

## **Appendix J. Alternatives Screening Analysis**



I-39/90/94 Corridor Study

Technical Memorandum

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## Alternatives Screening Analysis

May 2024

Wisconsin Department of Transportation

# CONTENTS

- 1. Study Overview.....1-1**
- 2. Screening Process.....2-1**
- 3. Alternatives Considered .....3-1**
  - 3.1. Initial Alternatives Dismissed .....3-1
    - 3.1.1. *No Build Alternative* ..... 3-1
    - 3.1.2. *Transportation Demand Management/Transportation Systems Management and Operations Alternative*..... 3-1
    - 3.1.3. *Off Alignment (East Reliever)* ..... 3-2
    - 3.1.4. *Spot Improvements*..... 3-2
    - 3.1.5. *Environmental Impacts* ..... 3-3
    - 3.1.6. *Evaluation* ..... 3-3
  - 3.2. Build Alternatives – Freeway Modernization .....3-4
    - 3.2.1. *Modernization of Existing Travel Lanes* ..... 3-6
    - 3.2.2. *Modernization Plus Added General-Purpose Lane*..... 3-7
    - 3.2.3. *Modernization Hybrid* ..... 3-8
    - 3.2.4. *Environmental Impacts* ..... 3-8
    - 3.2.5. *Evaluation* ..... 3-9
  - 3.3. Build Alternatives – Interchanges .....3-11
    - 3.3.1. *US 12/18 Interchange* ..... 3-13
    - 3.3.2. *I-94/WIS 30 Interchange* ..... 3-14
    - 3.3.3. *Proposed New Milwaukee Street Interchange*..... 3-18
    - 3.3.4. *US 151/High Crossing Boulevard Interchanges* ..... 3-22
    - 3.3.5. *Proposed New Hoepker Road Interchange* ..... 3-32
    - 3.3.6. *US 51 Interchange*..... 3-36
    - 3.3.7. *WIS 19 Interchange*..... 3-40
    - 3.3.8. *County V Interchange*..... 3-47
    - 3.3.9. *County CS Interchange* ..... 3-51
    - 3.3.10. *I-39 I-90/94 Split Interchange* ..... 3-54
    - 3.3.11. *WIS 33 Interchange at I-39* ..... 3-60
    - 3.3.12. *WIS 33 Interchange at I-90/94*..... 3-64
    - 3.3.13. *US 12 Interchange*..... 3-68
    - 3.3.14. *WIS 23 Interchange*..... 3-73
    - 3.3.15. *WIS 13 Interchange*..... 3-76
    - 3.3.16. *US 12/WIS 16 Interchange*..... 3-82

**4. Summary of Alternatives Recommended for Further Study .....4-1**  
**Appendix A. Mainline Alternative Typical Cross Sections ..... A-1**  
**Appendix B. Design Exception Memoranda ..... B-1**

**TABLES**

Table 2-1: Alternatives Grading Rubric.....2-2  
 Table 3-1: Dismissed Alternatives Impacts Summary .....3-3  
 Table 3-2: Dismissed Alternatives Evaluation Criteria.....3-3  
 Table 3-3: Freeway Modernization Alternative Impacts Summary .....3-8  
 Table 3-4: Freeway Modernization Alternative Evaluation Criteria .....3-10  
 Table 3-5: I-94/WIS 30 Interchange Alternative Impacts Summary .....3-17  
 Table 3-6: I-94/WIS 30 Interchange Alternative Evaluation Criteria .....3-17  
 Table 3-7: Proposed New Milwaukee Street Interchange Alternatives Impacts Summary .....3-21  
 Table 3-8: Proposed New Milwaukee Street Interchange Alternatives Evaluation Criteria .....3-21  
 Table 3-9: US 151/High Crossing Boulevard Interchange Alternatives Impacts Summary .....3-30  
 Table 3-10: US 151/High Crossing Boulevard Interchange Alternatives Evaluation Criteria.....3-31  
 Table 3-11: Proposed New Hoepker Road Interchange Alternatives Impacts Summary .....3-35  
 Table 3-12: Proposed New Hoepker Road Interchange Alternatives Evaluation Criteria .....3-35  
 Table 3-13: US 51 Interchange Alternatives Impacts Summary .....3-39  
 Table 3-14: US 51 Interchange Alternatives Evaluation Criteria .....3-39  
 Table 3-15: WIS 19 Interchange Alternatives Impacts Summary .....3-46  
 Table 3-16: WIS 19 Interchange Alternatives Evaluation Criteria .....3-47  
 Table 3-17: County V Interchange Alternatives Impacts Summary.....3-50  
 Table 3-18: County V Interchange Alternatives Evaluation Criteria .....3-50  
 Table 3-19: County CS Interchange Alternatives Impacts Summary.....3-54  
 Table 3-20: County CS Interchange Alternatives Evaluation Criteria .....3-54  
 Table 3-21: I-39 I-90/94 Split Interchange Alternatives Impacts Summary .....3-59  
 Table 3-22: I-39 I-90/94 Split Interchange Alternatives Evaluation Criteria.....3-59  
 Table 3-23: WIS 33 Interchange at I-39 Alternatives Impacts Summary.....3-63  
 Table 3-24: WIS 33 Interchange at I-39 Alternatives Evaluation Criteria .....3-63  
 Table 3-25: WIS 33 Interchange at I-90/94 Alternatives Impacts Summary .....3-67  
 Table 3-26: WIS 33 Interchange at I-90/94 Alternatives Evaluation Criteria.....3-67  
 Table 3-27: US 12 Interchange Alternatives Impacts Summary .....3-72  
 Table 3-28: US 12 Interchange Alternatives Evaluation Criteria .....3-72  
 Table 3-29: WIS 23 Interchange Alternatives Impacts Summary .....3-75  
 Table 3-30: WIS 23 Interchange Alternatives Evaluation Criteria .....3-75  
 Table 3-31: WIS 13 Interchange Alternatives Impacts Summary .....3-80

Table 3-32: WIS 13 Interchange Alternatives Evaluation Criteria .....3-81

Table 3-33: US 12/WIS 16 Interchange Alternatives Impacts Summary .....3-85

Table 3-34: US 12/WIS 16 Interchange Alternatives Evaluation Criteria.....3-85

Table 4-1: Alternatives Recommended for Further Study .....4-1

**FIGURES**

Figure 1-1: Location Map ..... 1-2

Figure 2-1: How Alternatives are Screened.....2-1

Figure 3-1: TDM/TSMO Measures to be Considered With Build Alternatives.....3-2

Figure 3-2: Specialty Lanes as Applied to Modernization Alternatives.....3-5

Figure 3-3: Modernization of Existing Travel Lanes; General-Purpose Lanes .....3-6

Figure 3-4: Modernization Plus Added General-Purpose Lane; General-Purpose Lanes .....3-7

Figure 3-5: Modernization Hybrid; General-Purpose Lanes .....3-9

Figure 3-6: Existing Corridor Interchanges.....3-12

Figure 3-7: US 12/18 Interchange .....3-13

Figure 3-8: I-94/WIS 30 – Full Modernization #1 .....3-15

Figure 3-9: I-94/WIS 30 – Full Modernization #2 .....3-16

Figure 3-10: Milwaukee Street – Partial Cloverleaf Interchange .....3-19

Figure 3-11: Milwaukee Street - Diamond Interchange .....3-20

Figure 3-12: US 151/High Crossing Boulevard – Directional Interchange.....3-23

Figure 3-13: US 151/High Crossing Boulevard – Loop Ramp Free Flow Interchange .....3-24

Figure 3-14: US 151/High Crossing Boulevard – East Washington Avenue South .....3-25

Figure 3-15: US 151/High Crossing Boulevard – East Washington Avenue North .....3-27

Figure 3-16: US 151/High Crossing Boulevard – 6-Lane High Crossing Boulevard.....3-28

Figure 3-17: US 151/High Crossing Boulevard – East Washington Avenue Freeway Connection.....3-29

Figure 3-18: Hoepker Road – Shifted Diamond Interchange .....3-33

Figure 3-19: Hoepker Road – Partial Cloverleaf Interchange .....3-34

Figure 3-20: US 51 – Partial Cloverleaf Interchange .....3-37

Figure 3-21: US 51 – Diverging Diamond Interchange .....3-38

Figure 3-22: WIS 19 - WIS 19 Over Railroad.....3-41

Figure 3-23: WIS 19 – Northbound Flyover.....3-42

Figure 3-24: WIS 19 – U-Ramp .....3-44

Figure 3-25:WIS 19 – 6-Lane WIS 19.....3-45

Figure 3-26: County V – Diamond Interchange .....3-48

Figure 3-27: County V – Diverging Diamond Interchange.....3-49

Figure 3-28: County CS – Partial Cloverleaf Interchange .....3-52

Figure 3-29: County CS – Diamond Interchange .....3-53

Figure 3-30: I-39 I-90/94 Split – High Build .....3-56

Figure 3-31: I-39 I-90/94 Split – Low Build.....3-58

Figure 3-32: WIS 33 at I-39 – Partial Cloverleaf Interchange .....3-61

Figure 3-33: WIS 33 at I-39 – Diamond Interchange .....3-62

Figure 3-34: WIS 33 at I-90/94 – Partial Cloverleaf Interchange.....3-65

Figure 3-35: WIS 33 at I-90/94 – Diamond Interchange .....3-66

Figure 3-36: US 12 – Diverging Diamond Interchange .....3-69

Figure 3-37: US 12 – Diamond Interchange .....3-70

Figure 3-38: US 12 – Partial Free Flow Interchange .....3-71

Figure 3-39: WIS 23 – Diamond Interchange .....3-73

Figure 3-40: WIS 23 – Diverging Diamond Interchange .....3-74

Figure 3-41: WIS 13 – Diamond Interchange with Realigned County H.....3-77

Figure 3-42: WIS 13 – Split Diamond Interchange .....3-78

Figure 3-43: WIS 13 – Trumpet Interchange .....3-79

Figure 3-44: US 12/WIS 16 – Diamond Interchange .....3-83

Figure 3-45: US 12/WIS 16 – Realigned Diamond Interchange.....3-84

# 1. Study Overview

The Wisconsin Department of Transportation (WisDOT) and the Federal Highway Administration (FHWA) are preparing an environmental impact statement (EIS) to evaluate potential improvements to provide reliable and safe travel on Interstate 39/90/94 (I-39/90/94) between United States Highway (US) 12/18 in Madison and US 12/Wisconsin State Highway (WIS) 16 in Wisconsin Dells. The study will also evaluate I-39 from its split with I-90/94 (the I-39 I-90/94 Split) to Levee Road near Portage. The study corridor is 67 miles long and travels through Dane, Columbia, Sauk, and Juneau counties; see Figure 1-1.<sup>1</sup> The study takes into account separate ongoing projects in the corridor:

- o I-39/90/94 bridge replacement over the Wisconsin River (Columbia County)
- o WIS 60 Interchange reconstruction (Columbia County)
- o County V Interchange reconstruction (Dane County)<sup>2</sup>

I-39/90/94 in the study corridor is a multi-lane interstate with 15 interchanges and over 100 bridges. The study corridor travels through the largely urban/suburban Madison metropolitan area on the south end of the corridor, while the northern portion of the corridor is characterized by rural and natural resource land uses and the Wisconsin Dells, a popular tourist destination.

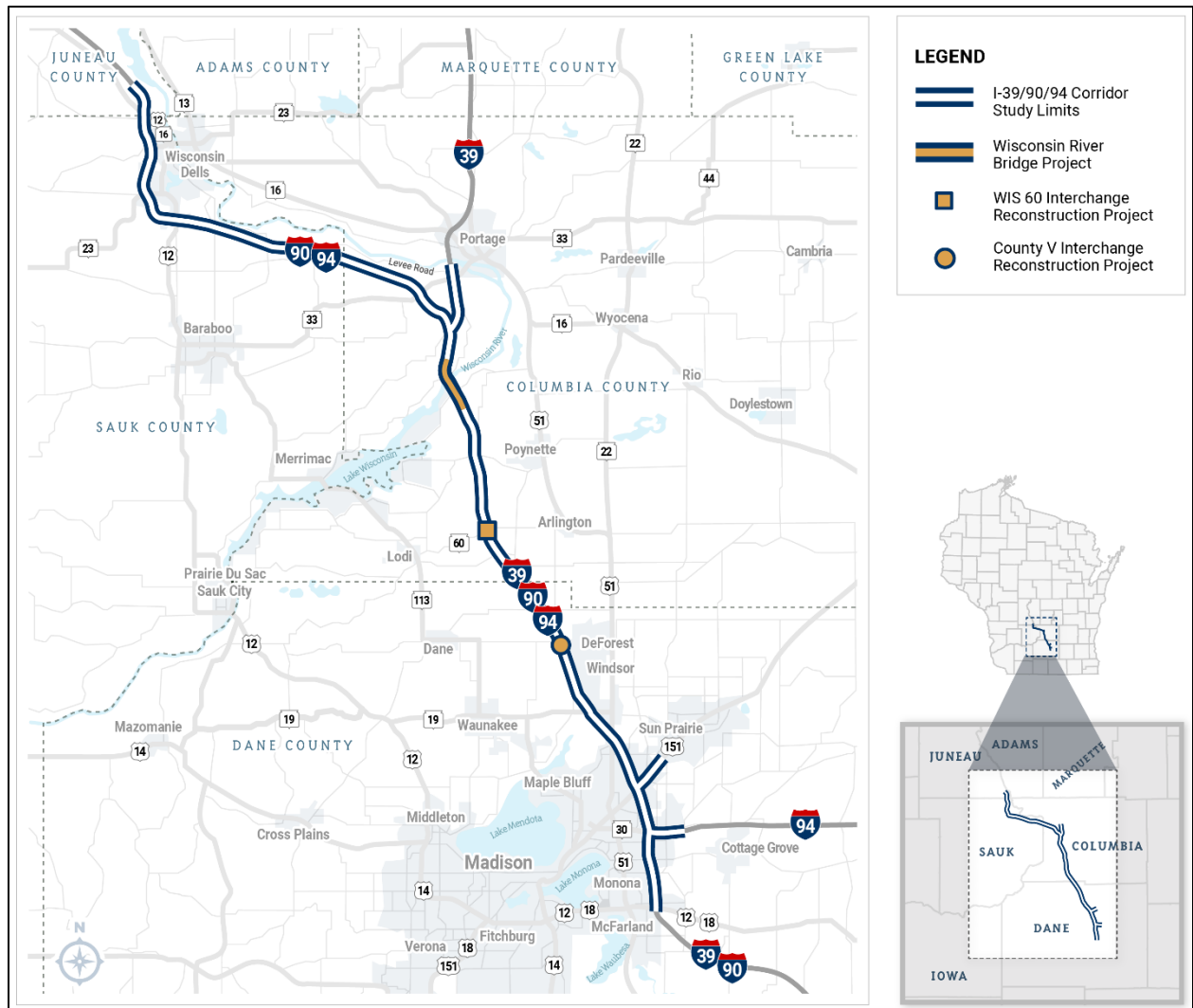
This technical memorandum summarizes the range of alternatives considered and screened from further study. Section 2 describes the screening process. Section 3 presents alternatives evaluated, the recommended preferred alternatives and additional alternatives recommended for further study in the EIS.

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<sup>1</sup> Additional detail on study termini, particularly on the local roadway network may be identified as the alternatives analysis at interchanges proceeds.

<sup>2</sup> A national convenience store is constructing a new store at the County V Interchange and privately funding interchange reconstruction as a separate project in coordination with the village of DeForest, Dane County, WisDOT and FHWA. The consultant for the development will complete an environmental document as an action separate from the I-39/90/94 Corridor Study.

Figure 1-1: Location Map





## 2. Screening Process

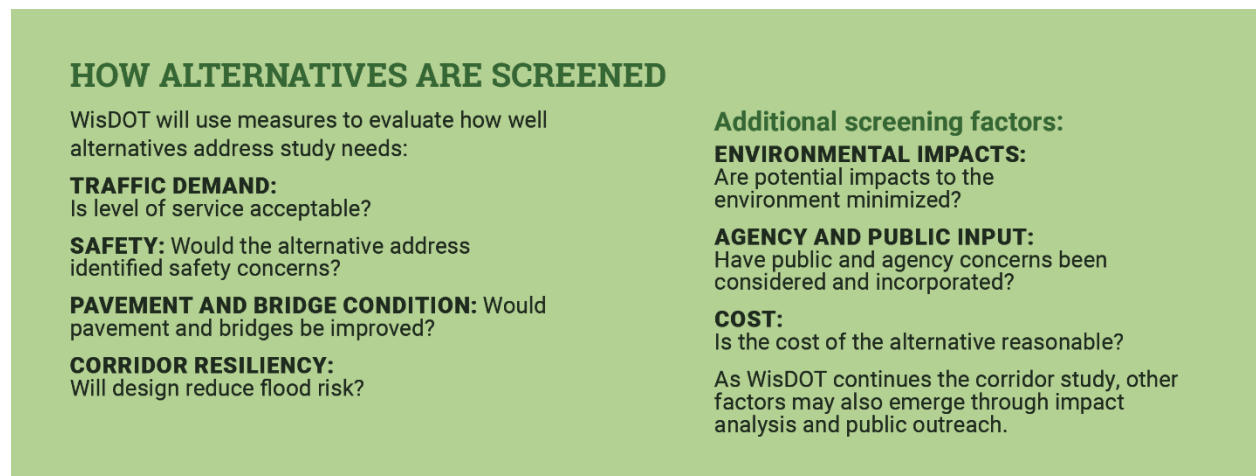
The purpose of the study is to address existing and future traffic demands, safety issues, aging and outdated infrastructure and corridor resiliency.

WisDOT first eliminated certain alternatives if they did not address one of the study’s needs listed below:

- o Existing and future travel demands
- o Safety
- o Pavement needs
- o Bridge needs
- o Corridor resiliency (applies to where Interstate flooding has occurred)

WisDOT advanced alternatives meeting the study purpose and need for further evaluation. WisDOT also presented the Interstate and interchange alternatives at public involvement meetings and further evaluated them based on purpose and need factors as well as environmental impacts, agency and public input, and projected cost, see Figure 2-1.

**Figure 2-1: How Alternatives are Screened**



Section 3 describes the existing conditions, the alternatives considered, and the preliminary environmental impacts associated with each alternative considered. An evaluation table is shown for the Interstate and each interchange and highlights which alternative(s) are recommended for further study in the EIS, as well as WisDOT’s recommended preferred alternative.

The evaluation tables assign a letter grade (A through F) indicating how well each alternative addresses a given purpose and need factor as compared to the other alternatives at that particular location, see Table 2-1. It is important to understand that this is location specific; for example, a grade of B at one location doesn’t necessarily mean that it performs better than an alternative with a C at a different location.

**Table 2-1: Alternatives Grading Rubric**

| Grade | Criteria  |
|-------|---|
| A     | Substantially better than other alternatives              |
| B     | Better than other alternatives                            |
| C     | Not substantially better or worse than other alternatives |
| D     | Worse than other alternatives                             |
| F     | Substantially worse than other alternatives               |

Environmental impacts are preliminary, and costs are relative to each other. Key environmental impacts that best distinguished differences between alternatives are right of way needs and impacts to public parks and open spaces (also called Section 4(f) properties)<sup>3</sup>, wetlands, floodplains and historic properties. The EIS will provide detailed discussion of a wide range of environmental impacts of alternatives screened in this analysis for further evaluation. The EIS evaluation of alternatives recommended for further study will analyze and describe potential impacts and benefits to minority populations, low-income populations and other social groups. Costs were developed using WisDOT’s majors cost estimating tool<sup>4</sup>. The lowest cost alternative is identified and the variance in costs for other alternatives is shown as a percentage greater than the lowest cost alternative.

<sup>3</sup> Section 4(f) is a term that refers to any park, recreation area, wildlife or waterfowl refuge or historic site that is protected under Section 4(f) of the 1966 US Department of Transportation Act.

<sup>4</sup> Construction and Materials Support Center University of Wisconsin-Madison. Majors Program Cost Estimating Software User Manual, Tool Version 3.6. September 2020.

## 3. Alternatives Considered

Alternatives under consideration range from no improvements to build alternatives.

### 3.1. Initial Alternatives Dismissed

Early in the evaluation process, WisDOT evaluated and dismissed four alternatives from further consideration that do not meet one or more study needs. There are certain features from these alternatives that may be used in the alternatives recommended for further study in the EIS. Section 3.1.5 and Section 3.1.6 summarize the projected environmental impacts and evaluation of dismissed initial alternatives, respectively.

#### 3.1.1. No Build Alternative

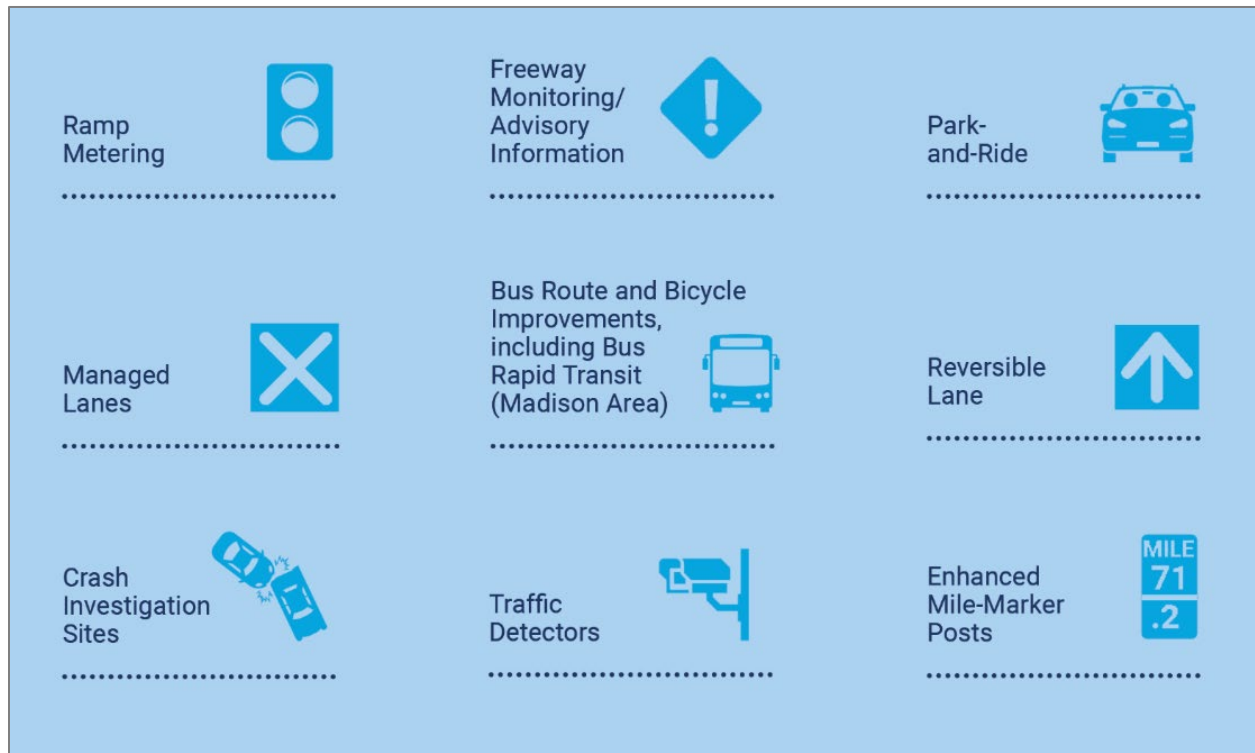
The No Build alternative assumes no improvements to the existing I-39/90/94 freeway or interchanges. This alternative would not reconstruct the Interstate or interchanges to modern design standards. This alternative also assumes the separate Wisconsin River Bridge replacement, the WIS 60 Interchange and County V Interchange reconstruction projects will be completed as scheduled. The No Build alternative does not meet the study purpose and need but is retained as a baseline alternative against which WisDOT will compare other alternatives screened for continued study in the EIS. WisDOT is moving forward with a No Build alternative at the County V Interchange, which is discussed further in 0.

#### 3.1.2. Transportation Demand Management/Transportation Systems Management and Operations Alternative

Transportation Demand Management (TDM) strategies reduce personal vehicular travel or shift such travel to alternative times and routes, allowing for more efficient use of the existing transportation system's capacity, see Figure 3-1. Transportation Systems Management and Operations (TSMO) strategies maximize existing transportation facilities' capacity and travel efficiency through freeway traffic management, street and highway traffic management and other measures to help alleviate congestion.

TDM and TSMO strategies are typically implemented in urban areas, including the Madison metropolitan area. The Greater Madison Metropolitan Planning Organization (MPO) and the Capitol Area Regional Planning Commission collaborated on the Connect Greater Madison Regional Transportation Plan for 2050, which identifies TDM and TSMO strategies that will be considered as part of the alternative development process. Regional transit and rail investments are also included in this alternative. WisDOT's long range transportation plan, Connect 2050, supports similar TDM and TSMO measures, as applicable to the Interstate system. The TDM/TSMO measures do not meet the study purpose and need as a standalone alternative and will not be taken forward for continued study in the EIS, but WisDOT may include several of these measures in other build alternatives.

**Figure 3-1: TDM/TSMO Measures to be Considered With Build Alternatives**



**3.1.3. Off Alignment (East Reliever)**

Between 2014 and 2017, WisDOT evaluated four alternatives for an off alignment, or east reliever route.<sup>5</sup> These four alternatives bypassed I-39/90/94 by constructing additional route(s) to the east of the Interstate. These alternatives would not reconstruct portions of I-39/90/94 in the study corridor.

WisDOT eliminated off alignment alternatives from further study as they did not have public support, they each had significantly greater impacts than the freeway modernization alternatives discussed below and did not meet the study purpose and need factors.

**3.1.4. Spot Improvements**

This alternative retains the existing Interstate in its current configuration and would only include spot safety and operational improvements with minimal or no right of way acquired. Example improvements would address interchanges with high crash rates, such as at US 12 and WIS 13 in Wisconsin Dells, freeway operational problems between the I-94/WIS 30 and US 151/High Crossing Boulevard interchanges in Madison and rehabilitating/replacing bridges with the greatest needs. While this alternative addresses some safety, pavement and bridge needs, it does not address those factors for the entire corridor, and it does not address existing and future travel demands or flood risk.

<sup>5</sup> The east reliever route alternatives were part of an environmental study that WisDOT cancelled in early 2017. *I-39/90/94 Study, letter, study cancellation (wisconsindot.gov)*. Accessed December 5, 2023.

### 3.1.5. Environmental Impacts

By definition, the No Build alternative would not have any environmental impacts. The TDM/TSMO alternative would potentially have some impacts for park and ride lots, managed lanes, bus rapid transit lanes, and/or crash investigation sites, but the alternative did not meet purpose and need prior to developing detailed impacts. The Off Alignment (East Reliever) project’s environmental impacts are from a previous study that did not identify impacts to Section 4(f) properties or historic properties. The Spot Improvements alternative makes improvements to certain interchanges/locations and therefore has limited impacts but does not meet purpose and need.

**Table 3-1: Dismissed Alternatives Impacts Summary**

| Alternative                   | Relocations (number) | New Right of Way (acres) | Section 4(f) Property (acres) | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|-------------------------------|----------------------|--------------------------|-------------------------------|------------------|---------------------|------------------------------|
| No Build                      | 0                    | 0.0                      | 0.0                           | 0.0              | 0.0                 | 0                            |
| TDM / TSMO                    | 0                    | 0.0                      | 0.0                           | 0.0              | 0.0                 | 0                            |
| Off Alignment (East Reliever) | 53 to 91             | 844 to 1,867             | Not determined                | 60 to 163        | 83 to 177           | Not determined               |
| Spot Improvements             | 1 to 3               | 11 to 60                 | 1 to 5                        | 1 to 12          | 0 to 1              | 0                            |

### 3.1.6. Evaluation

None of the initially dismissed alternatives meet needs to address pavement, bridge or flood risk and poorly address traffic demand and safety needs. WisDOT will retain the No Build alternative as a baseline alternative against which WisDOT will compare other alternatives screened for continued study in the EIS. Costs were not determined and not all the alternatives were shown to the public. The Off Alignment alternative was the only alternative shown to the public and reactions were very negative.

**Table 3-2: Dismissed Alternatives Evaluation Criteria**

| Alternative                   | Addresses Existing and Future Travel Demands | Addresses Safety | Addresses Pavement Needs | Addresses Bridge Needs | Addresses Flood Risk | Environmental Impact |
|-------------------------------|--|------------------|--------------------------|------------------------|----------------------|----------------------|
| No Build                      | No   | No               | No                       | No                     | No                   | Low                  |
| TDM / TSMO                    | Yes - D                                      | Yes - F          | No                       | No                     | No                   | Low                  |
| Off Alignment (East Reliever) | Yes - C                                      | Yes - D          | No                       | No                     | No                   | High                 |
| Spot Improvements             | No   | Yes - F          | No                       | No                     | No                   | Low                  |

### 3.2. Build Alternatives – Freeway Modernization

Modernization alternatives reconstruct the Interstate to modern design standards whenever possible. All modernization alternatives would implement recommendations from WisDOT’s Baraboo River floodplain analysis completed as part of this study. The analysis recommends raising I-39 and I-90/94 near the river and lengthening the I-39 Baraboo River bridge to reduce flood risks on the Interstate. In addition to also addressing safety needs, all modernization alternatives would:

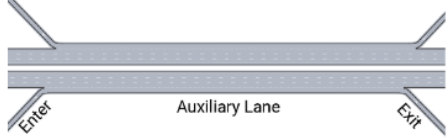
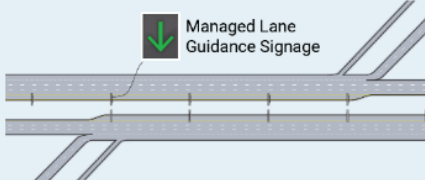
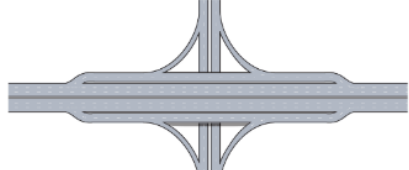
- o Replace or rehabilitate deteriorating pavement, bridges and culverts
- o Move all ramps to the right, eliminating lefthand entrances and exits
- o Improve ramp lengths and bridge clearances
- o Expand shoulders
- o Improve roadway curves, lighting and signage
- o Consider opportunities to add bike and pedestrian facilities

WisDOT also considered implementing strategies to improve operations, including Auxiliary Lanes, Managed Lanes, and/or Collector-Distributor (C-D) Lanes in each of the modernization alternatives, see Figure 3-2. All modernization alternatives are generally within the existing right of way but depending on specific site conditions and alternative design, additional impacts outside the right of way could occur.

WisDOT evaluated three modernization alternatives:

- o Modernization of Existing Travel Lanes
- o Modernization, plus Added General-Purpose Lane
- o Modernization Hybrid

Figure 3-2: Specialty Lanes as Applied to Modernization Alternatives

|  | ALTERNATIVE                            |  |                      |
|--|--|--|----------------------|
|  | Modernization of Existing Travel Lanes | Modernization + Added General-Purpose Lane | Modernization Hybrid |
|  <p><b>AUXILIARY LANES</b><br/>Auxiliary lanes are immediately adjacent to mainline lanes and can be useful for traffic weaving, truck climbing, maneuvering of entering and exiting traffic, or other operational advantages.</p>  | ✓                                      | ✓  | ✓                    |
|  <p><b>MANAGED LANES</b><br/>Managed lanes allow travel on roadway shoulders during periods of peak travel demand.</p>  |  |  | ✓                    |
|  <p><b>COLLECTOR-DISTRIBUTOR (C-D) LANES</b><br/>C-D Lanes are barrier separated from the mainline freeway; they collect traffic from on-ramps and distribute traffic to off-ramps on lanes dedicated for merging traffic. C-D lanes allow for less weaving on the mainline freeway.</p> |  | ✓  | ✓                    |

### 3.2.1. Modernization of Existing Travel Lanes

This alternative retains the existing number of freeway travel lanes but reconstructs the Interstate to modern design standards, including 12-foot shoulders along the existing alignment. Reconstruction would replace pavement, bridges and interchanges, while making the improvements described above. Figure 3-3 shows the number of interstate general-purpose lanes for this alternative and the figures on pages A-2 and A-3 in Appendix A show the typical sections. The Modernization of Existing Travel Lanes does not meet purpose and need for addressing existing and future travel demands and safety compared to the two other modernization alternatives and WisDOT dismissed it from further study.

**Figure 3-3: Modernization of Existing Travel Lanes; General-Purpose Lanes**





### 3.2.2. Modernization Plus Added General-Purpose Lane (Recommended Preferred Alternative)

This alternative would reconstruct the Interstate with 12-foot shoulders, similar to the Modernization of Existing Travel Lanes alternative but would provide an additional general-purpose lane in each direction along the present freeway alignment throughout a majority of the corridor. I-39 from the I-39 I-90/94 Split to Levee Road would maintain the same number of lanes as the existing condition. Where operationally prudent, the alternatives include C-D and auxiliary lanes. Figure 3-4 shows the number of interstate general-purpose lanes for this alternative and the figures on pages A-4 and A-5 in Appendix A show typical sections.

**Figure 3-4: Modernization Plus Added General-Purpose Lane; General-Purpose Lanes**



### 3.2.3. Modernization Hybrid (Recommended for Further Study)

This alternative would reconstruct the Interstate with a combination of adding a general-purpose lane or adding a managed lane (depending on location, see Figure 3-5); this alternative also utilizes C-D lanes and auxiliary lanes to further manage traffic. Managed lanes could be used in a variety of situations including part-time hard shoulder running, high-occupancy vehicle (HOV) lanes, transit only lanes, or Connected and Automated Vehicles.

From US 12/18 to WIS 19, the Interstate would feature the same number of general-purpose lanes as are currently present and include an 18-foot inside shoulder that would be utilized as a managed lane. C-D lanes are proposed between the I-94/WIS 30 and US 151 interchanges. Auxiliary lanes are proposed between the US 12/18 and I-94/WIS 30 interchanges and between the US 151 and WIS 19 interchanges.

A general-purpose lane would be added to the Interstate from WIS 19 to the I-39 I-90/94 Split and to I-90/94 from the I-39 I-90/94 Split to the US 12/WIS 16 interchange. I-39 from the I-39 I-90/94 Split to Levee Road would maintain the same number of lanes as the existing condition. Figure 3-5 shows the number of Interstate general-purpose lanes for this alternative and the figures on pages A-6 and A-7 in Appendix A show typical sections.

### 3.2.4. Environmental Impacts

The environmental impacts in Table 3-3 do not include impacts at each interchange along the corridor; impacts for each interchange alternative can be found in Section 3.3.

The Modernization of Existing Travel Lanes alternative does not require new right of way but impacts wetlands and floodplains within the existing right of way. Both the Modernization Plus Added General-Purpose Lanes and Modernization Hybrid alternatives require new right of way along portions of the 67-mile study corridor. The difference in new right of way between those two alternatives is the additional 6-foot width on either side of the Interstate (12 feet total increased width) from US 12/18 to WIS 19 exclusive of interchanges. Both alternatives have more impacts to wetlands. Temporary easements would be required under both alternatives for construction along the mainline at Pine Island State Wildlife Area and Mirror Lake State Park.

**Table 3-3: Freeway Modernization Alternative Impacts Summary**

| Alternative   | Relocations (number) | New Right of Way (acres) | Section 4(f) Property (acres) | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|---|----------------------|--------------------------|-------------------------------|------------------|---------------------|------------------------------|
| Modernization of Existing Travel Lanes                                | 0                    | 0.0                      | 0.0                           | 25.0             | 129.8               | 0                            |
| Modernization Plus Added General-Purpose Lane (Preferred Alternative) | 0                    | 82.8                     | 7.4 (temporary easement)      | 52.4             | 130.8               | 0                            |
| Modernization Hybrid (Retain for further study)                       | 0                    | 74.9                     | 7.4 (temporary easement)      | 51.3             | 130.8               | 0                            |

Figure 3-5: Modernization Hybrid; General-Purpose Lanes



### 3.2.5. Evaluation

The Modernization of Existing Travel Lanes does not meet purpose and need for addressing existing and future travel demands and safety compared to the two other modernization alternatives. Because this alternative does not meet purpose and need, it will not be taken forward for additional consideration.

WisDOT retained the two remaining modernization alternatives for further study.

The primary difference between the Modernization Plus Added General-Purpose Lane and Modernization Hybrid alternatives is between US 12/18 and WIS 19. In that section, the Modernization Plus Added General-Purpose Lane alternative consists of a 12-foot inside shoulder and added 12-foot lane in each direction where the Modernization Hybrid consists of an 18-foot inside shoulder that could be utilized as a travel lane with a 6-foot shoulder during heaviest travel periods.

**Table 3-4: Freeway Modernization Alternative Evaluation Criteria**

| Alternative   | Addresses Existing and Future Travel Demands | Addresses Safety | Addresses Pavement Needs | Addresses Bridge Needs | Addresses Flood Risk | Projected Const. Cost | Public Feedback | Environmental Impact |
|---|--|------------------|--------------------------|------------------------|----------------------|-----------------------|-----------------|----------------------|
| Modernization of Existing Travel Lanes                                | No   | Yes - F          | Yes - C                  | Yes - C                | Yes - C              | Lowest Cost           | Neutral         | Low                  |
| Modernization Plus Added General-Purpose Lane (Preferred Alternative) | Yes - C                                      | Yes - B          | Yes - C                  | Yes - C                | Yes - C              | +20%                  | Neutral         | Medium               |
| Modernization Hybrid (Retain for further study)                       | Yes - C                                      | Yes - D          | Yes - C                  | Yes - C                | Yes - C              | +20%                  | Neutral         | Medium               |

The environmental impacts of the Modernization Plus Added General-Purpose Lane are similar to the Modernization Hybrid. The projected construction costs of the two alternatives are similar with the Modernization Plus Added General-Purpose Lane expected to cost more up front and the Modernization Hybrid costing more over time due to the additional staffing and technical infrastructure maintenance required to operate the managed lane. WisDOT anticipates long term maintenance costs after 15 years will be greater than the Modernization Plus Added General-Purpose Lane alternative due to increased capital costs to replace managed lane infrastructure.

Safety is another variable between the two alternatives. The predicted crash reduction from the Modernization Hybrid compared to the No Build alternative is 1-3% while the predicted crash reduction from the Modernization Plus Added General-Purpose lane alternative is around 30%. The six-foot shoulders on the managed lane result in approximately 10% higher crash rates than 12-foot shoulders. WisDOT anticipates that 25% of the day when managed lanes are opened, they would subsequently be partially or full closed due to incidents, large snow events or other events limiting access. There is a higher risk of traffic diversion to other roadways during outages.

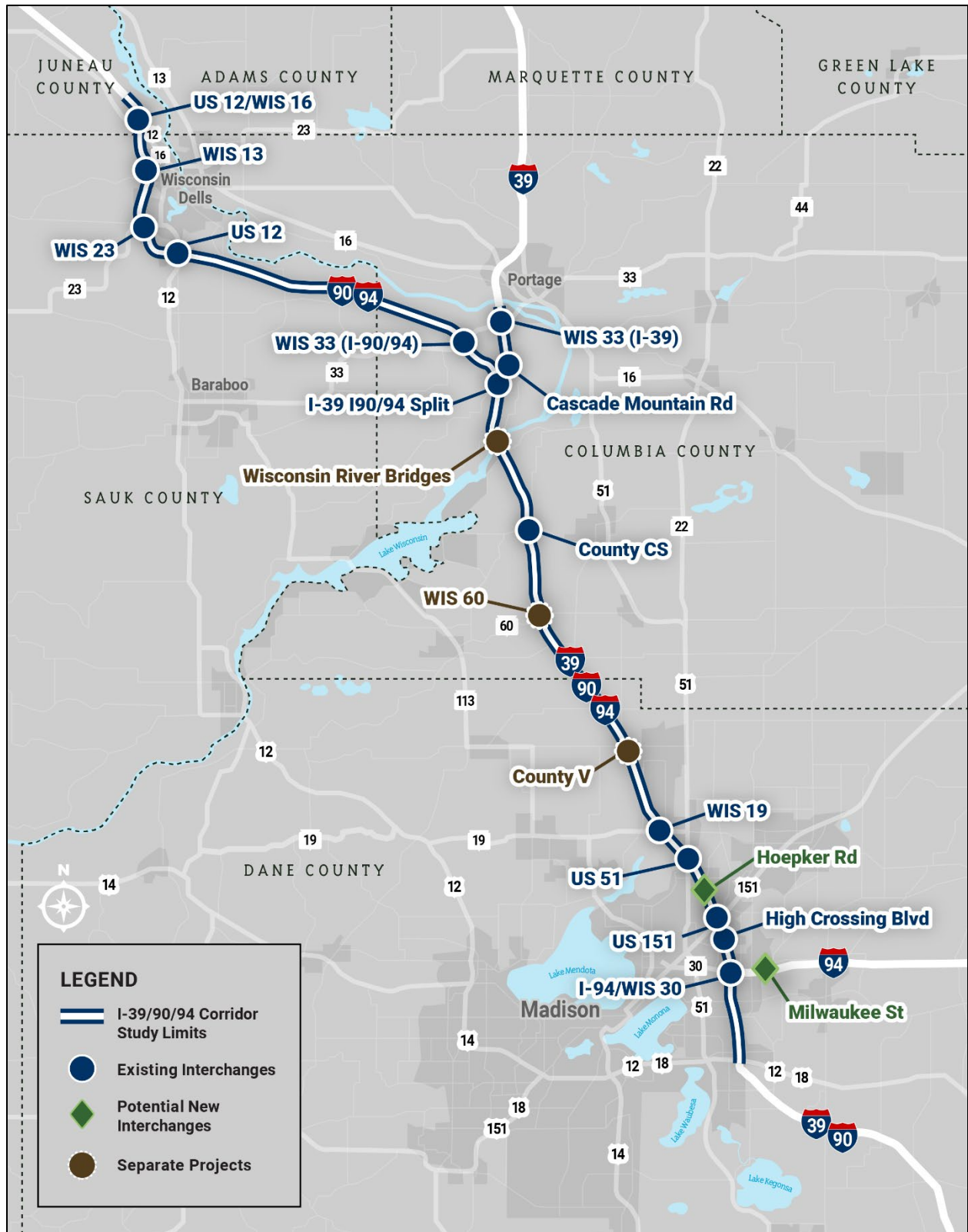
The Modernization Hybrid alternative operates most effectively with a large percentage of familiar drivers (local commuters). This corridor is characterized by high truck volumes present on all days and high volumes of recreational drivers present on the high traffic Fridays and Sundays. Both these drivers are typically unfamiliar with local lane configurations and managed lanes may be underutilized. The Modernization Plus Added General-Purpose Lane meets driver expectations in a corridor used by a substantial amount of through traffic with destinations beyond the Madison metropolitan area.

WisDOT recommends the Modernization Plus Added General-Purpose Lane as the preferred alternative. Because of high local interest in the Modernization Hybrid alternative, WisDOT is also retaining the Modernization Hybrid alternative for further study.

### **3.3. Build Alternatives – Interchanges**

The study corridor includes 15 existing interchanges (see Figure 3-6) with a range of design deficiencies that contribute to poor traffic operations and crashes. The study does not include the WIS 60 interchange which will be reconstructed as a separate project. WisDOT evaluated multiple conceptual alternatives at each of the 15 interchanges, as well as two potential new interchanges. Similar to the Interstate conceptual alternatives, WisDOT evaluated these alternatives based on how well they meet purpose and need, minimize impacts, address public and agency input and costs. The following sections describe alternatives considered for each interchange in the study corridor.

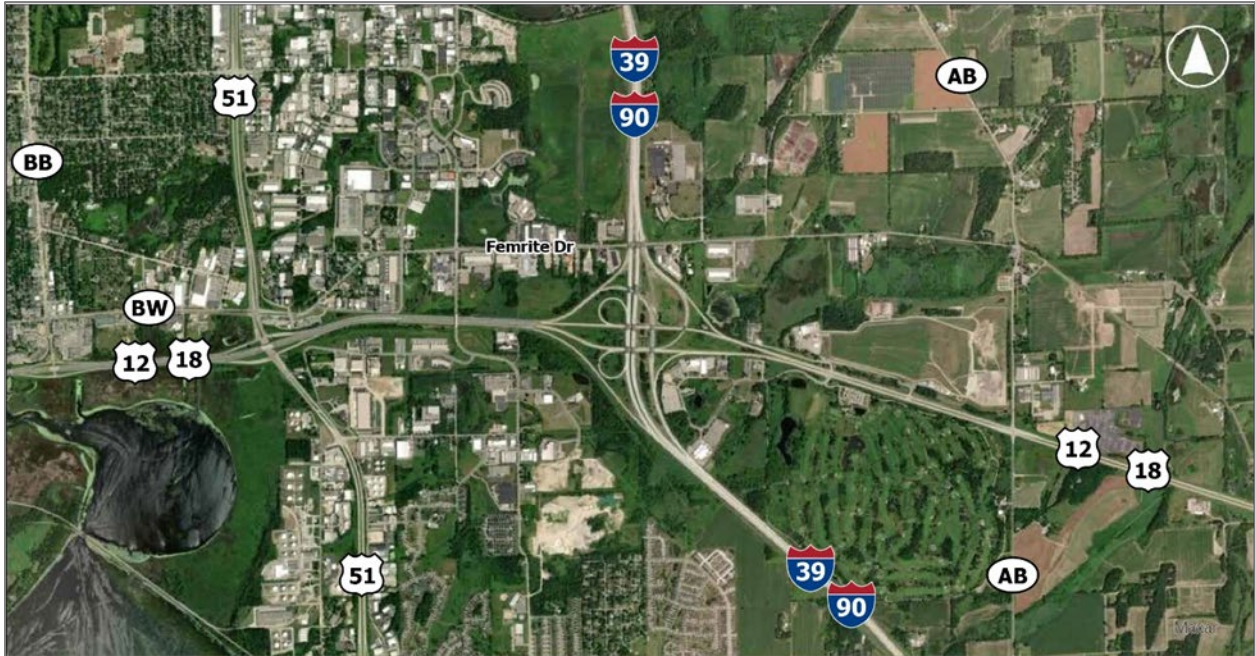
Figure 3-6: Existing Corridor Interchanges



### 3.3.1. US 12/18 Interchange

In 2021, WisDOT partially modified the US 12/18 Interchange, see Figure 3-7. While the US 12/18 Interchange is included in the study area, WisDOT is evaluating alternatives for re-construction in a separate study.<sup>6</sup> Any improvements to I-39/90 in the interchange area are limited to freeway improvements necessary to transition to the eventual preferred freeway alternative north of the interchange.

**Figure 3-7: US 12/18 Interchange**



<sup>6</sup> State of Wisconsin Department of Transportation, (n.d.) Madison Beltline Study. Retrieved from <https://wisconsindot.gov/Pages/projects/by-region/sw/madisonbeltline/default.aspx> on 11/21/2023.

### 3.3.2. I-94/WIS 30 Interchange

The I-94/WIS 30 Interchange is a four-legged system interchange<sup>7</sup> where I-39/90 meets I-94 to the east of the interchange and WIS 30 to the west. The interchange has multiple left-hand entrance and exit ramps and substandard curves. Existing left hand exits and entrances are undesirable and contrary to driver expectations. The I-94/WIS 30 Interchange is about a mile south of the US 151/High Crossing Boulevard interchange. The heavy traffic weaving movements between these interchanges impact operations and safety.

WisDOT evaluated two full modernization alternatives at the I-94/WIS 30 Interchange (one with a smaller footprint than the other, see Figure 3-8 and Figure 3-9). Both alternatives allow for a potential new interchange on Milwaukee Street on I-94. The I-94/WIS 30 Interchange and US 151/High Crossing Interchange alternatives would address weaving issues and remove left hand entrances and exits.

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<sup>7</sup> A system interchange connects two freeways. The interchange connects freeways such that all traffic movements continue without any obstruction and minimizes speed reductions.



### Full Modernization Alternative #1

This alternative reconstructs the existing interchange with added modernization features noted in Section 3.2. The design footprint is smaller and therefore the ramp speeds are typically 5 miles per hour slower compared to Alternative #2 and may not meet driver expectations for a system interchange connecting two Interstate highways.

By removing left hand entrances and exits, weave movements are reduced compared to the existing conditions, however eastbound WIS 30 to northbound I-39/90/94 would still need to weave across westbound I-94 to northbound I-39/90/94 traffic to access the US 151 interchange. The Full Modernization Alternative #2 moves that movement to the outside so that weave is no longer necessary.

Figure 3-8: I-94/WIS 30 – Full Modernization #1



### Full Modernization Alternative #2 (Recommended Preferred Alternative)

The Full Modernization #2 alternative features less complicated geometry, fewer complex structures and ramp speeds are closer to the freeway design speeds. Full Modernization Alternative #2 ramps accommodate traffic weaves better than the Full Modernization Alternative #1, potentially providing safer movements from the I-39/90/94 exit to the US 151/High Crossing Boulevard Interchange.

Figure 3-9: I-94/WIS 30 – Full Modernization #2



### Environmental Impacts

The environmental impacts are similar for the two alternatives. Both alternatives would relocate the Dane County maintenance facility located between the I-39/90 northbound and southbound lanes on the north side of the interchange. The relocation of this facility minimizes impacts to parcels outside of the existing right of way. The Full Modernization #2 alternative requires more new right of way as it has a larger footprint to accommodate the higher speed ramps.

**Table 3-5: I-94/WIS 30 Interchange Alternative Impacts Summary**

| Alternative                                   | Relocations (number) | New Right of Way (acres) | Section 4(f) Property (acres) | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|---|----------------------|--------------------------|-------------------------------|------------------|---------------------|------------------------------|
| Full Modernization #1                         | 1                    | 22.0                     | 0.0                           | 4.9              | 0.6                 | 0                            |
| Full Modernization #2 (Preferred Alternative) | 1                    | 27.0                     | 0.0                           | 4.7              | 0.9                 | 0                            |

### Evaluation

These two alternatives would operate very similarly and have nearly identical costs. The Full Modernization #2 alternative has higher speed ramps in certain locations, most notably the westbound to northbound and southbound to eastbound ramp movements that carry I-94 traffic. The Full Modernization #2 alternative received better public feedback due to the increased I-94 ramp speeds.

**Table 3-6: I-94/WIS 30 Interchange Alternative Evaluation Criteria**

| Alternative                                   | Addresses Existing and Future Travel Demands | Addresses Safety | Addresses Pavement Needs | Addresses Bridge Needs | Addresses Flood Risk | Projected Constr. Cost | Public Feedback | Environmental Impact |
|---|--|------------------|--------------------------|------------------------|----------------------|------------------------|-----------------|----------------------|
| Full Modernization #1                         | Yes - C                                      | Yes - C          | Yes - C                  | Yes - C                | N/A                  | Nearly Identical Cost  | Neutral         | Medium               |
| Full Modernization #2 (Preferred Alternative) | Yes - C                                      | Yes - C          | Yes - C                  | Yes - C                | N/A                  | Nearly Identical Cost  | Positive        | Medium               |

Since the Full Modernization #2 alternative achieves the purpose and need at a nearly identical cost as Full Modernization #1, WisDOT recommends the Full Modernization #2 alternative as the preferred alternative.

### **3.3.3. Proposed New Milwaukee Street Interchange**

Milwaukee Street dead ends near East Hill Parkway and does not currently cross I-94. The city of Madison requested WisDOT evaluate a new interchange for a proposed extension of Milwaukee Street at I-94 as recommended in the city's Sprecher Neighborhood Development Plan (NDP) and the Northeast Neighborhoods NDP. WisDOT previously reconstructed I-94 in the early 2010's and constructed bridges as an overpass for a future Milwaukee Street extension.

WisDOT evaluated two build alternatives, a partial cloverleaf and a diamond interchange, at the proposed Milwaukee Street extension. Both alternatives are compatible with either build alternative at the I-94/WIS 30 Interchange. The Milwaukee Street interchange would be dependent on a funding agreement with the city of Madison. If a funding agreement does not occur, WisDOT would select the No Build alternative.

### Partial Cloverleaf (Recommended Preferred Alternative)

This alternative utilizes a loop ramp for the westbound entrance ramp to maximize distance from the I-94/WIS 30 Interchange and allows a longer distance for traffic to weave between the proposed new Milwaukee Street entrance ramp and the I-94/WIS 30 interchange, see Figure 3-10.

Figure 3-10: Milwaukee Street – Partial Cloverleaf Interchange



### Diamond

This alternative is a standard diamond that is most familiar to drivers in Wisconsin, see Figure 3-11. It does not provide as long a westbound weave distance between the proposed Milwaukee Street Interchange and the I-94/WIS 30 Interchange.

Figure 3-11: Milwaukee Street - Diamond Interchange



### Environmental Impacts

Both alternatives have substantial right of way needs, including relocating a barn and severing a farm operation north of I-94 and relocating two residences on the property.

**Table 3-7: Proposed New Milwaukee Street Interchange Alternatives Impacts Summary**

| Alternative                                | Relocations (number) | New Right of Way (acres) | Section 4(f) Property (acres) | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|--|----------------------|--------------------------|-------------------------------|------------------|---------------------|------------------------------|
| Partial Cloverleaf (Preferred alternative) | 1                    | 15.8                     | 0.0                           | 1.5              | 0.1                 | 0                            |
| Diamond                                    | 1                    | 11.6                     | 0.0                           | 1.9              | 0.0                 | 0                            |

### Evaluation

The biggest difference between the two alternatives is the safety benefits provided in the Partial Cloverleaf alternative by increasing the weave distance between Milwaukee Street and the I-94/WIS 30 Interchange. Public feedback on the Milwaukee Street interchange has been mixed, with the city of Madison, some residents and property developers in favor of an interchange. Other local residents are opposed to an interchange since it would increase traffic and decrease quality of life associated with new Interstate access. Dependent on local funding agreements, WisDOT recommends the Partial Cloverleaf as the preferred alternative.

**Table 3-8: Proposed New Milwaukee Street Interchange Alternatives Evaluation Criteria**

| Alternative                                | Addresses Existing and Future Travel Demands | Addresses Safety | Addresses Pavement Needs | Addresses Bridge Needs | Addresses Flood Risk | Projected Constr. Cost | Public Feedback       | Environmental Impact |
|--|--|------------------|--------------------------|------------------------|----------------------|------------------------|-----------------------|----------------------|
| Partial Cloverleaf (Preferred alternative) | Yes - C                                      | Yes - B          | N/A                      | Yes - C                | N/A                  | +25%                   | Positive and Negative | High                 |
| Diamond                                    | Yes - C                                      | Yes - D          | N/A                      | Yes - C                | N/A                  | Lowest Cost            | Positive and Negative | High                 |

### 3.3.4. US 151/High Crossing Boulevard Interchanges

The existing US 151 Interchange is a cloverleaf design and is about 0.25 miles north of the High Crossing Boulevard Interchange, which is a half diamond interchange with access to/from the south. The US 151 and High Crossing Boulevard interchanges share northbound exit ramps from I-39/90/94 and are often heavily congested during morning and evening commutes and weekends, leading to poor operations and safety conditions. The distance between the I-94/WIS 30 interchange and the northbound exit ramps to US 151/High Crossing Boulevard Interchanges is about a mile, and the current interchange configurations often require traffic to merge across up to four lanes of traffic in short distance to reach their destination. Several of the ramps have experienced high crash levels.

US 151 west of the interchange is also called East Washington Avenue and is a hub for shopping and other commercial uses. US 151 east of the interchange is a freeway with access only at interchanges along US 151. Speeding is common along East Washington Avenue as traffic from the freeway portion of US 151 often doesn't slow until the first signalized intersection at East Springs Drive (about 0.5 miles west of the interchange).

WisDOT evaluated several alternatives at the US 151/High Crossing Boulevard Interchanges, primarily addressing traffic operations and weaving issues. Throughout the alternative development process, WisDOT worked closely with the city of Madison to refine alternatives that support the city's development and transportation goals, in combination with the study needs.



**Directional (Recommended Preferred Alternative)**

The US 151 interchange is reconstructed such that the freeway-to-freeway movements to/from the east are free-flow movements while a diamond interchange is embedded at East Washington Avenue to provide local access and slow traffic from the freeway portion of US 151 as it enters the commercial area of East Washington Avenue, see Figure 3-12. This alternative maintains a half interchange at High Crossing Boulevard, but better separates the ramps to/from the south to address congestion and safety. The current US 151 interchange at Nelson Road/American Parkway is moved slightly northeast to Eastpark Boulevard to provide appropriate weave distances between I-39/90/94 and the interchange.

**Figure 3-12: US 151/High Crossing Boulevard – Directional Interchange**



### Loop Ramp Free Flow

This alternative keeps loop ramps in three out of the four quadrants of the US 151 interchange while providing free-flow ramp movements for the heaviest westbound to southbound movement between USH 151 and the Interstate, see Figure 3-13. The alternative also maintains a half-diamond interchange at High Crossing Boulevard to/from the south. This alternative reconstructs and moves the Nelson Road/American Parkway interchange on US 151, with a new connection to American Family Drive. The westbound to southbound ramp from US 151 crosses over High Crossing Boulevard, making it taller compared to other alternatives where a ramp would cross under the road.

Figure 3-13: US 151/High Crossing Boulevard – Loop Ramp Free Flow Interchange



### East Washington Avenue – South

This alternative separates local and through traffic on US 151 by constructing a new East Washington Avenue next to but separated from through traffic on the freeway portion of US 151, on the south side of US 151. The alternative features flyover ramps and configures the East Washington Avenue and High Crossing Boulevard interchange as a split diamond interchange. The new East Washington Avenue extension would provide direct access to commercial properties between the Interstate and Nelson Road and between US 151 and High Crossing Boulevard, see Figure 3-14.

**Figure 3-14: US 151/High Crossing Boulevard – East Washington Avenue South**



This alternative would provide high-speed free-flow ramps for all system movements between US 151 and the Interstate while providing local connections between the east and west sides of the Interstate. Similar to the Loop Ramp Free Flow alternative, this alternative reconstructs and moves the Nelson Road/American Parkway interchange on US 151.

Much of the traffic currently on US 151 travels into Madison as it transitions to East Washington Avenue. Traffic would now need to exit at American Family Drive and utilize an extended East Washington Avenue through multiple additional intersections, which would add commute time. Traffic analyses project the additional travel time would cause a substantial traffic diversion (about 50%) from East Washington Avenue onto WIS 30 and the Interstate between the I-94/WIS 30 and US 151, which requires substantially more infrastructure to maintain traffic operations. Additional infrastructure could include an additional lane on the Interstate between US 151 and WIS 30 and/or a second ramp lane for the southbound to westbound movement onto WIS 30 from the Interstate.

### **East Washington Avenue – North**

Similar to the East Washington Avenue – South alternative, the East Washington Avenue – North alternative separates local and through traffic on US 151 by constructing a new East Washington Avenue next to but separated from through traffic on the freeway portion of US 151, on the north side of US 151, see Figure 3-15. This alternative does not provide access to the commercial area south of US 151 but does improve access between the neighborhoods to the east and west of the Interstate.

This alternative features flyover ramps and configures the East Washington Avenue and High Crossing Boulevard interchange as a split diamond interchange. This alternative reconstructs and moves the Nelson Road/American Parkway interchange on US 151, with a new connection to Eastpark Boulevard.

Similar to the East Washington Avenue – South alternative, traffic analyses show substantial traffic diversion (about 40%) from East Washington Avenue onto WIS 30 and the Interstate between the I-94/WIS 30 and US 151 interchanges, which requires substantially more infrastructure to maintain traffic operations.

Figure 3-15: US 151/High Crossing Boulevard – East Washington Avenue North



### 6-Lane High Crossing Boulevard

In coordination with the city of Madison, WisDOT developed an alternative that realigns East Washington Avenue west of the Interstate to High Crossing Boulevard east of the Interstate to separate local traffic from through traffic on the freeway portion of US 151. The existing 4-lane High Crossing Boulevard is reconstructed to six lanes. The direct East Washington Avenue connection to High Crossing Boulevard would provide direct access to commercial properties east of the Interstate, see Figure 3-16.

Figure 3-16: US 151/High Crossing Boulevard – 6-Lane High Crossing Boulevard



The alternative configures East Washington Avenue and High Crossing Boulevard as a single full diamond interchange with added flyover ramps for Interstate to US 151 freeway connections. This alternative reconfigures the Nelson Road/American Parkway interchange on US 151.

Traffic analyses show substantial traffic diversion (about 50%) from East Washington Avenue onto WIS 30 and the Interstate between the I-94/WIS 30 and US 151 interchanges, which requires substantially more infrastructure to maintain traffic operations.

### East Washington Avenue – Freeway Connection

This alternative builds off the 6-Lane High Crossing Boulevard alternative; it similarly realigns East Washington Avenue to High Crossing Boulevard to separate local traffic from through traffic on the freeway portion of US 151. The alternative configures East Washington Avenue and High Crossing Boulevard as a single full diamond interchange. This alternative configures the Nelson Road/American Parkway interchange on US 151, see Figure 3-17.

Figure 3-17: US 151/High Crossing Boulevard – East Washington Avenue Freeway Connection



The biggest difference between this alternative and the 6-Lane High Crossing Boulevard alternative are the added direct connect ramps between US 151 and East Washington Avenue. Adding these ramps reduces the projected traffic diversion onto the Interstate and WIS 30 and maintains four lanes on High Crossing Boulevard.

### Environmental Impacts

All alternatives have similar environmental impacts. The 6-Lane High Crossing Boulevard and East Washington Avenue-Freeway Connection alternatives would acquire a business parcel. The East Washington Boulevard – South, East Washington Boulevard – North, and 6-Lane High Crossing Boulevard alternatives divert traffic away from the highly commercial East Washington Avenue; even though traffic diversion is not shown as an environmental consideration in Table 3-9, it is taken into account in the “Environmental Impact” column in Table 3-10.

**Table 3-9: US 151/High Crossing Boulevard Interchange Alternatives Impacts Summary**

| Alternative                               | Relocations (number) | New Right of Way (acres) | Section 4(f) Property (acres) | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|---|----------------------|--------------------------|-------------------------------|------------------|---------------------|------------------------------|
| Directional (Preferred Alternative)       | 0                    | 29.6                     | 0.0                           | 7.3              | 0.1                 | 0                            |
| Loop Ramp Free Flow                       | 0                    | 27.3                     | 0.0                           | 7.1              | 0.1                 | 0                            |
| East Washington Boulevard - South         | 0                    | 39.7                     | 0.0                           | 7.4              | 0.2                 | 0                            |
| East Washington Boulevard - North         | 0                    | 31.7                     | 0.0                           | 7.0              | 0.1                 | 0                            |
| 6-Lane High Crossing Boulevard            | 1                    | 26.9                     | 0.0                           | 7.1              | 0.1                 | 0                            |
| East Washington Avenue Freeway Connection | 1                    | 23.0                     | 0.0                           | 7.0              | 0.2                 | 0                            |

### Evaluation

The alternatives variably address existing and future travel demands on US 151 and the Interstate. Three alternatives (East Washington Avenue - South, East Washington Avenue-North and 6-Lane High Crossing Boulevard) perform poorly due to the 40%-50% traffic diversion to the Interstate and WIS 30. The diversion to the Interstate and WIS 30 would require substantially more infrastructure to accommodate and maintain traffic operations. The East Washington Avenue Freeway Connection alternative introduces short weave distances and merging traffic that create a greater safety risk compared to other alternatives. The Loop Ramp Free Flow did not perform better than the Directional alternative in any area, but scored lower in terms of cost, public feedback and slightly higher environmental impacts. Public feedback from local businesses and the city of Madison on the Loop Ramp Free Flow alternative was least favorable because it is the only alternative that does not address speeds along East Washington Avenue. All other alternatives add ramp terminals to slow traffic from westbound US 151 onto East Washington Avenue.



There’s a substantial range of costs between the alternatives due to infrastructure requirements. The 6-Lane High Crossing Boulevard alternative requires fewer structures and is the lowest cost alternative compared to other alternatives that range anywhere from 10% to 100% higher in costs. WisDOT recommends the Directional alternative as the preferred alternative as it addresses travel demand needs better than other alternatives, addresses safety concerns by removing short weaves, has similar environmental impacts and has a reasonable cost at 15% higher than the lowest cost alternative.

**Table 3-10: US 151/High Crossing Boulevard Interchange Alternatives Evaluation Criteria**

| <b>Alternative</b>                        | <b>Addresses Existing and Future Travel Demands</b> | <b>Addresses Safety</b> | <b>Addresses Pavement Needs</b> | <b>Addresses Bridge Needs</b> | <b>Addresses Flood Risk</b> | <b>Projected Constr. Cost</b> | <b>Public Feedback</b> | <b>Environmental Impact</b> |
|---|---|-------------------------|---------------------------------|-------------------------------|-----------------------------|-------------------------------|------------------------|-----------------------------|
| Directional (Preferred Alternative)       | Yes - B   | Yes - C                 | Yes - C                         | Yes - C                       | N/A                         | +15%                          | Positive               | Low                         |
| Loop Ramp Free Flow                       | Yes - C   | Yes - C                 | Yes - C                         | Yes - C                       | N/A                         | +45%                          | Negative               | Medium                      |
| East Washington Avenue - South            | Yes - F   | Yes - C                 | Yes - C                         | Yes - C                       | N/A                         | +100%                         | Positive               | High                        |
| East Washington Avenue - North            | Yes - F   | Yes - C                 | Yes - C                         | Yes - C                       | N/A                         | +80%                          | Neutral                | High                        |
| 6-Lane High Crossing Boulevard            | Yes - F   | Yes - C                 | Yes - C                         | Yes - C                       | N/A                         | Lowest Cost                   | Positive               | High                        |
| East Washington Avenue Freeway Connection | Yes - C   | Yes - D                 | Yes - C                         | Yes - C                       | N/A                         | +10%                          | Positive               | Low                         |

### **3.3.5. Proposed New Hoepker Road Interchange**

Hoepker Road is an overpass on I-39/90/94. The city of Madison requested WisDOT to evaluate an interchange at Hoepker Road, which would provide access to ongoing business and residential development, including the American Family campus and UW Health hospital.

WisDOT evaluated two alternatives. Both alternatives shift the Interstate slightly eastward to avoid existing development west of the Interstate. An interchange at Hoepker Road would reduce traffic at the US 51 and US 151/High Crossing Boulevard interchanges while increasing traffic on Hoepker Road. Similar to the Milwaukee Street Interchange, this interchange would be dependent on a funding agreement with the city of Madison. If a funding agreement does not occur, WisDOT would select the No Build alternative.

### Shifted Diamond (Recommended Preferred Alternative)

This standard interchange design is the most familiar interchange type with motorists and the ramps are easiest for freight vehicles to navigate, see Figure 3-18. This alternative would acquire a residence in the southeast quadrant but has lower overall real estate impacts on adjacent developable properties in the northeast quadrant of the interchange.

Figure 3-18: Hoepker Road – Shifted Diamond Interchange



### Partial Cloverleaf

This alternative avoids a residential relocation in the southeast quadrant but requires more right of way from a property planned for development in the northeast quadrant, see Figure 3-19.

**Figure 3-19: Hoepker Road – Partial Cloverleaf Interchange**



### Environmental Impacts

Most environmental impacts are similar between the Hoepker Road Interchange alternatives except for right of way required. While the Shifted Diamond relocates a residence, it has a much lower right of way

impact compared to the Partial Cloverleaf alternative. The city of Madison’s Pumpkin Hollow Neighborhood Development Plan anticipates development east of the Interstate on both the north and south sides of Hoepker Road. The differences in wetland and floodplain impacts between the alternatives are slight and additional design refinements during preliminary engineering could further reduce impacts.

**Table 3-11: Proposed New Hoepker Road Interchange Alternatives Impacts Summary**

| Alternative                             | Relocations (number) | New Right of Way (acres) | Section 4(f) Property (acres) | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|---|----------------------|--------------------------|-------------------------------|------------------|---------------------|------------------------------|
| Shifted Diamond (Preferred Alternative) | 1                    | 7.7                      | 0.0                           | 4.2              | 0.7                 | 0                            |
| Partial Cloverleaf                      | 0                    | 16.6                     | 0.0                           | 4.1              | 0.5                 | 0                            |

### Evaluation

Both alternatives equally meet the study purpose and need factors. The projected construction cost of the Shifted Diamond alternative is up to 20% higher than the Partial Cloverleaf alternative, but the cost would likely be offset by the additional real estate costs for the additional 8.9 acres of right of way needed. Feedback from public meetings was mixed on whether an interchange should be built in this location, but if an interchange moves forward at this location, most commenters indicated a preference for a diamond interchange, with lower right of way impacts, over a partial cloverleaf. WisDOT recommends the Shifted Diamond alternative as the preferred alternative.

**Table 3-12: Proposed New Hoepker Road Interchange Alternatives Evaluation Criteria**

| Alternative                             | Addresses Existing and Future Travel Demands | Addresses Safety | Addresses Pavement Needs | Addresses Bridge Needs | Addresses Flood Risk | Projected Constr. Cost | Public Feedback | Environmental Impact |
|---|--|------------------|--------------------------|------------------------|----------------------|------------------------|-----------------|----------------------|
| Shifted Diamond (Preferred Alternative) | Yes - C                                      | Yes - C          | N/A                      | Yes - C                | N/A                  | +20%                   | Positive        | Medium               |
| Partial Cloverleaf                      | Yes - C                                      | Yes - C          | N/A                      | Yes - C                | N/A                  | Lowest Cost            | Neutral         | High                 |

### 3.3.6. US 51 Interchange

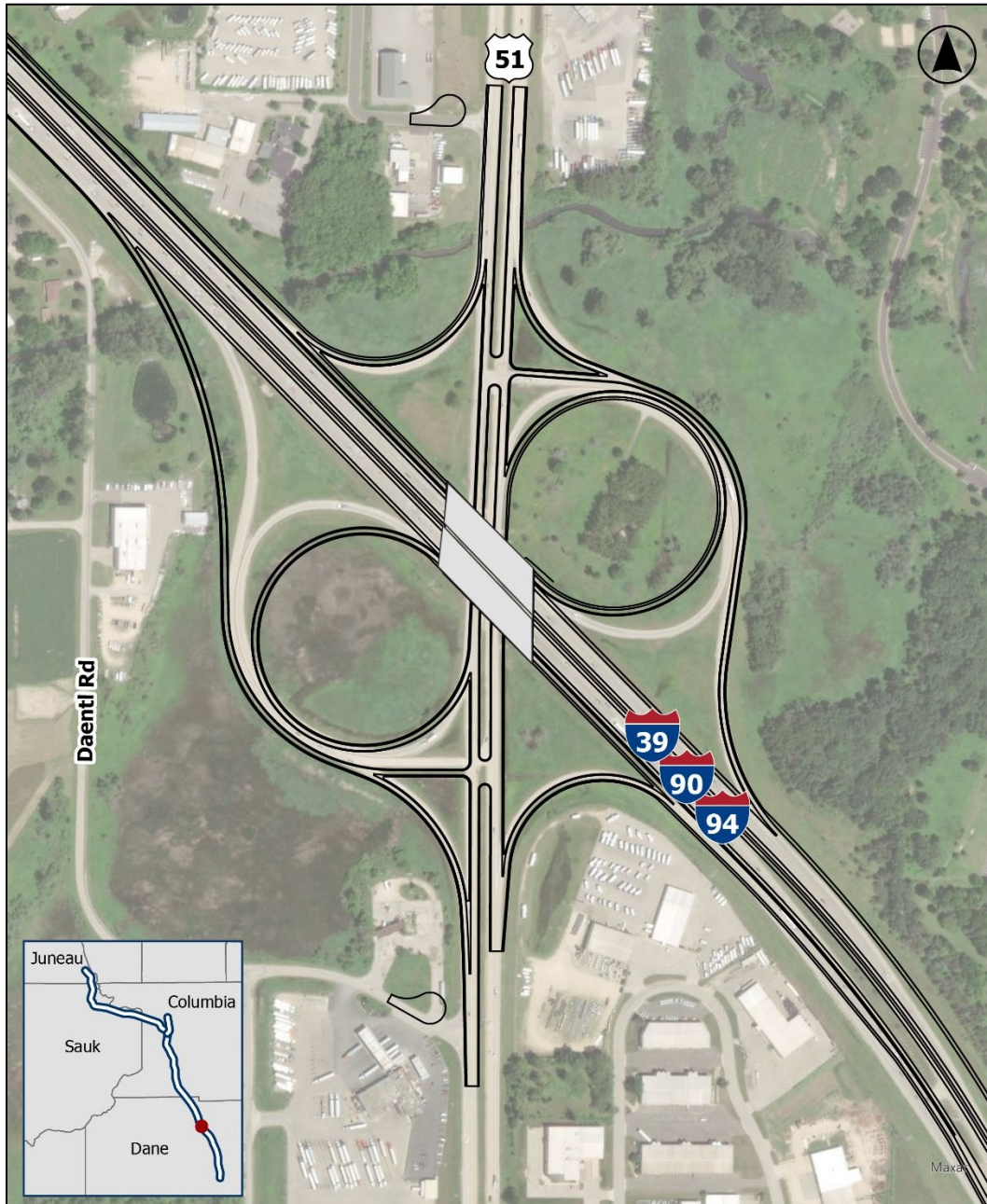
The US 51 interchange is a partial cloverleaf interchange with slow speed free-flow movements between the Interstate and US 51 that do not meet current design standards. North American Lane (about 420 feet north of the interchange) and Daentl Road (about 250 feet south of the interchange) pose traffic operational concerns due to their close proximity to interchange ramps. The westbound Interstate exit ramp, the US 51 southbound to northbound entrance ramp, and the US 51 southbound to southbound entrance ramp all have elevated crash levels.

WisDOT evaluated two alternatives to address substandard design and safety needs at US 51. In order to improve traffic operations, both alternatives propose closing access to US 51 at North American Lane and Daentl Road which are too close to interchange ramps. Diverted traffic would use existing intersections (about a quarter mile north and south of the interchange) to access US 51. WisDOT is completing analyses of diverted traffic in coordination with the village of DeForest and with WisDOT's separate, ongoing US 51 study south of the interchange.

### Partial Cloverleaf (Recommended Preferred Alternative)

This alternative reconstructs the existing interchange in a similar footprint, increases the entrance and exit ramp lengths and adds an extended northbound ramp along the Interstate. The extended ramp allows two closely spaced northbound entrance ramps (the US 51 southbound to northbound ramp and the US 51 northbound to northbound ramp) to merge prior to entering the Interstate as a single ramp, see Figure 3-20. The extended ramp improves traffic operations and safety by reducing merging and lane changes. Extended entrance ramps allow more time to achieve higher speed prior to merging and additional time to merge during heaviest travel times.

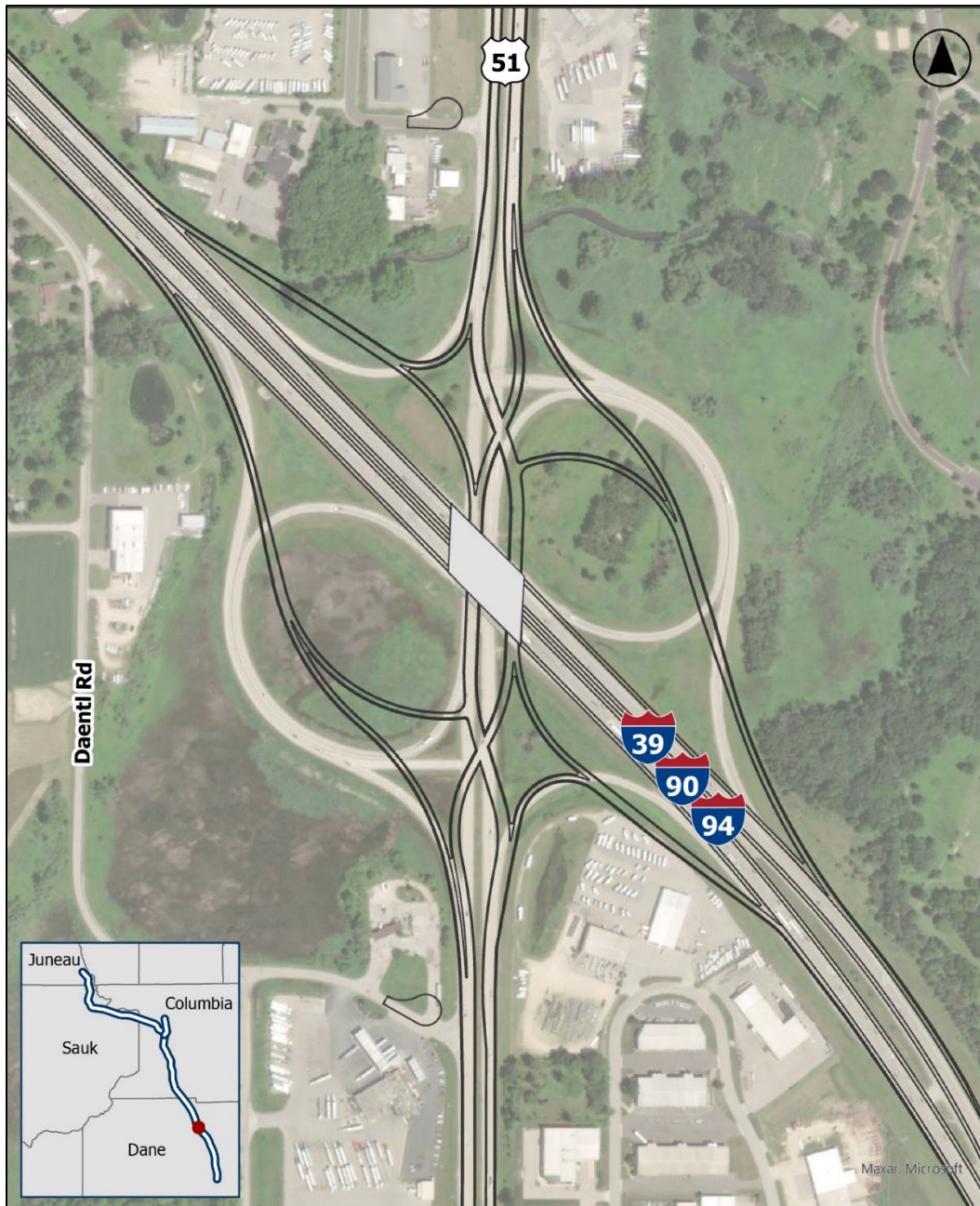
Figure 3-20: US 51 – Partial Cloverleaf Interchange



### Diverging Diamond

This alternative provides free flow left turns from US 51 to the entrance ramps, which would minimize traffic delays for those movements. This alternative would introduce more traffic delays along US 51 due to the added signals required as part of the diverging diamond configuration. This alternative reduces the number of crossing conflict points at the ramp terminal intersections where the off ramp left-turn traffic merges with one stream of US 51 traffic, see Figure 3-21.

**Figure 3-21: US 51 – Diverging Diamond Interchange**





### Environmental Impacts

The Diverging Diamond alternative has a smaller footprint and slightly fewer environmental impacts than the Partial Cloverleaf alternative. The Partial Cloverleaf alternative requires 1.3 more acres of new right of way, 1.8 more acres of wetland impact, and 1.4 more acres of floodplain impacts compared to the Diverging Diamond alternative.

**Table 3-13: US 51 Interchange Alternatives Impacts Summary**

| Alternative                                | Relocations (number) | New Right of Way (acres) | Section 4(f) Property (acres) | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|--|----------------------|--------------------------|-------------------------------|------------------|---------------------|------------------------------|
| Partial Cloverleaf (Preferred Alternative) | 0                    | 2.6                      | 0.0                           | 15.4             | 9.5                 | 0                            |
| Diverging Diamond                          | 0                    | 1.3                      | 0.0                           | 13.6             | 8.1                 | 0                            |

### Evaluation

Both alternatives at US 51 would meet purpose and need factors, but the Diverging Diamond alternative costs about 40% more than the Partial Cloverleaf alternative. The Partial Cloverleaf also has lower average travel delays compared to the Diverging Diamond. The differences in wetland and floodplain impacts between the alternatives are slight and additional design refinements during preliminary engineering could further reduce impacts; the lower impacts do not outweigh the substantially higher cost or traffic delays of the Diverging Diamond alternative. WisDOT recommends the Partial Cloverleaf alternative as the preferred alternative.

**Table 3-14: US 51 Interchange Alternatives Evaluation Criteria**

| Alternative                                | Addresses Existing and Future Travel Demands | Addresses Safety | Addresses Pavement Needs | Addresses Bridge Needs | Addresses Flood Risk | Projected Constr. Cost | Public Feedback | Environmental Impact |
|--|--|------------------|--------------------------|------------------------|----------------------|------------------------|-----------------|----------------------|
| Partial Cloverleaf (Preferred Alternative) | Yes -B                                       | Yes - C          | Yes - C                  | Yes - C                | N/A                  | Lowest Cost            | Neutral         | Medium               |
| Diverging Diamond                          | Yes - D                                      | Yes - C          | Yes - C                  | Yes - C                | N/A                  | +40%                   | Neutral         | Low                  |

### **3.3.7. WIS 19 Interchange**

The WIS 19 Interchange is next to a railroad crossing that typically has one train during the daytime hours, one train during the nighttime hours, and one switching train per day. There are five signalized intersections on WIS 19 between Tierney Crossing and Pepsi Way (a distance of about a mile). The Interstate eastbound exit ramp intersection with WIS 19 has a high crash rate and operates at LOS D. The County CV southbound left turn onto WIS 19 operates poorly in the afternoon rush hour. About 86% of afternoon rush hour northbound Interstate traffic exits to turn left onto westbound WIS 19. The Cherokee Marsh abuts the Interstate eastbound entrance ramp.

WisDOT considered four alternatives at the WIS 19 Interchange. Because of the high travel demand on WIS 19, all four alternatives also factor in improving traffic operations on WIS 19.

### WIS 19 over Railroad

This alternative constructs a new WIS 19 bridge over the Canadian Pacific Railroad (CPRR) to remove traffic/train conflicts on WIS 19, see Figure 3-22. Because of the close proximity of the CPRR and WIS 19 Interchange, the bridge over the CPRR also requires WIS 19 to go over the Interstate (the Interstate currently crosses over WIS 19). The two new bridges raise road elevations on County CV and WIS 19, which would require relocating a business that would no longer have access to either WIS 19 or County CV. The alternative would maintain four traffic lanes on WIS 19.

Figure 3-22: WIS 19 - WIS 19 Over Railroad



### Northbound Flyover

This alternative maintains four traffic lanes on WIS 19 and constructs a flyover ramp for the high-volume Interstate northbound to westbound WIS 19 movement, see Figure 3-23. This configuration helps reduce traffic crossing the CPRR and reduces the through traffic at three of the four ramp terminals. Left hand turns would still be allowed at the northbound exit ramp immediately east of the CPRR for traffic access to County CV.

Figure 3-23: WIS 19 – Northbound Flyover



### U-Ramp (Recommended Preferred Alternative)

This alternative has been modified since it was presented at the April 2023 public meeting and the Notice of Intent published in July 2023. The original concept bridged WIS 19 over the CPRR and Interstate and routed northbound traffic onto I-39/90/94 on a U-ramp over the Interstate. The alternative also increased capacity along WIS 19 from four to six lanes between Tierney Crossing and Pepsi Way. This alternative would have required a business relocation. The constructability of this alternative has been determined to be impractical as WIS 19 would be closed for a construction season (March to November), which impacts local businesses and residents. The overall construction duration, which would include lane closures, would also need to be around three years.

WisDOT modified the U-Ramp alternative keeping many of the aspects of the previous alternative but removed the bridge over the CPRR, see Figure 3-24. The alternative maintains WIS 19 under the Interstate and the U-ramp now crosses under extended Interstate bridges over the railroad. The alternative increases capacity along WIS 19 from four lanes to six lanes between Tierney Crossing and Pepsi Way while reducing the number of signalized intersections along this portion of WIS 19 from five to four and the total number of intersections from nine to seven. By removing bridges on WIS 19, a business relocation is no longer required.

Figure 3-24: WIS 19 – U-Ramp



### 6-Lane WIS 19

This alternative reconstructs the WIS 19 Interchange in a similar footprint and adds a travel lane in each direction to improve traffic operations on WIS 19, providing a six-lane roadway between Tierney Crossing and Pepsi Way see Figure 3-25. This alternative maintains all current intersections along WIS 19.

Figure 3-25: WIS 19 – 6-Lane WIS 19



### Environmental Impacts

The existing WIS 19 right of way can generally accommodate the needs of the four alternatives, but some new right of way (0.5 to 2.0 acres) is required for each alternative. The most impactful environmental consideration is the required business relocation at the intersection of WIS 19 and County CV in the WIS 19 over Railroad alternative.

**Table 3-15: WIS 19 Interchange Alternatives Impacts Summary**

| Alternative                    | Relocations (number) | New Right of Way (acres) | Section 4(f) Property (acres) | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|--------------------------------|----------------------|--------------------------|-------------------------------|------------------|---------------------|------------------------------|
| WIS 19 over Railroad           | 1                    | 2.0                      | 0.0                           | 4.6              | 0.6                 | 0                            |
| Northbound Flyover             | 0                    | 1.2                      | 0.0                           | 3.2              | 0.6                 | 0                            |
| U-Ramp (Preferred Alternative) | 0                    | 1.0                      | 0.0                           | 4.2              | 0.7                 | 0                            |
| 6-Lane WIS 19                  | 0                    | 0.5                      | 0.0                           | 5.1              | 0.6                 | 0                            |

### Evaluation

The WIS 19 over Railroad and Northbound Flyover alternatives do not address existing and future travel demands along WIS 19. These two alternatives feature WIS 19 as a 4-lane roadway, which cannot accommodate future projected travel demands. The U-Ramp alternative reduces the number of intersections between Tierney Crossing and Pepsi Way, which better addresses safety compared to the 6-Lane WIS 19 alternative. Public feedback supported fewer intersections and improved capacity on WIS 19. The 6-Lane WIS 19 alternative is the least costly alternative, with the U-ramp alternative coming in approximately 15% more costly. WisDOT recommends the U-ramp alternative as the preferred alternative as it best addresses safety and existing and future travel demands.



**Table 3-16: WIS 19 Interchange Alternatives Evaluation Criteria**

| Alternative                    | Addresses Existing and Future Travel Demands | Addresses Safety | Addresses Pavement Needs | Addresses Bridge Needs | Addresses Flood Risk | Projected Constr. Cost | Public Feedback | Environmental Impact |
|--------------------------------|--|------------------|--------------------------|------------------------|----------------------|------------------------|-----------------|----------------------|
| WIS 19 over Railroad           | No   | Yes - C          | Yes - C                  | Yes - C                | N/A                  | +50%                   | Neutral         | High                 |
| Northbound Flyover             | No   | Yes - C          | Yes - C                  | Yes - C                | N/A                  | +20%                   | Neutral         | Medium               |
| U-Ramp (Preferred Alternative) | Yes - C                                      | Yes - B          | Yes - C                  | Yes - C                | N/A                  | +15%                   | Positive        | Medium               |
| 6-Lane WIS 19                  | Yes - C                                      | Yes - C          | Yes - C                  | Yes - C                | N/A                  | Lowest Cost            | Neutral         | Medium               |

**3.3.8. County V Interchange**

The County V bridge over the Interstate was reconstructed in 2002, but there are severe crash rates at the existing ramp terminals. After the start of this study, the village of DeForest approved a large gas station/convenience store development along County V just west of the interchange. The development would generate substantial traffic demand and require improvements to the County V interchange. The developer is coordinating with WisDOT, Dane County, the village of DeForest, and FHWA and would complete a separate environmental review to privately fund the interchange reconstruction before construction could occur for a proposed project analyzed with this EIS.

Should the development occur, WisDOT recommends the No Build alternative as the preferred alternative. Under a No Build alternative, retaining wall work would be needed under the County V bridge to accommodate the reconstructed Interstate lanes, and freeway improvements would reconstruct ramps to match into the limits of the privately funded interchange ramp reconstruction.

WisDOT evaluated two build alternatives to address safety needs at County V: a diamond interchange and a diverging diamond interchange.

### Diamond (Recommended for Further Study)

WisDOT would modify the existing diamond interchange with improved traffic signalization and accommodate westbound to southbound traffic by providing dual left-turn lanes on County V, see Figure 3-26. This alternative meets traffic demands as currently provided by regional travel models from the Greater Madison MPO, which does not include the recently approved development at County V. This alternative would not meet future traffic demand once the development is constructed.

Figure 3-26: County V – Diamond Interchange



### Diverging Diamond

This alternative provides free-flow left-turn lanes to entrance ramps, which would reduce traffic delays, see Figure 3-27. The free flow left turns onto entrance ramps accommodate a much higher volume of left turns in a single lane compared to the Diamond alternative. Because of this, fewer left-turn lanes are required resulting in less structure costs. The Diverging Diamond also reduces conflict points through intersections, which would contribute to improved safety.

**Figure 3-27: County V – Diverging Diamond Interchange**



### Environmental Impacts

The Diamond alternative requires about a tenth of an acre of new right of way and would impact about six acres of wetlands while the Diverging Diamond alternative requires 3.3 acres of new right of way and would impact about 10 acres of wetlands.

**Table 3-17: County V Interchange Alternatives Impacts Summary**

| Alternative                           | Relocations (number) | New Right of Way (acres) | Parks/ Public Lands (acres) | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|---------------------------------------|----------------------|--------------------------|-----------------------------|------------------|---------------------|------------------------------|
| Diamond (Recommend for further study) | 0                    | 0.1                      | 0.0                         | 5.9              | 0.0                 | 0                            |
| Diverging Diamond                     | 0                    | 3.3                      | 0.0                         | 9.8              | 0.0                 | 0                            |

*Note: The Diamond alternative is the preferred alternative should private development with a new reconstructed interchange not move forward.*

### Evaluation

The Diamond alternative can accommodate traffic demands as currently provided by regional travel models from the Greater Madison MPO and is less costly than the Diverging Diamond alternative as only minor modifications are needed.

The development to the west of the interchange is expected to complete a separate environmental document and reconstruct the interchange before construction could occur for a potential project through this EIS. Retaining wall work will be needed under the County V bridge to accommodate the reconstructed Interstate lanes, and freeway improvements would reconstruct ramps to match into the limits of the privately funded interchange ramp reconstruction.

If the development west of the interchange does not move forward, WisDOT recommends the Diamond alternative as the preferred alternative and is retaining the alternative for further study.

**Table 3-18: County V Interchange Alternatives Evaluation Criteria**

| Alternative                           | Addresses Existing and Future Travel Demands | Addresses Safety | Addresses Pavement Needs | Addresses Bridge Needs | Addresses Flood Risk | Projected Constr. Cost | Public Feedback | Environmental Impact |
|---------------------------------------|--|------------------|--------------------------|------------------------|----------------------|------------------------|-----------------|----------------------|
| Diamond (Recommend for further study) | Yes - C*                                     | Yes - C          | Yes - C                  | Yes - C                | N/A                  | Lowest Cost            | Positive        | Low                  |
| Diverging Diamond                     | Yes - C*                                     | Yes - C          | Yes - C                  | Yes - C                | N/A                  | +850%                  | Neutral         | Medium               |

*Note: The Diamond alternative is the preferred alternative should private development with a new reconstructed interchange not move forward.*

*\*Based on current travel demand models that do not assume future new development in the northwest interchange quadrant.*

### 3.3.9. County CS Interchange

The County CS Interchange is a partial cloverleaf interchange where entrance or exit ramps variably meet design standards and high crash rates occur on the southbound exit ramp. Substandard design makes braking on exit ramps and getting up to speed on entrance ramps difficult for trucks. Trucks entering the Interstate at low speeds slow mainline traffic during heavy travel times such as summer Sunday afternoons can cause backups on the Interstate. WisDOT evaluated two alternatives to address substandard design and safety issues.

### Partial Cloverleaf

This alternative reconstructs the existing interchange in a similar footprint and reconstructs County CS and the bridge over the Interstate. Ramp curves would be realigned to improve driver comfort and deceleration lanes for the loop ramps would be extended to better accommodate truck deceleration. Reconstructed County CS would include a divided median and protected left turns onto the Interstate entrance ramps, see Figure 3-28.

**Figure 3-28: County CS – Partial Cloverleaf Interchange**



### Diamond (Recommended Preferred Alternative)

This alternative reconfigures the interchange to a diamond interchange and reconstructs County CS and the bridge over the Interstate. Reconstructed County CS would include a divided median and protected left turns onto the Interstate entrance ramps, see Figure 3-29.

The diamond ramp alignments improve driver comfort compared to loop ramps, providing improved line of sight and driver reaction time. This alternative is able to provide improved deceleration lanes for trucks with the expanded Interstate footprint. The longer southbound acceleration lane helps traffic operations during heavy travel times on Sunday afternoons.

**Figure 3-29: County CS – Diamond Interchange**



### Environmental Impacts

The Diamond alternative requires 1.7 acres more right of way and affects slightly more (0.5 acres) wetlands, but also requires 500 fewer feet of a drainage way that includes 3,700 feet of constructed stormwater drainage swales and weirs and 2,225 feet of ephemeral stream compared to the Partial Cloverleaf alternative.

**Table 3-19: County CS Interchange Alternatives Impacts Summary**

| Alternative                     | Relocations (number) | New Right of Way (acres) | Section 4(f) Property (acres) | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|---------------------------------|----------------------|--------------------------|-------------------------------|------------------|---------------------|------------------------------|
| Partial Cloverleaf              | 0                    | 10.0                     | 0.0                           | 5.6              | 3.1                 | 0                            |
| Diamond (Preferred Alternative) | 0                    | 11.7                     | 0.0                           | 6.1              | 3.1                 | 0                            |

### Evaluation

The Partial Cloverleaf alternative does not address safety as well as the Diamond alternative with little difference in environmental impact. Additional design refinements during preliminary engineering could further reduce environmental impacts. WisDOT recommends the Diamond alternative as the preferred alternative.

**Table 3-20: County CS Interchange Alternatives Evaluation Criteria**

| Alternative                     | Addresses Existing and Future Travel Demands | Addresses Safety | Addresses Pavement Needs | Addresses Bridge Needs | Addresses Flood Risk | Projected Constr. Cost | Public Feedback | Environmental Impact |
|---------------------------------|--|------------------|--------------------------|------------------------|----------------------|------------------------|-----------------|----------------------|
| Partial Cloverleaf              | Yes - C                                      | Yes - C          | Yes - C                  | Yes - C                | N/A                  | Lowest Cost            | Neutral         | Medium               |
| Diamond (Preferred Alternative) | Yes - C                                      | Yes - B          | Yes - C                  | Yes - C                | N/A                  | +14%                   | Positive        | Medium               |

### 3.3.10. I-39 I-90/94 Split Interchange

The I-39 I-90/94 Split Interchange includes access to WIS 78 and is within a mile of the Cascade Mountain Road Interchange. Improvements to one interchange influences the other. This area is in a floodplain where past floods have closed all or part of both I-39 and I-90/94. The Baraboo Waterfowl Production Area, a Section 4(f) property, is located north of the interchange between I-39 and I-90/94.

WisDOT is evaluating two alternatives to address traffic operations, safety and flooding in this area. WisDOT’s floodplain analysis in this area recommends a combination of raising the Interstate roadways and lengthening the I-39 Baraboo River bridge to reduce flood risk on the Interstate. Both alternatives



assume this recommendation. Both alternatives also remove the Cascade Mountain Road interchange while providing access to the area via WIS 78 ramps which are embedded into the interchange.

### High Build

This alternative reconstructs the existing interchange as a 4-level interchange (4 levels of roadway) within the existing interchange footprint and reconstructs the WIS 78 interchange as a diamond interchange. The alternative relocates Cascade Mountain Road interchange access to the Interstate via the WIS 78 Interchange. It also provides desirable free-flow, right-side ramps for system to system (freeway to freeway) movements, see Figure 3-30.

**Figure 3-30: I-39 I-90/94 Split – High Build**



**Low Build (Recommended Preferred Alternative)**

This alternative is similar to the High Build alternative, including Cascade Mountain Road access via the WIS 78 Interchange, but reconstructs the existing interchange as a 3-level interchange in a similar footprint, see Figure 3-31. Low traffic volumes on two ramps allow for flexibility to design the interchange to avoid greater impacts associated with higher design-speed ramps that are typical of system interchanges. The I-90/94 eastbound to I-39 northbound movement is constructed with over or underpass bridges rather than creating the typical flyover ramp to connect the two interstates. WisDOT is requesting a design speed exception for this ramp since it carries only 490 vehicles per day. WisDOT is also requesting a design speed exception for the I-39 southbound movement to westbound I-90/94, which has only 130 vehicles per day. Appendix B includes the design exceptions memoranda for the interchange.

Figure 3-31: I-39 I-90/94 Split – Low Build



### Environmental Impacts

The Low Build alternative requires slightly more right of way to accommodate the I-90/94 eastbound to I-39 northbound movement but does not affect additional Section 4(f) properties, wetlands, or floodplains compared to the High Build alternative. The flyover structure of the High Build alternative is one level higher than any bridge in the Low Build alternative. Floodplain impacts are associated with filling to raise the Interstates out of the floodplain and reconfiguring the WIS 78 Interchange.

**Table 3-21: I-39 I-90/94 Split Interchange Alternatives Impacts Summary**

| Alternative                       | Relocations (number) | New Right of Way (acres) | Section 4(f) Property (acres)          | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|-----------------------------------|----------------------|--------------------------|--|------------------|---------------------|------------------------------|
| High Build                        | 0                    | 11.4                     | 1.1 (temp. easement)<br>0.3 (acquired) | 14.3             | 53.1                | 0                            |
| Low Build (Preferred Alternative) | 0                    | 12.8                     | 1.1 (temp. easement)<br>0.3 (acquired) | 14.3             | 53.1                | 0                            |

**Evaluation**

Both the High Build and Low Build alternatives perform nearly identically as the only major difference between them is the I-90/94 eastbound to I-39 northbound movement. Meetings with local residents and officials indicated a preference for the Low Build alternative. Because the Low Build alternative does not require a flyover ramp, the projected construction cost of the alternative costs less than the High Build alternative. WisDOT recommends the Low Build alternative as the preferred alternative.

**Table 3-22: I-39 I-90/94 Split Interchange Alternatives Evaluation Criteria**

| Alternative                       | Addresses Existing and Future Travel Demands | Addresses Safety | Addresses Pavement Needs | Addresses Bridge Needs | Addresses Flood Risk | Projected Constr. Cost | Public Feedback | Environmental Impact |
|-----------------------------------|--|------------------|--------------------------|------------------------|----------------------|------------------------|-----------------|----------------------|
| High Build                        | Yes - C                                      | Yes - C          | Yes - C                  | Yes - C                | Yes - C              | +25%                   | Neutral         | High                 |
| Low Build (Preferred Alternative) | Yes - C                                      | Yes - C          | Yes - C                  | Yes - C                | Yes - C              | Lowest Cost            | Positive        | High                 |

### 3.3.11. WIS 33 Interchange at I-39

The existing WIS 33 Interchange at I-39 is a partial cloverleaf interchange where none of the entrance or exit ramps meet current design standards. The westbound entrance-ramp and eastbound exit-ramp have high crash rates. The interchange is located in a floodplain where past floods have closed all or parts of I-39 and WIS 33. The Pine Island State Wildlife Area, a Section 4(f) property,<sup>8</sup> is located north of WIS 33 on both sides of the Interstate. WisDOT owns land in the northeast and southwest interchange quadrants.

WisDOT evaluated two alternatives to address substandard design, safety, and flooding issues. Both alternatives assume implementing WisDOT's recommendations from its floodplain analysis to reduce flood risk. The recommendation would on average, raise I-39 four feet and widen the I-39 bridge over the Baraboo River to 500 feet.

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<sup>8</sup> Section 4(f) is a term that refers to any park, recreation area, wildlife or waterfowl refuge or historic site that is protected under Section 4(f) of the 1966 US Department of Transportation Act.

### Partial Cloverleaf

This alternative would reconstruct the existing interchange in a similar footprint. Ramp curves would be realigned to improve driver comfort entering and exiting the Interstate. This alternative adds a divided median to protect WIS 33 left turning traffic onto entrance ramps, see Figure 3-32.

The alternative would require about 3.8 acres from the Pine Island State Wildlife Area 4(f) property to extend the southbound exit ramp from I-39 to WIS 33.

**Figure 3-32: WIS 33 at I-39 – Partial Cloverleaf Interchange**



### Diamond (Recommended Preferred Alternative)

This alternative would reconstruct the WIS 33 interchange at I-39 as a diamond interchange and reconfigure ramp alignments to improve sight distances for improved driver reaction time, see Figure 3-33. A diamond interchange is the most favored interchange type for WisDOT as they help prevent wrong-way drivers and meet driver expectations. This was reinforced at the April 2023 public meeting when many people indicated a preference for diamond interchanges whenever possible. The alternative impacts about 2.5 acres of the Pine Island State Wildlife Area to construct the southbound exit and northbound entrance ramps. This alternative would also add a divided median to protect WIS 33 left turning traffic onto entrance ramps.

**Figure 3-33: WIS 33 at I-39 – Diamond Interchange**





### Environmental Impacts

The Diamond alternative is largely constructed within WisDOT right of way but has slightly higher environmental impacts for wetlands and floodplains and requires less property from the Section 4(f) Pine Island State Wildlife Area compared to the Partial Cloverleaf alternative. Floodplain and wetland impacts are associated with expanded interchange infrastructure and filling to raise the Interstate out of the floodplain.

**Table 3-23: WIS 33 Interchange at I-39 Alternatives Impacts Summary**

| Alternative                     | Relocations (number) | New Right of Way (acres) | Section 4(f) Property (acres) | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|---------------------------------|----------------------|--------------------------|-------------------------------|------------------|---------------------|------------------------------|
| Partial Cloverleaf              | 0                    | 7.1                      | 3.8 (acquired)                | 40.9             | 82.0                | 0                            |
| Diamond (Preferred Alternative) | 0                    | 7.2                      | 2.5 (acquired)                | 41.9             | 85.3                | 0                            |

### Evaluation

Both alternatives similarly meet the study purpose and need factors, have similar construction costs and environmental impacts. The Diamond alternative received better feedback at public meetings and requires less land from the Pine Island State Wildlife State Wildlife Area. Additional design refinements during preliminary engineering could further reduce environmental impacts. WisDOT recommends the Diamond alternative as the preferred alternative.

**Table 3-24: WIS 33 Interchange at I-39 Alternatives Evaluation Criteria**

| Alternative                     | Addresses Existing and Future Travel Demands | Addresses Safety | Addresses Pavement Needs | Addresses Bridge Needs | Addresses Flood Risk | Projected Constr. Cost | Public Feedback | Environmental Impact |
|---------------------------------|--|------------------|--------------------------|------------------------|----------------------|------------------------|-----------------|----------------------|
| Partial Cloverleaf              | Yes - C                                      | Yes - C          | Yes - C                  | Yes - C                | Yes - C              | Nearly Identical Cost  | Neutral         | High                 |
| Diamond (Preferred Alternative) | Yes - C                                      | Yes - C          | Yes - C                  | Yes - C                | Yes - C              | Nearly Identical Cost  | Positive        | High                 |

### **3.3.12. WIS 33 Interchange at I-90/94**

The existing WIS 33 interchange at I-90/94 is a partial cloverleaf where none of the entrance ramps or exit ramps meet current design standards. The eastbound I-90/94 exit ramp to WIS 33 has a curve that is difficult to navigate and causes high crash rates. This interchange is in a floodplain where past floods have closed all or parts of WIS 33 and I-90/94

Similar to the WIS 33 interchange at I-39, WisDOT evaluated two alternatives to address substandard design, safety, and flooding issues at the WIS 33 interchange at I-90/94. Both alternatives assume implementing WisDOT's recommendations from its floodplain analysis, which would, on average raise I-90/94 three feet to reduce flood risk.

### Partial Cloverleaf (Recommended Preferred Alternative)

This alternative would reconstruct the existing interchange in a similar footprint. Ramp curves would be realigned to improve driver comfort entering and exiting the Interstate. Acceleration and deceleration lanes would be lengthened. This alternative adds a divided median to protect WIS 33 left-turning traffic onto entrance ramps, see Figure 3-34.

**Figure 3-34: WIS 33 at I-90/94 – Partial Cloverleaf Interchange**



**Diamond**

This alternative would reconstruct the WIS 33 interchange at I-90/94 to a diamond interchange and reconfigure ramp alignments to improve sight distances for improved driver reaction time, see Figure 3-35. A diamond interchange is the most favored interchange type for WisDOT as they help prevent wrong-way drivers and meet driver expectations. This was reinforced at the April 2023 public meeting when many people indicated a preference for diamond interchanges whenever possible.

This alternative would also add a divided median to protect WIS 33 left turning traffic onto entrance ramps.

**Figure 3-35: WIS 33 at I-90/94 – Diamond Interchange**



### Environmental Impacts

The environmental impacts for the Diamond alternative are substantially higher than those of the Partial Cloverleaf alternative. The Diamond alternative requires more right of way for new ramps in interchange quadrants where wetlands and floodplains are present. The Diamond alternative requires 11.4 more right of way acres, 11.5 more wetland acres, and 11.6 more floodplain acres compared to the Partial Cloverleaf alternative.

**Table 3-25: WIS 33 Interchange at I-90/94 Alternatives Impacts Summary**

| Alternative                                | Relocations (number) | New Right of Way (acres) | Section 4(f) Property (acres) | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|--|----------------------|--------------------------|-------------------------------|------------------|---------------------|------------------------------|
| Partial Cloverleaf (Preferred Alternative) | 0                    | 2.3                      | 0                             | 1.8              | 37.7                | 0                            |
| Diamond                                    | 0                    | 13.7                     | 0                             | 13.3             | 49.3                | 0                            |

### Evaluation

Both alternatives similarly meet the study purpose and need factors but differ substantially on environmental impact and costs. WisDOT recommends the Partial Cloverleaf alternative as the preferred alternative as it meets all purpose and need factors, has the fewest environmental impacts by avoiding over 11 acres of wetland and floodplain impacts and is the least costly alternative.

**Table 3-26: WIS 33 Interchange at I-90/94 Alternatives Evaluation Criteria**

| Alternative                                | Addresses Existing and Future Travel Demands | Addresses Safety | Addresses Pavement Needs | Addresses Bridge Needs | Addresses Flood Risk | Projected Constr. Cost | Public Feedback | Environmental Impact |
|--|--|------------------|--------------------------|------------------------|----------------------|------------------------|-----------------|----------------------|
| Partial Cloverleaf (Preferred Alternative) | Yes - C                                      | Yes - C          | Yes - C                  | Yes - C                | Yes - C              | Lowest Cost            | Neutral         | Low                  |
| Diamond                                    | Yes - C                                      | Yes - C          | Yes - C                  | Yes - C                | Yes - C              | +30%                   | Positive        | High                 |

### 3.3.13. US 12 Interchange

The existing US 12 interchange is a partial free-flow interchange that has some of the worst safety statistics in the study corridor. Six of the eight ramp movements do not meet current design standards while all four non-loop ramps have high crash rates. The complex entrance ramp configurations on both eastbound and westbound I-90/94 require drivers to merge across two lanes to enter the Interstate. There are two major hotels in the northeast and northwest quadrants of the interchange and tribal land in the southeast quadrant.

WisDOT evaluated three alternatives to address substandard design and safety issues in this heavily used interchange with a substantial number of left-turn movements and complex traffic weaves to and from the Interstate.

**Diverging Diamond (Recommended Preferred Alternative)**

This alternative reconstructs the existing interchange in a smaller footprint, see Figure 3-36. The alternative provides free flow left turns to entrance ramps and ramp alignments improve sight distances for improved driver reaction time. The diverging diamond configuration addresses traffic operations and improves safety on US 12 by reducing the number of conflict points at intersections compared to a standard diamond interchange configuration. Improved geometrics of ramps allow vehicles to exit or enter the Interstate at speeds closer to the posted speed. Deceleration and acceleration will better match driver expectations.

**Figure 3-36: US 12 – Diverging Diamond Interchange**



### Diamond

This alternative reconstructs the existing interchange in a smaller footprint and ramp alignments improve sight distances for improved driver reaction time, see Figure 3-37. Ramp design allows vehicles to exit or enter the Interstate at speeds closer to the posted speed. Deceleration and acceleration will better match driver expectation, compared to the existing interchange configuration. However, traffic operations do not perform well compared to the Diverging Diamond alternative.

**Figure 3-37: US 12 – Diamond Interchange**





### Partial Free-Flow

This alternative reconstructs the existing interchange in a similar footprint but merges two entrance ramps into a single lane to reduce traffic conflicts before merging with I-90/94, see Figure 3-38.

Figure 3-38: US 12 – Partial Free Flow Interchange



### Environmental Impact

All three alternatives have very similar environmental impacts.

**Table 3-27: US 12 Interchange Alternatives Impacts Summary**

| Alternative                               | Relocations (number) | New Right of Way (acres) | Section 4(f) Property (acres) | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|---|----------------------|--------------------------|-------------------------------|------------------|---------------------|------------------------------|
| Diverging Diamond (Preferred Alternative) | 0                    | 5.3                      | 0                             | 0.0              | 0.0                 | 0                            |
| Diamond                                   | 0                    | 5.9                      | 0                             | 0.0              | 0.0                 | 0                            |
| Partial Free-Flow                         | 0                    | 5.9                      | 0                             | 0.0              | 0.0                 | 0                            |

### Evaluation

While all three alternatives meet purpose and need, the Diverging Diamond alternative addresses safety better than the other two alternatives and the Diamond alternative does not address existing and future travel demands as well as the other two alternatives. The Partial Free-Flow alternative is more costly because of more required infrastructure: acceleration lanes will be on bridges, and there would be more pavement on the freeway acceleration lanes on two entrance ramps in each direction (Compared to one entrance ramp in each direction with the other alternatives). WisDOT recommends the Diverging Diamond alternative as the preferred alternative.

**Table 3-28: US 12 Interchange Alternatives Evaluation Criteria**

| Alternative                               | Addresses Existing and Future Travel Demands | Addresses Safety | Addresses Pavement Needs | Addresses Bridge Needs | Addresses Flood Risk | Projected Constr. Cost | Public Feedback | Environmental Impact |
|---|--|------------------|--------------------------|------------------------|----------------------|------------------------|-----------------|----------------------|
| Diverging Diamond (Preferred Alternative) | Yes - C                                      | Yes - B          | Yes - C                  | Yes - C                | N/A                  | +5%                    | Positive        | Low                  |
| Diamond                                   | Yes - D                                      | Yes - C          | Yes - C                  | Yes - C                | N/A                  | Lowest Cost            | Neutral         | Low                  |
| Partial Free Flow                         | Yes - C                                      | Yes - C          | Yes - C                  | Yes - C                | N/A                  | +30%                   | Neutral         | Low                  |

### 3.3.14. WIS 23 Interchange

The WIS 23 Interchange is a diamond interchange where none of the exit or entrance ramps meet current design standards. The westbound entrance and eastbound exit ramps have high crash rates. WisDOT evaluated two alternatives to address substandard design and safety issues.

#### Diamond (Recommended Preferred Alternative)

This alternative reconfigures the interchange in a similar but slightly smaller footprint, see Figure 3-39. Ramp alignments improve sight distances for improved driver reaction time.

Figure 3-39: WIS 23 – Diamond Interchange



### Diverging Diamond

This alternative reconstructs the existing interchange in a similar footprint, see Figure 3-40. The alternative provides free flow left turns to entrance ramps to reduce conflicts and ramp alignments improve sight distances for improved driver reaction time.

Figure 3-40: WIS 23 – Diverging Diamond Interchange



### Environmental Impacts

Both alternatives have very similar footprints and therefore similar environmental impacts.

**Table 3-29: WIS 23 Interchange Alternatives Impacts Summary**

| Alternative                     | Relocations (number) | New Right of Way (acres) | Section 4(f) Property (acres) | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|---------------------------------|----------------------|--------------------------|-------------------------------|------------------|---------------------|------------------------------|
| Diamond (Preferred Alternative) | 0                    | 3.2                      | 0                             | 0.2              | 0.0                 | 0                            |
| Diverging Diamond               | 0                    | 3.2                      | 0                             | 0.1              | 0.0                 | 0                            |

### Evaluation

Both alternatives adequately meet purpose and need with similar minimal environmental impacts. The Diamond alternative adequately manages existing and future traffic demand while addressing safety problems, with a lower construction cost compared to the Diverging Diamond alternative. While the Diverging Diamond alternative would accommodate traffic, existing and future traffic demand and patterns do not require the higher left-turn capacity of a diverging diamond configuration. WisDOT recommends the Diamond alternative as the preferred alternative. The Diamond alternative addresses existing and future traffic demand as well as other purpose and need factors in a cost-effective manner.

**Table 3-30: WIS 23 Interchange Alternatives Evaluation Criteria**

| Alternative                     | Addresses Existing and Future Travel Demands | Addresses Safety | Addresses Pavement Needs | Addresses Bridge Needs | Addresses Flood Risk | Projected Constr. Cost | Public Feedback | Environmental Impact |
|---------------------------------|--|------------------|--------------------------|------------------------|----------------------|------------------------|-----------------|----------------------|
| Diamond (Preferred Alternative) | Yes - C                                      | Yes - C          | Yes - C                  | Yes - C                | N/A                  | Lowest Cost            | Positive        | Low                  |
| Diverging Diamond               | Yes - C                                      | Yes - C          | Yes - C                  | Yes - C                | N/A                  | +10%                   | Neutral         | Low                  |

### **3.3.15. WIS 13 Interchange**

The current WIS 13 Interchange is a trumpet interchange with WIS 13 to the east of I-90/94. Three of the four ramps do not meet current design standards and both entrance ramps have high crash rates. County H also crosses under the Interstate about 750 feet north of WIS 13. The Hulburt Creek Fishery, a Section 4(f) property, is immediately west of the interchange.

Once WisDOT started investigating alternatives, the city of Wisconsin Dells requested WisDOT investigate an alternative that better connects County H to the WIS 13 Interchange. WisDOT evaluated three alternatives to address substandard design. Two alternatives also connect County H to the interstate.

#### **Diamond - Realigned County H**

This alternative reconstructs the interchange as a diamond interchange and realigns County H with a direct connection to the WIS 13 Interchange west of the Interstate, see Figure 3-43. This alternative reconstructs the interchange to current design standards. Ramp curves would be realigned to improve driver comfort entering and exiting the Interstate. The ramp design allows vehicles to exit or enter the Interstate at speeds closer to the posted speed. Deceleration and acceleration would match driver expectation. The southbound exit ramp and northbound entrance ramp would be lengthened to meet current design standards, which requires removing the existing County H underpass. This alternative crosses through Hulburt Creek Fishery Area.

Figure 3-41: WIS 13 – Diamond Interchange with Realigned County H



### Split Diamond (Recommended for Further Study)

This alternative reconstructs the interchange as a split diamond interchange. It maintains the current configuration of County H under the Interstate, see Figure 3-42. The split diamond allows for ramps to and from WIS 13 and County H, providing Interstate access to both roads while connecting them with one-way frontage roads on either side of I-90/94. Roundabouts are added at the end of ramps to improve traffic operations and safety.

**Figure 3-42: WIS 13 – Split Diamond Interchange**





### Trumpet (Recommended Preferred Alternative)

This alternative reconstructs the interchange to current design standards. WisDOT proposed this alternative to address potential risk of increased crashes with the Diamond-Realigned H and Split Diamond alternatives, which introduce more conflict points compared to the Trumpet alternative. Ramp curves would be realigned to improve driver comfort entering and exiting the Interstate. Ramp curves would be realigned to improve driver comfort entering and exiting the Interstate.

Figure 3-43: WIS 13 – Trumpet Interchange



### Environmental Impacts

The Trumpet alternative requires the least amount of new right of way. All alternatives relocate a maintenance and storage building, while the Split Diamond alternative relocates an additional small commercial/storage building and a storage shed. WisDOT real estate analysis considers the relocation impacts between the alternatives as similar given the small building sizes and uses. The Diamond-Realigned County H alternative substantially impacts the Hulburt Creek Fishery Area with a new alignment through the property. Impacts to wetlands and floodplains among all alternatives are an acre or less, but the Trumpet interchange has the lowest impacts to the Hulburt Creek Fishery Area and wetlands.

**Table 3-31: WIS 13 Interchange Alternatives Impacts Summary**

| Alternative                                   | Relocations (number) | New Right of Way (acres) | Section 4(f) Property (acres)          | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|---|----------------------|--------------------------|--|------------------|---------------------|------------------------------|
| Diamond Realign H                             | 1                    | 16.6                     | 2.9                                    | 0.7              | 0.6                 | 0                            |
| Split Diamond (Recommended for further study) | 3                    | 13.2                     | 0.4 (temp. easement)<br>0.8 (acquired) | 0.5              | 0.8                 | 0                            |
| Trumpet (Preferred Alternative)               | 1                    | 10.5                     | 0.1 (temp. easement)                   | 0.1              | 1.0                 | 0                            |

### Evaluation

All alternatives generally meet purpose and need but differ on how well they meet the safety factor. The Diamond-Realigned H alternative has few conflict points and ramps that more closely align with driver expectations compared to the other alternatives. The Trumpet alternative scores better than the Split Diamond alternative for safety because it has fewer conflict points, which reduce the risk of crashes. The projected construction cost of the Split Diamond and Trumpet alternatives are higher than the Diamond-Realigned H alternative, but the real estate impacts of the Diamond-Realigned H alternative likely offset the additional cost. The Split Diamond alternative creates a County H connection to the WIS 13 Interchange while minimizing impacts to the Hulburt Creek Fishery Area.

WisDOT recommends the Trumpet as the preferred alternative because of its added safety benefits compared to the Split Diamond alternative and lower environmental impacts compared to the Diamond-Realigned H alternative. However, WisDOT also recommends the Split Diamond alternative for further study because of continued public interest in a potential new Interstate connection at County H.

**Table 3-32: WIS 13 Interchange Alternatives Evaluation Criteria**

| Alternative                              | Addresses Existing and Future Travel Demands | Addresses Safety | Addresses Pavement Needs | Addresses Bridge Needs | Addresses Flood Risk | Projected Constr. Cost | Public Feedback | Environmental Impact |
|--|--|------------------|--------------------------|------------------------|----------------------|------------------------|-----------------|----------------------|
| Diamond Realign H                        | Yes - C                                      | Yes - B          | Yes - C                  | Yes - C                | N/A                  | Lowest Cost            | Neutral         | High                 |
| Split Diamond (Retain for further study) | Yes - C                                      | Yes - D          | Yes - C                  | Yes - C                | N/A                  | +10%                   | Positive        | Medium               |
| Trumpet (Preferred Alternative)          | Yes - C                                      | Yes - C          | Yes - C                  | Yes - C                | N/A                  | +19%                   | TBD             | Low                  |

### **3.3.16. US 12/WIS 16 Interchange**

The US 12/WIS 16 Interchange is a diamond interchange where three of the four ramps do not meet current design standards and the westbound entrance ramp has a high crash rate. US 12/WIS 16 is slightly skewed to I-90/94 and 60th Street is about 475 feet to the east of the westbound entrance ramp.

WisDOT evaluated two diamond interchange alternatives that address substandard design and safety issues. One alternative removes the 60th Street intersection at US 12/WIS 16. 60th Street is a connecting route for the Ice Age Trail and provides access to campsites in Rocky Arbor State Park, a Section 4(f) property.

### Diamond (Recommended Preferred Alternative)

This alternative reconstructs the existing interchange in a similar footprint with improved ramp design to provide better sight distance, which improves driver reaction time, see Figure 3-44. The alternative provides protected left turn lanes on US 12/WIS 16 to Interstate entrance ramps. The alternative realigns the 60th Street intersection to improve sight distance.

Figure 3-44: US 12/WIS 16 – Diamond Interchange



### Realigned Diamond

This alternative reconstructs the existing interchange in a similar footprint but realigns US 12/WIS 16 to provide better intersection angles at ramp intersections, see Figure 3-45. Ramp design is similar to the Diamond alternative and protected left turn lanes are provided on US 12/WIS 16 to Interstate entrance ramps. This alternative would remove 60th Street access to US 12/WIS 16 because it would be too near the westbound entrance ramp intersection for safe traffic operations.

**Figure 3-45: US 12/WIS 16 – Realigned Diamond Interchange**



### Environmental Impacts

While both alternatives have similar impacts, the Realigned Diamond alternative has more overall right of way impacts. 60th Street removal under the Realigned Diamond alternative would require rerouting the Ice Age Trail to other local roads and providing alternate campsite access in Rocky Arbor State Park. The Realigned Diamond alternative requires strip right of way from the Rocky Arbor State Park, which lies on both sides of US 12/WIS 16, east of the Interstate. The Diamond alternative requires temporary easement during construction. The park is also eligible for listing on the National Register of Historic Places.

**Table 3-33: US 12/WIS 16 Interchange Alternatives Impacts Summary**

| Alternative                     | Relocations (number) | New Right of Way (acres) | Section 4(f) Property (acres) | Wetlands (acres) | Floodplains (acres) | Historic Properties (number) |
|---------------------------------|----------------------|--------------------------|-------------------------------|------------------|---------------------|------------------------------|
| Diamond (Preferred Alternative) | 0                    | 4.6                      | 0.8 (temp. easement)          | 0.1              | 0.0                 | 1                            |
| Realigned Diamond               | 0                    | 6.0                      | 0.9 (acquired)                | 0.1              | 0.0                 | 1                            |

### Evaluation

Both alternatives meet the purpose and need and have nearly identical costs. The Realigned Diamond alternative has a slightly higher environmental impact and local officials requested maintaining the 60th Street connection, which provides access to campsites and a more direct route to County N. WisDOT recommends the Diamond alternative as the preferred alternative.

**Table 3-34: US 12/WIS 16 Interchange Alternatives Evaluation Criteria**

| Alternative                     | Addresses Existing and Future Travel Demands | Addresses Safety | Addresses Pavement Needs | Addresses Bridge Needs | Addresses Flood Risk | Projected Constr. Cost | Public Feedback | Environmental Impact |
|---------------------------------|--|------------------|--------------------------|------------------------|----------------------|------------------------|-----------------|----------------------|
| Diamond (Preferred Alternative) | Yes - C                                      | Yes - C          | Yes - C                  | Yes - C                | N/A                  | Nearly Identical Cost  | Positive        | Medium               |
| Realigned Diamond               | Yes - C                                      | Yes - C          | Yes - C                  | Yes - C                | N/A                  | Nearly Identical Cost  | Negative        | Medium               |

## 4. Summary of Alternatives Recommended for Further Study

Based on the screening factors described in Section 2, WisDOT recommends preferred alternatives as summarized in Table 4-1. In addition to preferred alternatives, WisDOT will continue to study the Modernization Hybrid, the County V Diamond and WIS 13 Split Diamond alternatives as described previously.

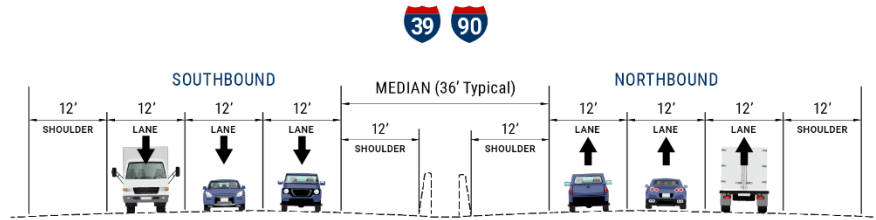
**Table 4-1: Alternatives Recommended for Further Study**

| Mainline or Interchange                   | Alternative                                   | Recommended Preferred Alternative                                |
|---|---|--|
| I-39/90/94 Freeway                        | Modernization Plus Added General-Purpose Lane | Yes  |
|   | Modernization Hybrid                          | No   |
| I-94/WIS 30 Interchange                   | Full Modernization #2                         | Yes  |
| Proposed New Milwaukee Street Interchange | Partial Cloverleaf                            | Yes  |
| USH 151/High Crossing Boulevard           | Directional                                   | Yes  |
| Proposed New Hoepker Road Interchange     | Shifted Diamond                               | Yes  |
| US 51 Interchange                         | Partial Cloverleaf                            | Yes  |
| WIS 19 Interchange                        | U-Ramp  | Yes  |
| County V Interchange                      | No Build                                      | Yes - if interchange constructed by others as a separate project |
|   | Diamond                                       | Yes – if private development does not occur                      |
| County CS Interchange                     | Diamond                                       | Yes  |
| I-39 I-90/94 Split Interchange            | Low Build                                     | Yes  |
| WIS 33 at I-39 Interchange                | Diamond                                       | Yes  |
| WIS 33 at I-90/94 Interchange             | Partial Cloverleaf                            | Yes  |
| US 12 Interchange                         | Diverging Diamond                             | Yes  |
| WIS 23 Interchange                        | Diamond                                       | Yes  |
| WIS 13 Interchange                        | Split Diamond                                 | No   |
|   | Trumpet                                       | Yes  |
| US 12/WIS 16 Interchange                  | Diamond                                       | Yes  |

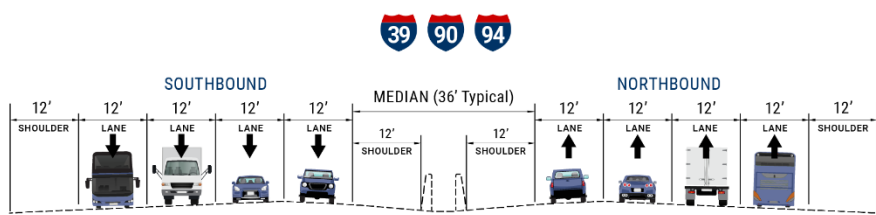
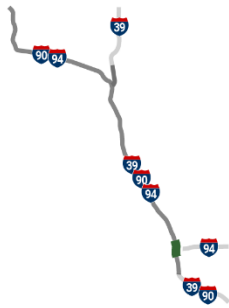


## **Appendix A. Mainline Alternative Typical Cross Sections**

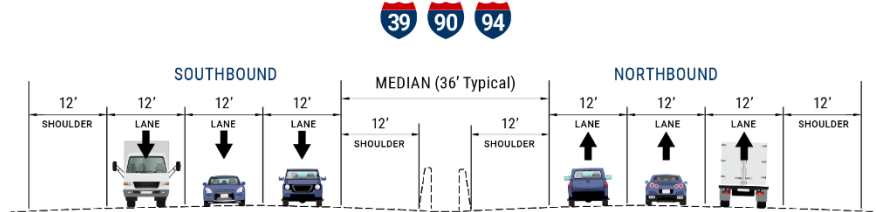
**PROJECT CORRIDOR CONTEXT** **TYPICAL SECTIONS: MODERNIZATION OF EXISTING LANES**



**I-39/90 from US 12/18 to I-94/WIS 30**  
6-Lane Section

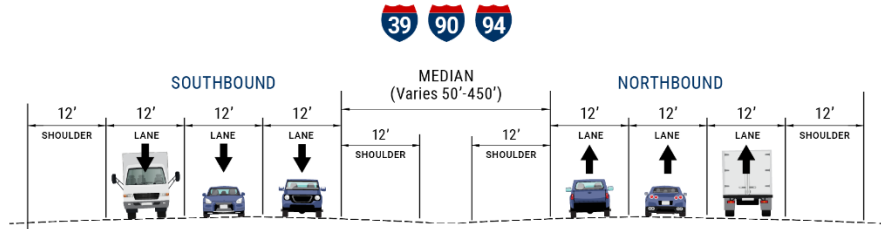


**I-39/90/94 from I-94/WIS 30 to US 151**  
8-Lane Section

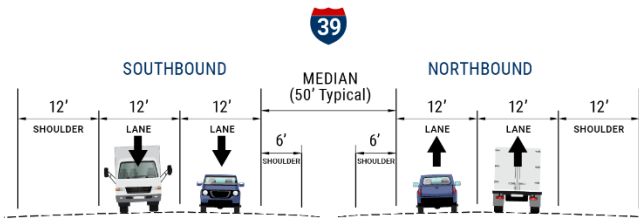


**I-39/90/94 from US 151 to Smokey Hollow Road**  
6-Lane Section

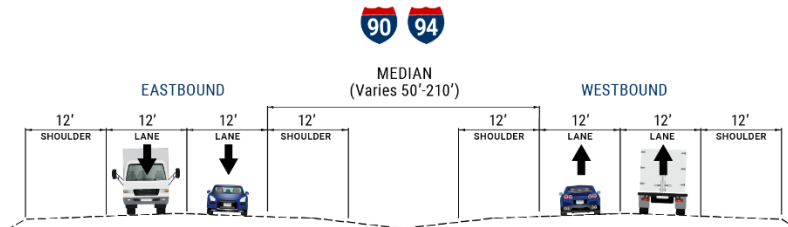
**PROJECT CORRIDOR CONTEXT** **TYPICAL SECTIONS: MODERNIZATION OF EXISTING LANES**



**I-39/90/94 from Smokey Hollow Road to I-39 I-90/94 Split**  
6-Lane Section

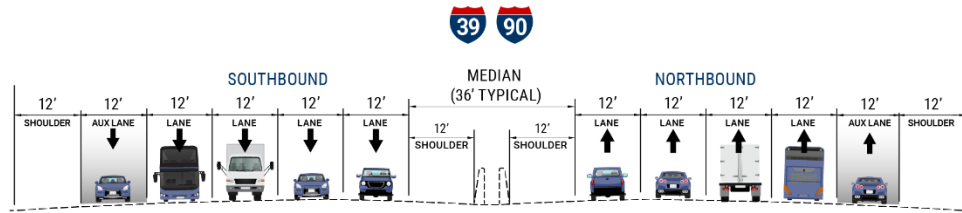
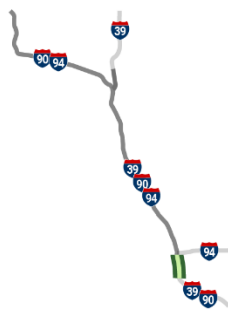


**I-39 from I-39 I-90/94 Split to Levee Road**  
4-Lane Section

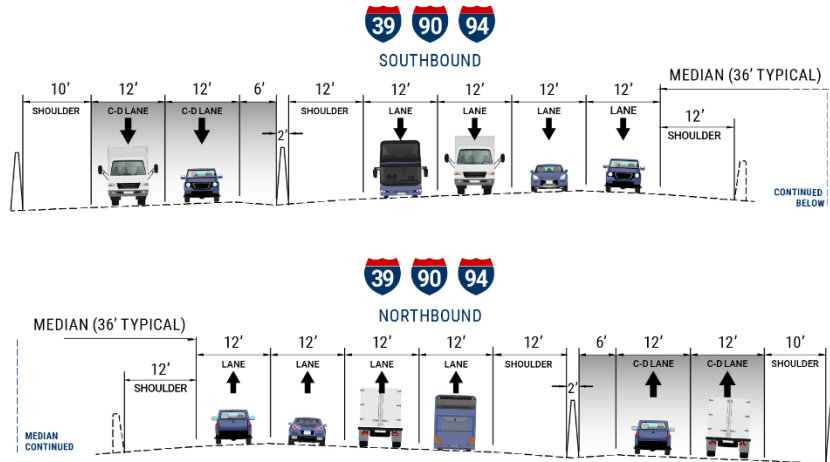


**I-90/94 from I-39 I-90/94 Split to US 12/WIS 16**  
4-Lane Section

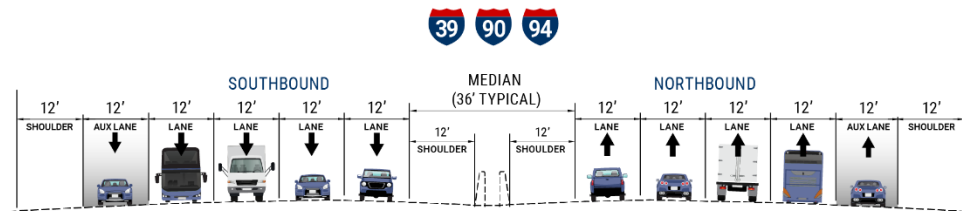
**PROJECT CORRIDOR CONTEXT** **TYPICAL SECTIONS: MODERNIZATION PLUS ADDED GENERAL PURPOSE LANE**



**I-39/90 from US 12/18 to I-94/WIS 30**  
8-Lane Section with Auxiliary Lanes

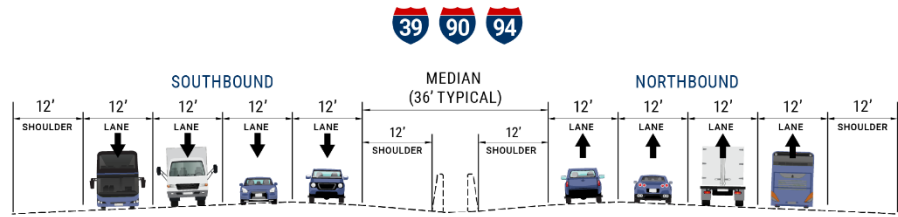


**I-39/90/94 from I-94/WIS 30 to US 151**  
8-Lane Section with 4 Collector-Distributor Lanes

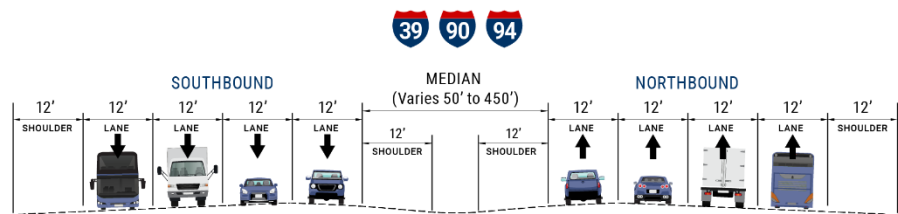
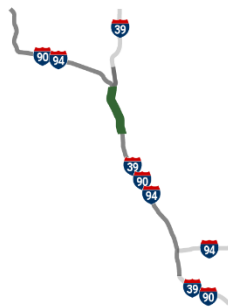


**I-39/90/94 from US 151 to WIS 19**  
8-Lane Section with Auxiliary Lanes

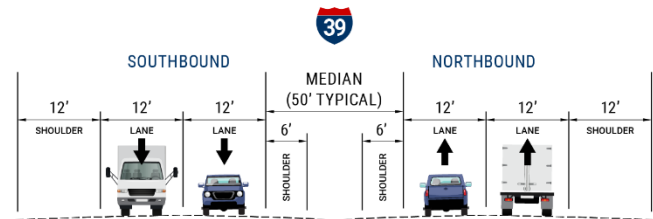
**PROJECT CORRIDOR CONTEXT** **TYPICAL SECTIONS: MODERNIZATION PLUS ADDED GENERAL PURPOSE LANE**



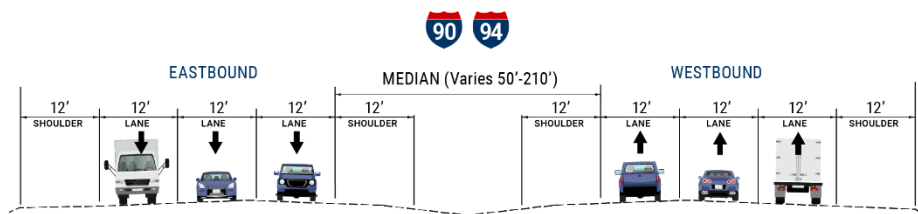
**I-39/90/94 from WIS 19 to Smokey Hollow Road**  
8-Lane Section



**I-39/90/94 from Smokey Hollow Road to I-39 I-90/94 Split**  
8-Lane Section

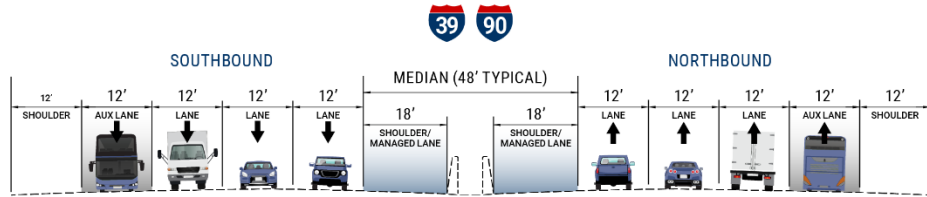


**I-39 from I-39 I-90/94 Split to Levee Road**  
4-Lane Section

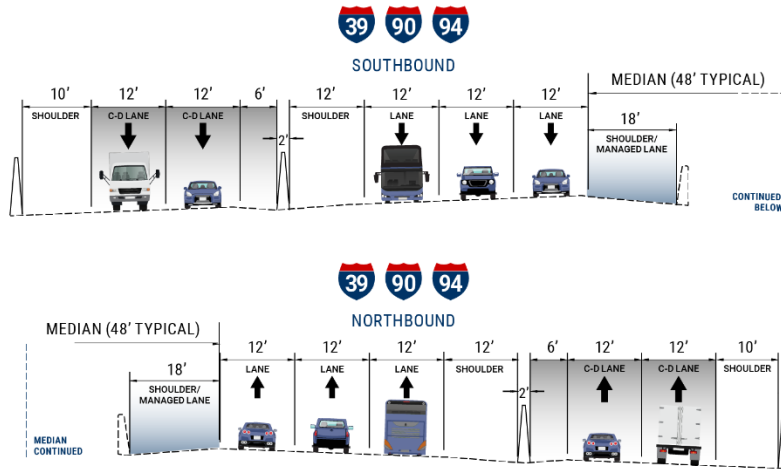


**I-90/94 from I-39 I-90/94 Split to US 12/WIS 16**  
6-Lane Section

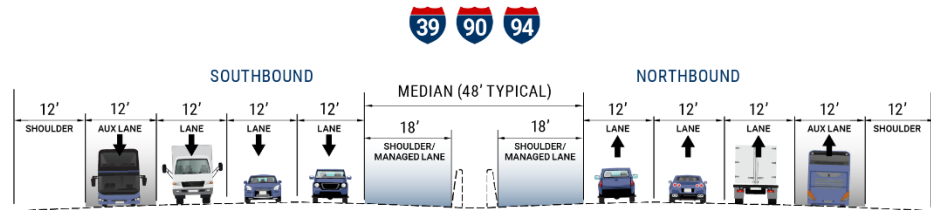
**PROJECT CORRIDOR CONTEXT** **TYPICAL SECTIONS: MODERNIZATION HYBRID**



**I-39/90 from US 12/18 to I-94/WIS 30**  
6-Lane Section with Managed Lanes and Auxiliary Lanes

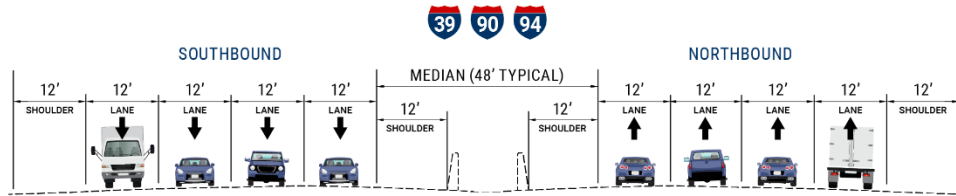
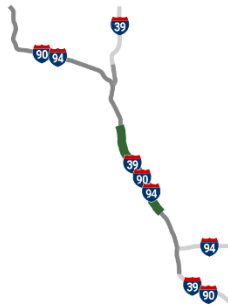


**I-39/90/94 from I-94/WIS 30 to US 151**  
6-Lane Section with Managed Lanes and 4 Collector-Distributor Lanes

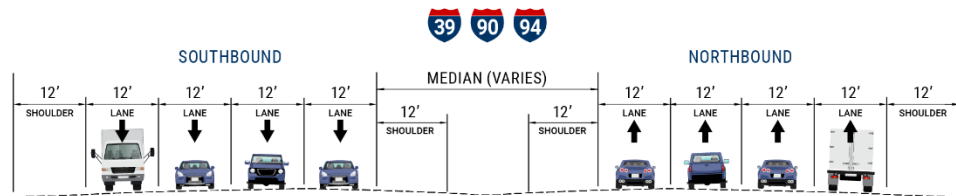
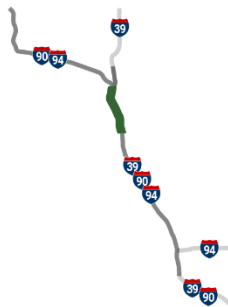


**I-39/90/94 from US 151 to WIS 19**  
6-Lane Section with Managed Lanes and Auxiliary Lanes

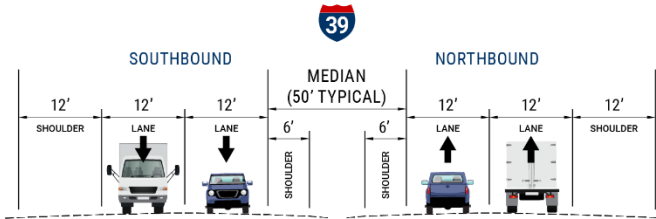
**PROJECT CORRIDOR CONTEXT** **TYPICAL SECTIONS: MODERNIZATION WITH HYBRID**



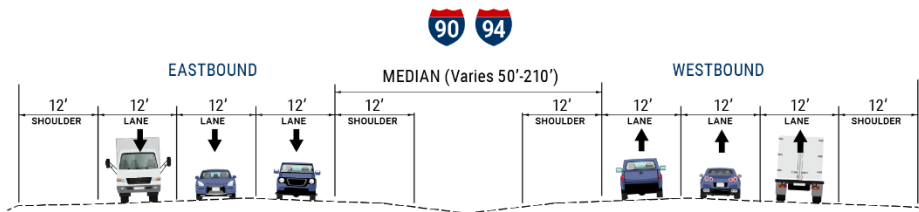
**I-39/90/94 from WIS 19 to Smokey Hollow Road**  
8-Lane Section



**I-39/90/94 from Smokey Hollow Road to I-39 I-90/94 Split**  
8-Lane Section



**I-39 from I-39 I-90/94 Split to Levee Road**  
4-Lane Section



**I-90/94 from I-39 I-90/94 Split to US 12/WIS 16**  
6-Lane Section

## **Appendix B. Design Exception Memoranda**



Date: May 7, 2024

To: David Schmidt, PE, Project Manager, WisDOT SWR  
Jenny Kobryn, PE, Project Supervisor, WisDOT SWR

From: Justin Arndt, PE, Design Project Manager, Kapur & Associates

Project ID: 1012-05-01                      1015-05-00

Project: Madison – Portage                      Wisconsin Dells – Portage  
STH 60 to IH 90/94                      USH 12/STH 16 to IH 39  
IH 39                      IH 90  
Columbia County                      Sauk & Columbia Counties

Subject: I-39 I-90/94 Split Interchange, SB to WB System Ramp Design Speed Justification

### Purpose

This technical memo documents the need for a design speed exception for the geometric layout of the I-39 SB to I-90/94 WB ramp in the I-39 I-90/94 Split interchange. The design speed exception is necessary due to the significant environmental impacts and utility and construction costs associated with meeting the required design standards for this system interchange ramp.

The design speed exception will be documented in the Design Study Report. However, without this exception, it is already known that significant environmental impacts would result with a higher design speed, so it is also being documented as part of the environmental process.

### Background

The I-39 I-90/94 Split interchange is a system interchange on the Interstate Highway System near Portage, Wisconsin. Interstates 39, 90 and 94 utilize the 3-legged interchange with I-39 being the north leg to provide access to Stevens Point and central Wisconsin, I-90 and I-94 running concurrently along the northwest leg to provide access to Wisconsin Dells and western Wisconsin, and I-39, I-90, and I-94 running concurrently along the south leg to provide access to Madison and southern Wisconsin.

Between 1993 and 1995, the existing I-90/94 service interchange with WIS 78 was rebuilt as a combination system and service interchange to provide free flow movements for the future I-39. Local service access was maintained to WIS 78 to the southwest, while free flow freeway ramps were provided to the northwest. The major freeway movement ramps – south leg to north leg and north leg to south leg – were designed to a 60-mph standard. The minor freeway movement ramps were designed as low speed ramps – the north leg to northwest leg ramp at 45-mph and the northwest leg to north leg ramp at 30-mph.

The I-39 I-90/94 Split interchange is being evaluated for potential reconstruction as part of a larger I-39/90/94 Planning Study from Madison to Wisconsin Dells.

### Existing Conditions & Environmental Consideration

The existing I-39 SB to I-90/94 WB system ramp meets a minimum design speed of 45-mph. The ramp also has minimal use as it has an existing Average Annual Daily Traffic (AADT) of 100 vehicles per day in 2021 and has a proposed design year AADT of 110 vehicles per day in 2050. These volumes are by far the lowest interstate to interstate system interchange ramp traffic volumes in Wisconsin.

Immediately north of the system interchange, I-39 travels through the Baraboo River and Wisconsin River floodplains. Under a 100-year storm event of either river, water flows over the interstate. The I-39/90/94 Planning Study is looking to address that by raising I-39. This includes removing the Cascade Mountain Road interchange and shifting Cascade Mountain Road access to the interstate system to the service interchange at WIS 78.

### Required Design Standard

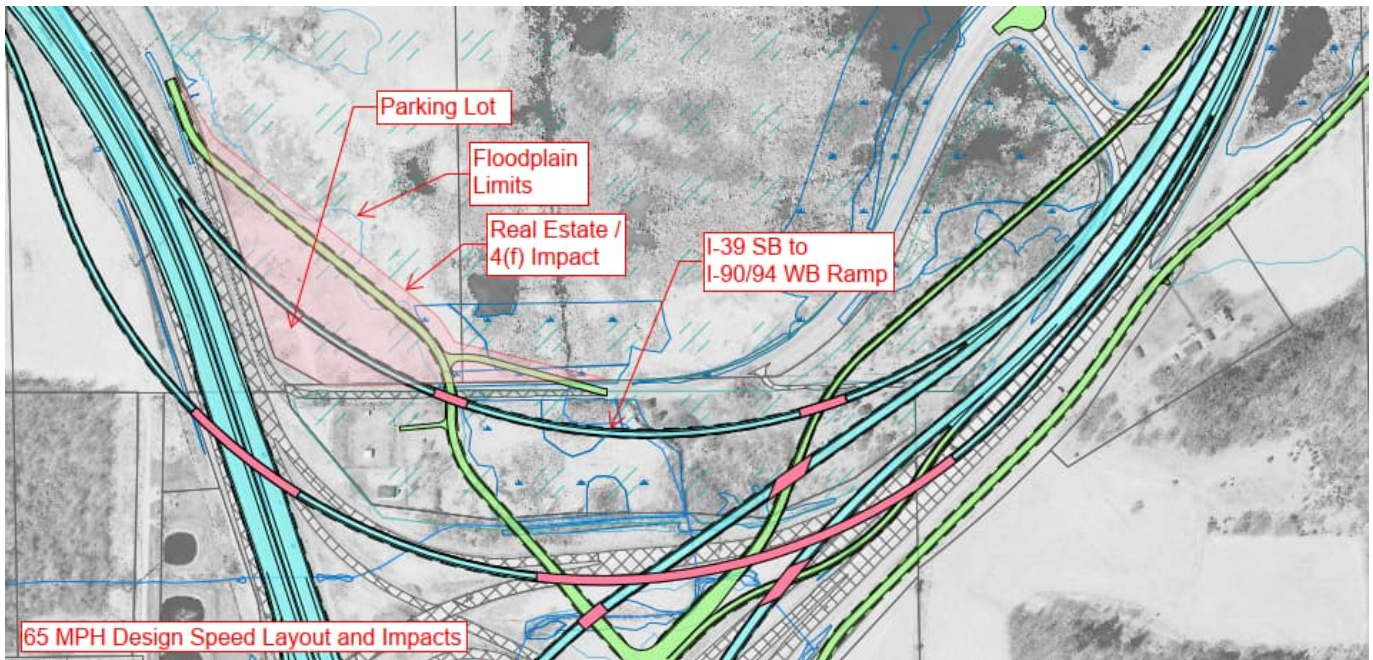
Wisconsin Department of Transportation's Facility Development Manual (WisDOT FDM) section 11-30-1.4.4 provides guidance for freeway ramp design speeds. For freeway-to-freeway directional ramps, the design speed should be within 10 mph of the mainline highway design speed. With the corridor using a 75-mph mainline freeway design speed, the directional ramps should be designed to a 65-mph design speed.

### Design Speeds Evaluated

Three design speeds alternatives – 65, 55 and 45 – were evaluated for the I-39 SB to I-90/94 WB system interchange ramp.

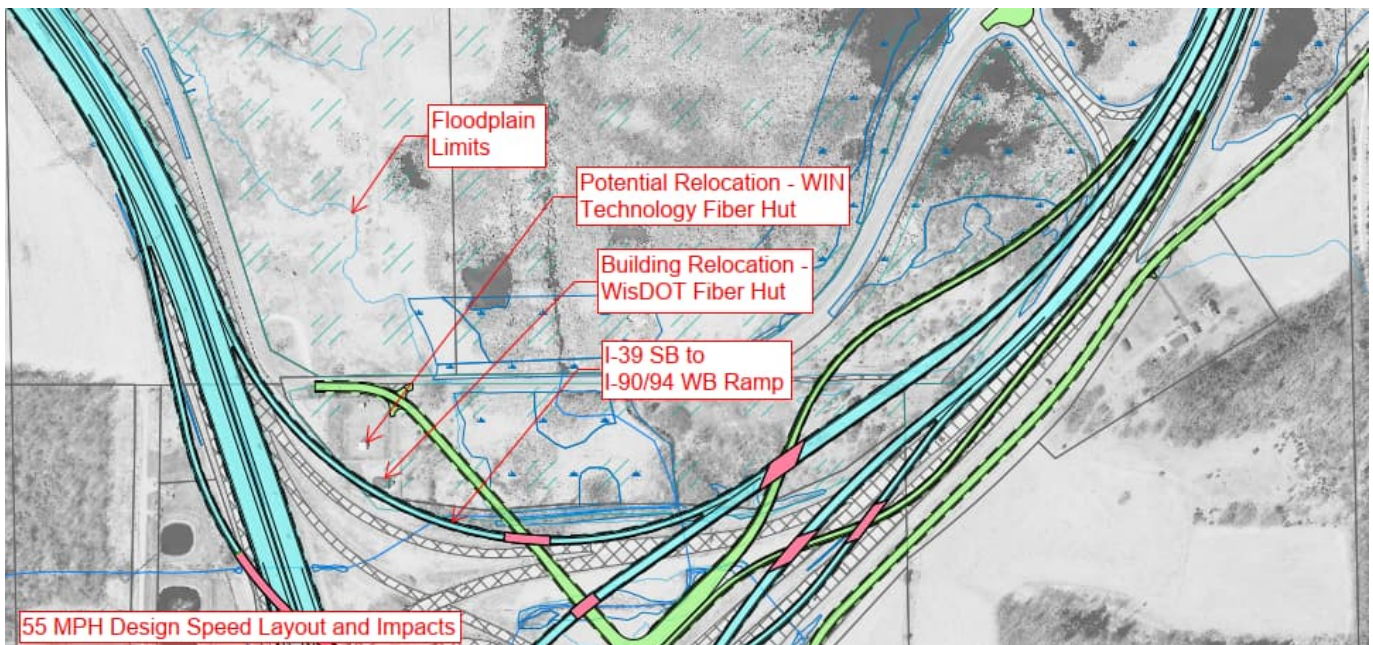
#### 65 mph

Due to the tight angle between the I-39 and I-90/94, meeting the 65-mph design speed pushes the ramp more than 300 feet north of its current location. In doing so, more of Cascade Mountain Road would need to be realigned than other alternatives, pushing impacts further north. The realignment of the ramp and Cascade Mountain Road would have substantial impact to the US Fish & Wildlife's Baraboo River Waterfowl Production Area.



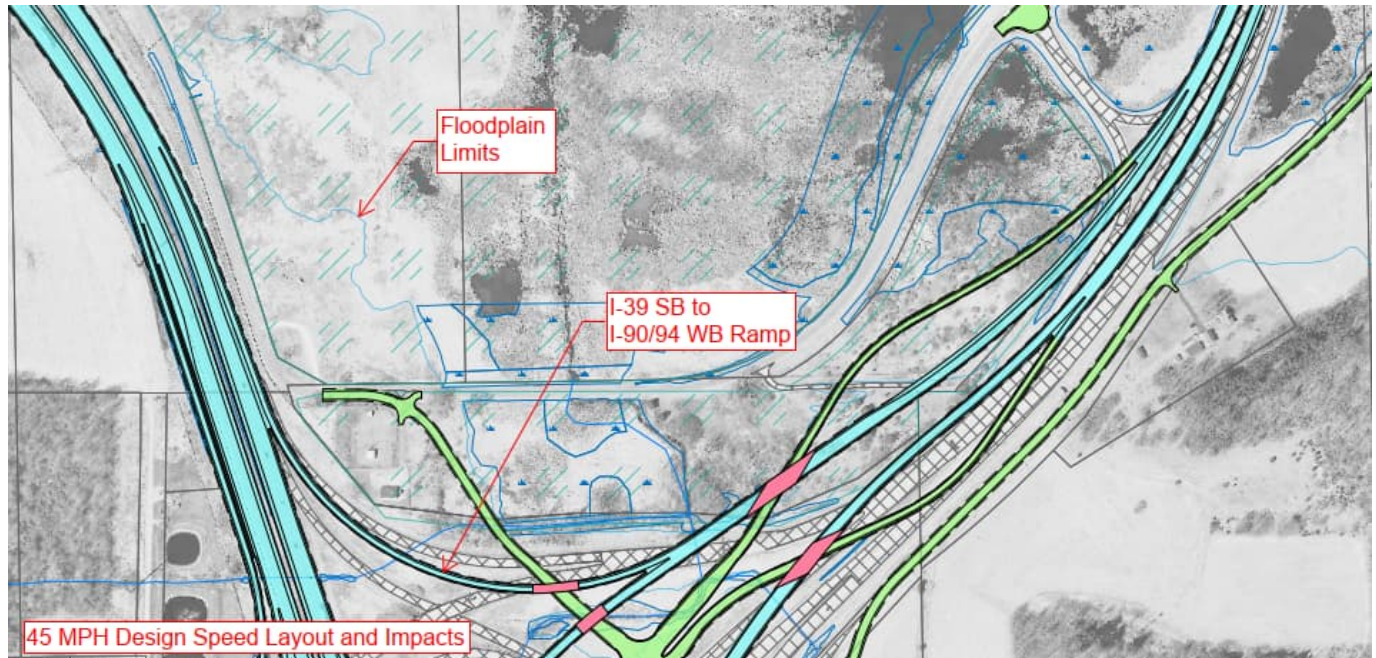
55 mph

Using a 55-mph design speed would push the ramp up to 100 feet north of its current location. This would require the relocation of WisDOT's fiber hut and potentially the WIN Technology fiber hut just north of WisDOT's as well.



### 45 mph

A 45-mph design matches the speed of the existing conditions. It would minimize impacts by keeping the I-39 SB to I-90/94 system interchange ramp inside the existing interchange footprint.



### Design Speeds Comparison

Meeting the 65-mph design standard has significantly greater environmental impacts compared to the other alternatives. It would impact 5.7 acres of the US Fish & Wildlife's Baraboo River Waterfowl Production Area, a 4(f) property, including the need to relocate a day-use parking lot. It would also more than double the amount of wetland impacts and infill an additional 5.6 acres of the Baraboo River floodplain. The construction cost would also be 26% more than the 45-mph design and 19% more than the 55-mph design.

The 55-mph design would have marginally higher wetland impacts and construction cost than the 45-mph design and would also require the relocation of WisDOT's fiber hut. In addition, if the existing 9-duct conduit must be relocated due to the relocation of WisDOT's facility, then the adjacent WIN Technologies fiber hut may need to be relocated as well.

In comparing the 3 design speeds, the 45-mph design has the least construction cost and environmental impacts, as highlighted in blue in the table below. It also matches the current design speed of the existing ramp.

| Design Speed<br>(MPH) | Construction Cost | Right-of-Way Required *<br>(Acres) | Relocations | Utility Relocations | 4(f) Impact (USFWS)<br>(Acres) | Wetland Impacts<br>(Acres) | Floodplain Impacts<br>(Acres) |
|-----------------------|-------------------|------------------------------------|-------------|---------------------|--------------------------------|----------------------------|-------------------------------|
| 45                    | \$9.1 Million     | 0.0                                | 0           | 0                   | 0.0                            | 2.3                        | 8.9                           |
| 55                    | \$9.7 Million     | 0.0                                | 0           | 1 or 2              | 0.0                            | 2.5                        | 8.9                           |
| 65                    | \$11.5 Million    | 5.7                                | 1           | 0                   | 5.7                            | 5.7                        | 14.5                          |

\* Includes 4(f) impact acreage

Conclusion

A 45-mph design speed for the I-39 SB to I-90/94 WB ramp in the I-39 I-90/94 Split interchange is an exception to WisDOT design standards. WisDOT has carefully considered the impacts and costs associated with the various design speed alternatives, as well as coordinated with WisDOT design standards experts and believes that the use of a 45-mph design speed is justified due to the extremely low proposed traffic volume of 110 vehicles per day, reduced environmental impacts to wetland, floodplain and 4(f) property, minimal utility impacts, and the lowest construction cost.

Date: May 7, 2024

To: David Schmidt, PE, Project Manager, WisDOT SWR  
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From: Justin Arndt, PE, Design Project Manager, Kapur & Associates

Project ID: 1012-05-01                      1015-05-00

Project: Madison – Portage              Wisconsin Dells – Portage  
STH 60 to IH 90/94                      USH 12/STH 16 to IH 39  
IH 39    IH 90  
Columbia County                          Sauk & Columbia Counties

Subject: I-39 I-90/94 Split Interchange, EB to NB System Ramp Design Speed Justification

### Purpose

This technical memo documents the need for a design speed exception for the geometric layout of the I-90/94 EB ramp to I-39 NB in the I-39 I-90/94 Split interchange. The design speed exception is necessary due to the significant environmental impacts and utility and construction costs associated with meeting the required design standards for this system interchange ramp.

The design speed exception will be documented in the Design Study Report. However, without this exception, it is already known that significant environmental impacts would result with a higher design speed, so it is also being documented as part of the environmental process.

### Background

The I-39 I-90/94 Split interchange is a system interchange on the Interstate Highway System near Portage, Wisconsin. Interstates 39, 90 and 94 utilize the 3-legged interchange with I-39 being the north leg to provide access to Stevens Point and central Wisconsin, I-90 and I-94 running concurrently along the northwest leg to provide access to Wisconsin Dells and western Wisconsin, and I-39, I-90, and I-94 running concurrently along the south leg to provide access to Madison and southern Wisconsin.

Between 1993 and 1995, the existing I-90/94 service interchange with WIS 78 was rebuilt as a combination system and service interchange to provide free flow movements for the future I-39. Local service access was maintained to WIS 78 to the southwest, while free flow freeway ramps were provided to the northwest. The major freeway movement ramps – south leg to north leg and north leg to south leg – were designed to a 60-mph standard. The minor freeway movement ramps were designed as low speed ramps – the north leg to northwest leg ramp at 45-mph and the northwest leg to north leg ramp at 30-mph.

The I-39 I-90/94 Split interchange is being evaluated for potential reconstruction as part of a larger I-39/90/94 Planning Study from Madison to Wisconsin Dells.

### Existing Conditions & Environmental Consideration

The existing I-90/94 EB ramp to I-39 NB system ramp is a loop ramp and meets a minimum design speed of 30-mph. The ramp also has minimal use as it had an existing Average Annual Daily Traffic (AADT) of 470 vehicles per day in 2021 and has a proposed design year AADT of 550 vehicles per day in 2050. These volumes are one of the lowest interstate to interstate system interchange ramp traffic volumes in Wisconsin.

Immediately north of the system interchange, I-39 travels through the Baraboo River and Wisconsin River floodplains. Under a 100-year storm event of either river, water flows over the interstate. The I-39/90/94 Planning Study is looking to address that by raising I-39. This includes removing the Cascade Mountain Road interchange and shifting Cascade Mountain Road access to the interstate system to the service interchange at WIS 78.

### Required Design Standard

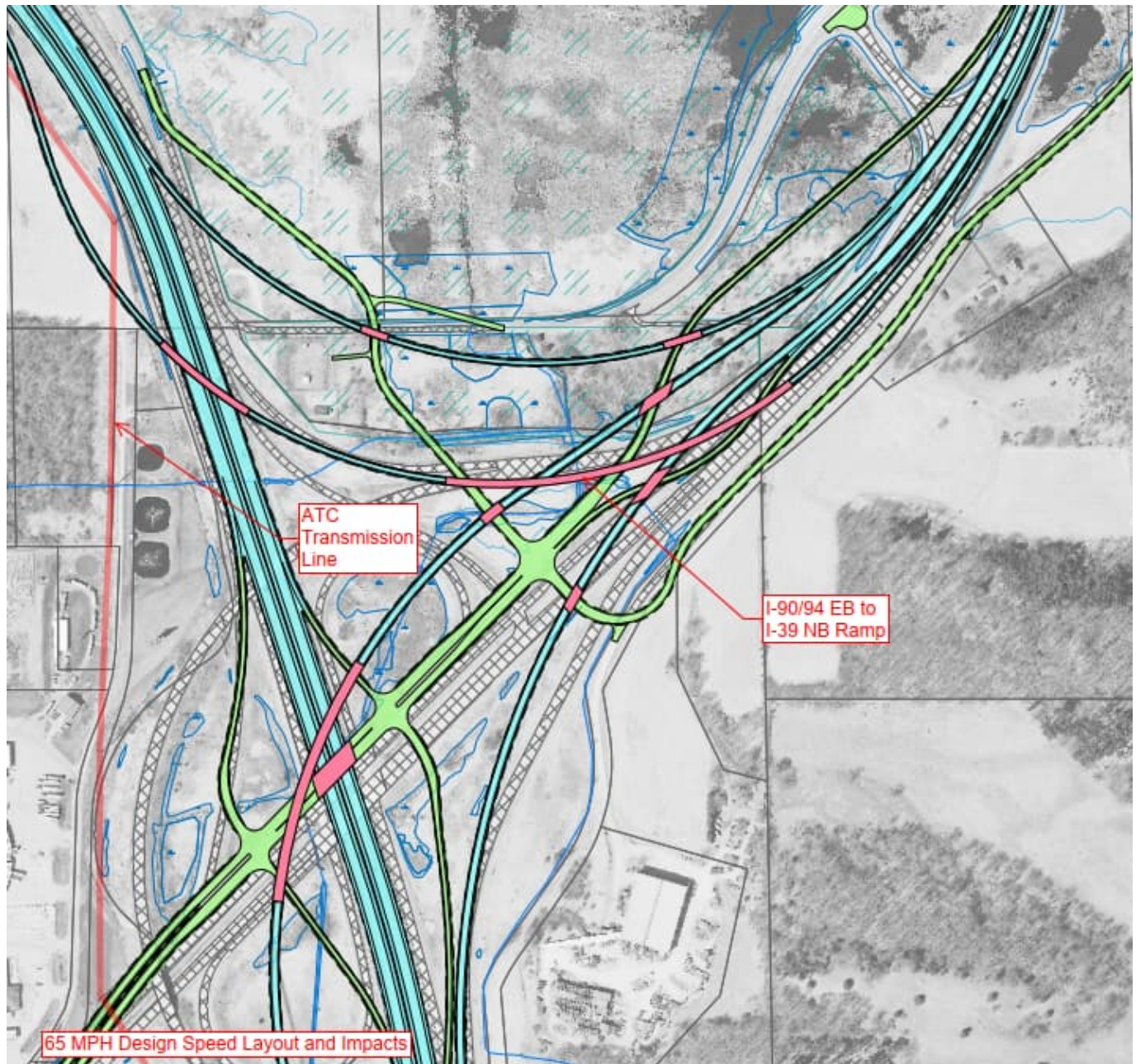
Wisconsin Department of Transportation's Facility Development Manual (WisDOT FDM) section 11-30-1.4.4 provides guidance for freeway ramp design speeds. For freeway-to-freeway directional ramps, the design speed should be within 10 mph of the mainline highway design speed. With the corridor using a 75-mph mainline freeway design speed, the directional ramps should be designed to a 65-mph design speed.

### Design Speeds Evaluated

Three design speeds alternatives – 65, 55 and 45 – were evaluated for the I-90/94 EB to I-39 NB system interchange ramp.

65 mph

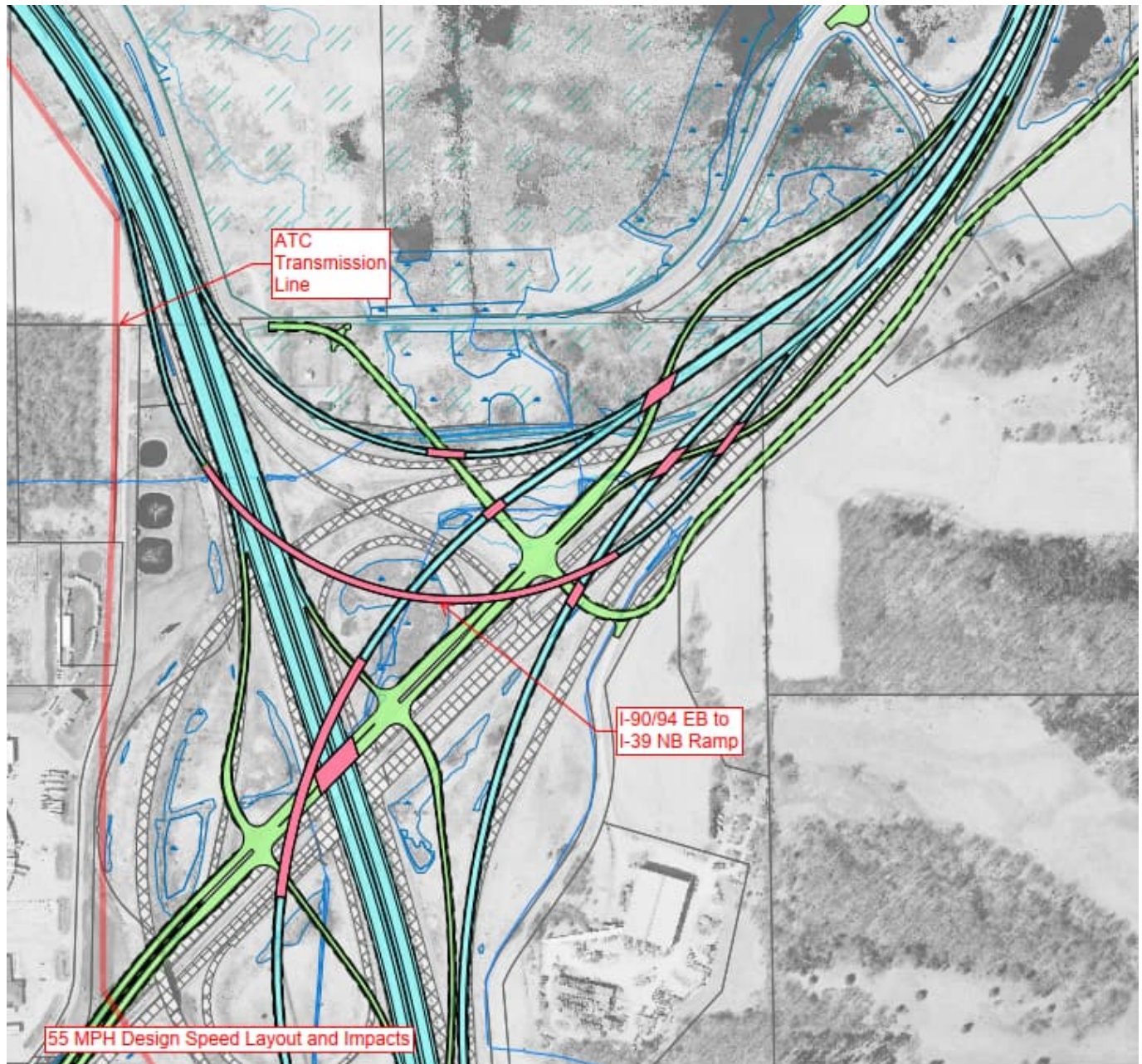
Due to the tight angle between the I-39 and I-90/94, meeting the 65-mph design speed pushes the ramp north of the core of the system interchange. To meet design standards for all the roadways and ramps in the interchange, the I-90/94 EB to I-39 NB system interchange ramps would need to cross over 6 roadways - I-90/94, Cascade Mountain Road, I-39 SB, the I-39 SB exit ramp to WIS 78, I-39 NB, and the I-39 NB entrance ramp from WIS 78. This would elevate the ramp to more than 50 feet above the existing ground. Due to this high ramp elevation, the ATC transmission line would need to be raised or relocated.





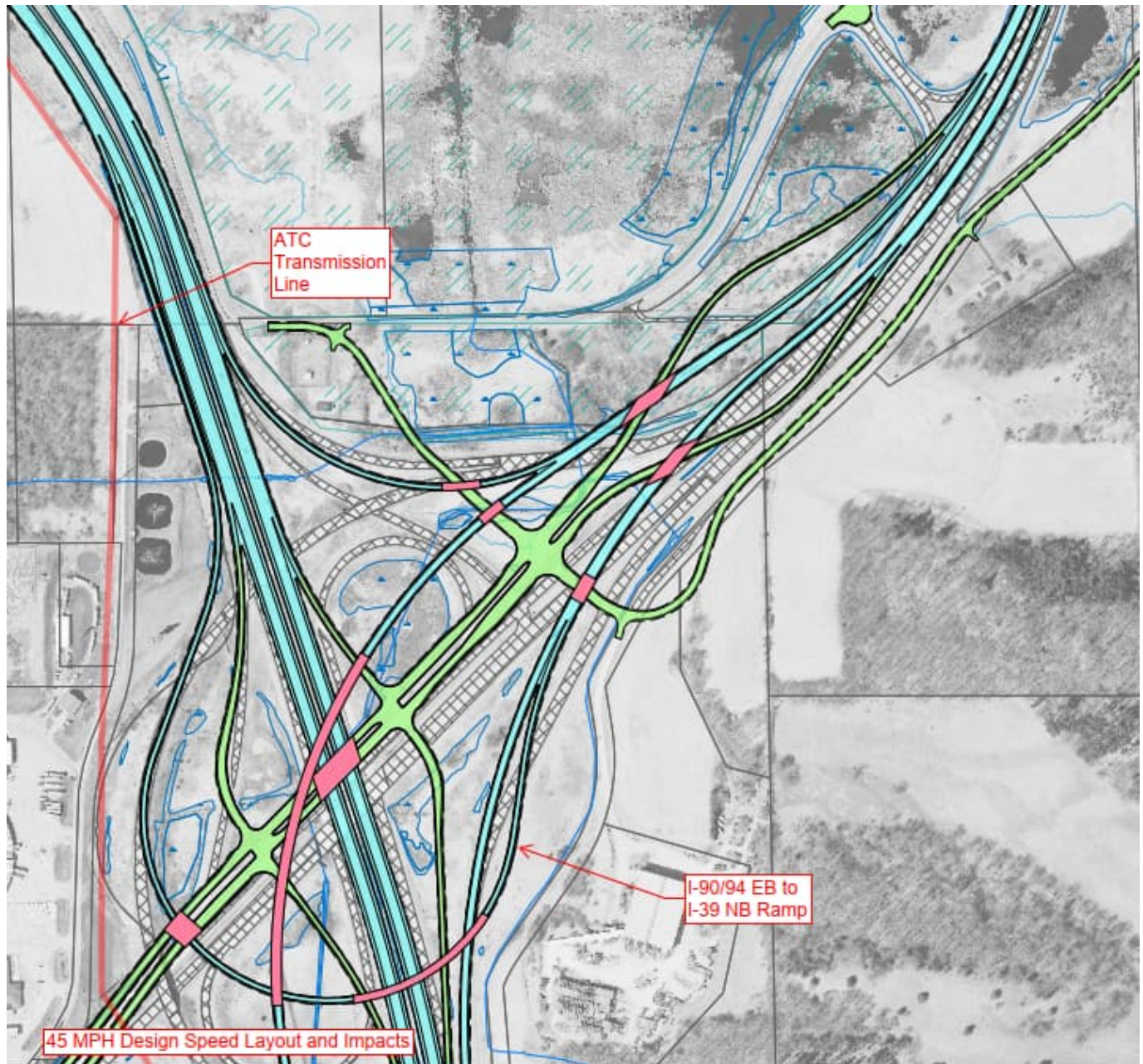
55 mph

Similar to the 65-mph alternative, the tight angle between the I-39 and I-90/94, the 55-mph design speed pushes the ramp north of the core of the system interchange. To meet design standards for all the roadways and ramps in the interchange, the I-90/94 EB to I-39 NB system interchange ramps would need to cross over 6 roadways - I-90/94, I-39 SB, WIS 78, Cascade Mountain Road, I-39 NB, and the I-39 NB entrance ramp from WIS 78. This would elevate the ramp to more than 65 feet above the existing ground.



45 mph

A 45-mph design exceeds the design speed of the existing conditions. The lower speed allows the ramp to maintain a lower profile by crossing under WIS 78 and I-39 SB before crossing over the I-90/94 entrance ramp from WIS 78, I-90/94, the I-90/94 exit ramp to WIS 78, I-39 NB, Cascade Mountain Road and the I-39 NB entrance ramp from WIS 78. The maximum profile elevation of the ramp would be 30 feet above existing ground. It minimizes real estate impacts by keeping the I-90/94 EB to I-39 NB system interchange ramp almost entirely inside the existing interchange footprint.



Design Speeds Comparison

Meeting the 65-mph design standard would have more than double the real estate impacts as compared to the other alternatives. It would infill an additional 0.8 acres of the Baraboo River floodplain but have less wetland impact than the 45-mph alternative. The ATC transmission line would have to be relocated, or the line would have to be raised. The construction cost would also be 57% more than the 45-mph design and 5% more than the 55-mph design.

The 55-mph design would be marginally better environmentally and cost wise compared to the 65-mph design. It would also not need an ATC relocation and require less than half of the real estate.

In comparing the 3 design speeds, the 45-mph design has the least construction cost, real estate required, and relocations and floodplain impacts, as highlighted in blue in the table below. It does have the most wet land impacts by 0.4 acres.

| Design Speed | Construction Cost | Right-of-Way Required | Utility Relocations | Wetland Impact | Floodplain Impact |
|--------------|-------------------|-----------------------|---------------------|----------------|-------------------|
| (MPH)        | (in Millions)     | (Acres)               |                     | (Acres)        | (Acres)           |
| 45           | \$17.0            | 1.3                   | 0                   | 0.9            | 2.1               |
| 55           | \$26.7            | 2.1                   | 0                   | 0.5            | 2.1               |
| 65           | \$28.1            | 4.7                   | 1                   | 0.5            | 2.9               |

Conclusion

A 45-mph design speed for the I-90/94 EB to I-39 NB ramp in the I-39 I-90/94 Split interchange is an exception to WisDOT design standards. WisDOT has carefully considered the impacts and costs associated with the various design speed alternatives, as well as coordinated with WisDOT design standards experts and believes that the use of a 45-mph design speed is justified due to the very low proposed traffic volume of 550 vehicles per day, lowest real estate cost, similar environmental impacts, minimal utility impacts, and lowest construction cost.