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2. Alternatives

This section summarizes the alternatives developed and analyzed during WisDOT’s alternatives screening process. Appendix J includes the alternatives screening document that is summarized in this section. WisDOT advanced alternatives meeting the study purpose and need for further evaluation and screening. WisDOT presented the alternatives at public involvement meetings and evaluated them based on purpose and need factors as well as preliminary environmental impacts, agency and public input, and projected construction cost, see Figure 2-1.

Figure 2-1: How Alternatives are Screened



Section 2.1 describes initial alternatives considered and dismissed. Section 2.2 and Section 2.3 summarize freeway and interchange alternatives evaluated and further screened based on how well they meet purpose and need and other screening criteria. Section 2.2 and Section 2.3 also identify WisDOT’s recommended preferred alternatives.

2.1. Initial Alternatives Considered

Early in the evaluation process, WisDOT evaluated and dismissed four alternatives from further consideration that do not meet one or more study needs.

2.1.1. No Build Alternative

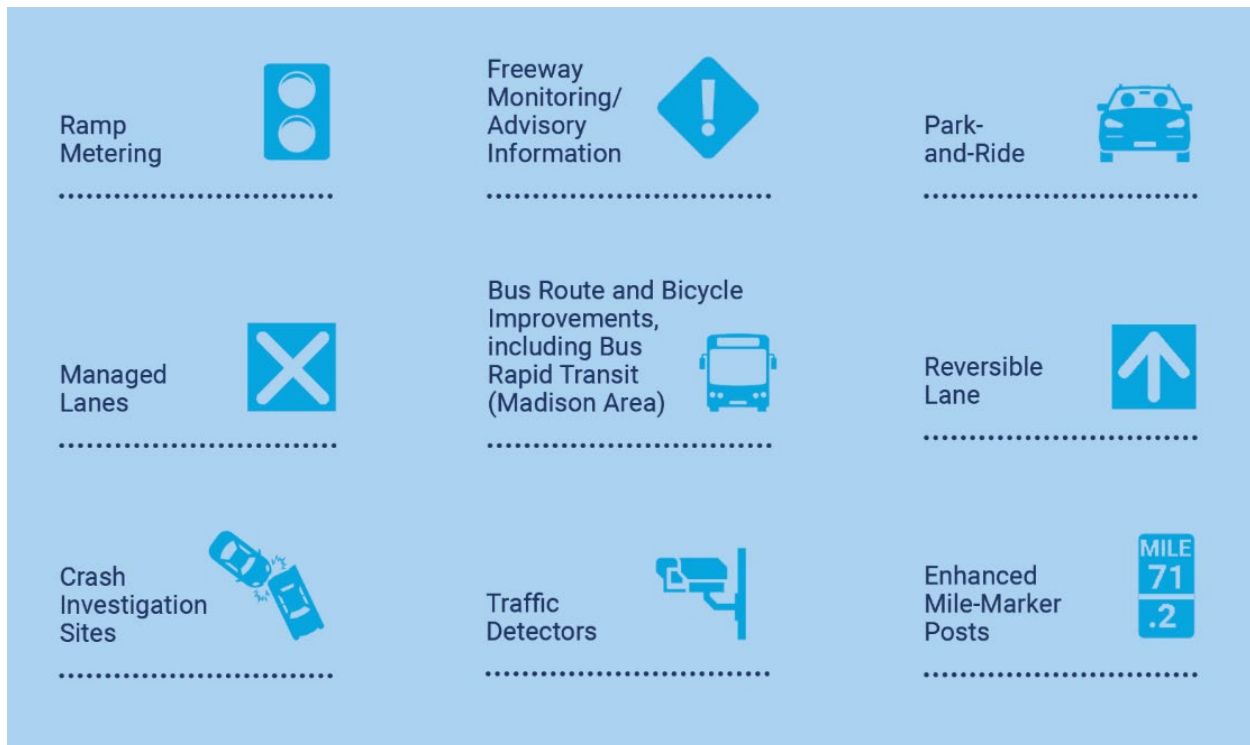
The No Build alternative assumes no improvements to the existing I-39/90/94 freeway or interchanges. This alternative would not reconstruct the Interstate or interchanges to modern design standards. This alternative also assumes the separate Wisconsin River Bridge replacement and the WIS 60 Interchange 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 the build alternatives are compared. WisDOT is also analyzing a No Build alternative at the County V Interchange, which is discussed further in Section 2.3.8.

2.1.2. 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 2-2. 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, but WisDOT may include several of these measures in other build alternatives. Some anticipated measures to be included are freeway monitoring and advisory information, crash investigation sites and law enforcement pads, traffic detectors and enhanced mile-marker posts. Bicycle and pedestrian improvements are included as noted in Section 3.2.2.

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



2.1.3. Off Alignment (East Reliever)

Between 2014 and 2017, WisDOT evaluated alternatives for an off alignment, or east reliever route.¹ The alternatives bypassed I-39/90/94 by constructing additional route(s) to the east of the Interstate and 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 had substantially greater impacts than build alternatives on the existing Interstate alignment and did not meet the study purpose and need factors.

2.1.4. 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.

2.2. 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 flood minimization study completed as part of this study, see Section 3.13.2. The analysis recommends raising portions of I-39 and I-90/94 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 evaluated three modernization alternatives:

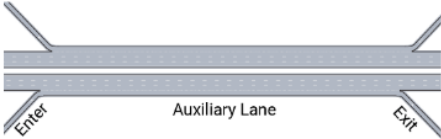
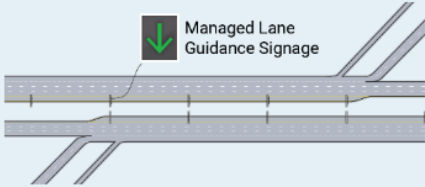
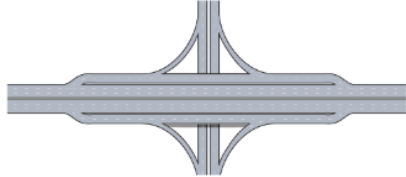
- o Modernization of Existing Travel Lanes
- o Modernization, plus Added General-Purpose Lane
- o Modernization Hybrid

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 2-3. All modernization alternatives are generally within the existing right of way but, depending

¹ 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. <https://wisconsindot.gov/Documents/projects/by-region/sw/399094/i399094study.pdf> Accessed Dec. 5, 2023.

on specific site conditions and alternative design, additional impacts outside the right of way could occur.

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

	ALTERNATIVE		
	Modernization of Existing Travel Lanes	Modernization + Added General-Purpose Lane	Modernization Hybrid
 <p>AUXILIARY LANES</p> <p>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>MANAGED LANES</p> <p>Managed lanes allow travel on roadway shoulders during periods of peak travel demand.</p>			✓
 <p>COLLECTOR-DISTRIBUTOR (C-D) LANES</p> <p>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>		✓	✓

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.

WisDOT retained the two remaining modernization alternatives for evaluation in Section 3.

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 12-foot travel lane during heavy travel periods with a 6-foot shoulder. As evaluated in the screening analysis, the preliminary 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 recommended both the Modernization Plus Added General-Purpose Lane and Modernization Hybrid alternatives for further study.

2.2.1. 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 add a general-purpose lane in each direction along the present freeway alignment throughout a majority of the study 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 2-4 shows the number of interstate general-purpose lanes for this alternative and figures in Appendix A show typical sections.

Figure 2-4: Modernization Plus Added General-Purpose Lane; General-Purpose Lanes



2.2.2. 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 2-5); 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 (Connected vehicles use technology to communicate with nearby vehicles and infrastructure. Automated vehicles have some level of automation to assist or replace human control.). By the year 2050, WisDOT anticipates the managed lanes would be open for about 40% of daylight hours on weekdays and for all daylight hours on weekends.

Figure 2-5: Modernization Hybrid; General-Purpose Lanes



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/High Crossing Boulevard interchanges. Auxiliary lanes are proposed between the US 12/18 and I-94/WIS 30 interchanges and between the US 151/High Crossing Boulevard and WIS 19 interchanges.

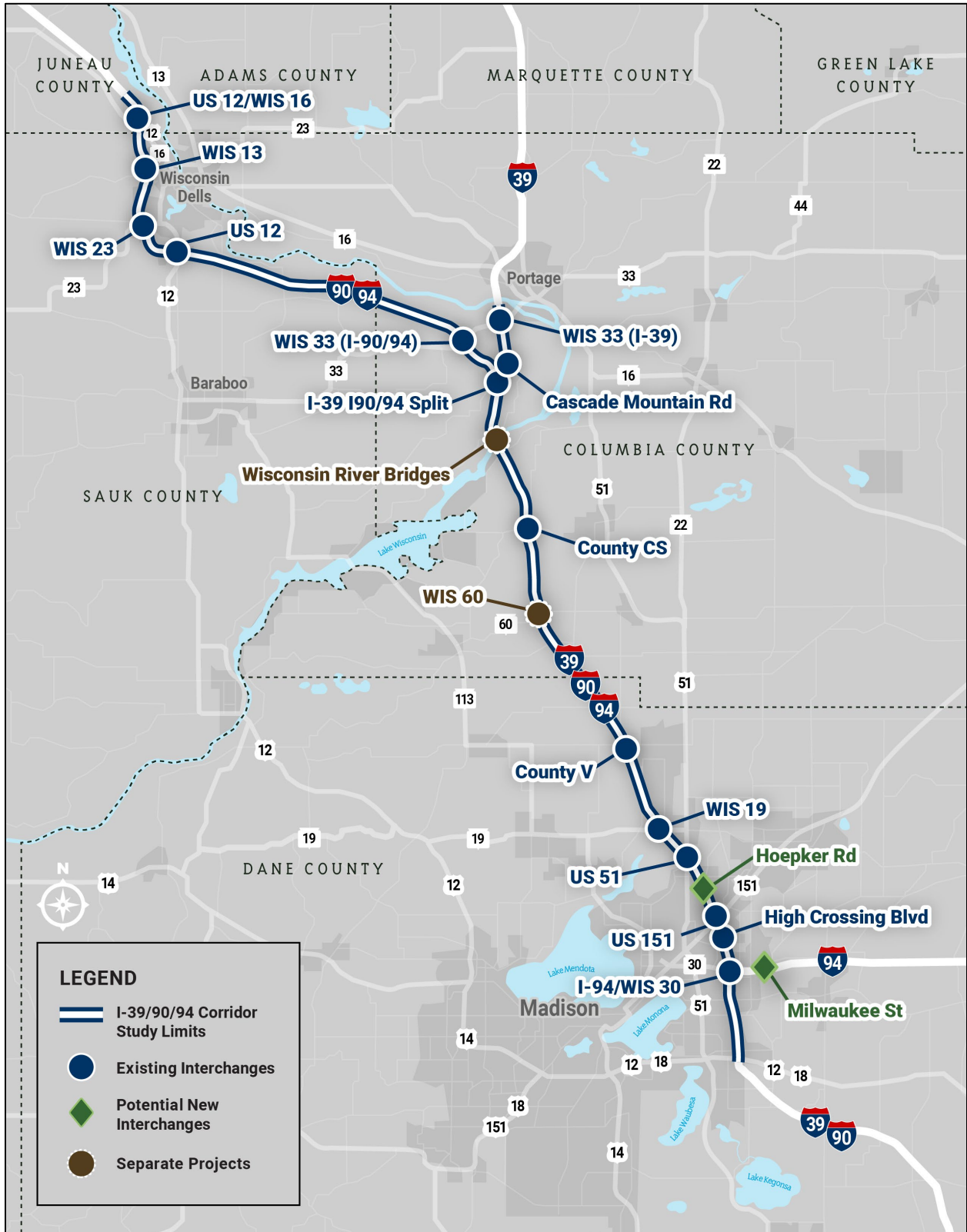
A general-purpose lane would be added to the Interstate from WIS 19 to the I-39 I-90/94 Split and to I-90/94 from the I-39 I-90/94 Split to the US 12/WIS 16 interchange. I-39 from the I-39 I-90/94 Split to

Levee Road would maintain the same number of lanes as the existing condition. Figure 2-5 shows the number of Interstate general-purpose lanes for this alternative and figures in Appendix A show typical sections.

2.3. Build Alternatives – Interchanges

The study corridor includes 15 existing interchanges (see Figure 2-6) with a range of design deficiencies that contribute to poor traffic operations and crashes. The study does not include the WIS 60 interchange, which is reconstructed as a separate project. WisDOT evaluated multiple conceptual alternatives at each of the 15 interchanges. Two potential new interchanges are also evaluated. Similar to the Interstate alternatives, WisDOT evaluated interchange alternatives based on how well they meet purpose and need, minimize impacts, address public and agency input and costs. The following sections summarize alternatives considered for each interchange in the study corridor, recommends preferred alternatives, as well as alternatives recommended for further study in Section 3. Plan views in Appendix A show the recommended preferred interchange alternatives, as well as other alternatives recommended for further study.

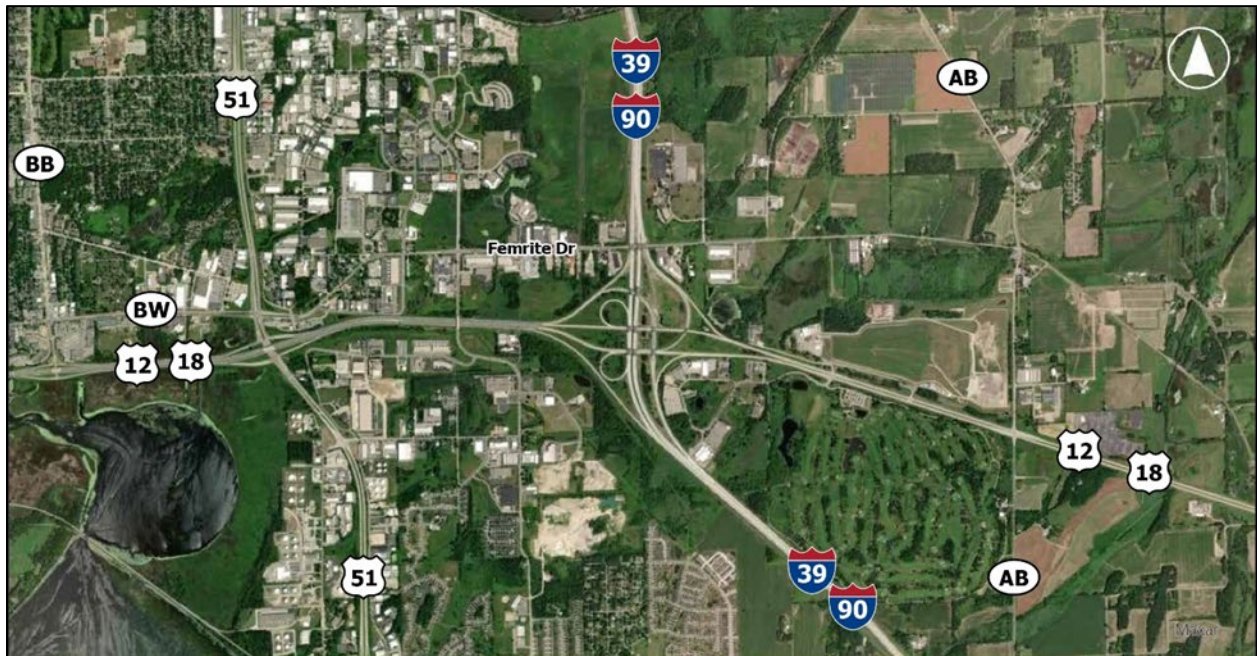
Figure 2-6: Existing and Potential New Interchanges



2.3.1. US 12/18 Interchange

In 2021, WisDOT partially modified the US 12/18 Interchange, see Figure 2-7. While the US 12/18 Interchange is included in the study corridor, WisDOT is evaluating alternatives for re-construction in a separate Madison Beltline Study.² 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 2-7: US 12/18 Interchange



2.3.2. I-94/WIS 30 Interchange

The I-94/WIS 30 Interchange is a four-legged system interchange (see text box on page **Error! Bookmark not defined.**) 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:

- o Full Modernization #1
- o Full Modernization #2

² Wisconsin Department of Transportation. Madison Beltline Study. <https://wisconsindot.gov/Pages/projects/by-region/sw/madisonbeltline/default.aspx>. Accessed Nov. 21, 2023.

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.

The environmental impacts are similar for the two alternatives. Both alternatives would relocate the Dane County highway maintenance building located between the I-39/90 northbound and southbound lanes on the north side of the interchange. The two alternatives would also operate very similarly. 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. The Full Modernization #2 alternative achieves the study purpose and need at a nearly identical cost as Full Modernization #1. WisDOT recommends the Full Modernization Alternative #2 as the preferred alternative.

Full Modernization Alternative #2 (Recommended Preferred Alternative)

Compared to the Full Modernization #1, 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 2-8: I-94/WIS 30 – Full Modernization #2



2.3.3. Proposed New Milwaukee Street Interchange

Milwaukee Street dead ends near East Hill Parkway and does not cross I-94. The city of Madison requested WisDOT to 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 at the proposed Milwaukee Street extension

- o Partial Cloverleaf
- o Diamond

Both alternatives are compatible with the 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.

Both alternatives have similar environmental impacts, including relocating a barn and severing a farm operation north of I-94. The primary difference between the Partial Cloverleaf and Diamond 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 noting it would increase traffic and decrease quality of life associated with new Interstate access. WisDOT recommends the Partial Cloverleaf as the preferred 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 2-9.

Figure 2-9: Milwaukee Street – Partial Cloverleaf Interchange



2.3.4. 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 described in Section 1.4.

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).

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

- o Directional
- o Loop Ramp Free Flow
- o East Washington Avenue – South
- o East Washington Avenue – North
- o 6-Lane High Crossing Boulevard
- o East Washington Avenue – Freeway Connection

All the alternatives have similar environmental impacts. 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.

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 2-13. 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 2-10: US 151/High Crossing Boulevard – Directional Interchange



2.3.5. 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:

- o Shifted Diamond
- o Partial Cloverleaf

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.

Most environmental impacts are similar between the 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.

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 as the preferred 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 2-11. 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 2-11: Hoepker Road – Shifted Diamond Interchange



2.3.6. 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:

- o Partial Cloverleaf
- o Diverging Diamond

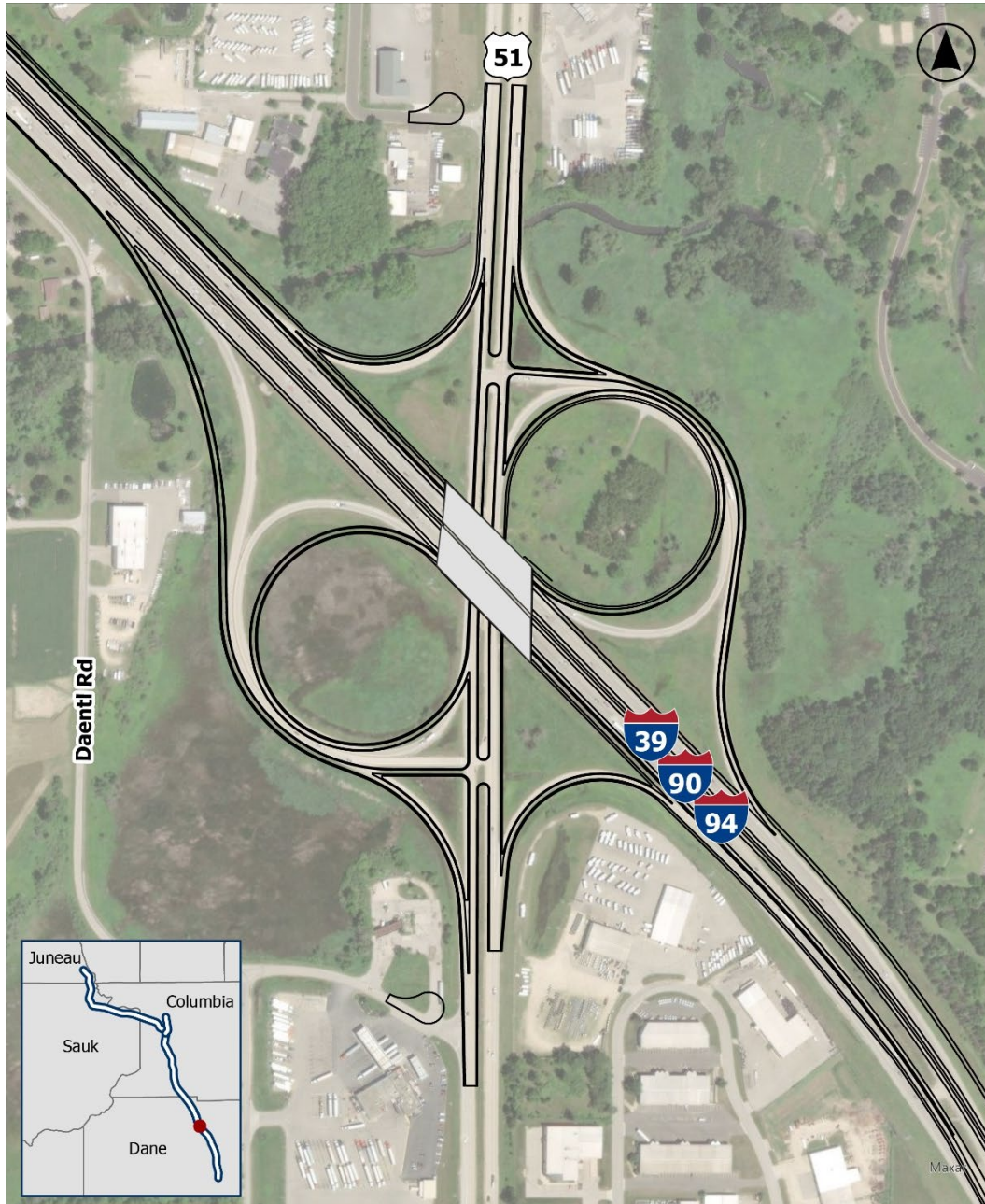
In order to improve traffic operations, both alternatives would close access to US 51 at North American Lane and Daentl Road. Diverted traffic would use existing intersections (about a quarter mile north and south of the interchange) to access US 51.

The Diverging Diamond alternative has a smaller footprint and slightly fewer environmental impacts than the Partial Cloverleaf alternative. 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 as the preferred alternative.

Partial Cloverleaf (Recommended Preferred Alternative)

This alternative corrects substandard ramp lengths, which can be addressed by reconstructing the interchange in a similar footprint. The alternative 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 2-12. 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 2-12: US 51 – Partial Cloverleaf Interchange



2.3.7. WIS 19 Interchange

The WIS 19 Interchange is next to a railroad crossing that typically has one train during daytime hours, one train during nighttime hours, and one switching train per day. Closely spaced intersections along WIS 19 have multiple conflict points that reduce safety and lead to poor traffic operations. 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:

- o WIS 19 over Railroad
- o Northbound Flyover
- o U-Ramp
- o 6-lane WIS 19

Environmental impacts among the four alternatives are generally similar. 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.

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.

U-Ramp (Recommended Preferred Alternative)

This alternative routes eastbound to northbound traffic onto I-39/90/94 via a U-Ramp, see Figure 2-13. The alternative maintains WIS 19 under the Interstate and the U-ramp crosses under extended Interstate bridges over the railroad, removing a turn movement on WIS 19. 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. This alternative increases ramp lengths to accommodate heavy northbound to westbound traffic volumes. The northbound exit ramp provides proper spacing between the exit from the Interstate and the ramp split for traffic exiting to eastbound and westbound WIS 19.

Figure 2-13: WIS 19 – U-Ramp



2.3.8. 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 if the development west of the interchange does not move forward:

- o Diamond
- o Diverging Diamond

The Diamond alternative would be constructed within existing right of way and would impact about 1.3 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. The Diamond alternative can accommodate traffic demands as currently provided by regional travel models from the MPO and is less costly than the Diverging Diamond alternative. WisDOT recommends the Diamond alternative for further study should the development west of the interchange does not move forward.

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 2-14.

Figure 2-14: County V – Diamond Interchange



2.3.9. 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 freeway traffic and can cause backups on the Interstate during heavy travel times such as summer Sunday afternoons.

WisDOT evaluated two alternatives to address substandard design and safety issues:

- o Partial Cloverleaf
- o Diamond

The environmental impacts of the two alternatives are similar, but the Diamond alternative requires 500 fewer feet of impact to combined ephemeral stream and constructed stormwater drainage swales and weirs between the northbound and southbound lanes, compared to the Partial Cloverleaf alternative. The Partial Cloverleaf alternative does not address safety as well as the Diamond alternative with little difference in environmental impact. WisDOT recommends the Diamond alternative as the preferred alternative.

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 2-15.

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 2-15: County CS – Diamond Interchange



2.3.10. 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:

- o High Build
- o Low Build

WisDOT's flood minimization study 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 and relocate access to the area via WIS 78 ramps that are embedded into the interchange.

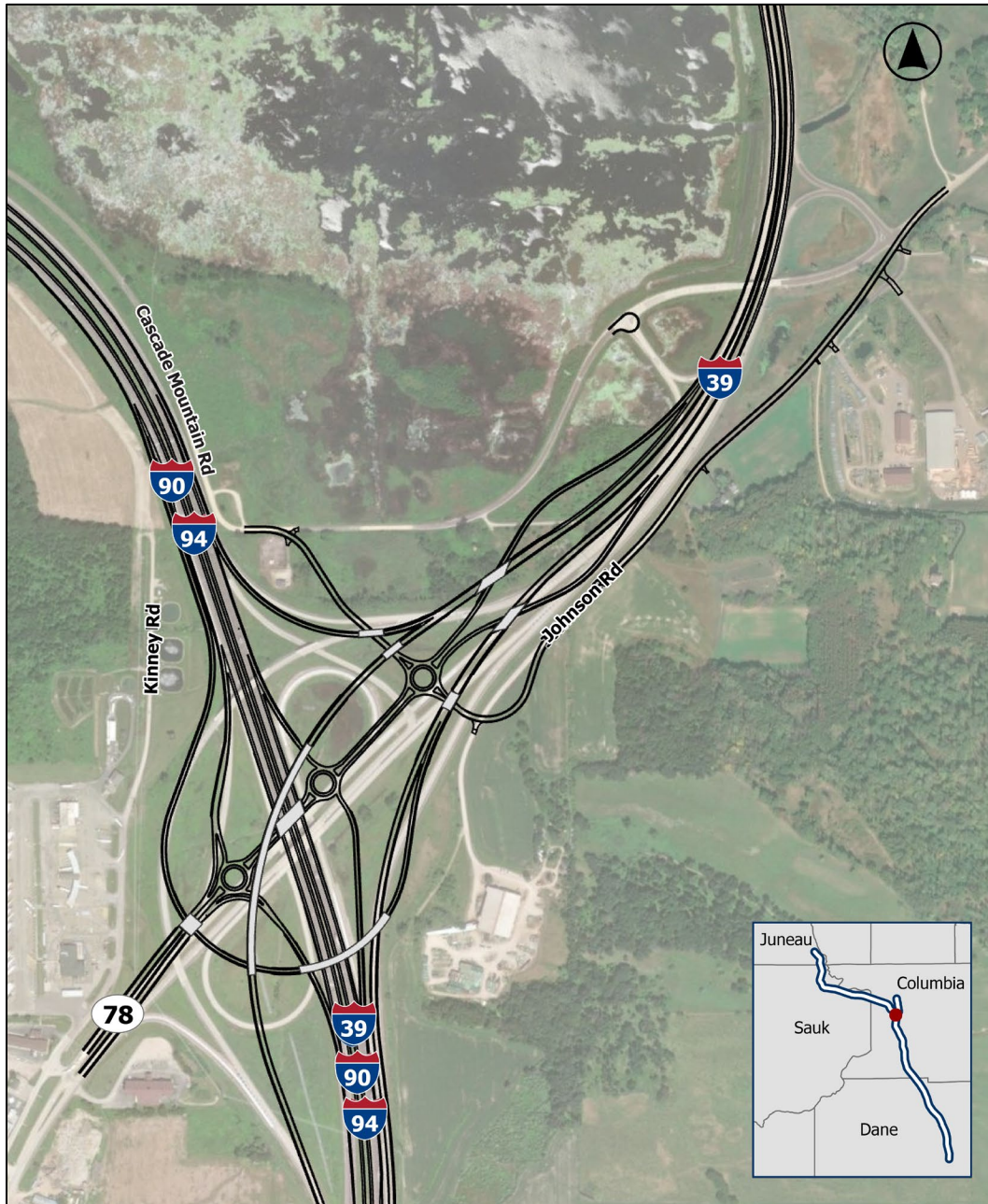
Both the High Build and Low Build alternatives perform nearly identically as the only major difference between them is the I-90/94 eastbound to I-39 northbound movement. Under the High Build alternative, the eastbound to northbound movement is carried via a flyover structure making the interchange one level higher than any bridge in the Low Build alternative. The Low Build alternative does not include a flyover structure and requires slightly more right of way to accommodate the same movement, but does not affect additional Section 4(f) properties, wetlands, or floodplains compared to the High Build alternative.

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 is lower than the High Build alternative. WisDOT recommends the Low Build alternative as the preferred alternative.

Low Build (Recommended Preferred Alternative)

This alternative reconstructs the existing interchange as a 3-level interchange in a similar footprint, see Figure 2-16. The I-90/94 eastbound to I-39 northbound movement is constructed with over or underpass bridges rather than creating a flyover ramp to connect the two interstates, which is a typical system interchange design standard. WisDOT is requesting this design exception since only 490 vehicles per day currently utilize this ramp. WisDOT is also requesting a design exception for the I-39 southbound movement to westbound I-90/94, which has only 130 vehicles per day. Appendix K includes memoranda regarding design exceptions in the interchange.

Figure 2-16: I-39 I-90/94 Split – Low Build



2.3.11. 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, 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:

- o Partial Cloverleaf
- o Diamond

Both alternatives assume implementing WisDOT's recommendations from its flood minimization study to reduce flood risk. The recommendation would on average, raise I-39 about 3 to 4 feet and widen the I-39 bridge over the Baraboo River to 500 feet.

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.

Both alternatives similarly meet the study purpose and need factors, have similar construction costs and environmental impacts. A diamond interchange is the most favored interchange type for WisDOT as they help prevent wrong-way drivers and meet driver expectations. The Diamond alternative received better feedback at public meetings and requires less land from the Pine Island State Wildlife Area. Additional design refinements during preliminary engineering could further reduce environmental impacts. WisDOT recommends the Diamond alternative as the preferred alternative.

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 line of sight for improved driver reaction time, see Figure 2-17. This alternative would also add a divided median to protect WIS 33 left turning traffic onto entrance ramps.

Figure 2-17: WIS 33 at I-39 – Diamond Interchange



2.3.12. 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:

- o Partial Cloverleaf
- o Diamond

Both alternatives assume implementing WisDOT's recommendations from its flood minimization study, which would raise I-90/94 about 3 feet to reduce flood risk.

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.

While both alternatives similarly meet the study purpose and need factors, WisDOT recommends the Partial Cloverleaf as the preferred alternative as it has lower environmental impacts by avoiding over 11 acres of wetland and floodplain impacts and is the least costly alternative.

Partial Cloverleaf (Recommended Preferred Alternative)

This alternative corrects substandard ramp curves, as well as tapered entrance and exits, which can be addressed by reconstructing the interchange in a similar footprint. Ramp curves would be realigned to improve line of sight and 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 2-18.

Figure 2-18: WIS 33 at I-90/94 – Partial Cloverleaf Interchange



2.3.13. 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:

- o Diverging Diamond
- o Diamond
- o Partial Free-Flow

All three alternatives have very similar environmental impacts. While all three alternatives meet purpose and need, the Diverging Diamond alternative addresses safety better than the other two alternatives. The Diamond alternative does not address existing and future traffic demands as well as the other two alternatives. The Partial Free-Flow alternative is more costly because of more infrastructure required to accommodate acceleration lanes on bridges. The Partial Free-Flow alternative also requires 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 as the preferred alternative.

Diverging Diamond (Recommended Preferred Alternative)

This alternative reconstructs the existing interchange in a smaller footprint, see Figure 2-19. The alternative provides free flow left turns to entrance ramps and ramp alignments improve line of sight 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 would better match driver expectations.

Figure 2-19: US 12 – Diverging Diamond Interchange



2.3.14. 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:

- o Diamond
- o Diverging Diamond

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. The higher left-turn capacity of a diverging diamond configuration is not required to meet existing and future traffic demand. WisDOT recommends the Diamond as the preferred alternative.

Diamond (Recommended Preferred Alternative)

This alternative corrects substandard curves, as well as a short acceleration lane on the eastbound I-90/94 entrance ramp. Improvements can be addressed by reconstructing the interchange in a similar but slightly smaller footprint, see Figure 2-20. Ramp alignments improve line of sight for improved driver reaction time.

Figure 2-20: WIS 23 – Diamond Interchange



2.3.15. 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. A narrow shoulder on the eastbound exit ramp limits the line of sight. 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.

WisDOT evaluated three alternatives to address substandard design, including two alternatives that connect County H to the Interstate:

- o Diamond – Realigned County H
- o Split Diamond
- o Trumpet

The Trumpet alternative requires the least amount of new right of way. All alternatives relocate a hotel maintenance and storage building, while the Split Diamond alternative relocates an additional small commercial/storage building and another storage building. 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.

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 would perform 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.

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 2-21. 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 2-21: WIS 13 – Split Diamond Interchange



Trumpet (Recommended Preferred Alternative)

This alternative corrects substandard curves and narrow shoulders, which can be addressed by reconstructing the interchange in a similar footprint. This alternative reconstructs the interchange to current design standards. Ramp curves would be realigned to improve line of sight, driver reaction time and driver comfort entering and exiting the Interstate.

Figure 2-22: WIS 13 – Trumpet Interchange



2.3.16. 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:

- o Diamond
- o Realigned Diamond

While both alternatives have similar environmental impacts, the Realigned Diamond alternative has more overall right of way impacts. The Realigned Diamond 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. 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 park is also eligible for listing on the National Register of Historic Places.

Both alternatives meet the purpose and need and have nearly identical costs. The Realigned Diamond alternative has a slightly higher right of way needs and impacts at Rocky Arbor State Park. Furthermore, 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 as the preferred alternative.

Diamond (Recommended Preferred Alternative)

This alternative corrects substandard ramp curves, which can be addressed by reconstructing the interchange in a similar footprint. The improved ramp design provides better line of sight, which improves driver reaction time, see Figure 2-23. 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 line of sight.

Figure 2-23: US 12/WIS 16 – Diamond Interchange



2.4. Preferred Alternatives and Alternatives Recommended for Further Study

Based on the screening factors described in Section 2, WisDOT recommends preferred alternatives as summarized in Table 2-1. In addition to recommended preferred alternatives, WisDOT will continue to study the Modernization Hybrid, the County V Diamond and WIS 13 Split Diamond alternatives as described previously. WisDOT continued refining impacts of preferred alternatives and those recommended for further study in Section 3 and Section 4.

Table 2-1: 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
US 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 – interchange constructed as a separate project
	Diamond	No
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

2.4.1. Least Environmentally Damaging Preferred Alternative

As part of the agency coordination process, WisDOT completed formal coordination and concurrence points on the study purpose and need statement, the range of alternatives and the recommended preferred alternative. Both the US Army Corps Engineers (USACE) and US Environmental Protection Agency (USEPA) have concurred with the preferred alternative, see Section 5.2. Based on agency concurrence the recommended preferred is determined to be the least environmentally damaging alternative, in accordance with the Clean Water Act section 404(b)(1),⁸ administered by USEPA and USACE. The guidelines mandate that dredged or fill material should not be discharged into aquatic ecosystems (including wetlands), unless no other practicable alternatives are demonstrated; that such discharge will not have unacceptable adverse impacts; and that all practicable measures are undertaken to minimize adverse effects. The recommended preferred alternative minimizes aquatic resource impacts

by maintaining the current alignment of the freeway and keeping the majority of impacts within and immediately next to the existing transportation corridor. WisDOT will continue to develop avoidance and minimization measures during final design in coordination with the Wisconsin Department of Natural Resources (WDNR) and USACE.