, and the environment
- Maintain community connectivity, to the extent practical

#### **Development and Evaluation of Alternatives**

The PEL used a two-level process to identify, evaluate, and refine concepts and alternatives. The specific needs, goals, and objectives of the M-14/Barton Dr PEL led to the identification of several alternatives.

The desire in the early development was to fit the concepts within the existing ROW and avoid impacts to nearby parklands. Moreover, alterations to the existing structure of M-14 over the Huron River were a project constraint because of the history of the repairs there and expected ROW issues, engineering, and environmental permitting complexity of any modification to the bridge.

The initial evaluation reviewed concepts from previous transportation studies or developed during this PEL based on needs, goals, and objectives of this PEL study. Concepts were intentionally broad to encompass all the ideas and included the following eight possibilities:

- No action
- Closure of eastbound ramps
- Modification of existing ramp geometry
- Tight diamond interchange
- Dual roundabout interchange
- Hybrid roundabout/diamond interchange
- Eastbound flyover exit ramp
- Diverging diamond

#### **Alternative Refinement**

Using the outcomes of the initial screening, the concepts progressed into practical alternatives for the second level evaluation. The MDOT project team discussed these concepts and refined them accordingly for the maximum benefit and to avoid significant impacts. In total, four distinct alternatives were evaluated. These included the following:

- No action alternative
- Closure of eastbound ramps

- Modify the existing ramp geometry
- Dual roundabout interchange

#### **Second Level Alternatives Evaluation**

There are numerous factors which can render an alternative "not prudent" because of unique issues. The analysis for the second level evaluation focused on four major areas: traffic operations, safety, roadway network connectivity, and environmental and community impacts. A selection matrix was prepared based on the criteria and used as a tool for selection.

#### **Recommended Alternatives**

MDOT is recommending the Dual Roundabout Interchange alternative as the locally acceptable alternative for the M-14 Barton Dr Interchange because it has the best overall performance in meeting the purpose and need of the project for the following reasons:

- Improvements to safety and operations at the interchange,
- No negative operational impacts to nearby interchanges or on the local roadways
- Avoids ROW acquisition, especially to parklands, and
- Increases connectivity for non-motorized transportation.

However, due to its cost, MDOT has yet to identify all the funding required to construct this alternative. Therefore, the schedule for implementation of the project is unknown at this time, and the benefits of the project will be delayed.

To achieve some of the project benefits as soon as possible, MDOT is also recommending the Closure of the Eastbound Ramps alternative as a short-term solution. This alternative would close the Barton Drive ramps as an interim solution that provides immediate safety and operational benefits to the traveling public until funding is available for the Dual Roundabout Interchange alternative. This alternative will not provide all connectivity benefits and full interchange operational benefits of the Dual Roundabout Interchange alternative.

# Table of Contents Chapter

## Table of Contents

Executive Summary	ii
Background Information	ii
Why is the Project Needed?	ii
What is the Purpose of the Project?	iii
Development and Evaluation of Alternatives	iii
Alternative Refinement	iii
Second Level Alternatives Evaluation	iv
Recommended Alternatives	iv
Table of Contents	v
Section 1 – Study Purpose	1
Introduction	1
Background Information	3
Purpose and Need	3
What is the Purpose of the Project?	3
Section 2 – Development and Evaluation of Alternatives	8
Development of Alternatives	8
Initial Evaluation	11
Alternative Refinement	14
No Action Alternative	14
No Action Alternative Closure of Eastbound Ramps Alternative	14 16
No Action Alternative Closure of Eastbound Ramps Alternative Modify the Existing Eastbound Ramp Geometry	14 16 18
No Action Alternative Closure of Eastbound Ramps Alternative Modify the Existing Eastbound Ramp Geometry Dual Roundabout Interchange Alternative	14 16 18 20
No Action Alternative Closure of Eastbound Ramps Alternative Modify the Existing Eastbound Ramp Geometry Dual Roundabout Interchange Alternative Second Level Alternatives Evaluation	14 16 18 20 22
No Action Alternative Closure of Eastbound Ramps Alternative Modify the Existing Eastbound Ramp Geometry Dual Roundabout Interchange Alternative Second Level Alternatives Evaluation Second Level Alternatives Evaluation Matrix	14 16 18 20 22 31
No Action Alternative Closure of Eastbound Ramps Alternative Modify the Existing Eastbound Ramp Geometry Dual Roundabout Interchange Alternative Second Level Alternatives Evaluation Second Level Alternatives Evaluation Matrix Recommended Alternatives	14 16 18 20 22 31 39
No Action Alternative Closure of Eastbound Ramps Alternative Modify the Existing Eastbound Ramp Geometry Dual Roundabout Interchange Alternative Second Level Alternatives Evaluation Second Level Alternatives Evaluation Matrix Recommended Alternatives Section 3 – Environmental Resource Considerations for the Locally Acceptable Alternative	14 16 20 22 31 39 <b>40</b>
No Action Alternative Closure of Eastbound Ramps Alternative Modify the Existing Eastbound Ramp Geometry Dual Roundabout Interchange Alternative Second Level Alternatives Evaluation Second Level Alternatives Evaluation Matrix Recommended Alternatives Section 3 – Environmental Resource Considerations for the Locally Acceptable Alternative Natural Environment Resources	14 16 18 20 22 31 39 40

## Page

Section 4 – Public and Agency Involvement	44
Public Involvement Activities	44
Feedback and Engagement	45
Section 5 – Next Steps for Project Implementation	48
Attachment A – Existing Conditions Report	
Attachment B – Environmental Resource Alternative Analysis	
B1- Environmental Resource Alternatives	
B2 Archaeology Report	
B3 Drainage	
Attachment C – Traffic and Safety Technical Report	
Attachment D – Roadway and Structure Design Elements	
Attachment E – Agency and Public Coordination Summary	
E1- Public Involvement Meeting Summaries	
E2- Tribal Consultation Documents	
Attachment F – M-14/Barton Drive Alternatives Analysis Planning and Environmental Linkages Draft Evaluation Matrix	5
Attachment G – Federal Highway Administration Planning and Environmental Linkages Questionnaire	
Attackment II. Duciant Cost Estimate Accumutions	

Attachment H – Project Cost Estimate Assumptions

## Figures

Figure 1 – Project Study Area	2
Figure 3 – Crash Heat Map for the Study Area (2015–2019)	6
Figure 4 – No Action Alternative	. 15
Figure 5 Closure of the Eastbound Ramps Alternative	. 17
Figure 6 Modify the Existing Eastbound Ramp Geometry Alternative	. 19
Figure 7 Dual Roundabout Alternative	21
Figure 8 Demographic Study Area	41
Figure 9 Parks and Recreation Resources in the Study Area	42
Figure 10 Specific Comments	46

## **Tables**

Table 1 – Identified Concepts for Improvements to M-14/Barton Drive (First Brainstorming Meeting)	9
Table 2 – Summary of Initial Concepts	13
Table 3 – Level of Service – M-14 Influence Area of Interchange - 2045	23
Table 4 – Traffic Impact on Local Network	24
Table 5 – Results of Safety Analysis (2025)	25
Table 6 – Results of Safety Analysis (2045)	26
Table 7 – Benefit Cost Ratio (2045)	28
Table 8 – Evaluation of Alternatives Summary	32
Table 9 – Anticipated Natural Environment Impacts for the Locally Acceptable Alternatives	40
Table 10 – Demographic Information for the Study Area	41
Table 11 – Public Involvement Events	44

## Section 1 – Study Purpose

## Introduction

The Michigan Department of Transportation (MDOT) conducted a Planning and Environmental Linkages (PEL) study for Eastbound (EB) M-14 and Barton Drive (Dr) Interchange, between North (N.) Main Street (St) in the City of Ann Arbor (the City) in the west and the Pontiac Trail bridge in the east, in Washtenaw County (see Figure 1). The goal of the study is to identify acceptable and cost-effective improvements to the geometry of the EB M-14 and Barton Dr on- and off-ramps to enhance safety and reliability.

A PEL study identifies transportation issues, along with environmental concerns, on a specific corridor. These studies help ensure planning decisions regarding the development and prioritization of transportation improvements are adopted or incorporated by reference as the project advances through the National Environmental Policy Act (NEPA) process. The PEL process generally composes of five primary parts:

- Existing conditions is the first step of the PEL process. This effort analyzes and identifies key issues along the corridor and the causes of these issues.
- The Purpose and Need guides decisions, and it provides the criteria used to evaluate alternatives. This statement defines core reasons why the project started.
- Alternative development is the process to generate and package different solutions to the identified issues and problems described in the existing conditions report.
- Alternative evaluation is the process used to analyze and refine the different options identified in the alternative development process. During this process, alternatives can be eliminated, refined, or carried forward into future phases of project development.
- Project phasing is the final step in the PEL process, in which one or more alternatives are advanced and project implementation strategies are identified to build projects.

The PEL is a collaborative and integrated transportation planning process with input from stakeholders, agencies, and the public. Public and agency review, along with identification of potential environmental issues, ensures that decisions made during the planning process advance to the NEPA process and shorten the time to implement the project. The information and analysis in this document will be adopted or incorporated by reference in the NEPA process for the project.

#### Figure 1 – Project Study Area



## **Background Information**

The M-14 freeway provides a connection between the Ann Arbor and Detroit metropolitan areas. The M-14 and Barton Dr Interchange was originally built in the 1960s, and at that time, it was constructed to be a temporary access to the northside area until the City completed the "inner beltway". This beltway was to be an extension of Huron Parkway (Pkwy) that ultimately connected to a new interchange northeast of the existing Barton Dr interchange.

In the 1980s, the City explored whether to build the segment of Huron Pkwy, just west of the terminus at Tuebingen Pkwy. One critical issue raised at the time was the location of Leslie Park (golf course and nature center), which is between Pontiac Trail and Tuebingen Pkwy. In 1989, as a part of the Northeast Area plan, the City decided not to complete the roadway extension due to public controversy, and the full interchange for the area was never built.

In 1997, due to safety and operational concerns, the City called for a comprehensive study to relocate the interchange, and the study was funded as part of the TEA-21 federal transportation funding authorization. The study reviewed 16 illustrative alternatives, with four to five practical alternatives remaining after assessing impacts and geometric viability. Published in 2002, the outcome of the study recommended closing the EB ramps to allow only emergency vehicle access. However, when the Ann Arbor City Council adopted the Northeast Ann Arbor Transportation Plan in 2006, it declined the recommendation, and the interchange remained open. Adopted in 2009 was the City of Ann Arbor Transportation Master Plan, and the current 2021 revision maintained this status quo. MDOT made minor improvements throughout the years to the interchange ramps.

In 2019, MDOT acquired an additional right-of-way (ROW) parcel adjacent to the eastbound M-14 onramp. In 2021, six crashes involving large trucks occurred in the vicinity of the interchange along M-14. One of the crashes resulted in a fuel spill, contaminating the Huron River; in 2019, a truck crash resulted in a fatality. On May 3, 2021, in response to these crashes, the Ann Arbor City Council agreed to have MDOT investigate improvements.

## **Purpose and Need**

The project's purpose and need statement identifies the root causes of any safety and operational issues in the corridor and explains why the project needs to be implemented to decision-makers, stakeholders, and the public. The purpose defines the goals and objectives of the study, and the need is used to identify specific problems to be solved.

The purpose and need statement is used to develop a reasonable range of alternatives, and evaluate the alternative solutions to problems in the corridor. An evaluation based on the purpose and need helps to compare pros and cons of the alternatives, so the study can recommend one or several possible solutions proceeding into the NEPA phase of project development.

The information described in the Existing Conditions Report (Attachment A) and the input gathered through public outreach efforts developed the purpose and need described below. Based on the multiple reviews, opportunities for input, and the subsequent refinement during the development of the purpose and need statement, the statement is likely to move directly into the NEPA process as the project-level purpose and need.

## What is the Purpose of the Project?

The M-14 interchange at Barton Dr project seeks to improve the safety and operations of the EB interchange and the surrounding transportation system, while minimizing impacts to the natural environment, adjoining properties, and drivers utilizing the corridor. The project will endeavor to meet the following goals:

• Reduce the crash risk in the area

- Improve the traffic operations in and around the interchange
- Address speed differentials on EB M-14 near the interchange
- Stay within existing limited access ROW, to the extent practical
- Maintain bicycle and pedestrian facility connectivity under M-14
- Optimize the maintenance of traffic to reduce disruptions during construction
- Minimize future maintenance costs
- Avoid or minimize impacts to adjacent public parks and to the natural environment
- Maintain community connectivity, to the extent practical

MDOT developed these goals through a review of the existing conditions data combined with input from the LAC and the community. They established the guidelines for developing and evaluating alternatives to address the needs identified for the project.

### How was the Purpose and Need Developed?

The development of the purpose and need was an iterative process with multiple opportunities for review and comments by the project team, Local Advisory Committee (LAC), and the public. The process included the following steps:

- LAC Meeting 1 Gather local concerns and priorities to craft the initial draft purpose and need
  - o Develop draft purpose and need and provide to Admin Team for review and comment
- LAC Meeting 2 Present draft purpose and need and obtain feedback
  - o Refine draft purpose and need based on LAC 2 comments
  - Community Conversation Present draft purpose and need for public review and comments
- LAC Meeting 3 Finalize purpose and need statement after revising based on public comments

Additional information on the LAC and the public outreach process is in Section 4.

### Why is the Project Needed?

As described above in the background information, MDOT determined that high rate of crashes in the vicinity is due to conflicts between vehicles that exit and enter the eastbound lanes at the interchange. This section provides information about the problems in the study area, and it shows data collected and analyzed in the Existing Conditions Report in Attachment A.

### Public Concern

The public provided their input about issues occurring at the interchange. Website comments were collected from May through July 2022. The project team scheduled a public meeting held at the Ann Arbor Farmer's Market on June 8<sup>th</sup>, 2022 and invited the public to attend and provide information or to ask questions.

Of the 221 public comments received to date, more than 27% of the total comments were about the frequency of crashes at the M-14 and Barton Dr Interchange. Commentary about closing the ramps for safety issues was considerable and found 20% of total respondents favored a closure, while almost 5% opposed it. In addition, 16% of respondents stated their concerns about high speeds in the area.

## Safety

Traffic crash information came from the Michigan Traffic Crash Facts site for the study. During the fiveyear analysis period (2015–2019), there were a total of 290 documented crashes within the mainline corridor (1000-feet (ft) west of Main St to 1000 ft east of Barton Dr). Traffic crash data from the year 2020 was excluded from the analysis due to the impact of the COVID-19 outbreak.

The predominant crash type is rear-end crashes, followed by fixed-object crashes due to lane departure, and side-swipe same crashes.



#### Figure 2 – Percent Crashes by Type

Generally, rear-end crashes occur east of Main St, where traffic is slowing and/or stopping because of congestion and the trailing vehicle fails to stop in an assured, clear distance. Due to speed differentials between N Main St and Barton Dr, weaving vehicles typically cause side-swipe crashes. While many single vehicle crashes are those that fail to negotiate the curve on the Barton Dr off-ramp accordingly, there is an occurrence of lane-departure involving vehicles striking the barrier wall or guardrail either on the median side or on the bridge structure.



#### Figure 3 – Crash Heat Map for the Study Area (2015–2019)

More details about the crash patterns, including collision diagrams are in the Existing Conditions Report (Attachment A).

### Roadway Deficiencies on the M-14 corridor

Roadway deficiencies exist where the older design of the highway does not meet modern standards. In addition, the design was intended to be temporary until construction of the new interchange for the planned Huron Pkwy extension (approximately 600 ft north), which would be safer but was never constructed. The deficiencies in the Barton Dr interchange system contribute to safety issues in the study area. The stop control at the Barton Dr entrance ramp to eastbound M-14 makes it difficult for vehicles to enter M-14 safely. Vehicles need to accelerate from a stop to the running speed to merge with mainline vehicles traveling 65 miles per hour (mph) or more. This complex maneuver results in speed differentials between vehicles. Variance in vehicle speeds leads to an increased likelihood of crashes, and it is an important safety consideration.

Vehicles exiting EB M-14 at Barton Dr must negotiate a tight radius approach and loop ramp. This requires vehicles to slow considerably on the mainline, cross the centerline, or strike the guardrail in the area. This is a very frequent occurrence and increases the risk for significant differences in speed between through traffic and vehicles entering and exiting EB M-14. Additionally, the superelevation of the mainline at the off ramp is counter to the ramp alignment causing exiting vehicles to cross over the break line.

The geometry of the mainline roadway approaching the Main St interchange, with a downhill grade and a horizontal curve with barrier wall, results in limited sight distance for the eastbound vehicles. The barrier wall along the roadway blocks the line of sight and obscures the presence of entering traffic.

## **Environmental and Community Resources**

The PEL includes a review of the existing environmental and community resources in the study area. At this stage of the PEL process, the intention is to identify any constraints that may influence the alternative development and evaluation. As outlined in the Existing Conditions Report in Attachment A, the primary resources of concern are impacts to parks; wetlands, streams, and forested areas; historic sites; and community cohesion.

## Section 2 – Development and Evaluation of Alternatives

The PEL used a two-level process to identify, evaluate, and refine concepts and alternatives. The specific needs, goals, and objectives of the M-14/Barton Dr PEL led to the identification of a number of potential alternatives for purposes of the study. The project's purpose and need, which derived from the initial goals and objectives, are in **Section 1**.

The initial evaluation reviewed concepts from previous transportation studies or developed during this PEL based on needs, goals, and objectives realized in **Section 1** of this PEL report. Four concepts from the initial evaluation meet the project's purpose and address known operational and safety issues at the interchange. These four remaining concepts were refined into more detailed alternatives reviewed in the second evaluation.

## **Development of Alternatives**

The desire in the early development was to fit the concepts within the existing ROW and avoid impacts to nearby parklands. Moreover, alterations to the existing structure of M-14 over the Huron River were a project constraint because of the history of the repairs there and expected engineering and environmental permitting complexity of any modification to the bridge.

Two concepts proceeded into the PEL process from MDOT University Region safety planning: one to modify existing ramp geometry and another to close the EB ramps. Additional concepts were developed through a series of brainstorming sessions with the PEL study team, MDOT, and industry thought leaders. Concepts were intentionally broad to encompass all the ideas and possibilities identified by stakeholders. Table 1 (shown below) lists initial concepts and brief descriptions.

Concept	Description	Primary Reason(s) for Consideration
No Action	This concept presents the expected future condition if no action occurs. This includes planned mobility improvements in the region within the Southeast Michigan Council of Government's (SEMCOG) Long Range Plan. This alternative is not the same as existing conditions, as other network improvements may occur.	This concept provides a baseline against which all other concepts are measured.
Closure of Eastbound Ramps	This concept will close EB on- and off-ramps between Barton Dr and M-14. Access will worsen to and from EB M-14 and reroute traffic throughout the network.	This alternative removes the weaving section between Main St and Barton Dr, while also eliminating the stop-controlled ramp approach onto M-14. Both reduce the potential of crashes in the vicinity of the interchange.
Modification of Existing Ramp Geometry	This concept will increase the radius of the EB off-loop ramp. The design speed will increase to 25 mph. Additionally, the on- ramp changes into a free-flow on-ramp, with an auxiliary lane of proper merging length.	This reduces the speed difference of EB exiting traffic and the through traffic on M-14. Also, the stop control is removed from the on-ramp. Both are positive improvements for safety.
Tight Diamond Interchange	This concept reconfigures the interchange to a tight diamond layout. This provides on-/off-ramps in each quadrant and a connecting road under M-14 to Whitmore Lake Road (Rd). This provides full access to and from M-14, utilizing limited space between the ramps to reduce the footprint of the interchange.	The off-ramp for EB traffic will be at a higher design speed, and the EB on-ramp will be free flowing. This reduces the potential of crashes due to the speed differential and elimination of the stop control. The spacing will also improve access to Main St for westbound (WB) ramps.
Dual Roundabout Interchange	This concept reconfigures the interchange to a diamond layout with roundabout intersections at the terminals. This provides on-/off-ramps in each quadrant and a connecting road under M-14 to Whitmore Lake Rd. This provides full access to and from M-14, utilizing limited space between the ramps to reduce the footprint of the interchange.	The off-ramp for EB traffic will be at a higher design speed, and the EB on-ramp will be free flowing. This reduces the potential of crashes due to the speed differential and elimination of the stop control. The spacing will also improve access to Main St for WB ramps. The roundabout intersections

#### Table 1 – Identified Concepts for Improvements to M-14/Barton Drive (First Brainstorming Meeting)

Concept	Description	Primary Reason(s) for Consideration
		improve operations and eliminate left-turn delays between the ramps.
Hybrid Roundabout/ Diamond Interchange	This concept reconfigures the interchange to a diamond layout with roundabout intersections at EB ramps and Whitmore Lake Rd only. This provides on-/off-ramps in each quadrant and a connecting road under M-14 to Whitmore Lake Road. This provides full access to and from M-14, utilizing limited space between the ramps to reduce the footprint of the interchange.	The off-ramp for EB traffic will be at a higher design speed, and the EB on-ramp will be free flowing. This reduces the potential of crashes due to the speed differential and elimination of the stop control. The spacing will also improve access to Main St for WB ramps. The roundabout intersections operations improve at EB ramps and Whitmore Lake Rd and eliminate left-turn delays, with a possibly smaller footprint.
Eastbound Flyover Exit Ramp	This concept was a part of the Road Safety Audit for M-14. The configuration includes a high-speed flyover ramp for exiting EB traffic, along with a free-flow on- ramp. The flyover connects with Whitmore Lake Rd on the west side of the interchange and reconfigure the WB ramps.	The off-ramp for EB traffic will be at a higher design speed, and the EB on-ramp will be free flowing. This reduces the potential of crashes due to the speed differential and elimination of the stop control. The spacing will also improve access to Main St for the WB ramps.
Diverging Diamond	This concept replaces the ramp system with a diamond configuration and configure the crossroad with opposite direction lanes. This connects Whitmore Lake Road to the ramp system.	This concept provides operational features similar to the tight diamond concept. However, it will eliminate the potential for left- turn delays. Due to the crossovers required, it will have a larger footprint.

## **Initial Evaluation**

The screening determined whether concepts listed in Table 1 met the project's goals and objectives. This was done by a qualitative evaluation of factors that include:

- Safety: Does the concept improve safety in the project area?
- Operations: Does the concept improve or provide for acceptable operations?
- ROW Impacts: Does the footprint of the improvement fit within the existing ROW and avoid parklands?
- Access: Does the concept maintain access to the local network?
- Non-motorized trail connection: Does the concept provide connectivity across M-14 for bicyclists and pedestrians?

Based on a qualitative evaluation, each concept received one of three responses to each of the evaluation questions: yes, neutral, or no (Table 2). A "yes" response indicated the concept will meet or has the potential to meet the criteria in question. A "neutral" response indicated the concept likely will not affect the criteria in question. A "no" response indicated the concept likely will negatively affect the criteria in question.

From these responses, concepts were either carried forward or removed from consideration.

### Concepts Screened Out in the Initial Evaluation

There were four concepts eliminated and not evaluated further after the initial screening:

- Tight Diamond Interchange
- Hybrid Roundabout/Diamond Interchange
- Eastbound Flyover Exit Ramp
- Diverging Diamond Interchange

The Tight Diamond Interchange would fit in the available ROW and provide access needs. However, this concept is not under further consideration because of the limited space between ramps that would increase congestion due to overlapping left-turn movements.

The Hybrid Roundabout concept was a modification on two of the alternatives. Presumably, it has a smaller footprint, bridge width, and minimal difference in operations. Conceptual layouts did not yield a benefit in size. It is not under further consideration because it did not avoid significant ROW impacts.

The Eastbound Flyover Exit Ramp concept will require additional space to the west to touchdown and join the local network. This will increase the footprint and require substantial bridge work. It is not under further consideration because it did not avoid significant ROW impacts.

The Diverging Diamond Interchange concept will provide assistance to handle left-turn movements to and from the freeway. However, it would require a larger footprint to accommodate crossover roadways. Also, there is a lack of conflicting through traffic that this type of interchange is designed to manage. Therefore, it is not under further consideration because it did not avoid significant impacts.

The remaining four concepts were carried forward for further evaluation and are discussed below.

## Concepts Remaining after the Initial Evaluation

The four concepts carried forward from the initial screening included:

- No Action
- Close the Eastbound Ramps
- Modify the Existing Eastbound Ramp Geometry
- Dual Roundabout Interchange

The No Action alternative is the baseline alternative for comparison. It must be included in the analysis. The Close the Eastbound Ramps alternative is carried forward as it is the selected result of previous studies. It is assumed to improve safety although restricting access in the area.

The modify the Existing Eastbound Ramp Geometry is carried forward as it the programmed improvement for the interchange. Although it in total does not improve operations for the network, it does provide local improvements at the interchange vicinity. Along with geometric / safety improvements.

The Dual Roundabout interchange is carried forward as it satisfied all the evaluation criteria. The concept provides safety and operational benefits in a compact footprint.

#### **Table 2 – Summary of Initial Concepts**

Concept	Improves Safety	Improves Operations	Limits ROW Impacts	Improves Access	Summary of Results
No Action	No	No	Neutral	Neutral	Carried Forward
Closure of Eastbound Ramps	Yes	Yes	Yes	No	Carried Forward
Modify the Existing Eastbound Ramp Geometry	Yes	No	No	Yes	Carried Forward
Tight Diamond Interchange	Yes	No	Yes	Neutral	Removed from Consideration
Dual Roundabout Interchange	Yes	Yes	Yes	Yes	Carried Forward
Hybrid Roundabout/Diamond Interchange	Yes	Yes	No	No	Removed from Consideration
Eastbound Flyover Exit Ramp	Yes	Yes	No	Neutral	Removed from Consideration
Diverging Diamond	Yes	Yes	No	Neutral	Removed from Consideration

**Green** = desirable change compared to existing condition, **yellow** = no change compared to existing condition, **red** = undesirable compared to existing condition

## **Alternative Refinement**

Using the outcomes of the initial screening, the concepts progressed into practical alternatives for the second level evaluation. The refined alternatives for the M-14 and Barton Dr Interchange allow for more details to determine their performance in meeting the project's purpose and need. This included measuring environmental and community impacts, traffic operational analysis, predictive safety analysis, and constructability/costs concerns. The MDOT project team discussed these concepts and refined them accordingly for the maximum benefit and to avoid significant impacts.

In total, four distinct alternatives were evaluated. These included the following:

- No Action Alternative
- Closure of Eastbound Ramps
- Modify the Existing Eastbound Ramp Geometry
- Dual Roundabout Interchange

#### **No Action Alternative**

This alternative describes the scenario in which no improvements are made to the M-14 and Barton Dr Interchange, and the geometry remains the same. This alternative includes no additional improvements besides road maintenance already programmed in the fiscally constrained Transportation Improvement Plan. The No Action Alternative provides a baseline to gauge how the various alternatives will meet the purpose and need and study goals for the project, and it is required for consideration in PEL and NEPA analyses. Additional discussion about potential ramifications of this alternative is in Attachment C, Traffic and Safety Technical Report.

Figure 3 provides an overview of this alternative.

#### Figure 3 – No Action Alternative



#### **Closure of Eastbound Ramps Alternative**

This alternative will close the EB exit and entrance ramps connecting M-14 to Barton Dr. This does not sever access to WB M-14 or the connection to Whitmore Lake Rd. A list of general improvements provided in this alternative is below.

- Eliminate weaving maneuver between Main St and Barton Dr.
- A long acceleration lane for traffic entering from Main St is possible.
- Eliminate stop-controlled approach entering onto M-14.
- Eliminate tight radius loop ramp.

**Error! Reference source not found.** provides an overview of this alternative. The alternative diverts traffic to other roadways on the network. Additional discussion about potential ramifications of this alternative is in Attachment C, Traffic and Safety Technical Report.



#### Figure 4 Closure of the Eastbound Ramps Alternative

#### **Modify the Existing Eastbound Ramp Geometry**

This alternative proposes improving the geometry of the existing EB ramps. An enlarged loop ramp would fulfill the MDOT preferred minimum radius and include construction of a free-flow on-ramp. An appropriate entrance merge lane will be included. The alternative provides these benefits:

- Loop ramp to accommodate a 25-mph design speed (existing 15 mph).
- Weaving distance between Main St and Barton Dr is slightly longer than the current spacing.
- Eliminate the stop control on the entrance ramp.
- Curvature of the entrance ramp improved, with improved sight distance along the horizontal alignment.
- Merge distance increased to improve entry speed.

Although this alternative retains some characteristics of the existing interchange configuration, it provides modest improvements to operations and safety through the reduction of speed differentials and turbulence in the interchange area. Additional discussions about potential ramifications of this alternative is in Attachment C, Traffic and Safety Technical Report.

The interchange provides an acceptable radius (per MDOT Geometrics unit) for the loop exit ramp and a long entry ramp to M-14. The non-motorized trail connection underneath M-14 will remain, with underpasses constructed beneath the ramp system. To construct the interchange within the existing ROW, retaining walls (assumed to be MSE) will be necessary. At an average height of 13 ft, approximately 1400 linear feet (LF) of walls will be needed.

Performance based practical design (PBPD) provides a design which excludes non-essential elements while delivering a satisfactory design in meeting the core needs of the project. It provides design flexibility in that it may not fully meet design guidance and regulations. Although the use of PBPD may be a good approach to improve the subject interchange, it was not used in this case. A standard design approach measured possible impacts on the land and natural environments.

Figure 6 provides an overview of this alternative, with the design assumptions contained in Attachment D and cost details in Attachment G. .

#### Figure 5 Modify the Existing Eastbound Ramp Geometry Alternative



### **Dual Roundabout Interchange Alternative**

This alternative proposes reconfiguration of EB and WB ramps. The ramps will be similar to a tight diamond interchange, with ramps close to the mainline, but with roundabout intersections at the end of the ramp where it connects with the local roadway. Appropriate length for entrance and exit acceleration and deceleration lanes are included in the design.

- Weaving distance between Main St and Barton Dr is slightly longer than existing.
- A 45-mph design speed used on all ramps.
- Eliminate the stop control on the entrance ramp.
- Merge distance increased to improve entry speed.

This alternative retains the access features of the existing interchange configuration, with modest improvements to traffic operations and safety. Increased ramp speed will reduce speed differentials and turbulence in the interchange area. Additional discussion about potential ramifications of this alternative is in Attachment C, Traffic and Safety Technical Report.

The design will include a roadway connection from the ramp system to Whitmore Lake Rd., under the M-14 highway. Additionally, a sidewalk connection will be created to access Whitmore Lake Road from the east side of the interchange. The non-motorized trail connection will be retained, with added tunnels to provide east-west access. To construct the interchange within the existing ROW, retaining walls (assumed to be MSE) will be necessary. At an average height of 23.5 ft, approximately 1800 LF of walls will be needed.

Figure 7 provides an overview of this alternative with the design assumptions contained in Attachment D and cost details in Attachment G.

#### **Figure 6 Dual Roundabout Alternative**



## **Second Level Alternatives Evaluation**

The analysis for the second level evaluation focused on four major areas: traffic operations, safety, roadway network connectivity, and environmental and community impacts.

## **Traffic Operations**

The traffic analysis for the M-14/Barton Dr PEL study used a combination of travel demand modeling, microsimulation (VISSIM), and deterministic traffic analysis (Synchro/HCS). This analysis used the most currently available forecasted travel demand, which in this case assumed an opening year of 2025 and a horizon year of 2045.

Additional information on the evaluation for traffic operations analysis is provided in Attachment C, **Traffic and Safety Technical Report**.

By 2045, the travel demand for the M-14/Barton Dr traffic analysis area is projected to increase by approximately 11%. Higher growth areas of the City are within the analysis area; thus, computing growth rates for individual links on the network occurred, as well.

Note that existing conditions within the traffic analysis area already include significant congestion. The 2045 SEMCOG model includes future improvements to the network contained in the long-range plan. The model includes travel demand resulting in future traffic volumes much higher than the roadway capacity and oversaturated conditions. These include the hard shoulder running "flex-route" extension on US-23 north of Ann Arbor, which increases peak-hour throughput, and provides for additional traffic on the US-23/M-14 system.

The detailed traffic analysis used a planning horizon-year of 2045. Each alternative was analyzed in VISSIM using 2045 volumes. Measures of effectiveness used to examine the performance of the alternatives included density, speed, and volume, as well as the implied level of service (LOS). Level of service is a term to describe the operating conditions of a roadway qualitatively and designates the levels with a letter, A to F—with A representing the best operating conditions and F representing the worst operating conditions (Table 3).

For the No Action alternative (Alt 1), the EB M-14 freeway/ramp system performs at an LOS C in the AM peak and an LOS E and LOS F in the PM peak. The WB direction performs at an LOS B to an LOS D in the AM peak and an LOS B and LOS C in the PM peak.

Under the Closure of the Eastbound Ramps alternative (Alt 2) the EB M-14 freeway/ramp system performs at an LOS F in both AM and PM peaks. The WB direction performs at an LOS B to an LOS E in the AM peak and an LOS B and an LOS C in the PM peak. Some degradation in LOS shows on the WB direction, as additional traffic loading is on the WB ramp to Whitmore Lake Rd as eastbound traffic is to exit the freeway further downstream and revert to the interchange.

For the Modified Loop alternative (Alt 3), the EB M-14 freeway/ramp system performs at an LOS Band an LOS C in the AM peak and an LOS D to an LOS F in the PM peak. Some degradation shows on the segment north of Barton due to the free-flow ramp impacts (entering traffic not metered by stop control). The WB direction performs at an LOS B to an LOS D in the AM peak and an LOS B and an LOS C in the PM period.

For the Dual Roundabout alternative (Alt 4), the EB M-14 freeway/ramp system performs at an LOS B and an LOS C in the AM peak and an LOS C and an LOS D in the PM peak. The WB direction performs at an LOS B and an LOS C in the AM peak and an LOS B in the PM peak. Overall, it shows improved performance compared to no build and modest improvement more than other alternatives, with WB operations area considered.

### Table 3 – Level of Service – M-14 Influence Area of Interchange - 2045

Alternative	Direction	AM Peak	PM Peak
No Action	EB	С	E/F
	WB	B-D	B/C
	EB	F	F
Close EB Ramps	WB	B-E	B/C
Modify Existing Eastbound	EB	B/C	D-F
Ramp	WB	B-D	B/C
Dual Poundabout	EB	B/C	C/D
	WB	B/C	В

\*VISSIM traffic model used in analysis

## Local Network Analysis

M-14 and Barton Dr Interchange is on the north side of Ann Arbor and provides an entrance into the city from north and east. The roadway network serves the northeast portion of the City, connecting to the northside neighborhood, UM Medical Center, UM north campus, and downtown areas.

To understand how improvements may affect the local roadway network, traffic volumes were evaluated at certain locations along Barton Dr and Main St from M-14, towards the downtown and northside areas. This analysis highlighted existing operational difficulties on these corridors and measured the impact of alternatives, particularly the closure of EB ramps. A summary of this analysis is in Table 4.

Additional information about the methodology used to perform the local network analysis and more detailed results can be found in Attachment C, **Traffic and Safety Technical Report**.

Alternative	Key Considerations
No Action	No changes in traffic volumes.
Closure of the Eastbound Ramps	Traffic volumes will decrease on Barton Dr. in the immediate interchange vicinity. Increased traffic volumes on Whitmore Lake Rd, the WB ramp system, US-23 and N. Territorial Rd. Increased traffic on Plymouth Rd, Jackson Rd/Huron St, Miller Rd, and Broadway St.
Modify the Existing Eastbound Ramp Geometry	No changes in traffic volumes.
Dual Roundabout Interchange	Similar traffic volumes to No Action (improved operations at roundabout control). No net effect on the Barton or Main St corridors.

#### Table 4 – Traffic Impact on Local Network

## Safety Analysis

The safety analysis performed on each alternative used the American Association of State Highway and Transportation Officials (AASHTO) 2010 Highway Safety Manual (HSM) methodology. This methodology uses a statistical analysis calibrated to historical conditions to predict the number of crashes on a future roadway facility based on its specific design elements and configuration (AASHTO, 2010).

The 2010 HSM methodology was originally used during the design phase of projects to help decisionmakers understand the specific safety benefits/trade-offs of detailed design elements, such as safety trade-offs for different shoulder widths in space-constrained areas. The HSM helps designers, from a safety perspective, determine whether decisions during the design process affected safety of a roadway. Although very useful in the design phase of a project, this detailed trade-off analysis does not reflect the high-level planning of alternatives in the PEL study. The alternatives evaluated at this level of study are conceptual in nature, and most of the details the HSM analyzes are neither welldefined nor differentiated within or between different alternatives. The outcomes of the HSM analysis and more information about its methodology and application are in Attachment C, Traffic and Safety Technical Report. However, a blended approach used the overall evaluation of alternatives in which the quantitative HSM results guided and informed a qualitative evaluation. The outcome of this approach (presented below) includes tabular data as well as a discussion about potential benefits and considerations of key elements for each alternative. Table 5 and Table 6 outline changes in expected crashes for 2025 and 2045. Using a Chi-Square statistical analysis, reductions in anticipated crashes were tested for statistical significance. Implications of the data for each alternative are presented after the tables.

Freeway + Arterial Safety Performance Metrics (Expected Crashes)	Observed Crashes (2015– 2019)	Alternative 1	Alternative 2	Statistically Significant	Alternative 3	Statistically Significant	Alternative 4	Statistically Significant?
All Crashes (crashes/yr) – Study Area	118	68.4	56.9	No	66	No	56.2	No
F/I Crashes (crashes/yr) – Study Area	18	12.9	9.9	No	12.5	No	10.3	No
PDO Crashes (crashes/yr) – Study Area	100	55.5	47	No	53.5	No	45.9	No
All Crashes (crashes/yr) – Outside Study Area	523.4	414.8	414.5	No	400.8	No	455	Yes (>80%)
F/I Crashes (crashes/yr) – Outside Study Area	86.4	81.5	80.9	No	76.6	No	86.8	No
PDO Crashes (crashes/yr) – Outside Study Area	437	333.3	333.6	No	324.2	No	368.2	Yes (>80%)

#### Table 5 – Results of Safety Analysis (2025)

1. F/I indicates fatal and injury crashes.

2. PDO indicates property damage only crashes.

3. The results tested for significance at the 95th percentile confidence level. Being statistically significant means the results are not attributable to chance alone.

#### Table 6 – Results of Safety Analysis (2045)

Freeway + Arterial Safety Performance Metrics (Expected Crashes)	Observed Crashes (2015–2019)	Alternative 1	Alternative 2	Statistically Significant	Alternative 3	Statistically Significant	Alternative 4	Statistically Significant?
All Crashes (crashes/yr) – Study Area	118	78.2	64.1	No	75	No	62	Yes (>80%)
F/I Crashes (crashes/yr) – Study Area	18	14.8	11	No	14.2	No	11.1	No
PDO Crashes (crashes/yr) – Study Area	100	63.4	53	No	60.8	No	50.9	No
All Crashes (crashes/yr) – Outside Study Area	523.4	461.5	476.9	No	461.6	No	461.4	No
F/I Crashes (crashes/yr) – Outside Study Area	86.4	91.5	95.1	No	91.6	No	91.5	No
PDO Crashes (crashes/yr) – Outside Study Area	437	370	381.8	No	370	No	369.9	No

1. F/l indicates fatal and injury crashes.

2. PDO indicates property damage only crashes.

3. The results tested for significance at the 95<sup>th</sup> percentile confidence level. Being statistically significant means the results are not attributable to chance alone.

#### Alternative 1 – No Action Alternative

Without improvements, conditions are likely to continue deteriorating on the M-14 and Barton Dr Interchange between now and 2045. Additionally, the total number of crashes are likely to remain unchanged due to the combination of increased traffic volumes and increases in vehicle safety throughout the next 20 years. Alternative 1 was the baseline for comparing other alternatives.

#### Alternative 2 – Closure of Eastbound Ramps

This alternative is likely to provide an overall annual reduction in crashes of 53.9, including 7.0 fatal and injury (FI) crashes in 2045 on M-14/US-23 as compared to the No Action alternative. This alternative diverts ramp traffic from the closed EB ramps to other areas of the network. Freeway and ramp crashes in the vicinity of the interchange decrease while an increase of 8.7 FI crashes occur on the surrounding arterial network. Moreover, this results in an overall net decrease of 100.4 crashes per year. Key improvements provided in this alternative that contribute to enhanced safety include:

- Improved ramp spacing will reduce the turbulence on the freeway from vehicles merging and weaving, allowing for a more predictable and constant flow of traffic.
- Full auxiliary lane will provide ample space for entering Main St vehicles to generate the running speed of M-14.
- There may be an increases in crashes on surrounding arterials due to diverted traffic because of ramp closures.

#### Alternative 3 – Modify the Existing Eastbound Ramp Geometry

The Alternative may reduce the number of crashes by 43 crashes per year compared to the No Action alternative. Key improvements provided in this alternative that contribute to improved safety include:

• Improved roadway geometrics including a larger radius loop ramp, which will allow higher exit

speeds from M-14 and reduce the speed differential.

- Remove the stop control at the entry ramp and allow a free-flow entrance to M-14.
- Longer ramps for exiting and entering the freeway will provide greater acceleration and deceleration distances.

#### Alternative 4 – Dual Roundabout Interchange

The Dual Roundabout Interchange is likely to provide some safety benefits to the corridor, while also introducing new safety elements for consideration. Key elements provided in this alternative that contribute to improved safety include:

- Improved ramp spacing will reduce the turbulence on the freeway from vehicles merging and weaving, allowing for a more predictable and constant flow of traffic.
- Remove the stop control at the entry ramp and allow a free-flow entrance to M-14.
- Longer ramps for exiting and entering the freeway will provide greater acceleration and deceleration distances.
- Roundabouts at ramp terminals will lower speeds onto the arterial network and have a lower total crash severity.

There are 56 fewer crashes per year expected—including 6.9 injury crashes—with this alternative. These reductions are primarily due to the conversion from a partial cloverleaf interchange to a roundabout interchange. In addition, this alternative addresses crashes on the M-14 WB ramps to Whitmore Lake Rd.

### Benefit Cost Analysis

Using the results shown above from the safety and operational analysis, a benefit cost analysis occurred. It quantifies safety and operational impacts of the four alternatives. The benefit cost analysis assumed a 20-year service life and a 7% discount rate. Additionally, it assumed an annual maintenance savings of \$150,000 per year for all alternatives except the No Action alternative.

To calculate the benefits, crash data was compared to societal costs of traffic crashes from the National Safety Council. Cost estimates were a part of the project as well. For operations, the total delay was calculated for each alternative. The user delay cost analysis for each alternative used MDOTs user costs from its Construction Congestion Cost (CO3) calculator. The user costs were weighted based on volumes of cars and trucks, with \$22.23 per hour for passenger cars and \$39.22 per hour for trucks.

For safety and operations, the change in crashes and user delay involved calculating the differences with Alternative 1, the No Action alternative. The equivalent uniform annual cost and benefits methodology was applied. The benefit cost ratio (BCR) for each alternative is shown in Table 7.

#### Table 7 - Benefit Cost Ratio (2045)

	Alternative 2 – Closure of the Eastbound Ramps Alternative 3 Modify the Exi Eastbound Ramps Geometry		Alternative 4 – Dual Roundabout Interchange
BENEFIT			
Reduction in PDO Crashes	8.5	2.0	9.6
Reduction in FI Crashes	3.0	0.4	2.6
Reduction Crash Costs	\$1,450,100.00	\$203,920.00	\$1,284,000.00
Reduction in User Delay Cost	\$(61,470.26)	\$6,805.25	\$22,341.28
TOTAL BENEFIT	\$1,388,629.74	\$210,725.25	\$1,306,341.28
COST			
Implementation Cost	\$4,000,000.00	\$15,000,000.00	\$41,000,000.00
Capital Recovery Factor <sup>1</sup>	0.09439	0.09439	0.09439
Annual Local Maintenance Savings	\$(150,000.00)	\$(150,000.00)	\$(150,000.00)
TOTAL COST(annualized)	\$227,560.00	\$1,265,850.00	\$ 3,719,990.00
Benefit Cost Ratio	6.1	0.17	0.35
Time-of Return (Years)	2.9	71.2	31.4

1 Based on a 20 year service life and 7% annual percentage rate; converts the total cost to an annualized cost.

Below is a summary of the results.

- Alternative 1 Due to no changes and no costs, the BCR for this alternative is zero.
- Alternative 2 While this alternative had the lowest crash reduction, it also had the lowest construction cost and resulted in a highest BCR. While this alternative had the highest BCR, the crash reductions utilized were not statistically significant.
- Alternative 3 The BCR is less than 1 due to the combination of the \$15M construction cost and reductions in crashes which were not statistically significant.
- Alternative 4 The BCR is less than 1 due to the combination of the \$41M construction cost and reductions in crashes which were not statistically significant.

## Environmental and Community Impacts Analysis

In addition to evaluating the benefits of potential improvements, the PEL study examined the level of potential impacts each alternative may have to the surrounding environment. To accomplish this goal at this level of study, the following environmental factors were evaluated.

- Non-Motorized
   Connectivity
- Community Resources Connectivity
- Right-of-Way/Property Acquisitions

- Wetlands
- Streams and Surface Waters

Floodplains

•

- Parks and Recreation sites
- Protected Flora and Fauna Species
- Cultural Resources
- Water
   Quality/Stormwater
- Forest Impacts

Attachment B of the PEL study includes the Environmental Alternative Resource Analysis Report, the Archaeology Sensitivity Assessment Report, and the Drainage Report, which provide more details related to potential impacts, mitigation, permits, and approvals required for the alternatives. A summary of impacts is below for each alternative.

#### Alternative 1 – No Action Alternative

The No Action alternative (Alt 1) will not change the connectivity of the local community to the region, and it will not improve the connectivity of bicycle and pedestrian facilities. It will not impact any environmental resources in the study area.

#### Alternative 2 – Closure of the Eastbound Ramps

The Closure of the Eastbound Ramps alternative (Alt 2) will not affect any environmental resources in the study area. This alternative will not improve the connectivity of bicycle and pedestrian facilities, and it will reduce the local community's connectivity within the region.

#### Alternative 3 – Modify the Existing Eastbound Ramp Geometry

The Modify Existing Ramp Geometry alternative (Alt 3) will improve the connectivity of bicycle and pedestrian facilities, and it will not change the local community's connectivity within the region. This alternative will have temporary impacts to three parcels (0.53 acres) and permanent impacts to six parcels (2.23 acres), permanent impact to 0.39 acre of wetlands, 1695 linear feet of permanent stream impacts, 12.12 acres of forest impact, and potentially impact three culturally sensitive archaeological or historic sites. It will not affect floodplains, threatened or endangered species, have no permanent effects on public parks or trails, and it can improve water quality by treating stormwater runoff before entering surface waters. Wetland mitigation is not anticipated for the current concept design of this alternative that does not exceed the permit threshold requirement. Stream mitigation will be determined as design advances based on agency confirmation of stream ratings and impact mitigation requirements for the project.

#### Alternative 4 - Dual Roundabout Interchange

For the Dual Roundabout alternative (Alt 4), it will improve the connectivity of the nearby community by adding bicycle and pedestrian facilities where none exist presently, allowing them non-motorized access in and through the area. It will not change the local community's connectivity within the larger region. This alternative will have temporary impacts to five parcels (1.04 acres) and permanent impacts to five parcels (2.15 acres), permanent impact to 0.75 acre of wetlands, 2357 LF of permanent stream impact, 15.9 acres of forest impact, impact to habitat for one state threatened species, temporary effects to the floodplain, and potentially affect three culturally sensitive archaeological or historic sites. It will not permanently affect public parks or trails, and it

can improve water quality by preserving stormwater runoff before enters nearby streams. Wetland mitigation may be required for this alternative if final design thresholds exceed the 1/3 acre impact to one individual wetland complex. Stream mitigation will be determined as design advances based on agency confirmation of stream ratings and impact mitigation requirements for the project.

A full comparison of the alternatives is in Attachment F and summarized in Table 8 below.

## **Second Level Alternatives Evaluation Matrix**

Table 8 compares the alternatives considered in this level of evaluation. The table provides a summary of the analysis using key criteria developed for the study, including the purpose and need statement, feedback received from the MDOT Admin Team and the LAC, and comments received from public involvement activities. The criteria focus on key elements of the purpose and need statement, such as traffic operations, safety, and non-motorized mobility, and ROW, community, and environmental impacts. For a detailed evaluation of the alternatives, refer to Attachment F.

Where possible, the quantitative data used in the evaluation criteria, including traffic operations and safety or acres of wetland impacts. Other criteria are qualitative; for example, a rating of increase/no change/decrease as to how well the alternatives meet the purpose and need or avoids impacts to environmental resources. Estimated costs in the comparison matrix illustrate the difference between the alternatives and identify future funding needs for planners if progressing an alternative is recommended. Table 8 below is a summary of the detailed evaluation matrix in Attachment F. The color coding in the table provides the potential effect expected to occur with each alternative. The meaning of the code is: Green = desirable change from existing condition, yellow = no improvement from existing condition, red = undesirable condition.

Table 8 -	<b>Evaluation</b>	of Alteri	natives	<b>Summary</b>
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Evaluation Criteria	Performance Measure	Evaluation Description	Alternative 1 – No Action	Alternative 2 – Closure of the Eastbound Ramps	Alternative 3 – Modify Existing Eastbound Ramp Geometry	Alternative 4 – Dual Roundabout Interchange
Safety						
Reduction in Fatal & Injury Crashes – Study Area	<ul> <li>Reduction in expected total crashes in 2025/2045</li> <li>Reduction in expected fatal and injury crashes in 2025/2045</li> <li>Statistically significant reductions with a level of confidence &gt;95%</li> </ul>	<ul> <li>Average number of expected crashes reduced per year expected within study area (includes mainline M-14, ramps, and ramp terminals).</li> <li>Average number of expected crashes reduced per year expected outside the study area due to changes within the study area.</li> </ul>	No improvement from existing condition	Desirable change from existing condition	Desirable change from existing condition	Desirable change from existing condition
Reduction in Total Crashes – Study Area	<ul> <li>Reduction in expected total crashes in 2025/2045</li> <li>Reduction in expected fatal and injury crashes in 2025/2045</li> <li>Statistically significant reductions with a level of confidence &gt;95%</li> </ul>	<ul> <li>Average number of expected crashes reduced per year expected within study area (includes mainline M-14, ramps, and ramp terminals).</li> <li>Average number of expected crashes reduced per year expected outside the study area due to changes within the study area.</li> </ul>	No improvement from existing condition	Desirable change from existing condition	No improvement from existing condition	No improvement from existing condition

Evaluation Criteria	Performance Measure	Evaluation Description	Alternative 1 – No Action	Alternative 2 – Closure of the Eastbound Ramps	Alternative 3 – Modify Existing Eastbound Ramp Geometry	Alternative 4 – Dual Roundabout Interchange
Reduction in Fatal & Injury Crashes – Impacted Areas Outside Study Area	<ul> <li>Reduction in expected total crashes in 2025/2045</li> <li>Reduction in expected fatal and injury crashes in 2025/2045</li> <li>Statistically significant reductions with a level of confidence &gt;95%</li> </ul>	<ul> <li>Average number of expected crashes reduced per year expected within study area (includes mainline M-14, ramps, and ramp terminals).</li> <li>Average number of expected crashes reduced per year expected outside the study area due to changes within the study area.</li> </ul>	No improvement from existing condition	Undesirable condition	No improvement from existing condition	No improvement from existing condition
Reduction in Total Crashes – Impacted Areas Outside Study Area	<ul> <li>Reduction in expected total crashes in 2025/2045</li> <li>Reduction in expected fatal and injury crashes in 2025/2045</li> <li>Statistically significant reductions with a level of confidence &gt;95%</li> </ul>	<ul> <li>Average number of expected crashes reduced per year expected within study area (includes mainline M-14, ramps, and ramp terminals).</li> <li>Average number of expected crashes reduced per year expected outside the study area due to changes within the study area.</li> </ul>	No improvement from existing condition	Undesirable condition	No improvement from existing condition	No improvement from existing condition
Traffic Operations	·				·	
Freeway Weaving	Level of Service	Lane changes on M-14 that slow traffic.	$\bigcirc$			$\bigcirc$
	1	1			1	

#### M-14/Barton Drive

Evaluation Criteria	Performance Measure	Evaluation Description	Alternative 1 – No Action	Alternative 2 – Closure of the Eastbound Ramps	Alternative 3 – Modify Existing Eastbound Ramp Geometry	Alternative 4 – Dual Roundabout Interchange
			No improvement from existing condition	Desirable change from existing condition	No improvement from existing condition	No improvement from existing condition
Ramp Terminals	Level of Service	Traffic conditions at Barton Dr on and off ramps (EB and WB).	No improvement from existing condition	No improvement from existing condition	No improvement from existing condition	Desirable change from existing condition
Freeway Mainline	Level of Service	Traffic conditions on M-14 from west of Main St to north of Barton Dr.	No improvement from existing condition	No improvement from existing condition	No improvement from existing condition	No improvement from existing condition
Arterial Network – within Study Area	Level of Service	Traffic conditions on local street network within the study area.	No improvement from existing condition	Desirable change from existing condition	No improvement from existing condition	No improvement from existing condition
Arterial Network – Outside Study Area	Level of Service	Traffic conditions on local street network outside the study area regionally.	No improvement from existing condition	No improvement from existing condition	No improvement from existing condition	No improvement from existing condition
Community Cohesion						

#### M-14/Barton Drive

Evaluation Criteria	Performance Measure	Evaluation Description	Alternative 1 – No Action	Alternative 2 – Closure of the Eastbound Ramps	Alternative 3 – Modify Existing Eastbound Ramp Geometry	Alternative 4 – Dual Roundabout Interchange
Community Cohesion	Increase/no change/decrease	Creates or removes barriers between local and regional communities and facilities.	No improvement from existing condition	Undesirable condition	No improvement from existing condition	Desirable change from existing condition
Non-Motorized Connectivity	Increase/no change/decrease	Addition of sidewalk or bike lanes with project.	No improvement from existing condition	No improvement from existing condition	Desirable change from existing condition	Desirable change from existing condition
Community Resources Connectivity	Increase/no change/decrease	Adds or removes access to other parts of the community/city from local neighborhoods.	No improvement from existing condition	Undesirable condition	No improvement from existing condition	Desirable change from existing condition
Right-of-Way						
ROW	Number of parcels	Need to purchase land or have a temporary/permanent easement.	Desirable change from existing condition	Desirable change from existing condition	Undesirable condition	Undesirable condition
Parkland/4(f)	Number of facilities	Change in use, connectivity, or access at publicly owned public parks, recreation areas, and wildlife or waterfowl refuges, or any publicly or privately owned historic site listed or eligible	Desirable change from existing condition	Desirable change from existing condition	No improvement from existing condition	Desirable change from existing condition

Evaluation Criteria	Performance Measure	Evaluation Description	Alternative 1 – No Action	Alternative 2 – Closure of the Eastbound Ramps	Alternative 3 – Modify Existing Eastbound Ramp Geometry	Alternative 4 – Dual Roundabout Interchange
		for listing on the National Register of Historic Places (historic sites accounted for in the Cultural/Historic category).				
Environmental						
Wetland Impacts	Acres	Acres of wetland disturbed or filled.	Desirable change from existing condition	Desirable change from existing condition	No improvement from existing condition	No improvement from existing condition
Stream Impacts	Linear Feet	LF of stream impacted.	Desirable change from existing condition	Desirable change from existing condition	No improvement from existing condition	No improvement from existing condition
Floodplain Impacts	Temporary/permanent	Encroachment into floodplain.	Desirable change from existing condition	Desirable change from existing condition	Desirable change from existing condition	No improvement from existing condition
Water Quality	Increase/same/decrease	Increase in impervious surface and required stormwater treatment.	No improvement from existing condition	Desirable change from existing condition	Desirable change from existing condition	Desirable change from existing condition

#### M-14/Barton Drive

Evaluation Criteria	Performance Measure	Evaluation Description	Alternative 1 – No Action	Alternative 2 – Closure of the Eastbound Ramps	Alternative 3 – Modify Existing Eastbound Ramp Geometry	Alternative 4 – Dual Roundabout Interchange
Forest Impacts	Acres	Acres of forest removed for grading.	Desirable change from existing condition	Desirable change from existing condition	No improvement from existing condition	No improvement from existing condition
Flora/Fauna	Presence/absence of habitat or species	Acres of threatened and endangered species habitat removed or disturbed.	Desirable change from existing condition	Desirable change from existing condition	Desirable change from existing condition	Undesirable condition
Cultural/Historic	Number of sites	Disturbance, change in setting, or use of historic or archaeological sites.	Desirable change from existing condition	Desirable change from existing condition	No improvement from existing condition	No improvement from existing condition
Construction and Maintenance						
Constructability	Ease or difficulty of construction	Addition or removal of structures or other non- standard, complicated features included in design to complete the alternative.	Undesirable condition	Desirable change from existing condition	No improvement from existing condition	No improvement from existing condition
Maintenance of Traffic during Construction	Closure of ramps and length of construction	Maintenance of acceptable traffic operations during construction and complicated detours or closures required.	Undesirable condition	Desirable change from existing condition	No improvement from existing condition	No improvement from existing condition

#### M-14/Barton Drive

Evaluation Criteria	Performance Measure	Evaluation Description	Alternative 1 – No Action	Alternative 2 – Closure of the Eastbound Ramps	Alternative 3 – Modify Existing Eastbound Ramp Geometry	Alternative 4 – Dual Roundabout Interchange
Evaluation Criteria	Performance Measure	Evaluation Description	Alternative 1 – No Action	Alternative 2 – Closure of the Eastbound Ramps	Alternative 3 – Modify Existing Eastbound Ramp Geometry	Alternative 4 – Dual Roundabout Interchange
Maintenance	Estimated local maintenance cost	Estimated local maintenance cost.	Undesirable condition	Desirable change from existing condition	No improvement from existing condition	No improvement from existing condition
Construction Cost	Estimated cost	What future funding will be required to construct this alternative?	Undesirable condition	Desirable change from existing condition	No improvement from existing condition	No improvement from existing condition
Benefit/Cost Analysis	Benefit cost ratio	Compare the safety and traffic operations benefits to life cycle costs for construction and maintenance.	Undesirable condition	Desirable change from existing condition	No improvement from existing condition	No improvement from existing condition

## **Recommended Alternatives**

MDOT is recommending the Dual Roundabout Interchange alternative as the locally acceptable alternative for the M-14 Barton Dr Interchange because it is the best long-term solution to address the purpose and need statement and goals of the project. It has the best overall performance in meeting the purpose and need of the project for the following reasons:

- It improves safety at the interchange,
- It improves operations of the interchange,
- It has minimal natural environmental impacts that can be mitigated with standard mitigation measures,
- It requires fewer ROW acquisition than other alternatives, especially to parklands, and
- It increases connectivity for non-motorized transportation.

However, due to its cost, MDOT must identify all the funding required to construct this alternative. Therefore, the schedule for implementation of the project is unknown at this time, and the benefits of the project will be delayed.

To achieve some of the benefits of the project as soon as possible, MDOT is also recommending the Closure of the Eastbound Ramps alternative as a short-term solution. This alternative is an interim solution because it provides immediate safety and operational benefits to the traveling public until allocating full funding for the Dual Roundabout Interchange alternative. This alternative will not provide all connectivity benefits and full interchange operational benefits of the Dual Roundabout Interchange alternative. No ROW acquisitions are required for this alternative.

## Section 3 – Environmental Resource Considerations for the

## **Locally Acceptable Alternative**

It is important to understand the environmental context and concerns when making recommendations and decisions; however, the detailed environmental analysis is only meaningful when specific information about the layout and design of improvements is known. Because the PEL study does not provide this level of detail at this time, only resources relevant to the study area warranted an evaluation at this early stage in the planning process. This chapter documents the recognized environmental considerations at the M-14 Barton Dr interchange; an additional analysis will be mandatory for evaluation in future NEPA studies.

## **Natural Environment Resources**

The Environmental Resource Alternative Analysis in Attachment B provides a detailed review of potential effects from each of the alternatives to the natural environment. The summary of the review provided the long-term and interim locally acceptable alternatives.

The Closure of Eastbound Ramps alternative (the short-term, interim recommendation) is not likely to impact any environmental resources.

The Dual Roundabout Interchange alternative (the long-term recommendation) is likely to impact wetlands, streams, and woodland forest resources. Additionally, this alternative is likely to impact the floodplain based on a proposed storm sewer outlet/upgrade at the Huron River. It is also likely to impact the state threatened oval ladies'-tresses. Table 11 provides a summary of the anticipated impacts for the interim and long-term alternatives based on current concept plans.

# Table 9 – Anticipated Natural Environment Impacts for the Locally Acceptable Alternatives

Alternative	Wetland Impacts (acres)	Stream Impacts (linear feet)	Woodland Forest Impacts (acres)	City of Ann Arbor Woodland Forest Impacts (acres)	Number of Street Trees to be Removed	Floodplain Impacts
Eastbound Ramp Closure Alternative	0	0	0	0	0	No
Dual Roundabout Interchange Alternative	0.75	2,357 ft	15.9 acres	0	0	Yes

## **Human Environment Resources**

In addition to natural environment resources, the study reviewed potential impacts to human environment resources in the study area.

#### M-14/Barton Drive

### Demographics and Environmental Justice

Most of the study area is within Ann Arbor Township in Washtenaw County, adjacent to the City boundary north of the Huron River. Areas with significant minority or low-income populations, however, are within the City boundary outside of the study area, east of Pontiac Trail which runs parallel to M-14.



#### **Figure 7 Demographic Study Area**

Source: https://ejscreen.epa.gov/mapper/

Demographic information provided by the US Census (2020) is in Table 10 below. The project is not likely to have high and adverse impacts to minority or low-income populations, and all communities can share in the benefits of the project.

#### Table 10 – Demographic Information for the Study Area

	Population	Percent Minority Population	Percent Persons in Poverty	Median household income	Business Revenue	Unemployment rate⁴
City of Ann Arbor <sup>1</sup>	121,538	32.5%	22.5%	\$73,276	\$6.57B	3.0%
Washtenaw County <sup>2</sup>	369,390	30%	12.4%	\$79,198	\$12.9B	3.0%
Michigan <sup>3</sup>	10,034,113	25.8%	11.6%	\$63,202	\$242.6B	4.3%

1. Source: https://www.census.gov/quickfacts/fact/table/annarborcitymichigan/IPE120221#IPE120221

2. Source: https://www.census.gov/quickfacts/fact/dashboard/washtenawcountymichigan,US/PST045222

3. Source: https://www.census.gov/quickfacts/fact/table/MI/PST045222

<sup>4.</sup> Source: https://www.bls.gov/eag/eag.mi\_annarbor\_msa.htm

### Parks and Recreation Resources

Numerous parks, trails, and recreational facilities are within the study corridor and are in Figure 9 below. Parks in the City have special protection that requires any change in ownership be subject for approval by a vote of the people. Neither the Closure the Eastbound Ramps or Dual Roundabout alternatives require the use of parkland or park property as shown in Figure 5 and Figure 7 above.





### Noise

The study area borders several locations with noise sensitive receptors where traffic noise can impact residences or commercial enterprises within areas of outdoor use. Per the MDOT Highway Noise Analysis and Abatement Handbook (2011), a Type I project consists of capacity increases, alignment changes, or the addition of weigh stations, rest stops, ride-share lots, and toll plazas. When a project identifies as Type I, a noise analysis study is required if noise sensitive receptors are present within 500 ft of the project. The Closure of Eastbound Ramps alternative is not likely to be a Type I project; however, the Dual Roundabouts Alternative is likely to be a Type I project. If either of the alternatives is a Type I project, MDOT will complete a noise analysis during the NEPA process.

## Air Quality

The Clean Air Act, amended 1990, requires the Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards for certain air pollutants of concern to protect human health and the environment from air pollution. These air pollutants, referred to as criteria pollutants, are carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), particulate matter smaller than 10 micrometers in diameter ( $PM_{10}$ ), particulate matter smaller than 2.5 micrometers in diameter ( $PM_{2.5}$ ), sulfur dioxide ( $SO_2$ ), ozone ( $O_3$ ), and lead (Pb).

The study area is in Washtenaw County, which is within a maintenance area for 1997 and the 2015 8-hour ozone standards. It is also in a maintenance area for the 2006 24-hour PM2.5 standard. Transportation conformity regulations apply to projects based on recommended federal action, regional significance, and funding. Conformity regulations apply only to the approval, funding, or implementation of FHWA or Federal Transit Administration (FTA) projects, as specified in 40 Code of Federal Regulations (CFR) §93.102(a)(1)(iii). If conformity requirements will not apply because of the funding source, 40 CFR §93.121 also applies if the project is regionally significant, regardless of funding source. The Closure of the Eastbound Ramps alternative is not likely to be a regionally significant project. The Dual Roundabouts alternative is not likely to be a regionally significant project either; however, coordination with FHWA and EPA may be required, as well as consultation with the interagency work group to determine if its exempt or not. Regardless of the funding source, if the project is determined to be regionally significant, it will need to be included in the most recent Regional Transportation Plan and Transportation Improvement Program maintained by the Southeast Michigan Council of Governments, as specified in 23 CFR §450.326.

Because Ozone is a regional pollutant that occurs with the mixture of certain compounds in the atmosphere and in presence of sunlight, no project-level, hot-spot modeling will be mandatory. The project is likely to be in conformity with regulations when it is in the fiscally constrained transportation plans for the area. The project also is likely to require an analysis of greenhouse gas emissions prior to approval.

## Section 4 – Public and Agency Involvement

As part of MDOT's PEL process, it formed a comprehensive public involvement plan. The Public Involvement Plan (PIP) provided a framework for meaningful public engagement and the communication and outreach strategies necessary to build awareness, trust, and support among residents and other stakeholders for the M-14/Barton Dr PEL study. Attachment E includes a copy of the PIP, meeting materials, and comments collected from outreach efforts.

The plan included in-person and virtual opportunities for the public to engage with MDOT to consider plans for improving the M-14 Barton Dr Interchange. Following the PEL process, engaging the community in a comprehensive way that aligns with the NEPA process and reduces redundancies of work throughout the project's development stages.

The project team used information during the public outreach process in the development of the alternatives and their evaluation. The input formed the purpose and need for the project, as described in **Section 1**.

In addition, the evaluation criteria used to review the alternatives measured the concerns of the community. The criteria measured how each alternative enhanced safety at the interchange, avoided impacts to parks and natural areas, and improved or disrupted community connections. More information on the evaluation criteria is in **Section 2**.

## **Public Involvement Activities**

An approach included both in-person and virtual engagement opportunities with stakeholders. Key stakeholders were present, including members of neighborhood Homeowners Associations and Senator Jeff Irwin and Representative Felicia Brabec. These key stakeholders served to support outreach for public meetings and encourage engagement. Additionally, MDOT created a LAC of leaders and stakeholders from the City, Ann Arbor Township, Barton Hills Village, Washtenaw County, Washtenaw County Road Commission, and University of Michigan.

### **Public Events**

Public involvement activities coincided with ongoing stakeholder activities that began in early 2022. Three public meetings were held throughout the PEL study, with two that occurred in 2022, and a third anticipated in 2023.

Event/Activity	Purpose/Goal	Date
Meeting with Officials from City of Ann Arbor	Initiate conversation with the City, prior to LAC to establish PEL process, obtain feedback, and build support.	May 12, 2022
Local Advisory Meeting	Introduce project, discuss schedule, and outcomes. Discuss the existing conditions findings.	May 19, 2022
Public Meeting #1 (In-person) Ann Arbor Farmers Market	Present the project, schedule, compilation of data and plans, and solicit input from the public and stakeholders for development of the Purpose and Need Statement.	June 8, 2022
Local Advisory Meeting	Discuss Purpose and Need statement. Present preliminary alternatives and their potential impacts to the public and area stakeholders for discussion.	August 11, 2022

#### Table 11 – Public Involvement Events

Event/Activity	Purpose/Goal	Date
Public Meeting #2 – Virtual	Present an update to the project, schedule, additional data, and plans. Share preliminary Alternatives for public feedback and comment and authorize draft final purpose and need.	September 14, 2022–October 2, 2022
Meeting with Barton Hills Village Board and Residents	Present an update to the project, schedule, additional data, and preliminary alternatives.	September 29, 2022
Local Advisory Meeting	Preview draft PEL report, including Share/approve Acceptable Alternative(s) design and Open House materials for public meeting #3	January 2023
Local Advisory Meeting	Present draft PEL report. Notify of the schedule and steps to completion.	June 23, 2023
Present to Barton Hills Village Board Members	Share Locally Acceptable Alternative(s)	August 8, 2023
Present to Barton Hills Village and Ann Arbor Township Members of the Public	Share/ Locally Acceptable Alternative(s)	August 10, 2023
Public Meeting #3 – Virtual	Share Locally Acceptable Alternative(s)	August 10, 2023
Press release/email to stakeholders	Present Acceptable Alternative with public comments incorporated for final public feedback and comment before finalizing the study.	TBD

MDOT provided communication with stakeholders through eNewsletters, media outlets, and internal channels, including:

- Press Releases
- Distribution List
- Project Website
- Project Hotline
- In-person Public Meeting
- Self-paced Virtual Public Meetings
- Social Media

## **Feedback and Engagement**

To date, approximately 900 members of the public have engaged in the public involvement process by providing comments/feedback. Stakeholders included neighborhood residents, area commuters, and interested parties. Throughout the virtual public meeting held in September, stakeholders had an

opportunity to review the purpose and need draft statement and four plan alternatives. Stakeholders asked questions and sought clarifications from MDOT while also sharing preferences and suggestions to support continued planning efforts.

### **Comment Summary**

Comments received throughout the process included:

- 51 comments and 80 participants at the Ann Arbor Farmer's Market on June 8,2022.
- 351 unique comments from 3723 visitors to the virtual meeting September 14–October 2, 2022.
- 443 website comment submissions originating from project website.
- Seven direct emails to MDOT team members.
- 396 sign-ups to distribution list.
- A petition with 318 signatures received during the virtual meeting in August 2023.
- 1,985 vistors to the virtual meeting site in August 2023 with 160 comments received.

#### **Figure 9 Specific Comments**



### **Input Summary**

Sentiments shared throughout the process focused on:

- Emphasis on safety as the opinion of interchange is "unsafe" or "dangerous".
- Excessive speed is an issue on the freeway.
- The interchange has an extensive history of crashes.
- Some support for closing the ramps.
- Opposite opinion NOT to close ramps as access is important.
- Do not use on-ramp because of a stop sign leading into a high-speed roadway.
- Desire to preserve area trails and parks.
- Want to preserve green space.
- Concerns about noise levels from the freeway for area residents and businesses.

- Truck crashes near the interchange, including fuel spill to the Huron River.
- Opposition to installing roundabouts
- Support for providing additional signing at the interchange.

### **Tribal Consultation**

MDOT consulted with 44 tribal organizations, inviting any interested tribes to become consulting partners on the effect to historic and cultural resources. The tribes were sent invitations requesting comments in their respective areas of expertise regarding any possible environmental effects associate with the project. Two of the tribes responded to MDOT and stated their determinations that the project would not affect any cultural resources or religious concerns. The tribes that responded with these conclusions are the Nottawaseppi Huron Band of the Potawatomi and the Pokagon Band of Potawatomi. The correspondence with the tribes is included in Attachment E.

## **Section 5 – Next Steps for Project Implementation**

To implement the Dual Roundabout Interchange and the Closure of the Eastbound Ramps alternatives, MDOT must follow the NEPA process before construction begins. This project is likely to predominately be located within the existing MDOT ROW. Therefore, the biggest issues from the PEL study relate to the potential endangered species, woodland forest, and wetland/stream impacts. MDOT must determine whether endangered species live within the affected limits and quantify the effects to forested woodlands and adjacent streams, floodplains, and potential wetlands.

Contaminated sites also must be further investigated by completing a Project Area Contamination Survey (PACS) to classify potential sites and locations.

Further coordination is necessary regarding potential impacts to above ground historic properties. Although it is unlikely any ROW will be necessary from any of these properties, changes to the curb line or streetscape can necessitate coordination with the MDOT historian and possibly SHPO.

Indirect and cumulative impacts were reviewed and presented no anticipated concerns. The project is not likely to induce significant impacts to planned growth or land use for the area, does not have significant impacts on travel patterns, and does not involve unusual circumstances.

Depending on the final design and associated environmental impacts, potential mitigation may be required. Mitigation measures are commitments that will be integrated into the project once the locally acceptable alternative proceeds to the design phase. Below is a preliminary list of potential mitigation that may be required for the project.

- Wetlands: Wetland mitigation will be required if the wetland impacts exceed 1/3 acre per wetland complex or more than one acre for the entire project.
- Endangered Species Flora: If any endangered species are present and avoidance is not
  possible, a Michigan Department of Natural Resources (MDNR) Threatened and Endangered
  Species Permit is required which would typically include mitigation such as fencing and signage to
  avoid plants, transplanting impacted species, and site/habitat restoration.
- Streams: Depending on potential impacts from the final roadway and bridge design, stream
  mitigation measures are possible and will require coordination with the Aquatic Resource
  Specialist. Stream mitigation requirements will be dependent on the baseline quality/rating of each
  stream, as well as the mitigation type (restoration, enhancement, preservation, etc.) being
  implemented.
- Tree Replacements: The resource specialist or MDOT roadside development unit will make recommendations on tree replacement requirements.

The NEPA class of action for the interim Closure of the Eastbound Ramps alternative is likely to meet the requirements for a Categorical Exclusion. The class of action for the Dual Roundabouts alternative is pending. MDOT will consult with FHWA about the class of action determination.

## **Attachment A – Existing Conditions Report**

# Attachment B – Environmental Resource Alternative Analysis

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**B1- Environmental Resource Alternatives** 

#### **B2 Archaeology Report**

#### **B3 Drainage**

## **Attachment C – Traffic and Safety Technical Report**

## **Attachment D – Roadway and Structure Design Elements**

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## **Attachment E – Agency and Public Coordination Summary**

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E1- Public Involvement Meeting Summaries

#### **E2- Tribal Consultation Documents**

# Attachment F – M-14/Barton Drive Alternatives Analysis Planning and Environmental Linkages Draft Evaluation Matrix

The purpose of this table is to easily compare the alternatives for consideration using key criteria developed for the study. The project's Purpose and Need Statement, feedback from the Admin Team and LAC, and comments from the public meetings are part of the criteria and the comparison of alternatives. The criteria focus on key elements of the Purpose and Need Statement, such as traffic operations, safety, non-motorized mobility, and environmental impacts.

Where possible, quantitative data is in the evaluation criteria, such as traffic operations and safety or acres of wetland impacts. Other criteria are qualitative; for example, a rating of increase/no change/decrease shows how well the alternative meets the purpose and need or avoids impacts to environmental resources. Estimated costs involved in the comparison matrix illustrate the differences between the alternatives and identify future funding needs for planners if the alternative proceeds. Attachment F contains the detailed analysis that was summarized in Table 8 in Section 2 of the PEL Report.

# Attachment G – Federal Highway Administration Planning and Environmental Linkages Questionnaire

## **Attachment H – Project Cost Estimate Assumptions**