Wisconsin Department of Transportation

WISCONSIN DEPARTMENT OF TRANSPORTATION

Stand-Alone Strategies Screening Report

Project IDs 5304-02-01 and 5304-02-04
Beltline Planning and Environment Linkages
Dane County

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A better BELTLINE
Studying Highways 12, 14, 18, 151

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SECTION 1
INTRODUCTION AND SUMMARY OF RESULTS

1.01 PURPOSE AND LEGISLATION

A. Purpose

The purpose of this report is to document the development and evaluation of Stand-Alone Strategies to determine if and to what extent each would potentially satisfy the root objectives of the Madison Beltline Planning and Environment Linkages (PEL) Study. Each Stand-Alone Strategy is placed in one of the following three categories:

- Conduct additional detailed analysis as a Stand-Alone Beltline Strategy.
- Conduct additional detailed analysis as part of a multicomponent solution, or strategy package.
- Eliminate entirely from further study.

The Madison Beltline PEL Study and this report uses the term "strategies" in place of the term "alternatives" as used in Title 23 of the Code of Federal Regulations (CFR) 450.212 to emphasize the different modes and methods that are being evaluated to address Beltline challenges.

B. Planning and Environment Linkages: Legislative and Regulatory Authority

Multiple authorities allow for the use of planning information in the National Environmental Policy Act (NEPA) process. Legal authority for incorporating planning products in NEPA documents was provided in Title 23 of the United States Code (USC) Parts 134 and 135, 49 USC Parts 5303 through 5306, and NEPA-related regulations 40 CFR Part 1500 and 23 CFR 771.[1] This was further clarified in Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) legislation that was enacted in 2005. In 2012, Moving Ahead for Progress in the 21st Century Act (MAP-21) reinforced and expanded this authority with Sections 1310 and 1311. Regulations also strongly support integration of planning information into the NEPA process. In 2007, statewide and metropolitan planning regulations including 23 CFR Part 450, Sections 212 and 318 and associated Appendix A detailed the conditions required to use planning information in the environmental review process. The regulations allow corridor and subarea planning studies as part of the statewide and metropolitan transportation planning processes. The results of these transportation studies may be used as part of the overall project development process consistent with NEPA and associated implementing regulations. These studies may result in producing purpose and need, travel corridor and mode, preliminary screening of alternatives and elimination of unreasonable alternatives, description of the environmental setting, and preliminary identification of environmental impacts and environmental mitigation. Appendix A of these rules provides additional information on the linkages between transportation planning, project development, and NEPA.

Appendix A to 23 CFR Part 450 (February 2007) was drafted to provide more information between the transportation planning processes and subsequent NEPA processes. The intent of the appendix was to "change the culture" wherein transportation planning and NEPA are functionally disconnected, resulting in duplication of efforts and/or delays in implementing transportation improvements. The appendix details how information, analysis, and products from transportation planning can be incorporated into and relied

[1] References to 40 CFR 1500 include only those regulations in effect before September 14, 2020.

upon in NEPA documents under existing laws, regardless of when the Notice of Intent was published. With regard to the elimination of alternatives, the appendix provides the following information:

> ***"11. Under what circumstances can alternatives be eliminated from detailed consideration during the NEPA process based on information and analysis from the transportation planning process?***
>
> *There are two ways in which the transportation planning process can begin limiting the alternative solutions to be evaluated during the NEPA process: (a) Shaping the purpose and need for the project; or (b) evaluating alternatives during planning studies and eliminating some of the alternatives from detailed study in the NEPA process prior to its start. Each approach requires careful attention, and is summarized below. . . . . .*
>
> *. . . . . (b) Evaluating and Eliminating Alternatives During the Transportation Planning Process: The evaluation and elimination of alternatives during the transportation planning process can be incorporated by reference into a NEPA document under certain circumstances. In these cases, the planning study becomes part of the NEPA process and provides a basis for screening out alternatives. As with any part of the NEPA process, the analysis of alternatives to be incorporated from the process must have a rational basis that has been thoroughly documented (including documentation of the necessary and appropriate vetting through the applicable public involvement processes). This record should be made available for public review during the NEPA scoping process.*
>
> ***12. What information or analysis from the transportation planning process is needed in an EA or EIS to support the elimination of an alternative(s) from detailed consideration?***
>
> *The section of the EA or EIS that discusses alternatives considered but eliminated from detailed consideration should:*
>
>> *(a) Identify any alternatives eliminated during the transportation planning process (this could include broad categories of alternatives, as when a long-range transportation plan selects a general travel corridor based on a corridor study, thereby eliminating all alternatives along other alignments);*
>>
>> *(b) Briefly summarize the reasons for eliminating the alternative; and*
>>
>> *(c) Include a summary of the analysis process that supports the elimination of alternatives (the summary should reference the relevant sections or pages of the analysis or study) and incorporate it by reference or append it to the NEPA document.*
>>
>> *Any analyses or studies used to eliminate alternatives from detailed consideration should be made available to the public and participating agencies during the NEPA scoping process and should be reasonably available during comment periods.*

Alternatives passed over during the transportation planning process because they are infeasible or do not meet the NEPA "purpose and need" can be omitted from the detailed analysis of alternatives in the NEPA document, as long as the rationale for elimination is explained in the NEPA document. Alternatives that remain "reasonable" after the planning-level analysis must be addressed in the EIS, even when they are not the preferred alternative. When the proposed action evaluated in an EA involves unresolved conflicts concerning alternative uses of available resources, NEPA requires that appropriate alternatives be studied, developed, and described."

In summary, the provisions of this guidance allow the adoption of the Beltline PEL alternatives screening in a future NEPA document. The process must consider impacts and include public and agency coordination. The outlined process does not require the approval of local governments or agencies.

C. Integration of Planning and Environment Review

1. MAP 21 Section 1310 (23 USC 168)
2. Fixing America's Surface Transportation (FAST Act) Section 1305 (23 USC 168)

Section 1310 of the MAP 21 Act amended Chapter 1 of title 23, USC, to allow the adoption of planning products for use in NEPA proceedings. The code was further modified in the FAST Act Section 1305. The FAST Act clarifies and/or modifies some of the provisions of 23 USC 168, while maintaining the earlier authorities. The most current text states:

> "(3) Planning Product–The term 'planning product' means a decision, analysis, study, or other documented information that is the result of an evaluation or decision making process carried out by a metropolitan planning organization or a State, as appropriate, during metropolitan or statewide transportation planning under section 134 or 135, respectively."

In 2016, the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) issued the final rule that explicitly recognizes a variety of PEL methods that may be used to integrate planning with environmental reviews. The final rule includes minor revisions to Appendix A and retains the previous rule's description of nonbinding guidance in Appendix A that discusses the integration of planning and environmental reviews.

The 23 USC 168 provides one authority to allow the use of a planning product (in this case the Madison Beltline PEL Study) in a NEPA document. As mentioned, other authorities are contained in 23 CFR 450. According to 23 USC 168, a transportation study may be used in the NEPA process if the relevant agency determines that certain provisions have been met. Provisions for using a planning product in a NEPA document include the following:

1. The planning product is developed through a planning process conducted according to applicable federal law.

2. The planning product is developed by engaging in active consultation with appropriate federal and state resource agencies and Indian tribes.

3. The planning process includes broad multidisciplinary consideration of systems-level or corridor-wide transportation needs and potential effects including effects on the human and natural environment.

4. The planning process includes public notice that the planning products produced in the planning process may be adopted during a subsequent environmental review process in accordance with 23 USC 168.

5. During the environmental review process, the relevant agency makes the planning documents available for public review and comment by members of the general public and federal, state, local, and tribal governments that may have an interest in the proposed project; provides notice of the intention to adopt or incorporate the planning product by referencing the planning product; and considers any resulting comments.

6. There is no significant new information or new circumstance that has a reasonable likelihood of affecting the continued validity or appropriateness of the planning product.

7. The planning product has a rational basis and is based on reliable and reasonably current data and reasonable and scientifically acceptable methodologies.

8. The planning product is documented in sufficient detail to support the decision or the results of the analysis and to meet requirements for use of the information in the environmental review process.

9. The planning product is appropriate for adoption or incorporation by reference and use in the environmental review process for the project and is incorporated in accordance with and is sufficient to meet the requirements of NEPA.

10. The planning product is approved five years or less before its adoption or incorporation by reference.

1.02 MADISON BELTLINE PEL STUDY BACKGROUND AND STAND-ALONE STRATEGY EVALUATION PROCESS

A. Stand-Alone Strategy Development Process

The Madison Beltline PEL Study process provides for the development of individual “Stand-Alone” Strategies that potentially address the Beltline PEL problem statement, goal, and objectives. These Stand-Alone Strategies have been developed in consideration of both systems-level and corridor-wide (Beltline) transportation needs. Stand-Alone Strategies that are reasonable and satisfy root PEL objectives by themselves or as a component of a strategy package are recommended for more detailed analysis in a subsequent NEPA document. Similarly, Stand-Alone Strategies that are not reasonable or that do not satisfy any PEL objectives are being eliminated from future consideration in a future NEPA document in accordance with the provisions discussed in Section 1.01 of this report.

The Beltline PEL Stand-Alone Strategy development process is summarized in Figure 1.02-1 and consists of:

1. Developing and testing Stand-Alone Strategies to see whether they have the ability to satisfy root Beltline PEL objectives. Root Beltline PEL objectives are those associated with transporting large numbers of people within the metropolitan area.

2. Developing and testing individual modal improvement components to see whether and to what extent they have the ability to satisfy one or more specific PEL objectives that are associated with the Beltline PEL problem statement and goal.

3. Assembling individual modal improvement components into strategy packages. These strategy packages, taken as a whole, have the potential to address all Beltline PEL objectives.

Figure 1.02-1 Strategy Development Process

This report discusses the development and evaluation of Stand-Alone Strategies. Other reports discuss modal component development and evaluation and strategy packages that have the potential to address all Beltline PEL objectives.

B. <u>Stand-Alone Strategy Development and Evaluation Process</u>

Stand-Alone Strategies have the capability of transporting large numbers of people and have the potential to address local and regional movement needs. Stand-Alone Strategies are evaluated to assess whether and to what extent they are able to address some or all root Beltline PEL objectives.

Examples of Stand-Alone Strategies include Bus Rapid Transit (BRT), rail, and bypass highway corridors. The iterative process for testing Stand-Alone Strategies is shown in Figure 1.02-2. The evaluation process starts with determining whether the Stand-Alone Strategy is viable. Metrics for viability include amount of traffic captured or amount of ridership obtained. For example, a rail Stand-Alone Strategy such as Transport 2020 that draws 10,000 riders per day may be viable, whereas a rail Stand-Alone Strategy that draws 1,000 riders per day may not be viable.

Second, the Stand-Alone Strategy is tested for its effectiveness in addressing root PEL objectives. These focus on improving Beltline travel conditions by either removing traffic from the Beltline or increasing Beltline capacity. Stand-Alone Strategies that are not able to satisfy the traffic objectives or any other

Beltline PEL objectives are eliminated from detailed study. Those that partially or entirely satisfy one or more objectives may be used later in the study as a component of a larger strategy package.

Third, impacts associated with the Stand-Alone Strategy are reviewed. Impacts include those to the natural and man-made environments, as well as potential public and agency issues or opposition. Large impacts to possible strategies will be documented. If it remains unclear whether better options than a specific strategy exist or challenges within a certain strategy have the potential to be mitigated, these Stand-Alone Strategies can be brought forward as a major component of a strategy package. Alternatively, Stand-Alone Strategies with large impacts making them unreasonable[2] are eliminated from detailed study. Strategies with substantial opposition can also be dismissed.

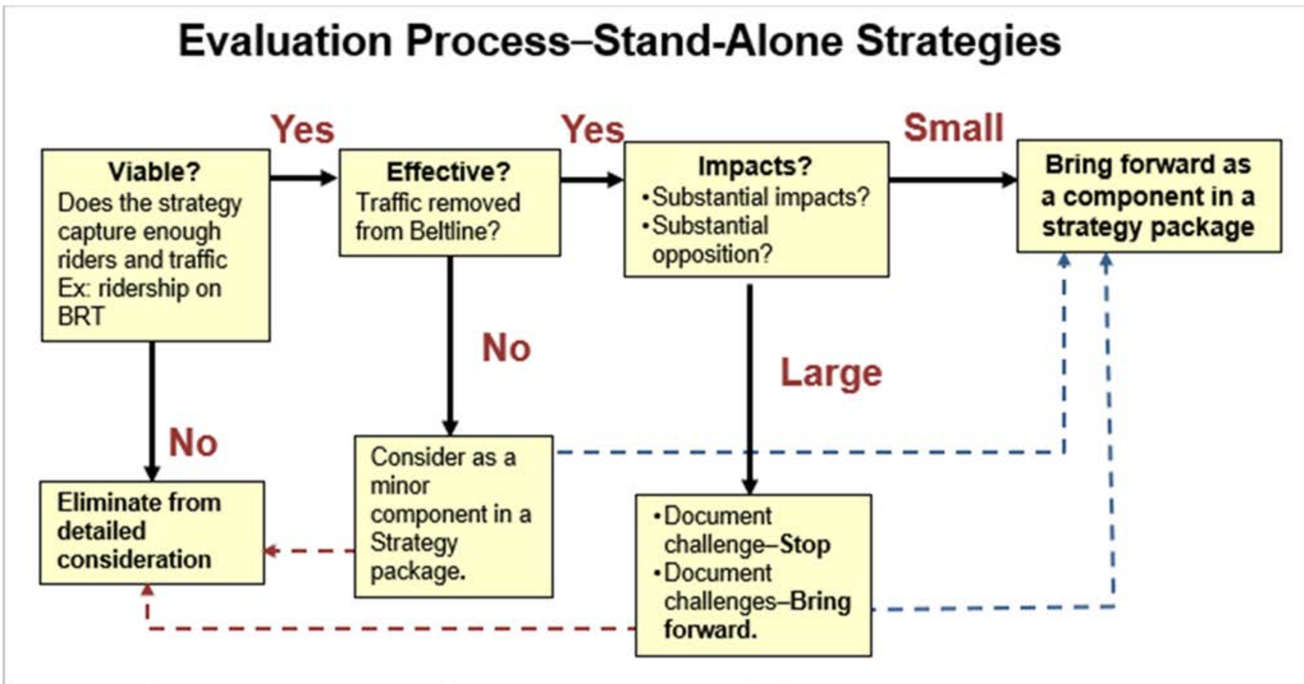


Figure 1.02-2 Evaluation Process Stand–Alone Strategies

[2]CEQ 40 Questions states *"Section 1502.14 requires the EIS to examine all reasonable alternatives to the proposal. In determining the scope of alternatives to be considered, the emphasis is on what is "reasonable" rather than on whether the proponent or applicant likes or is itself capable of carrying out a particular alternative. Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant."*

C. Stand-Alone Strategy Screening Criteria

PEL Stand-Alone Strategies need to effectively address some or all seven root objectives in order to be recommended for further evaluation in a future NEPA document as a Stand-Alone Strategy or a component of a strategy package solution. Because the objectives include many modes, strategy packages with multiple components are formed to address each PEL objective. The Stand-Alone Strategy evaluation reviews whether and to what extent the Stand-Alone Strategy satisfies some or all the Beltline PEL objectives. There are 12 study objectives; however, many of the objectives overlap or have similarities that could lead to duplication in the screening process. To avoid duplicate questions, the 12 objectives were synthesized into the following seven root objectives and desired outcomes. Table 1.02-1 shows the seven root PEL objectives, the desired outcome, and which objectives are targeted in the Stand-Alone Strategy evaluation.

Table 1.02-1 Stand-Alone Strategy Screening Questions

Root Objective	Desired Outcome (what represents success?)	Targets of the Stand-Alone Strategy Evaluation
1. Improve safety for all modes		
▪ Bicycles	Reduce bicycle and motor vehicle crashes (rates and severities).	Evaluate as part of strategy packages when bike and pedestrian improvements are incorporated.
▪ Pedestrians	Reduce pedestrian and motor vehicle crashes (rates and severities).	
▪ Motor vehicle	Decrease crashes (rates and severities) (in areas of high crash frequency).	Does the Stand-Alone Strategy address safety deficiencies on the Beltline or have the potential to reduce congestion-related motor vehicle crashes on the Beltline?
2. Address Beltline infrastructure condition and deficiencies	Critical pavement and geometric deficiencies addressed.	Does the Stand-Alone Strategy preclude addressing Beltline infrastructure deficiencies?
3. Improve system mobility (congestion) for all modes	Mobility–The ability of the transportation system to facilitate the efficient and comfortable movement of people and goods (along and across).	
▪ Pedestrian	Comfortable and convenient access near, across, and along the Beltline Corridor.	Evaluate as part of strategy packages when bike and pedestrian improvements are incorporated.
▪ Bicycle	Direct and comfortable routes across and along the Beltline.	
▪	Provide convenient alternate mode choices or transfers (duplicate).	
▪ Transit	Enhance rider access to transit facilities and vehicles. Enhance transit routing opportunities.	Does the Stand-Alone Strategy preclude improvements to transit facilities and routing?
▪ Motor vehicles (including passenger and freight)	Provide better travel time reliability (reduce nonrecurring congestion).	Does the Stand-Alone Strategy decrease Beltline traffic, or increase Beltline capacity, enough to address conditions that lead to unstable traffic flow on the Beltline?
	Decrease or reduce recurring congestion.	
	Provide convenient alternate route choices.	
	Reduce motor vehicle trips during peak periods.	
4. Limit adverse social, cultural, and environmental effects to extent practicable.	Consideration of strategies that balance transportation need and protection of environmental and community resources.	Evaluate as part of strategy packages when impacts are measured.
5. Enhance efficient multimodal access to economic centers.	Ramp terminals and connecting roadways operate at satisfactory service levels.	Evaluate as part of strategy packages when bike, ped, and transit components are assembled.
	Convenient and comfortable access to economic centers for all travel modes.	
6. Decrease Beltline diversion impacts to neighborhood streets.	Diverted traffic uses roadways classified as collectors or above.	Evaluate later in the study in more detailed modeling stage.
7. Complement other major transportation initiatives and studies in the city of Madison (Madison) area.	Concept complements other transportation initiatives.	

Reasonable Stand-Alone Strategies that only partially satisfy the root objectives can still be a component in a larger strategy package that is forwarded to the NEPA study for more detailed analysis. The evaluation of each Stand-Alone Strategy includes a recommendation to dismiss entirely or consider as a part of a larger strategy package.

1.03 STAND-ALONE STRATEGIES EVALUATED

Over the past several years, numerous transportation initiatives have been evaluated in the Madison metropolitan area. Many initiatives are summarized in the *Beltline Existing Conditions Report*. This regional history of transportation initiatives provides a baseline knowledge and a broad range of Stand-Alone Strategies. Table 1.03-1 lists the Stand-Alone Strategies evaluated as part of the Beltline PEL and their background.

Table 1.03-1 Stand-Alone Strategy Description

Stand-Alone Strategy	Background
North Mendota Corridors	In 1992, the Dane County 2020 task force recommended a broad study of a north ring corridor along the north side of Lake Mendota. This led to several studies and committee efforts, including the 1997 North Ring corridor committee, the 2000 to 2002 North Mendota study and committee, and the 2007 to 2008 North Mendota Environmental and Transportation committee. All study efforts focused on providing a high-mobility corridor from United States Highway (US) 12 to Interstate (I)-39 on the north side of Lake Mendota. Dane County has since moved focus from a high-mobility corridor to improving existing corridors. For instance, County M between Oncken Road and Willow Road on the northwest side of Lake Mendota is scheduled for expansion in 2023.
South Reliever (SR) Corridors	As part of the US 151 Verona Road interchange environmental study, several community members suggested that a high-mobility south Beltline would eliminate the need for Verona Road improvements. This led to a 2002 and 2008 Wisconsin Department of Transportation (WisDOT) study that looked at high-mobility south ring corridors in the general vicinity of County Highway M and County Highway B. These corridors had various lengths, but they generally spanned from US 151 in the city of Verona (Verona) to I-39.
Rail	Since 1993 there have been several studies regarding the possible implementation of commuter and passage rail service in the Madison area. The most recent initiative is Transport 2020, which proposed east-west rail service running along an existing rail corridor from the city of Middleton (Middleton) to Reiner Road near the city of Sun Prairie (Sun Prairie) through the Isthmus. Local governments submitted a New Starts Application to the FTA in June 2008, but it was later withdrawn because of the lack of a local funding mechanism.
Bus Rapid Transit (BRT)	With the withdrawal of the Transport 2020 New Starts Application, government entities within the Madison metropolitan area began exploring other high-mobility transit strategies. In February 2013, the Madison Area Metropolitan Planning Organization (MPO) released a report analyzing the feasibility of BRT for the Madison Area and laying out several corridors with the greatest potential for ridership. In February 2017, the Madison Common Council approved Madison in Motion, Madison's Sustainable Transportation Master Plan (Madison in Motion). One of the major themes of Madison in Motion is to improve transit service with the most important recommendation being to develop and implement BRT in the next five years. In March 2020, the city of Madison identified a BRT Locally Preferred Alternative (LPA). The city of Madison is currently working with the FTA to initiate the NEPA process. Any future developments or progress made by the city of Madison related to BRT will be considered during a future Beltline NEPA process.
Beltline Transit Service	Metro Transit of Madison (Metro) is the primary transit provider in the Madison area. Metro runs more than 60 routes in the Madison area, using a node system with five transfer stations. While providing service throughout the metropolitan area, only five Metro routes use the Beltline. Some transit advocates have suggested more extensive service on the Beltline, perhaps with priority lanes, would lead to increased ridership.
Beltline Corridor Strategy	This strategy would expand the motor vehicle capacity of the Beltline mainline and interchanges by location to the extent needed. This mainline expansion could be via managed through lanes (such as High Occupancy Vehicle lanes), using the shoulder as a through lane during the most congested periods (Part-Time Shoulder Use [PTSU]), or through conventional expansion. This strategy increases projected Beltline daily traffic volumes compared to an alternative that does not add capacity. This is because when the capacity constraint is removed, vehicles that would be seeking alternate routes return to the Beltline corridor. This

Stand-Alone Strategy	Background
	is sometimes called "latent demand." This strategy would improve Beltline operations by providing sufficient capacity to accommodate the latent travel demand.

1.04 SCENARIOS PLANNING

In addition to Stand-Alone Strategies, there are other possible scenarios that could affect the need for transportation improvements on the Beltline corridor. The FHWA Scenario Planning Guidebook (February 2011) says,

> *"The hallmark of scenario planning is identifying land-use patterns as variables (rather than as static inputs) that could affect transportation networks, investments, and operations. Other variables might include demographic, economic, political, and environmental trends. . . . .*
> *. . . . . .Scenarios are narratives or sets of assumptions that explore plausible trajectories of change. They provide a means of visioning possible future changes and different policy and investment options."*

Scenario planning was used to evaluate two different base-assumption scenarios involving land use development and mode choice. The analysis sought to understand whether different land use and mode choice patterns had the ability to eliminate the need for Beltline improvements. These two scenarios were unable to remove enough traffic from the Beltline to allow the existing facility to adequately meet transportation demands without additional improvements.

1.05 COORDINATION

The Beltline PEL involved state and federal agencies, local governments, and Native American tribes throughout the process. The interaction was used to develop the Beltline PEL goal, objectives, and strategies as well as evaluate Stand-Alone Strategies. In addition to interacting with local governments and interest groups, the study used a Policy Advisory Committee (PAC) made up of elected local government officials, and a Technical Advisory Committee (TAC) made up of local government staff persons. The interactions are detailed in the Coordination Plan for the study. A summary of these meetings is presented in Table 1.05-1. A complete listing of meetings with neighborhood groups, interest groups, and government committees is available upon request as well as in the coordination plan for the project.

Table 1.05-1 Local Agency and Public Interaction Summary

Date	Meeting	Remarks
May 8, 2013	Local Officials Introduction Meeting with the city of Monona (Monona), village of McFarland (McFarland), and Dane County.	Introduction of the Madison Beltline PEL Study to local officials to gain input and involvement and invite participation.
May 15, 2013	Local Officials Introduction Meeting with the city of Fitchburg (Fitchburg), city of Stoughton (Stoughton), Verona, and village of Oregon (Oregon).	Introduction of the Madison Beltline PEL Study to local officials to gain input and involvement and invite participation.
May 15, 2013	Local Officials Introduction Meeting with Middleton, village of Waunakee (Waunakee), and town of Westport (Westport).	Introduction of the Madison Beltline PEL Study to local officials to gain input and involvement and invite participation.
May 30, 2013	Kickoff Agency Meeting with federal and state agency representatives	Introduction of the Madison Beltline PEL Study to federal and state agencies; discussion to obtain comments on draft PEL documents: draft Memorandum of Understanding (MOU), draft work plan, and draft Beltline PEL problem statement, goal and objectives.
July 9, 2013	Briefing with the Madison Mayor and staff	Introduction of the Madison Beltline PEL Study.
July 22, 2013	Kickoff TAC Meeting	Introduction of the Madison Beltline PEL Study.
July 25, 2013	Madison Long Range Transportation Committee Update	Introduction of the Madison Beltline PEL Study.
July 29, 2013	Kickoff PAC Meeting	Introduction of the Madison Beltline PEL Study.
August 6, 2013	Madison City Council	Introduction of the Madison Beltline PEL Study.
September 9, 2013 to September 23, 2013	Five Public Involvement Meetings (PIMs)	Presented needs of the Beltline and proposed Beltline PEL problem statement, goal, and objectives.
September 30, 2013	TAC Meeting No. 2	Discussed screening criteria.
October 2, 2013	PAC Meeting No. 2	Discussed screening criteria.
October 30, 2013	TAC Meeting No. 3	Development of strategies and packages for testing and evaluation.
November 6, 2013	State and Federal Agency Meeting	Provided project update and discussed strategy screening criteria.
November 13, 2013	PAC Meeting No. 3	Development of strategies and packages for testing and evaluation.
December 12, 2013	PAC Meeting No. 4	Continuation of development of strategies and packages for testing and evaluation.
April 3, 2014	TAC Meeting No. 4	Reviewed North Mendota Corridors and transit strategies, such as Beltline buses, BRT, and Transport 2020 rail as Stand-Alone Strategies.
April 22, 2014	PAC Meeting No. 5	Reviewed North Mendota Corridors and transit strategies, such as Beltline busses, BRT, and Transport 2020 rail as Stand-Alone Strategies.
June 12, 2014	TAC Meeting No. 5	Reviewed SR concepts as Stand-Alone Strategies. Update on Transit Modeling (Beltline buses, BRT, and Transport 2020) as Stand-Alone Strategies.
June 23, 2014	PAC Meeting No. 6	Reviewed SR concepts as Stand-Alone Strategies. Update on Transit Modeling (Beltline buses, BRT, and Transport 2020) as Stand-Alone Strategies.
September 10, 2014	TAC Meeting No. 6	Reviewed Demand Modeling results for the Beltline Strategies and connections. Also reviewed the recently compiled results of the University of Wisconsin (UW) survey center.
September 16, 2014	PAC Meeting No. 7	Reviewed Demand Modeling results for the Beltline Strategies and connections. Also reviewed the recently compiled results of the UW survey center.
October 1, 2014	TAC Meeting No. 7	Review a new Beltline crossings and connections for merit. Reviewed interchange removals and modifications for merit.
October 15, 2014	PAC Meeting No. 8	Review a new Beltline crossings and connections for merit. Reviewed interchange removals and modifications for merit.
November 6, 2014	PAC/TAC Meeting	Previewed the PIM exhibits for the PAC, TAC, and monthly meeting group. Open house.
November 11, 2014 to December 3, 2014	Eight PIMs	Presented the results of Stand-Alone Strategies, including North Mendota Parkway (NMP), SR, Beltline Buses, BRT, and Transport 2020.
November 13, 2014	State and Federal Agency Meeting	Update on the Madison Beltline PEL project and Stand-Alone Strategies considered, including NMP, SR, Beltline Buses, BRT, and Transport 2020.
January 22, 2015	PAC Meeting No. 10	Presented the effects of scenario planning evaluation for more compact land use patterns and increased transit and bike usage.
January 29, 2015	TAC Meeting No. 9	Presented the effects of scenario planning evaluation for more compact land use patterns and increased transit and bike usage.

1.06 DATA COLLECTION AND EVALUATION TOOLS

WisDOT invested in several state-of-the art data collection and evaluation tools for the review of these Stand-Alone Strategies. The amount of travel information collected for the study is unprecedented for Wisconsin. The following paragraphs summarize these tools.

A. Origin-Destination (O-D) Study

1. Time-Lapse Aerial Photography

WisDOT subcontracted an aerial time-lapse photography O-D survey of the Beltline in fall 2012. The efforts included the use of four helicopters stationed over the Beltline taking synchronized pictures of traffic along the Beltline for 1.5 hours during the AM and PM peak hours and during midday. The images were taken at one-second intervals and were then combined to create a complete image of the Beltline for each time slice.

The images were then viewed to perform traffic counts at the ramp terminal and adjacent intersections and determine regional O-D data along the Beltline corridor. The intersection counts used a 100 percent capture rate with every car being counted.

The O-D data was developed by tracing the route of every eighth car from where it entered the Beltline system at an on-ramp or from either end until it exited at another interchange or at either end. Vehicles entering or exiting at the interchanges were further separated into coming from or going to the north or south sides of the Beltline.

2. Bluetooth Traffic Detectors

WisDOT subcontracted to deploy Bluetooth detectors throughout Dane County to collect regional travel data that is used to analyze larger O-D patterns and also calibrate the Greater Madison MPO travel demand model (TDM). The Bluetooth detectors work by recording the MAC address of individual Bluetooth-enabled devices such as cell phones, headsets, and cars. Matched pairs of the recorded MAC addresses are analyzed to establish travel patterns. The Bluetooth data collection period spanned a full month in fall 2012. The detection data is postprocessed using biproportional factoring to control for volumes and fleet vehicle weighting. Using this data collected in September 2012, several analyses were performed to understand regional travel patterns throughout Dane County.

B. TDM

The Madison Beltline PEL Study uses the Greater Madison MPO TDM to understand area traffic patterns and volumes. The computerized travel demand model is based on Traffic Analysis Zones (TAZ) that produce trips and a computerized roadway network and distributes the trips. The actual computer program used is Cube developed by Citilabs, Inc. The travel demand model is based on the current and projected metropolitan land uses and existing roadway network. The model is calibrated to existing roadway volumes as well as origins and destinations. In 2014, the Dane County's TDM underwent several revisions, which were performed by Cambridge Systematics and coordinated with the Greater Madison MPO and WisDOT Traffic Forecasting Section. These revisions included updating the model with information provided by the 2010 census and new population, household, and employment projections for the year 2040 extrapolated to the year 2050. It was also converted to a Time of Day model, in which modeled traffic volumes are separated into four daily periods, rather than reported as a single daily volume. The extensive amount of time-lapse aerial photography, along with Bluetooth O-D studies, has allowed this TDM update to be calibrated to a greater extent than previous models. The TDM has a 2010 base year and a 2050 horizon year, which are referenced frequently in this report.

A TDM can efficiently predict how different roadway and land use scenarios would change area travel patterns. For example, a new roadway can be added to the network and the TDM will predict how much traffic the new roadway, such as the NMP corridor, would attract and how traffic patterns would change in the rest of the travel network. The TDM is not exclusively used for traffic forecasts. WisDOT's Forecasting unit uses both the TDM and historic traffic data through WisDOT's Traffic Analysis Forecasting Information System (TAFIS) to develop official forecasts. A TDM, however, provides useful analysis tool to understand the potential effect of network changes.

Key inputs into the TDM include current and future households and employment. The household forecasts were provided by the Wisconsin Department of Administration (WDOA), Demographic Services Center. The household forecasts were then locationally allocated within each jurisdiction by Greater Madison MPO staff, in consultation with planning staff for each Dane County community.

The employment forecasts were developed by the Capital Area Regional Planning Commission (CARPC) and reviewed by Madison Area Transportation Board and Wisconsin Department of Workforce Development staff. CARPC's employment forecast is based on a labor supply forecast derived from the WDOA's population by age forecasts and assumptions regarding changes to labor force participation rates by age and workers commuting in from adjacent counties. The employment forecasts were also regionally allocated by Greater Madison MPO staff based on CARPC's urban service area population forecasts, municipal employment trends since 1990, and land use plans with input from local planning staff.

The Greater Madison MPO TDM used for analysis was provided by WisDOT with a date stamp of October 2014. The TDM analysis for the Stand-Alone Strategies was current as of June 2016. For the TDM analysis the equilibrium assignment closure criteria were set to more stringent levels. This effectively forced the TDM to run for more assignment iterations. The extra assignment iterations eliminated minor volume fluctuations in the final iterations between comparison alternatives.

C. Geographic Information Systems (GIS)

To understand the type and number of significant resources near the strategies being considered, the study developed a resource data base. These resources were put into a GIS. Data within the system is shown in Table 1.06-1.

Table 1.06-1 GIS Data

Used Yes (√)	Item	Data Date (if available)	Data Description (Data and Layers, Coverage or Location, Original Coordinate System)	Agency Source
√	Wetlands		Wisconsin Wetland Inventory (WWI) maps, Dane County	Wisconsin Department of Natural Resources (WDNR)
√	Wetlands		WWI maps, Dane County	WDNR
√	MAP		The data set consists of structures the size of a single-car garage or larger for Dane County, Wisconsin excluding structures within Madison. In Madison, building polygons are included for structures the size of a duplex or larger, except for around the Isthmus area.	Dane County
√	REC		Bicycle, Pedestrian, and Hiking Paths in Dane County Wisconsin.	MPO
√	ENV		This data set displays the location of environmental corridors that limit development. Generally speaking, an environmental corridor is a protected resource and follows wetland buffers, floodplain boundaries, and natural resource protection areas.	DANE
√	WATER		This is a comprehensive, county-wide data set of 2,400-scale hydrography linework in Dane County, Wisconsin	Dane County
√	WATER		This is a comprehensive, county-wide data set of 2,400-scale hydrography polygons in Dane County, Wisconsin.	Dane County
√	LAND	2010	Parcel-based land use inventory for Dane County, Wisconsin for the year 2010, This data set was developed for site-specific and regional planning including land use, transportation, and environmental resource applications. Parcel boundaries are reflective off April 1, 2010, while agricultural, specifically crop and field delineations and identifications are reflective of June through August 2010.	Dane County
√	PARCEL		A county-wide municipal boundaries data set.	Dane County
√	MAP		Road centerlines.	Dane County
√	PARCEL		Tax parcel product and Public Land Survey System (PLSS) grid.	Dane County
√	SOIL		Slopes greater than or equal to 12 percent in Dane County, Wisconsin.	Dane County
	PARCEL		Supervisory districts–Keep as reference information, do not display.	Dane County
√	UTIL		Madison Metropolitan Sewerage District (MMSD) service area boundary.	CARPC
√	UTIL	2007	Sanitary utility districts within the MMSD service area obtained in 2007 for a Collection System Evaluation. It includes some districts that have since been incorporated into municipalities or other sanitary districts.	CARPC
√	UTIL	2011	Septic system location data obtained from Madison–Dane County Public Health Department in 2011 as a spreadsheet of addresses. Merged it with GIS parcel data to create this data set.	CARPC
√	UTIL		This is the urban and limited sewer service area boundary data within Dane County that CARPC maintains.	CARPC
√	REC	2013	WDNR Managed Lands.	WDNR
√	REC	2012	This data set is an SDE Production Feature Class representing the WDNR Board-approved projects with explicit boundaries. The boundaries of these projects define an area in which WDNR has designated a specific type of management approach on state owned, eased, or leased lands within the boundary	WDNR
√	ENV	2008	The approximate location of each fire recorded in WDNR fire reports during the years 1982 through 2008.	WDNR
√	WATER		0.2 percent flood areas.	WDNR
√	WATER		Flood lines.	WDNR
√	LAND		This data set is a polygon shapefile representing WDNR Geographic Management Units (GMUs). GMU boundaries are subject to review and periodic revision by WDNR management.	WDNR
√	LAND		Land Type Associations (LTAs) of Wisconsin represent a further definition of the National Hierarchical Framework of Ecological Units (NHFEU). The NHFEU is an ecological classification system that divides landscapes into ecologically significant regions at multiple scales. Ecological types are classified and units are mapped based on the associations of biotic and environmental factors which include climate, physiography, water, soils, air, hydrology, and potential natural communities.	WDNR
√	AERIAL		Satellite imagery of the midwest.	WDNR
√	T&E WATERS	2013	File contains two GIS data sets. WT_NHI_ASNRI_WATER_AR_SV_EXP (Area GIS File) and WT_NHI_ASNRI_WATER_LN_SV_EXP (GIS Linefile). They show waters inhabited by endangered, threatened, or special concern species identified in the NHI.	WDNR (NHI info)
	WATER	2011	Outstanding and Exceptional Resource Waters (NR102) of Wisconsin. Area file.	WDNR
	WATER	2011	Outstanding and Exceptional Resource Waters (NR102) of Wisconsin. Line file.	WDNR
√	WATER	2013	Outstanding and Exceptional Resource Waters (NR102) of Wisconsin. File contains data sets for both area and line files. Updated from 2011 versions above.	WDNR
	MAP		This polygon shapefile provides an index grid based on latitude and longitude intervals corresponding to the United States Geological Survey (USGS) topographic quadrangle series at 1:250,000 scale. The latitude/longitude interval corresponding to this quadrangle index is 1 degree latitude by 2 degrees longitude.	WDNR
√	WETLAND		This Grid-format data set is a raster representation of the reed canary grass dominated wetlands of Wisconsin, derived from Landsat satellite imagery.	WDNR
√	REC		State parks in Dane County.	WDNR
√	REC		Tax law point is a generalized point representation of lands enrolled in the Managed Forest and Forest Crop Law Programs. Points are located at the center point of each 40-acre quarter-quarter section in which land is enrolled. Acreage enrolled from fractional or government lots is located to the most approximate QQ, Q, or S as possible. (Enrolled parcels are represented by the PLSS shape they lie within; however, the actual size of the enrolled property may be as small as 10 acres.)	WDNR
√	WATER		Contains the files below.	WDNR
√	WATER		HydroBank consists of BK Bank arcs of all water features from the release coverage model HYDNW924 Version 6 including banks for Lake Michigan and Lake Superior.	WDNR
√	MAP		Wisconsin county boundaries.	WDNR
√	MAP	2010	Wisconsin major roads.	WDNR
√	MAP	2010	Wisconsin roads.	WDNR
√	WATER		This data set is a complete digital hydrologic unit boundary layer to the subwatershed (12-digit) sixth level for the State of Wisconsin.	WDNR

Used Yes (√)	Item	Data Date (if available)	Data Description (Data and Layers, Coverage or Location, Original Coordinate System)	Agency Source
√	SOIL		Statewide soil map unit feature class, including commonly used attributes, for general mapping and analysis purposes.	NRCS
√	AG/SOIL		Statewide farmland classification feature class	NRCS
√	HISTORIC	2013	This data set represents the locations of archaeological sites as listed in the Architecture and History Inventory (AHI) of the Division of Historic Preservation, Wisconsin Historical Society (WHS).	WHS
√	ARCH	2013	This data set represents the locations of archaeological sites as listed in the Archaeological Sites Inventory (ASI) of the Division of Historic Preservation, Wisconsin Historical Society.	WHS
√	HISTORIC	2013	This data set represents the locations of archaeological surveys as listed in the Bibliography of Archaeological Reports (BAR) of the Division of Historic Preservation, Wisconsin Historical Society.	WHS
√	AERIAL	2010	Dane County Aerial from WV, images from National Agriculture Imagery Program (NAIP).	WV/NAIP (WV Site, NAIP info)
√	REC, T&E	2011	Federal, State, Tribal, etc. Protected Areas Land Ownership.	United States Department of Agriculture (USDA) (USGS data)
√	AG/SOIL	2006	Major land resource areas (MLRAs) are geographically associated land resource units (LRUs).	USDA
√	MAP	2002	The Digital Raster Graphic (DRG) is a scanned image of a USGS standard series topographic map that includes all collar information (e.g., legend, scale bar, index map).	USDA
√	REC		The Capital Springs Boundary feature class contains the polygon boundary of the Capital Springs State Recreation Area Dane County Natural Resource Area (NRA). A NRA consists of lands that contain valuable natural resources or greenbelt corridors that were identified through a public process. Ideally, lands protected within these project areas should be large, contiguous blocks that may include a mixture of agricultural, water, wetlands, steep topography, prairie, and forests. All NRA boundaries are included in the NRA Boundaries feature data class except for two: Ice Age Trail Corridor and Capital Springs Boundary. Because these two boundaries overlap other NRA boundaries, they are each stored in their own feature class.	Dane County
√	REC		The Park Commission Forest Boundaries feature class contains polygon boundaries of Dane County Park Commission Forest Boundaries. These lands were classified as "County Forest Sites" in the 2001 to 2005 Dane County Parks & Open Space Plan. The 2006 to 2011 Dane County Parks and Open Space Plan recommends that these lands now be referred to as "Forests." Properties that fall under this classification are intended to be actively managed forests and woodlots by Dane County. A variety of forest management practices will be used to grow healthy forests and provide timber for revenue using sustainable harvest practices. The Madison School Forest, while not under Dane County Park Commission control, is included within this classification in order to be eligible for Dane County Conservation Fund acquisition dollars.	Dane County
√	HISTORIC		The Historical Cultural Site Boundaries feature class contains polygon boundaries of Dane County Historical and Cultural Sites. These project areas consist of lands specifically purchased for the preservation, restoration, or reconstruction of features significant to the history or cultural heritage of an area. These may include historic buildings, reconstructed historic buildings, and archaeological sites. Activities at a historic site may be limited to sightseeing and the study of its historic or cultural features. Sites may be surrounded by lands in another category, such as recreation parks or NRAs. Sites included in the data set may not be owned or managed by Dane County. For example, Fort Blue Mounds is owned by the WHS. Note: This category does not include several smaller historical sites on County-owned property such as Native American mound sites, and cabin remnants.	Dane County
√	ENVT		No Description in file–Part of the area overlaps with WDNR Managed Lands.	Dane County
√	REC		The Ice Age Trail Corridor feature class is a polygon that shows the corridor or area considered a zone of opportunity that is used to focus the efforts of the various partners, volunteers, agencies and organizations working to complete the Ice Age National Scenic Trail. The proposed corridor averages one to five miles in width. It is significantly wider than what is actually needed to allow flexibility for routing. The trail will only pass through the property of willing participants. The Ice Age National Scenic Trail is a 1,000-mile footpath entirely within Wisconsin that celebrates the legacy of the Ice Age. Diverse geological features along the trail rank among the finest examples of continental glaciation anywhere in the world. No one entity owns all the land through which the Ice Age Trail passes. The trail passes through a patchwork of lands owned by WDNR, Ice Age Park and Trail Foundation, county parks, local municipalities, and hundreds of generous private landowners.	Dane County
√	ENVT		The NRA Boundaries feature class contains polygon boundaries of Dane County NRAs. A NRA consists of lands that contain valuable natural resources or greenbelt corridors that were identified through a public process. Ideally, lands protected within these project areas should be large, contiguous blocks that may include a mixture of agricultural, water, wetlands, steep topography, prairie, and forests. All NRA boundaries are stored in the NRA Boundaries feature data class except for two: Ice Age Trail Corridor Boundary and Capital Springs State Recreation Area Boundary. Because these two boundaries overlap other NRA Boundaries, they are each stored in their own feature class	Dane County
√	REC		Proposed trails.	Dane County
√	REC		Wildlife areas.	Dane County
√	REC		Ice Age Trail–Existing path.	Dane County
√	ENVT	2012 to 2017	North Mendota proposed NRAs.	Dane County

1.07 SUMMARY OF RESULTS

The following sections of this report investigate Stand-Alone Strategies to determine whether they could satisfy PEL root objectives and eliminate, or greatly reduce, the need for Beltline improvements on their own.

Table 1.07-1 shows the Beltline Volume reduction of a representative section between Verona Road and John Nolen Drive for each Stand-Alone Strategy or Scenario.

Strategy	Change in 2050 Beltline Volume Between Verona Road and Fish Hatchery Road
NMP	+2,300 vpd
SR	-1,100 vpd
Transport 2020 (Rail)	-50 vpd
BRT	-200 vpd
Beltline Buses	-360 vpd
Scenario Planning–Alternate B (infill, more compact) Land Use	+3,700 vpd
Scenario Planning–Alternate Mode Choice	-3,500 vpd
Combined Off-Corridor Strategies (NMP, BRT, SR)	-1,700 vpd
Beltline Corridor Strategy (assumes unconstrained Beltline capacity, or all traffic that would prefer to use the Beltline is able to use it)	43,000 vpd[3]
2050 Beltline TDM Projected Volume (vpd)	147,500 vpd[2]

Notes: vpd=vehicles per day

[2]43,000 vpd is the forecasted increase in 2050 traffic for an “unconstrained” Beltline corridor (unlimited daily capacity available) versus a “constrained” Beltline corridor (assumes the existing number of travel lanes remain).

[3]Note that this value represents a “constrained” condition in 2050 for the Beltline corridor (assumes the existing number of travel lanes remain) from the TDM for comparison and analysis purposes only. Actual 2050 forecasts will be developed using a combination of the TDM and regression analyses from historic traffic growth.

Table 1.07-1 Stand-Alone Strategy Beltline Traffic Summary

Table 1.07-2 summarizes the findings of these analyses.

Table 1.07-2 Stand-Alone Strategy Screening Summary and Results

Strategy	Discussion	Results
NMP	Has merit in providing mobility north of Lake Mendota, yet does not reduce Beltline traffic volumes enough to satisfy root PEL objectives.	Eliminate as a Stand-Alone Strategy from further consideration.
SR	Is able to capture a large amount of traffic and provides greater mobility to southern Dane County communities. Yet only reduces Beltline volumes by 11 percent in 2010, and 3 percent in 2050. These Beltline traffic reductions are not great enough to address Beltline operational problems. The SR also has considerable natural resource impacts. Therefore, this strategy is unable to satisfy root PEL objectives.	Eliminate as a Stand-Alone Strategy from further consideration.
Rail	Transport 2020 greatly enhances access to and through the Isthmus. It does not remove enough traffic from the Beltline to improve traffic operations. Because there are other, potentially more viable high capacity transit alternatives being studied, Transport 2020 is being eliminated from consideration as a Stand-Alone Strategy.	Eliminate as a Stand-Alone Strategy from further consideration.
BRT	BRT is projected to draw up to nearly 20,000 daily riders in its east-west route line. Yet it does not reduce Beltline traffic volumes and, therefore, is unable to address Beltline congestion. BRT is unable to satisfy all root PEL objectives; therefore, it is eliminated from further consideration as a Stand-Alone Strategy. It does address several other PEL objectives that focus on alternate mode mobility and access.	Eliminate as a Stand-Alone Strategy but carry forward and evaluate for possible inclusion as a component in strategy packages.
Beltline Buses	Beltline buses could capture up to 2,100 daily boards in 2010 and 2,500 daily boards in 2050. Yet this strategy does not reduce Beltline traffic volumes by any appreciable amount and, therefore, does not satisfy that root PEL objective. Beltline buses do address other PEL objectives that focus on alternate mode mobility and access.	Eliminate as a Stand-Alone Strategy but carry forward and evaluate for possible inclusion as a component in strategy packages.
Scenario Planning–Alternate (infill, more compact) Land Use	Implementing Madison in Motion's Infill Scenario (B) would increase households and employment by redeveloping urban activity centers. The Infill Scenario (B) does increase potential BRT ridership. Yet because many urban activity centers lie adjacent to the Beltline, the Infill Scenario (B) would increase Beltline traffic volumes. Therefore, alternate, and more compact, land use patterns as evaluated by Madison in Motion, are not able to change traffic patterns enough to satisfy root PEL objectives. Therefore, it is eliminated as a Stand-Alone Strategy. Madison may continue to pursue more compact land use patterns in efforts to increase transportation and utility network efficiency.	Eliminate as a Stand-Alone Strategy. More compact land use, while not technically an improvement component, should be considered in the evaluation of strategy packages in future analyses.
Scenario Planning–Alternate Mode Choice	Tripling transit and bicycle ridership provides a measurable difference in traffic volumes through the Isthmus. This strategy has a very modest effect on Beltline traffic volumes and, consequently, does not satisfy root PEL objectives. Therefore, this scenario-planning alternative is being eliminated from consideration as a Stand-Alone Strategy. The infrastructure measures that would be associated with tripling transit and bike ridership do address other PEL objectives. Measures associated with effecting a mode shift should be a component in strategy packages.	Eliminate as a Stand-Alone Strategy. Investigation of enhancements to improve existing transit and bicycle infrastructure should be part of strategy packages in future analyses.
Combined Off-Corridor Strategies (NMP, BRT, SR)	The Combined Off-Corridor Strategies result in Beltline traffic volumes in 2050 that are similar to existing volumes. Yet current traffic volumes still produce operations that do not meet operational goals. These combined strategies would also incur considerable land and monetary impacts. The combination of these three strategies, therefore, do not satisfy root PEL objectives and the combination of them is eliminated from further study as a Stand-Alone Strategy.	Eliminate as a Stand-Alone Strategy from further consideration.
Beltline Corridor Strategy	The Beltline Corridor Strategy addresses three root PEL objectives and one that can be paired with other components. The Beltline Corridor Strategy is unable, on its own, to address some PEL objectives.	Eliminate as a Stand-Alone Strategy but carry forward and evaluate for possible inclusion as a component in strategy packages.

1.08 ABBREVIATIONS AND ACRONYMS

The following lists common abbreviations and acronyms used in this report.

ADT	average daily traffic
AHI	Architecture and History Inventory
ASI	Archaeological Sites Inventory
BAR	Bibliography of Archaeological Reports
BRT	Bus Rapid Transit
CARPC	Capital Area Regional Planning Commission
CFR	Code of Federal Regulations
DMU	diesel-multiple-unit
DRG	Digital Raster Graphic
EA	Environmental Assessment
EIS	Environmental Impact Statement
FAST Act	Fixing America’s Surface Transportation Act
FHWA	Federal Highway Administration
FOLKS	Friends of Lake Kegonsa Society
FTA	Federal Transit Administration
GIS	Geographic Information System
GMU	Geographic Management Units
HOV	High Occupancy Vehicle
HSR	Hard Shoulder Running
I	Interstate
LOS	Level of Service
LPA	Locally Preferred Alternative
LRT	Light Rail Transit
LRU	land resource unit
LTA	Land Type Associations
MAP 21 Act	Moving Ahead for Progress in the 21st Century Act
MEV	(One) Million Entering Vehicles
Metro	Metro Transit of Madison
MLRA	Major Land Resource Areas
MMSD	Madison Metropolitan Sewerage District
MOU	Memorandum of Understanding
mph	miles per hour
MPO	Metropolitan Planning Organization
NAIP	National Agriculture Imagery Program
NEPA	National Environmental Policy Act
NHFEU	National Hierarchal Framework of Ecological Units
NHI	National Heritage Inventory
NMETS	North Mendota Environmental and Transportation Study
NMP	North Mendota Parkway
NMPAC	North Mendota Parkway Advisory Committee
NMPIOC	North Mendota Parkway Implementation Oversight Committee

NRA	Natural Resource Area
O-D	Origin-Destination
PAC	Policy Advisory Committee
PEL	Planning and Environment Linkages
PIM	Public Involvement Meeting
PLSS	Public Land Survey System
PTSU	Part-Time Shoulder Use
RTA	Regional Transportation Authority
R/W	right of way
SR	South Reliever
TAC	Technical Advisory Committee
TAFIS	Traffic Analysis Forecasting Information System
TAZ	Traffic Analysis Zone
TDM	Travel Demand Model
TDP	Transit Development Plan
TOD	Transit Oriented Development
US	United States
USC	United States Code
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UW	University of Wisconsin
VA	Veterans Administration
vpd	vehicles per day
WDNR	Wisconsin Department of Natural Resources
WDOA	Wisconsin Department of Administration
WHS	Wisconsin Historical Society
WisDOT	Wisconsin Department of Transportation
WPS	Wisconsin Physicians Service
WWI	Wisconsin Wetland Inventory
YOE	Year of Expenditure

SECTION 2
NORTH MENDOTA CORRIDORS

2.01 BACKGROUND

A. History

The addition or creation of a high-mobility corridor on the north side of Lake Mendota has been discussed for almost three decades. A 2001 presentation by the Dane County Planning Division summarizes key milestones in the formation of this concept.[1] Table 2.01-1 summarizes the study effort over the past two decades.

November 1992	Recommendation in the Final Report of the Dane County 2020 Task Force to complete a broad study of alternative ways to respond to travel needs in and through the North Ring Corridor area.
July 1995	The North Ring Corridor Committee was created by the Dane County Board resolution to conduct “preliminary discussions” related to transportation issues in the North Ring Corridor area (in the context of the Vision 2020 Land Use and Transportation Planning Process).
February 1997	Final Report of the North Ring Corridor Committee: Recommended a four-lane expressway or parkway alignment based on travel forecasting exercises; included the caveat that further, more detailed planning be done before any improvements occur.
June 2000	The proposal to officially map the North Ring Corridor Committee’s recommended alignment. The North Mendota Parkway Advisory Committee (NMPAC) created via the Dane County Board resolution and charged with completing the North Mendota Parkway Study. Primary purpose of study is to provide NMPAC with sufficient information to make a recommendation to the Dane County Board with regard to official mapping.
2000 to 2002	NMPAC develops a study strategy and hires a consultant. Study looks at various growth scenarios, transportation corridors, and possible cross sections.
May 2003	NMPAC recommendations released that include intergovernmental agreements and a coordinated North Mendota Transportation Policy, Interim Official Maps, and further environmental study.
2006 to 2009	North Mendota Parkway Implementation Oversight Committee (NMPIOC) formed to oversee the North Mendota Environmental and Transportation Study (NMETS). The study is charged with identifying an Environmental Resource Boundary and a corridor for an NMP.
January 2009	Draft North Mendota Screening Report presented to the NMPIOC.
September 2009	NMPIOC releases recommended corridors for official mapping.

Table 2.01-1 Key Events North Mendota Corridors Evaluation

[1]http://danedocs.countyofdane.com/webdocs/PDF/execCommittees/8_23_01rpcpresentation.pdf accessed October 2014

B. NMPIOC Recommended Corridor

The 2009 NMETS evaluated 16 potential corridors. Figure 2.01-1 illustrates the final corridor area recommended by the NMPIOC. West of County Q, the area designated for a potential corridor is 1-mile wide and spans from below County K to approximately 0.75 mile north of County K. East of County Q, the designated corridor is much narrower and follows the north side of Dorn Creek before it connects with County M. No recommendations were made for the section from the County K and County M intersection to the WIS 19 connection with I-39.

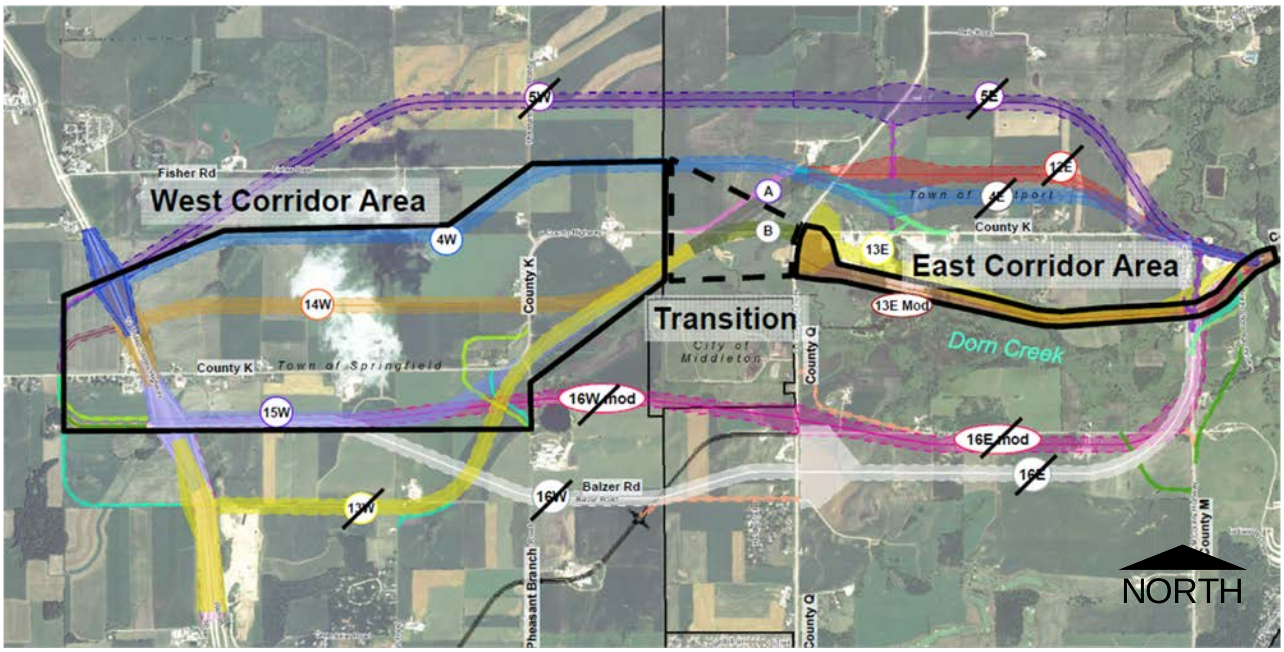


Figure 2.01-1 NMPIOC Recommended North Mendota Corridor

C. Government Positions

1. Dane County: In May 2010, the Dane County Board passed a resolution adopting the recommended alignment areas. The resolution asks communities to officially map the corridor east of County Q and urges WisDOT to design and locate the corridor west of County Q.

2. Town of Windsor (Windsor): In 2013, Windsor passed a resolution urging WisDOT to consider jurisdictionally transferring WIS 19 to the county and construct an NMP as a state highway from US 12 to WIS 113.

3. Westport: In March 2010, the Town of Westport passed a resolution supporting the NMP and referencing the alignments recommended in the Dane County resolution. In

February 2012, Westport passed a subsequent resolution advocating the jurisdictional transfer of WIS 19 to the county and the construction of the NMP as the new WIS 19.

4. Middleton: Middleton, through its extraterritorial official mapping powers, has officially mapped the NMP Corridor area recommended by the Dane County Board resolution. Figure 2.01-2 is an excerpt of Middleton's Comprehensive Plan, adopted May 3, 2011, in the North Mendota area.

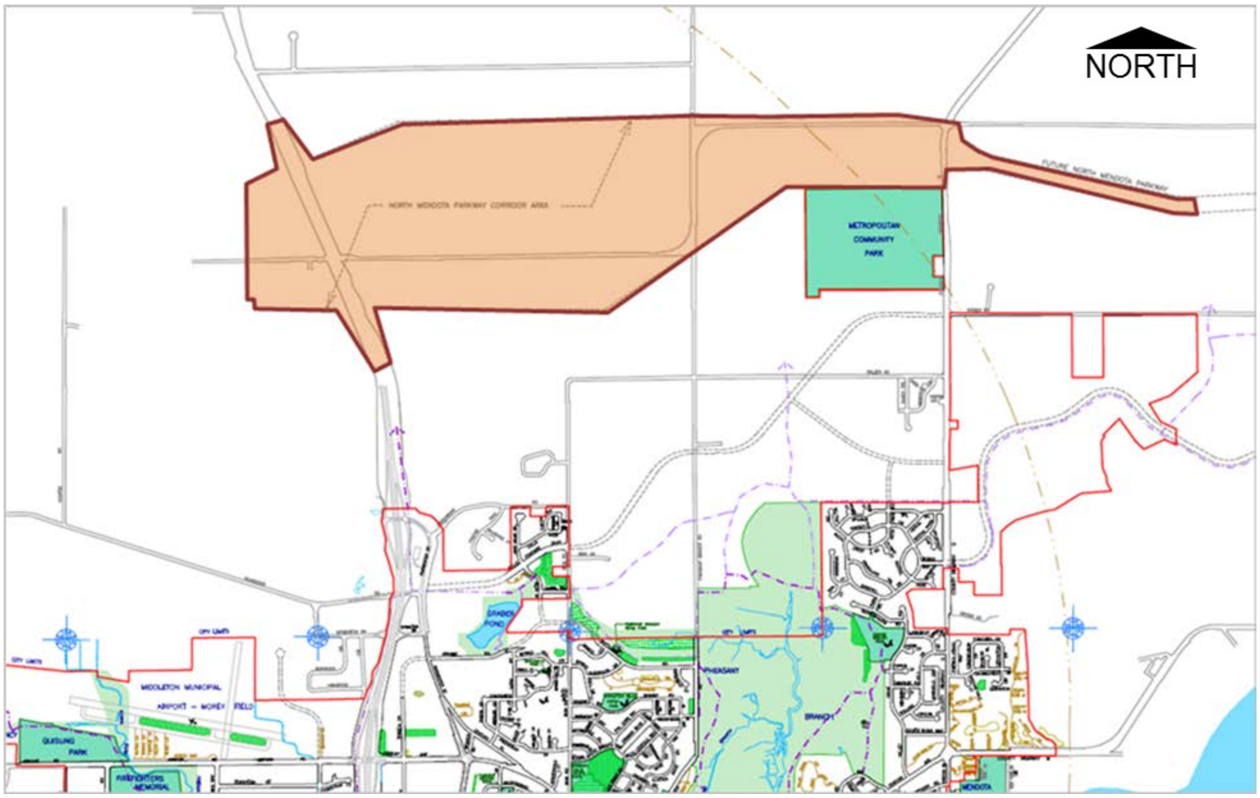


Figure 2.01-2 2011 Middleton's Official Map of the North Mendota Corridor

5. Town of Springfield (Springfield): Springfield has not officially endorsed or advocated for an NMP. The Comprehensive Plan, updated May 21, 2012, and shown in Figure 2.01-3, shows potential routes for an NMP.

6. Village of DeForest (DeForest): On November 5, 2013, DeForest passed Resolution 2013-088 urging WisDOT to consider jurisdictionally transferring WIS 19 to the county and construct an NMP as a state highway from US 12 to WIS 113.

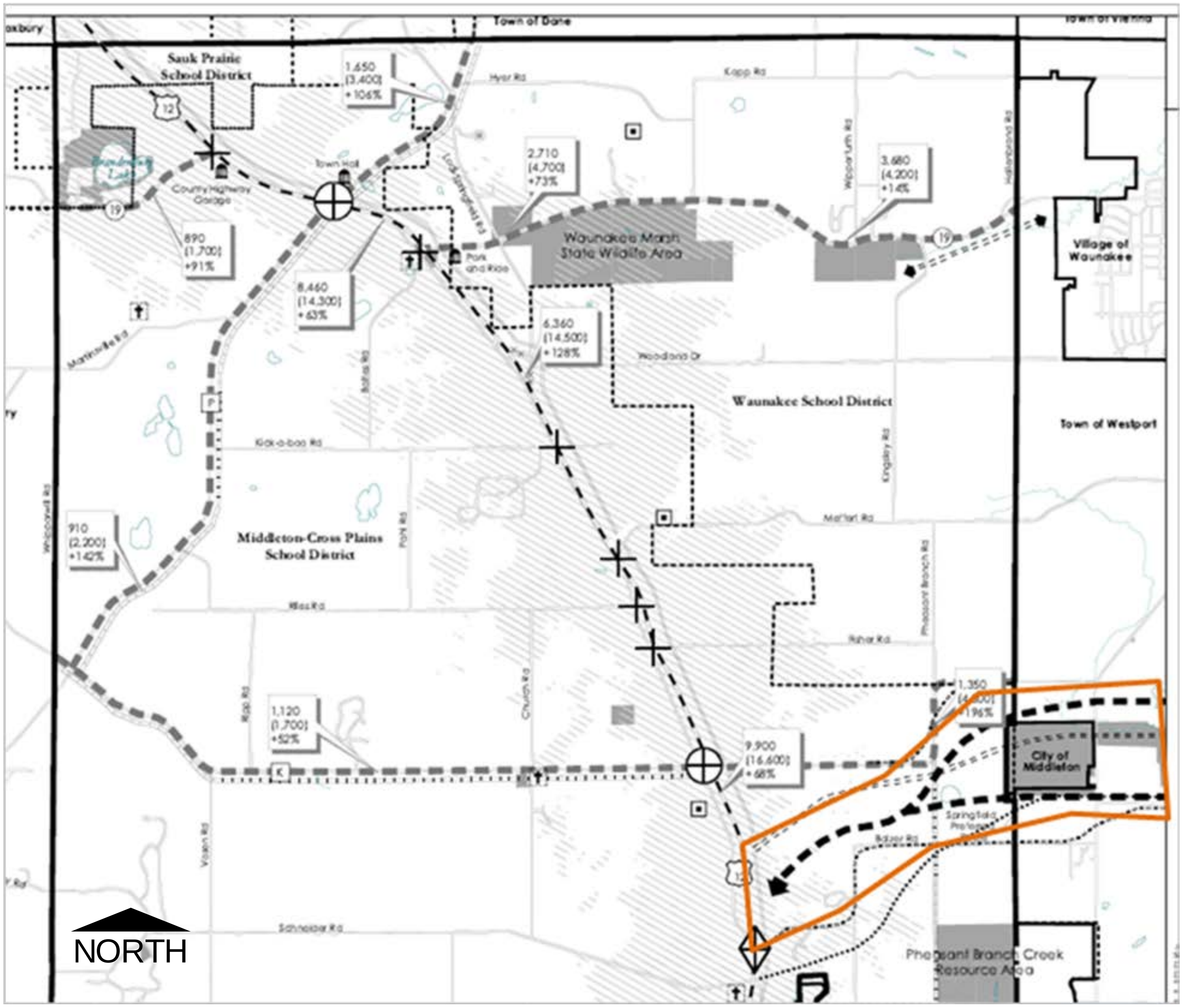


Figure 2.01-3 Springfield Comprehensive Plan 2012

7. Waunakee: On January 20, 2014, Waunakee passed a resolution supporting the NMP and the expansion of County M to four lanes. Within that resolution, Waunakee expressed its desire to not expand WIS 19 to four lanes through Waunakee.

2.02 TRAVEL PATTERNS

A. Traffic Volumes

Many roadways north of Lake Mendota carry relatively high traffic volumes for two-lane roads. Figure 2.02-1 illustrates 2009 and 2012 Annual Average Daily Traffic counts for area roadways. Roadways carrying high traffic volumes include County M, County K, and County Q.

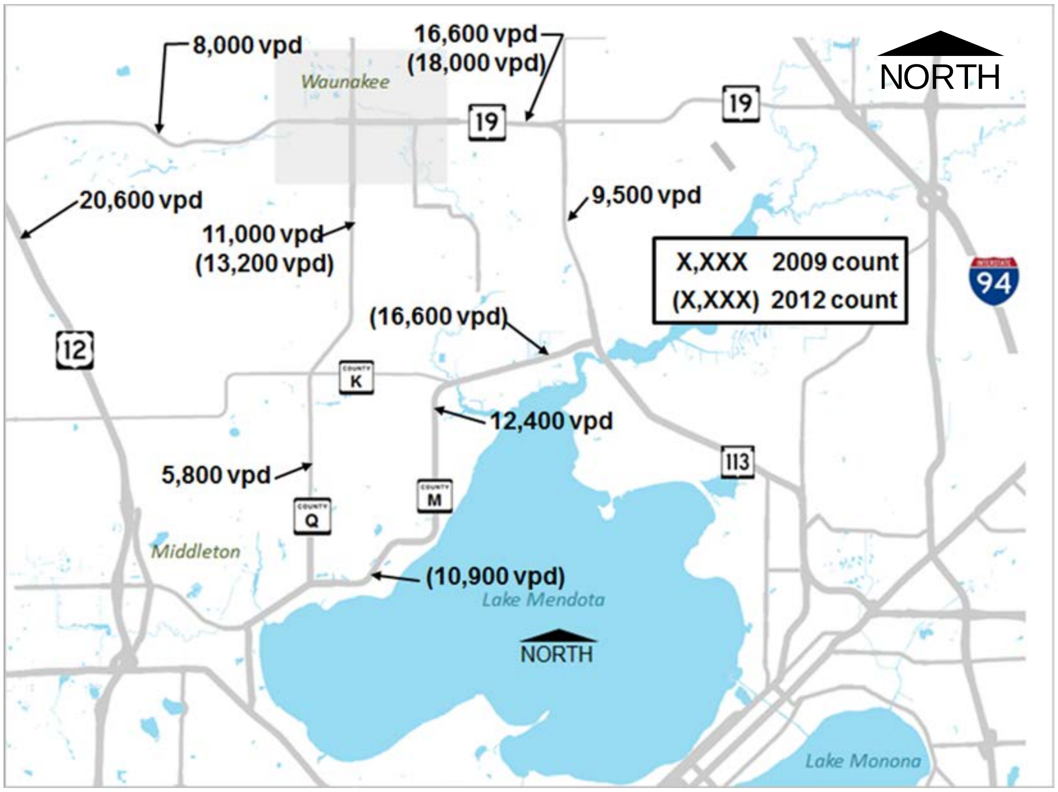


Figure 2.02-1 Area Traffic Volumes

B. <u>Operations</u>

The NMETS did not evaluate current or predicted future operations on roadways currently serving east-west trips north of Lake Mendota. Many trips currently use WIS 19, County K, and County M. Anecdotally, peak period drivers describe slow conditions with long groups of slow moving vehicles during the evening rush hour in particular.

Many east-west drivers are using County K and County M. The US 12 and County K intersection is a signalized intersection on the US 12 expressway and is bearing the burden of a good portion of these east-west North Mendota trips.

Figure 2.02-2 shows the existing lane configuration along with the modeled existing (2012) Level of Service (LOS) from Paramics, a traffic operations simulation computer program, for both the AM and PM peak hours[2] at this location. LOS is a measure of operational conditions on a highway during periods of peak traffic volume. At signalized intersections it is based on the average delays (in seconds) experienced by vehicles traveling through the intersection and uses a graduated scale from LOS A for the best

[2]The AM and PM peak hours are the one-hour periods in the morning and afternoon that experience the highest traffic volumes (rush hour).

conditions and lowest delay to LOS F for the worst conditions when there is more traffic arriving than the intersection can handle.

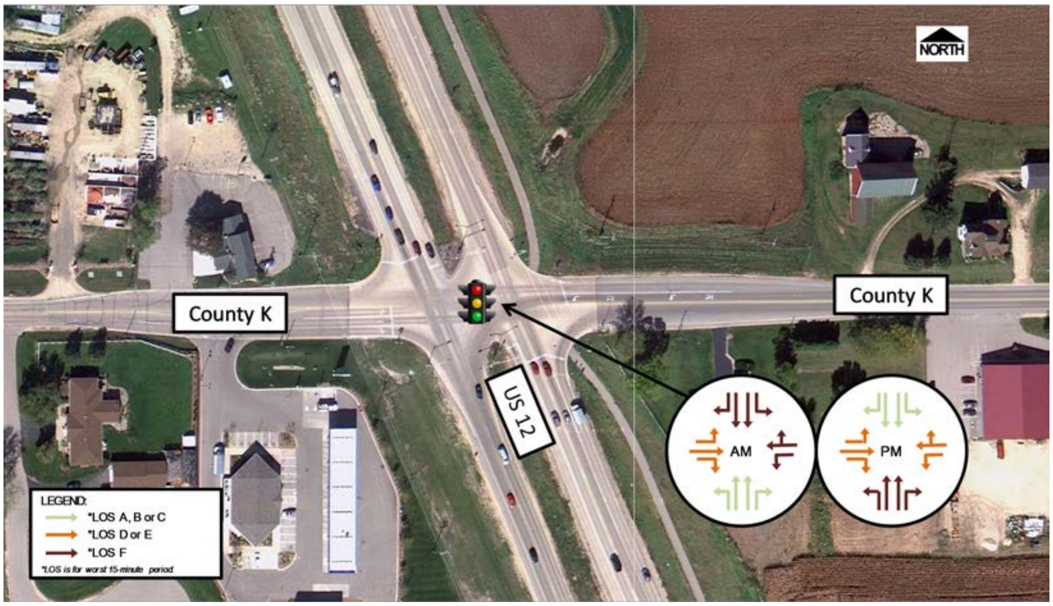


Figure 2.02-2 US 12 and County K Intersection

1. AM Peak Hour

The intersection operates at LOS F in the AM peak hour with an overall modeled average delay over 300 seconds. Modeled southbound queuing along US 12 and westbound queuing along County K in the AM peak hour both exceed 2,000 feet. These long queues have been confirmed with field observations. The southbound and westbound approaches both operate at LOS F during the AM peak hour and each approach has an overall modeled average delay over 300 seconds. In 2015, intersection improvements were constructed that have helped moderate these queues.

2. PM Peak Hour

The intersection operates at LOS F in the PM peak hour with an overall modeled average delay of 90 seconds. The northbound approach fails during the PM peak hour with an overall modeled average delay of 120 seconds, with queues approaching 2,000 feet. These queues have been confirmed with field observations.

C. <u>Crashes</u>

WisDOT did not perform a crash analysis for the roadways that are currently carrying east-west traffic on the north side of Lake Mendota, such as County K and County M. For intersections, crash rates are calculated based the number of crashes per million entering vehicles (MEV).

County K carries a substantial portion of the east-west traffic between Lake Mendota and Waunakee and it connects with the US 12 expressway with a signalized intersection. The US 12 and County K intersection had a total of 58 crashes occur between 2008 and 2012, including 22 injury crashes and one fatal crash. This resulted in a total crash rate at this intersection of 1.36 crashes per MEV, the second highest among the intersections analyzed as part of the Madison Beltline PEL Study. An injury crash rate of 0.52 injury crashes per MEV ranked highest among the intersections analyzed.

Nearly 60 percent (34 total) of the crashes that occurred were rear-end crashes. Of the rear-end crashes, 19 of the 34, or 56 percent, occurred in the westbound (northbound) direction on US 12. This indicates that traffic congestion at the signal and the transition to an expressway from the US 12 freeway may be a contributing factor to the high intersection crash rate. Figure 2.02-3 shows a breakdown of the types of crashes that occurred at the US 12 and County K intersection.

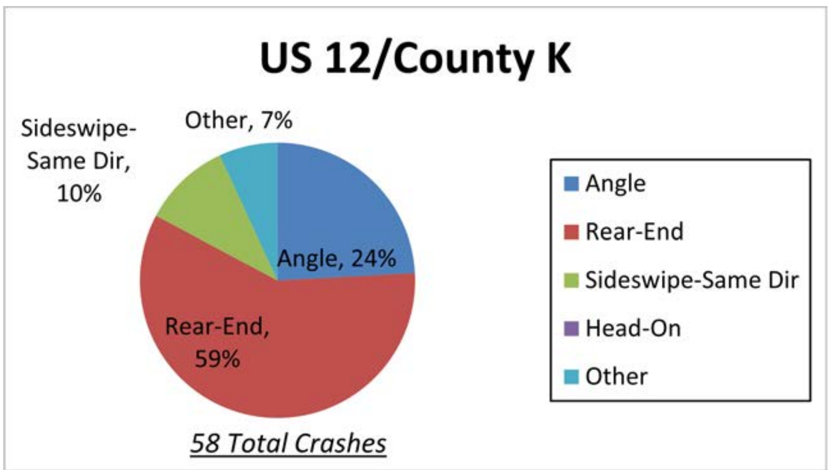


Figure 2.02-3 Manner of Collision–US 12 and County K

D. <u>Travel Patterns</u>

1. Methodology

In order for a North Mendota Corridor to satisfy root PEL objectives, the corridor would need to relieve the Beltline of sufficient current and future travel demand to substantially improve operations. To understand the ability of a north corridor to capture more east-west metropolitan travel, it is necessary to understand regional origins and destinations.

As mentioned in Section 1, WisDOT performed a county-wide O-D study to understand regional travel patterns. For the Beltline, WisDOT used time-lapse aerial photography. For the remainder of the county, WisDOT used Bluetooth detection. Bluetooth technologies were used to understand travel patterns on the north side of Lake Mendota.

2. West Madison and Middleton to East of I-39 and Sun Prairie Area

A broad analysis was conducted to understand the travel patterns to and from employment centers in the west Madison and Middleton area and the northeast Madison and Sun Prairie area east of I-39/94. These trips have a variety of routing options to choose from, including WIS 19 and County M on the north side of Lake Mendota, through the Isthmus, and on the Beltline. If a high-mobility North Mendota Corridor were constructed, it may attract some of the trips that are currently using the Beltline to get to the west side of Madison. Figure 2.02-4 illustrates the results of this analysis. Approximately 11,500 vehicles travel between the two areas each day. Currently, 71 to 77 percent of the daily trips coming from the Sun Prairie area to the west Madison area uses the Beltline. While this is a large percentage, it amounts to only approximately 8,500 vehicles per day (vpd). Between 19 and 23 percent of these trips use WIS 19 for at least a portion of their trip, amounting to almost 2,400 vpd daily.

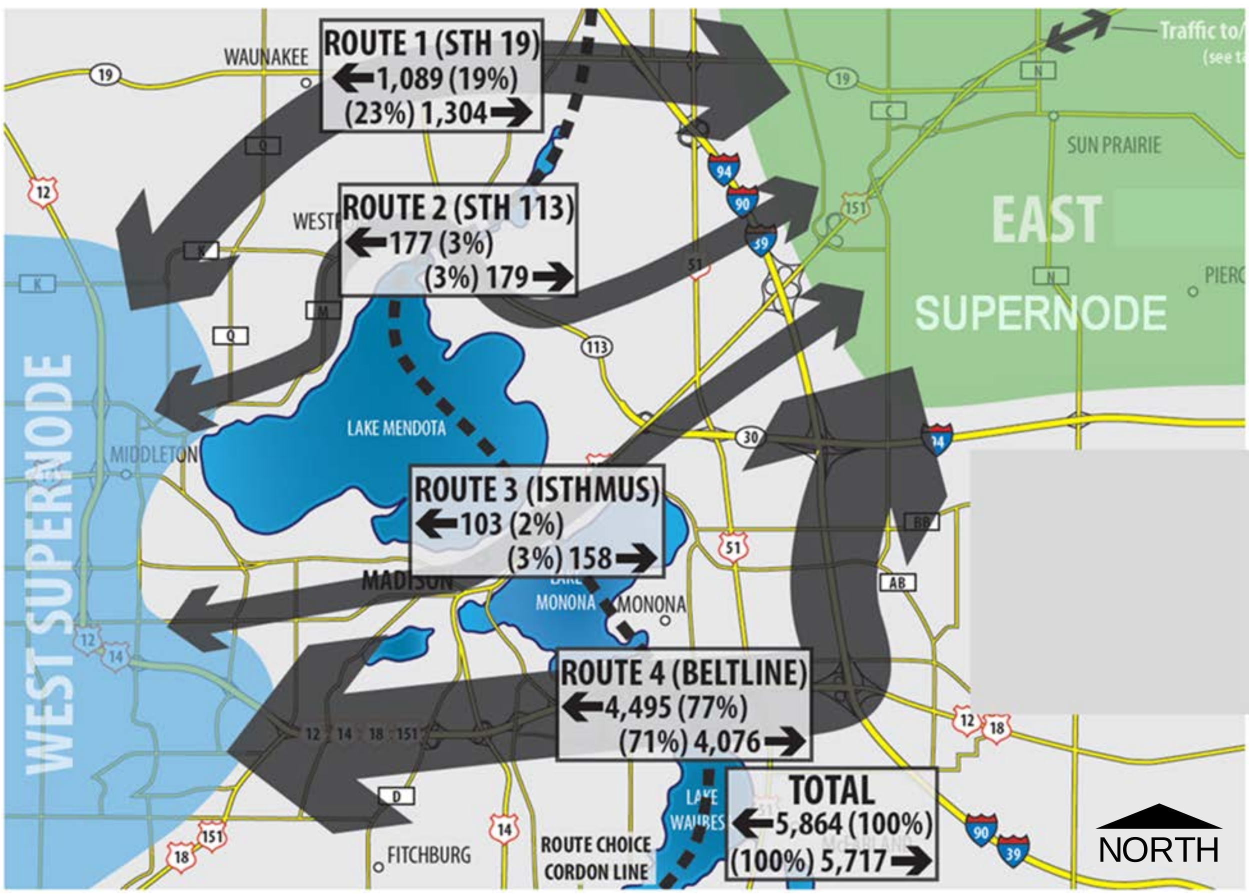


Figure 2.02-4 West Madison–Sun Prairie O-D Patterns–Daily Trips

3. Middleton to I-39/90/94

A second west side analysis was completed in the Middleton area to understand the origins of all trips that enter the area and either remain there or pass through on their way to destinations. The Middleton area included US 12, County K, County M and Airport Road, and University Avenue. Figure 2.02-5 shows the results for the morning peak period from 6 to 9 A.M. The morning peak period provides a good representation of predictable travel patterns because of the large percentage of work trips.

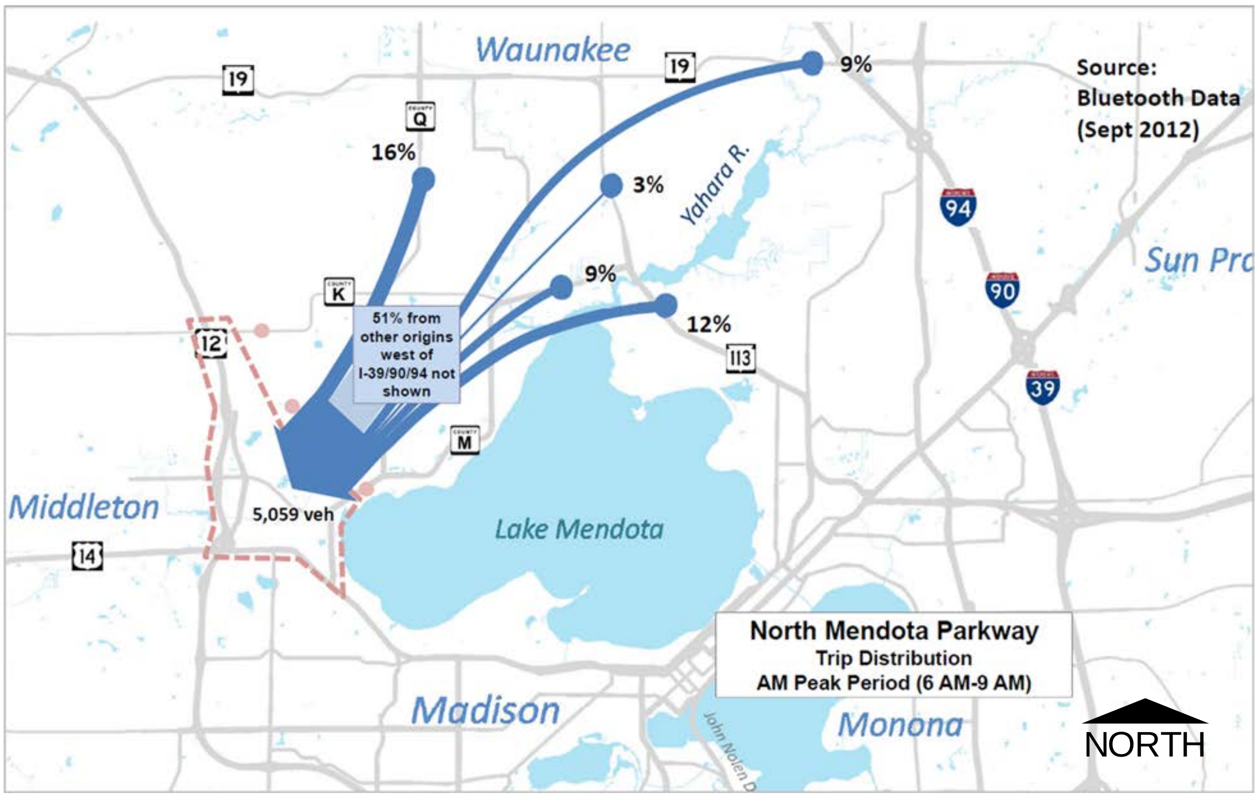


Figure 2.02-5 Morning North Mendota O-D Patterns

The figure shows that of the 5,059 trips that enter the Middleton analysis area during the morning peak period, only 12 percent originate from WIS 113 (Northport Drive) and 9 percent originate from I-39/90/94. Conversely, 79 percent of trips originate from other origins west of I-39/90/94. The trips that span the full length of the corridor from I-39/90/94 or WIS 113 to Middleton are trips that could use the Beltline as an option for east-west travel. The relatively large percentage of trips that originate west of I-39/90/94 are not as likely to use the Beltline for east-west travel. However, these trips would be attracted to a high-mobility corridor on the north side of Lake Mendota.

Figure 2.02-6 shows the destination travel patterns originating from the Middleton analysis area during the same morning peak period. This graphic shows approximately one-half as many trips originate from or pass through the analysis area (2,519) with 8 percent destined to WIS 19 by I-39/90/94 and 26 percent destined for WIS 113. While the percentage of trips that span the full east-west corridor is greater for trips originating or passing through the Middleton analysis area, the total number of trips is much less, being 2,519 for the three-hour period.

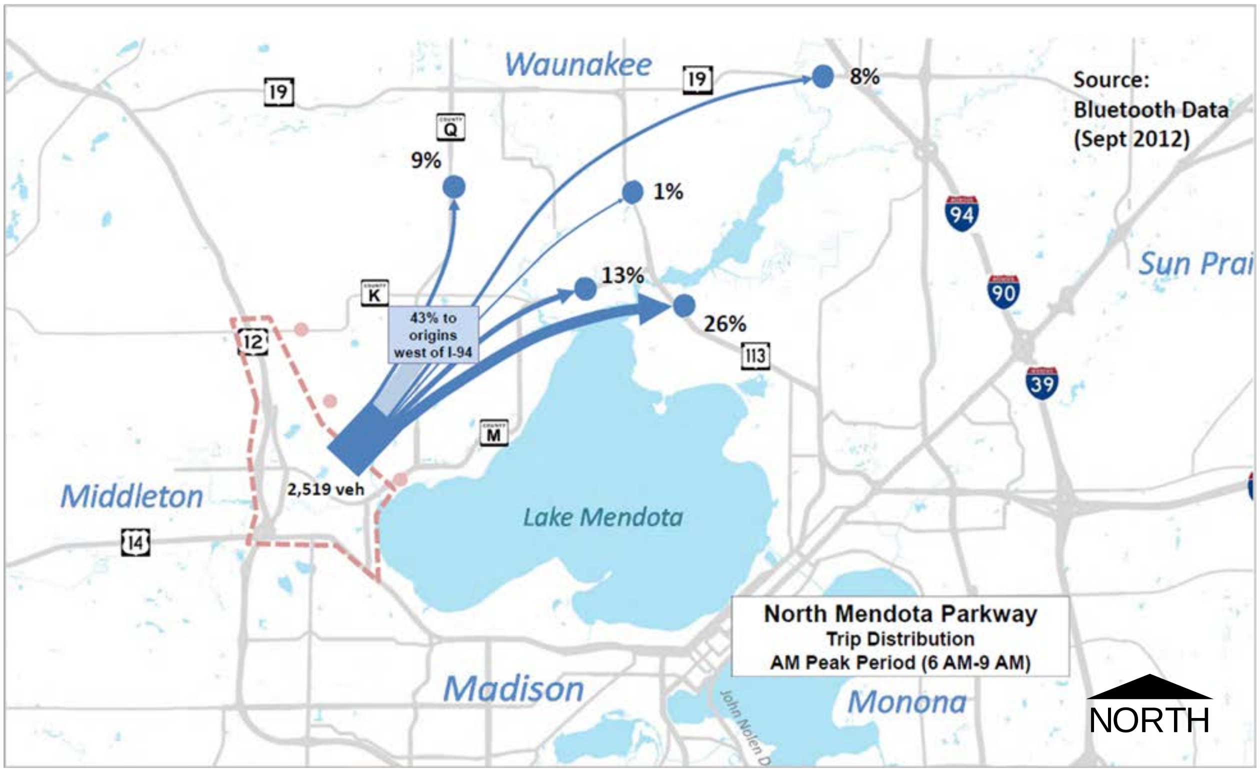


Figure 2.02-6 Morning Peak Period North Mendota O-D Patterns

4. Routing of Middleton Area Trips to I-39/90/94 Trips

After presentations to local officials, a subsequent analysis was performed analyzing the routing of traffic that spans the full corridor from Middleton to the I-39/90/94/WIS 19 interchange. Note that this is a subset of the total traffic on WIS 19 and includes only the traffic that travels the full distance from Middleton to I-39/90/94/WIS 19. Figure 2.02-7 shows the amount of daily traffic that travels from the northeast to the southwest portions of the North Mendota area, as well as from the northwest to the southeast portions of the North Mendota area. The northeast-to-southwest travel pattern carries approximately 4,350 vpd, whereas the northwest-to-southeast travel pattern carries approximately 975 vpd.

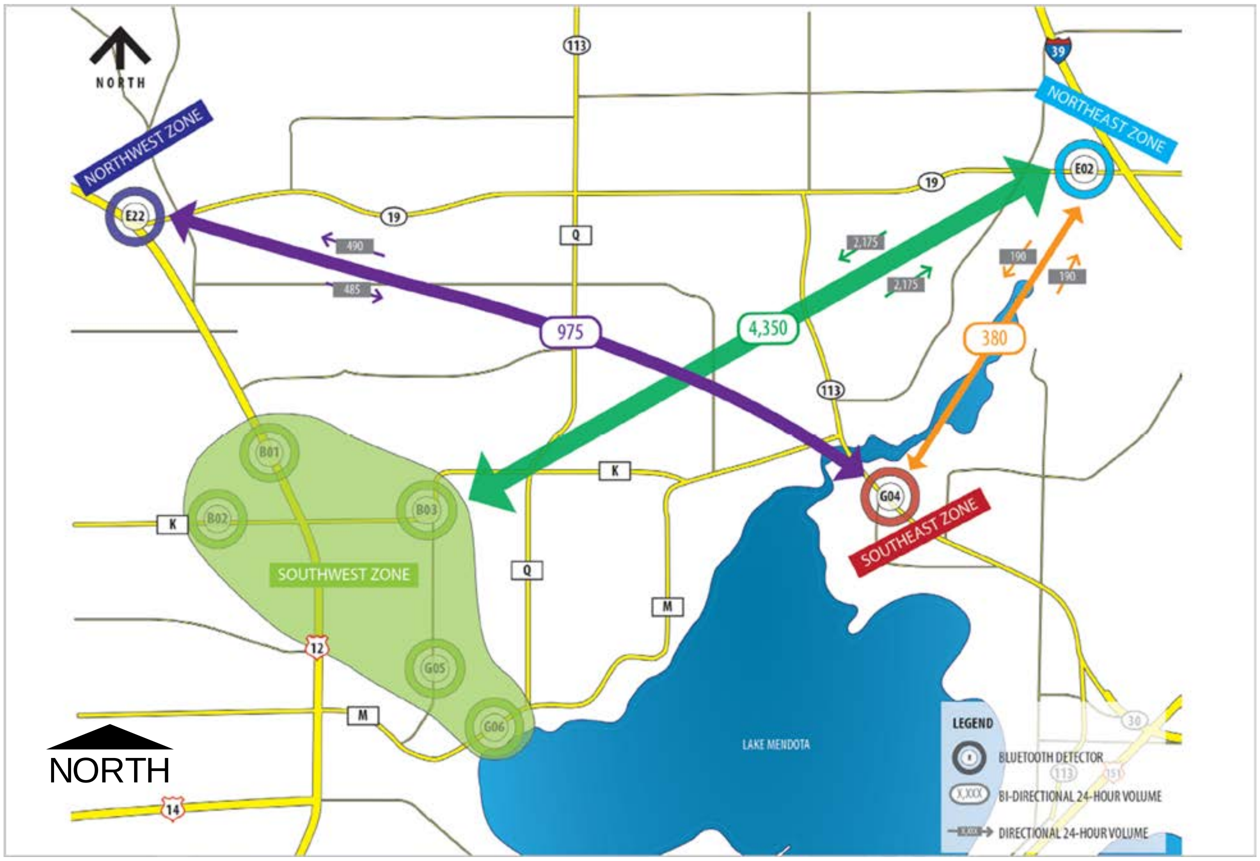


Figure 2.02-7 North Mendota Daily O-D Volumes

Figures 2.02-8 and 2.02-9 illustrate the routing of these trips. Of traffic coming from the I-39/90/94/WIS 19 interchange and going to the Middleton analysis area, approximately one-half of the traffic travels on County M while the other one-half travels through Waunakee on WIS 19 and County Q. In the reverse direction, the percentages are approximately the same. Presumably, drivers are choosing to travel through downtown Waunakee, even with the lower speed limit and traffic signals, to avoid congestion occurring on County M.

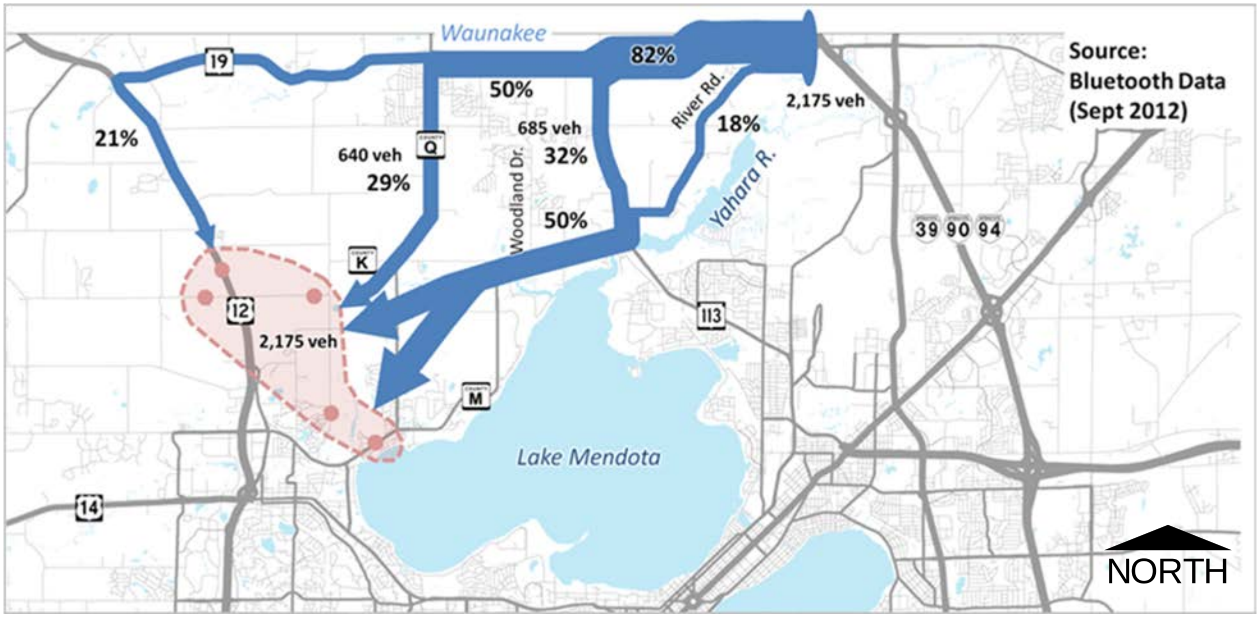


Figure 2.02-8 WIS 19 O-D Patterns

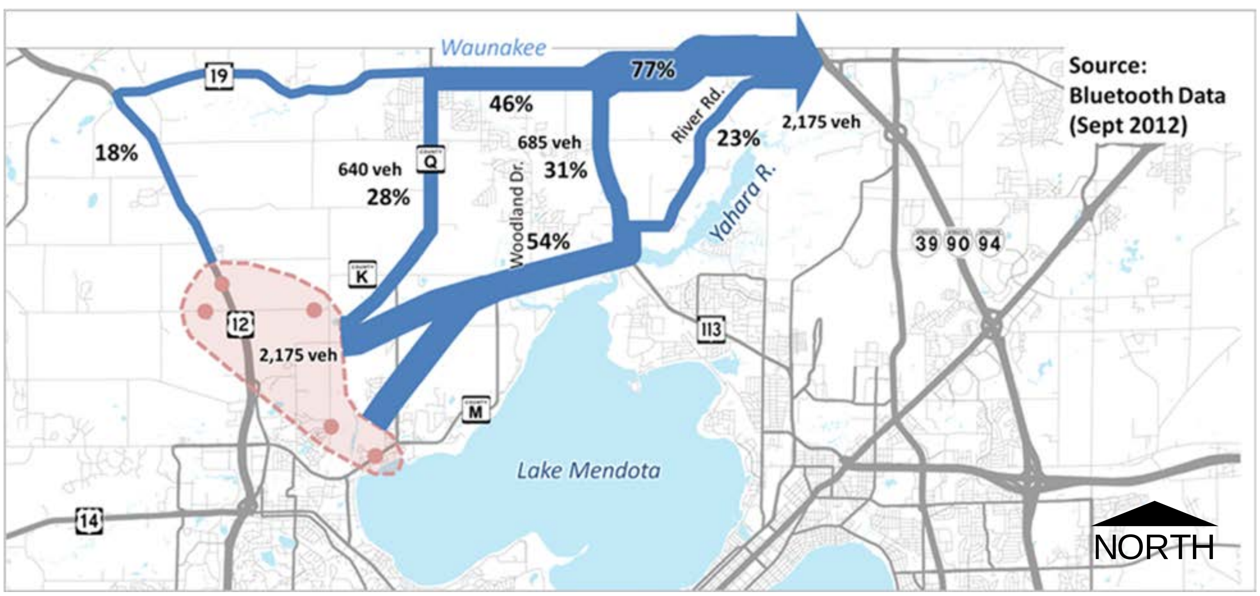


Figure 2.02-9 WIS 19 O-D Patterns

These analyses suggest the following:

1. Approximately 8,500 daily trips to and from Sun Prairie, DeForest, and West Madison currently use the Beltline. A portion of these trips that originate from the northwest and the

northeast could be attracted to a North Mendota Corridor if it offered a similar or better travel time.

2. A North Mendota Corridor is more likely to attract trips that originate from the communities located on the north side of Lake Mendota. Capturing this traffic is unlikely to affect Beltline traffic volumes.

3. A high-mobility corridor, either north or south of Waunakee, has the potential to reduce traffic in downtown Waunakee.

2.03 STRATEGY DESCRIPTION

The study evaluated two North Mendota conceptual alignments that represent this strategy. The two alignments are separated by approximately 3 miles and are meant to broadly represent the types of effects a high-mobility corridor would produce on the north side of Lake Mendota.

The first strategy alignment generally follows the alignment endorsed by Dane County and is called the South Waunakee Corridor. This alignment starts at US 12 in the vicinity of the US 12 and County K intersection. It then travels easterly, off-alignment to the intersection of County K and County M. Here it follows County M to WIS 113 and travels north on WIS 113 to WIS 19 and I-39/90/94.

The second conceptual alignment that represents this strategy is north of the village of Waunakee. It starts at the US 12 and WIS 19 intersection. It then travels easterly along WIS 19 until west of Waunakee, where it goes off alignment on the north side of Waunakee. This alignment would connect with I-39/90/94 at a new interchange approximately 1 mile north of WIS 19.

Figure 2.03-1 schematically represents the two strategy corridors.

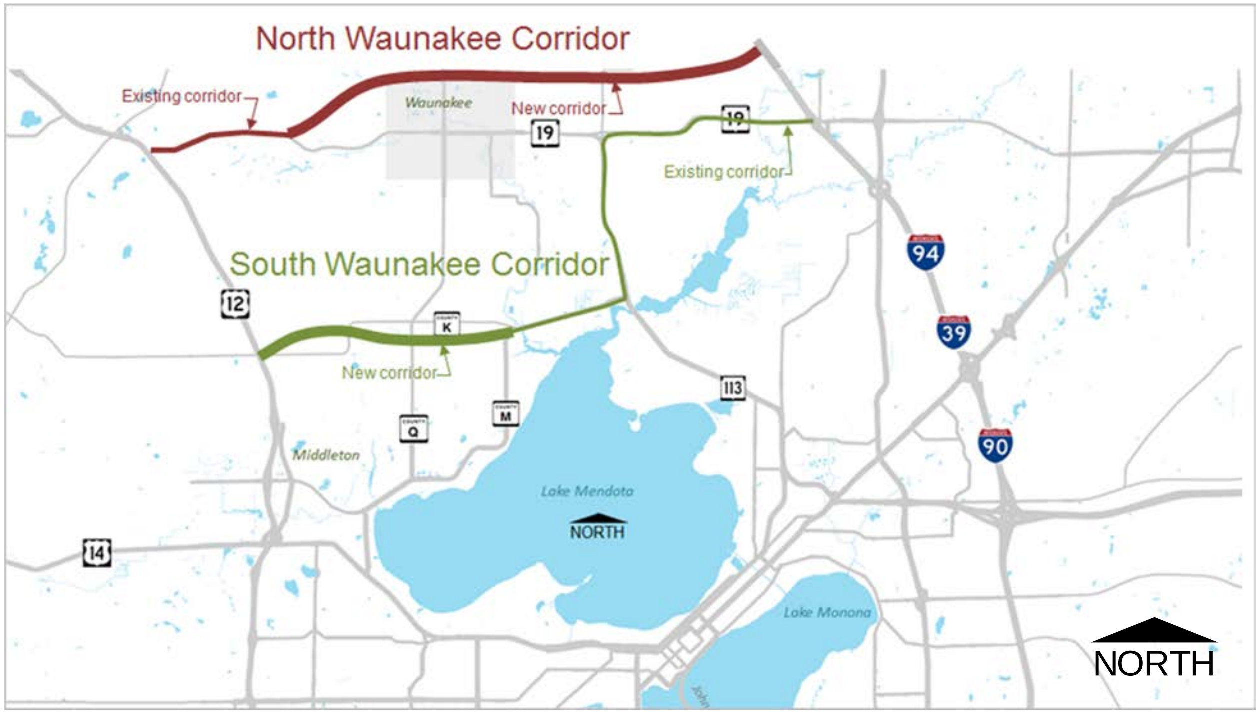


Figure 2.03-1 Strategy Corridors

2.04 TRAFFIC IMPACTS

As mentioned in Section 1, the Madison Beltline PEL Study uses the Greater Madison MPO's TDM to understand area traffic patterns and volumes. The extensive amount of time-lapse aerial photography, along with Bluetooth O-D studies, has allowed this TDM update to be calibrated to a greater extent than previous models.

With a TDM, different roadway and land use scenarios can be tested to understand how they would change area travel patterns. For example, a new roadway can be added to the network and the TDM will predict how much traffic the new roadway would attract and how traffic patterns would change with the new roadway link. The TDM is an effective and useful tool for evaluating roadway network changes such as the NMP.

The two strategy alignments were modeled in the 2010 TDM with two different classifications of roadway: an expressway defined as a divided arterial highway with partial control of access by a combination of interchanges, at-grade intersections and driveways; and a freeway defined as a divided arterial highway with full access control with access at grade separated interchanges only. This is similar to the difference experienced between US 51 (Stoughton Road) and the Interstate freeway. The TDM is able to model this behavior. It should be noted that constructing an interstate highway-type freeway with system connections is unlikely in this corridor. The speed on the NMP was coded in the TDM at 60 miles per hour (mph). Speeds of 40 mph and 50 mph were also evaluated, but are not presented in this report as the 60-mph results are more conservative (i.e., draw more traffic than the lower speed options).

Figure 2.04-1 shows the traffic volume changes that a North Waunakee Corridor would create in the 2010 base year, and Figure 2.04-2 shows the traffic volume changes for the 2050 horizon year. There are several pertinent observations.

1. The North Waunakee Corridor captures less traffic as an expressway than as a freeway.
2. If built, the North Waunakee Corridor would attract up to 28,100 vpd in the 2010 base year, and up to 51,300 vpd (freeway) in the 2050 horizon year.
3. The North Waunakee Corridor decreases traffic on WIS 19 through Waunakee by up to 50 percent.
4. The North Waunakee Corridor has a small effect on County M (east of County K) and Century Avenue traffic volumes.
5. The North Waunakee Corridor has no effect on Isthmus traffic.
6. The North Waunakee Corridor has essentially no effect on Beltline traffic volumes.

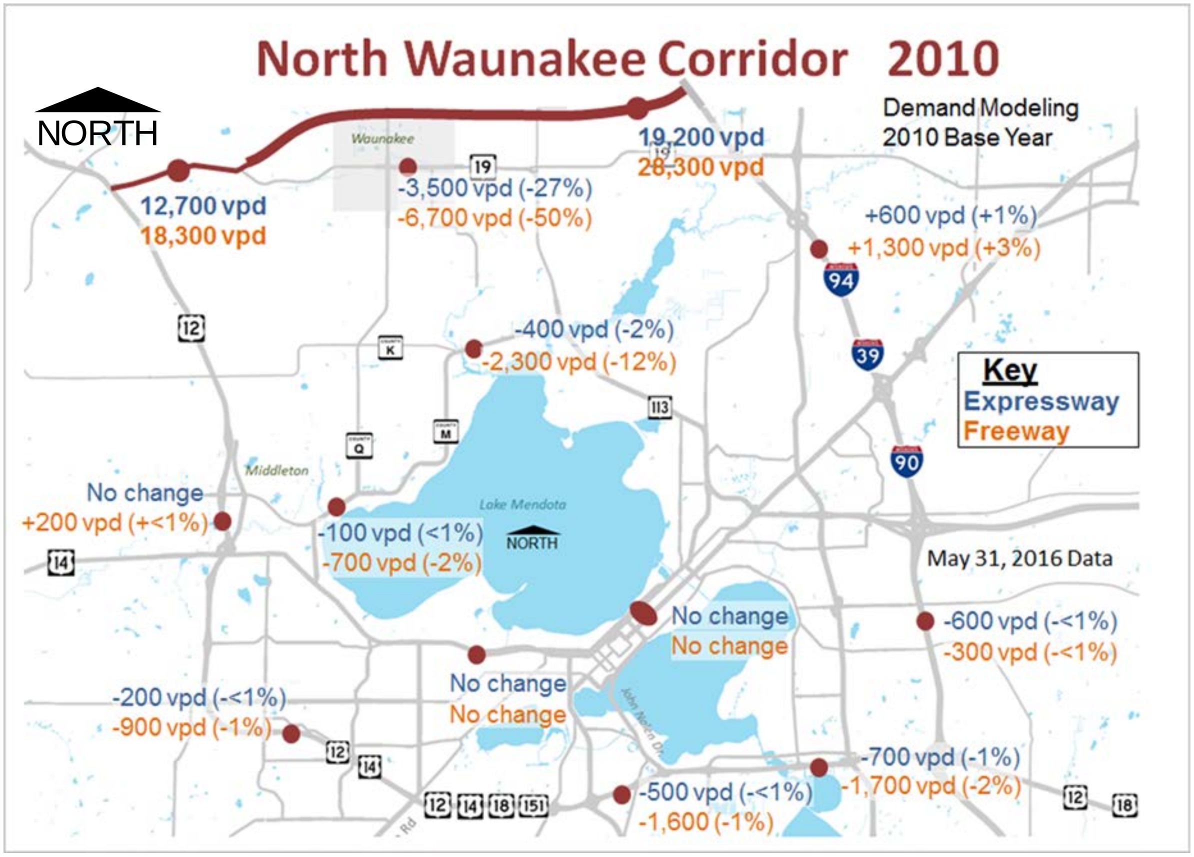


Figure 2.04-1 2010 Traffic Effects of North Waunakee Corridor

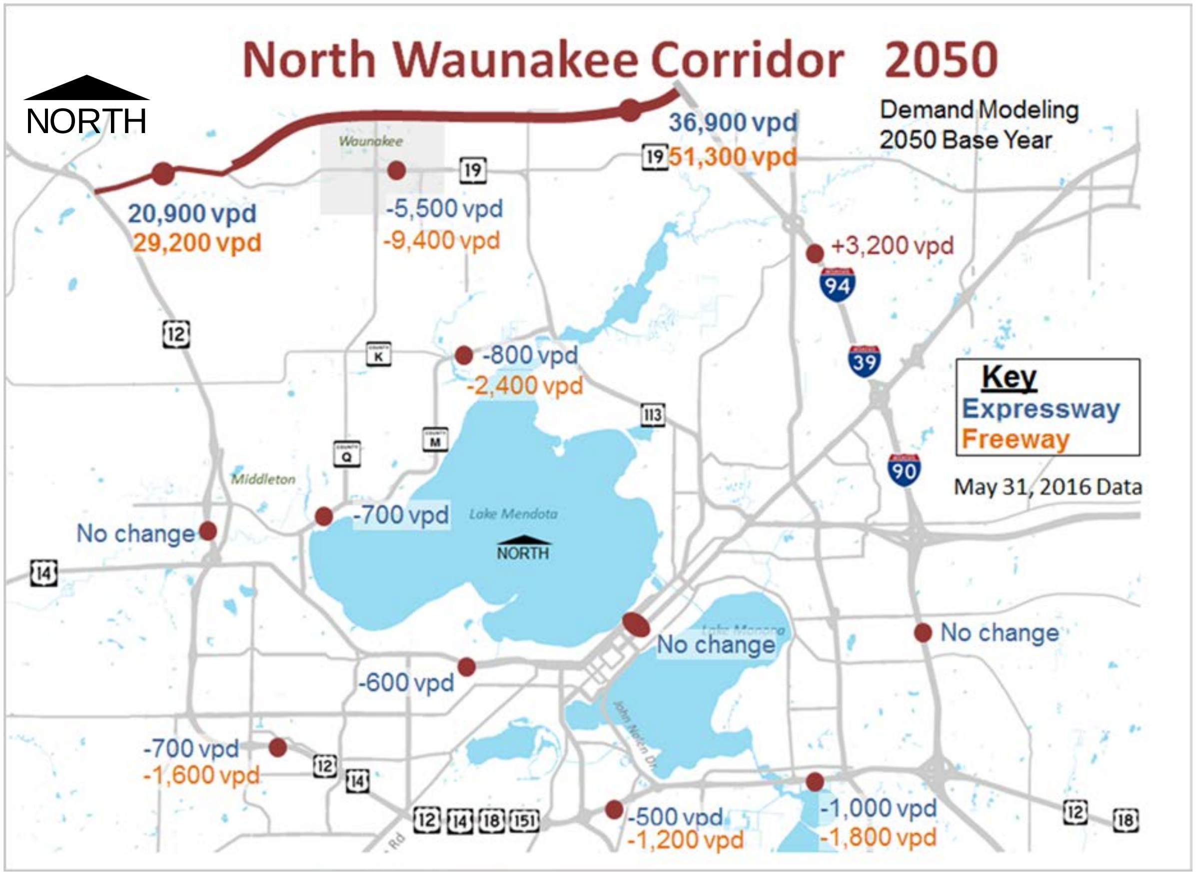


Figure 2.04-2 2050 Traffic Effects of North Waunakee Corridor

Figure 2.04-3 shows the traffic volume changes a South Waunakee Corridor would create in the 2010 base year, and Figure 2.04-4 shows the traffic volume changes for the 2050 horizon year. There are several pertinent observations.

1. As with the North Waunakee Corridor, a higher classification of roadway (freeway) draws greater traffic volumes.

2. The South Waunakee Corridor captures up to 80 percent greater traffic volumes in 2010 than the North Waunakee Corridor.

3. The South Waunakee Corridor would have a small impact on traffic traveling WIS 19 through Waunakee.

4. The South Waunakee Corridor reduces County M (east of County Q) traffic volumes by approximately 10 to 20 percent in 2010 and 2050.

5. The South Waunakee Corridor increases County M (east of County K) traffic volumes by up to 100 percent in 2010.

6. The South Waunakee Corridor has a small effect on Isthmus traffic.

7. The South Waunakee Corridor has essentially no effect on the main section of Beltline traffic volumes, with some sections experiencing volume increases in 2050.

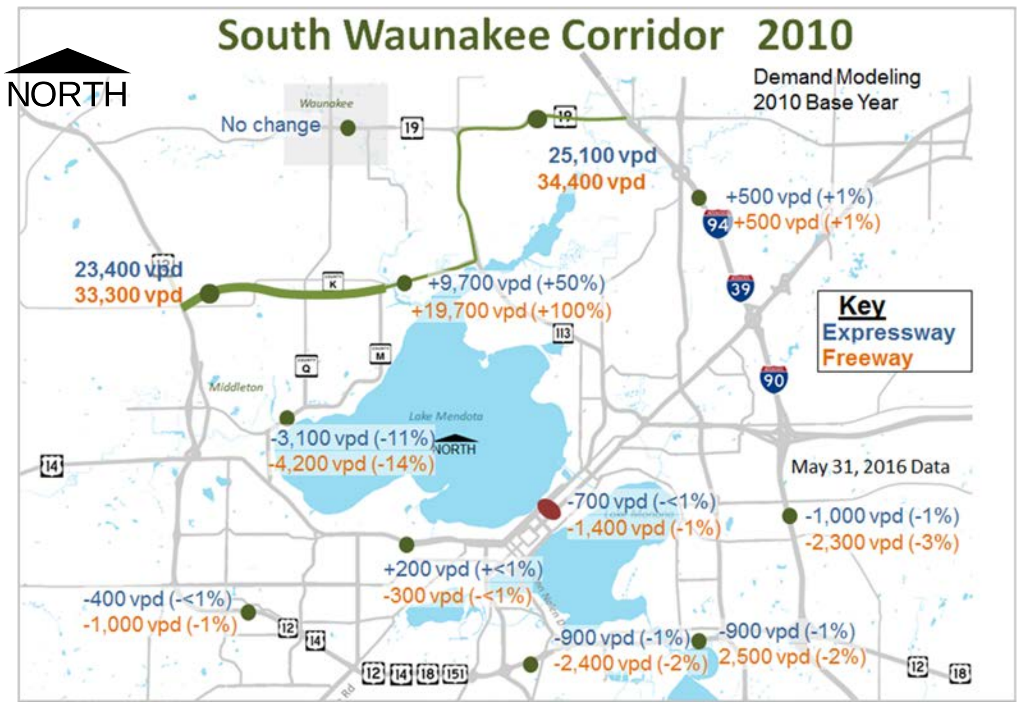


Figure 2.04-3 2010 Traffic Effects of South Waunakee Corridor

Figure 2.04-4 2050 Traffic Effects of South Waunakee Corridor

Perhaps one reason a North Mendota Corridor does not greatly affect Beltline volumes is because most travelers that would benefit from a North Mendota Corridor are already using existing routes north of Lake Mendota.

2.05 OTHER IMPACTS

Figure 2.05-1 shows the different public natural resource areas with the conceptual strategy corridors superimposed on them. Figure 2.05-2 shows the water resource areas with the conceptual strategy alignments superimposed on them. Figure 2.05-3 shows the agricultural resource areas with the conceptual strategy corridors superimposed on them.

The following paragraphs summarize the broad impact each strategy alignment would have on resource areas. If these strategies satisfy the Beltline PEL goal and objectives, a more detailed impact analysis will be performed.

A. North Waunakee Corridor

Starting at the US 12 and WIS 19 intersection, the North Waunakee Corridor would travel along an existing WIS 19 corridor for approximately 2.2 miles. The Waunakee Marsh State Wildlife Area is adjacent to WIS 19 on both sides in the west end of the corridor, and it is unlikely that an expanded roadway could avoid it. It is likely that roadway expansion along this portion of WIS 19 would be to the north and would require several residential relocations. As the North Waunakee Corridor veers to the north, on the north side of Waunakee, most impacts would be to farmlands. Most of the land north of Waunakee is classified as prime farmland. Within the alignment, there are also fingers of soils classified as farmland of statewide importance. The agricultural impacts would be characterized by direct acquisition of farmland, as well as triangulation and farm severances.

A 300-foot-wide corridor is a reasonable approximation of the footprint for a four-lane roadway in this area. This width could require between 300 and 400 acres of new R/W. The North Waunakee Corridor spans the full distance from US 12 to I-39/90/94, a distance of 10.5 miles.

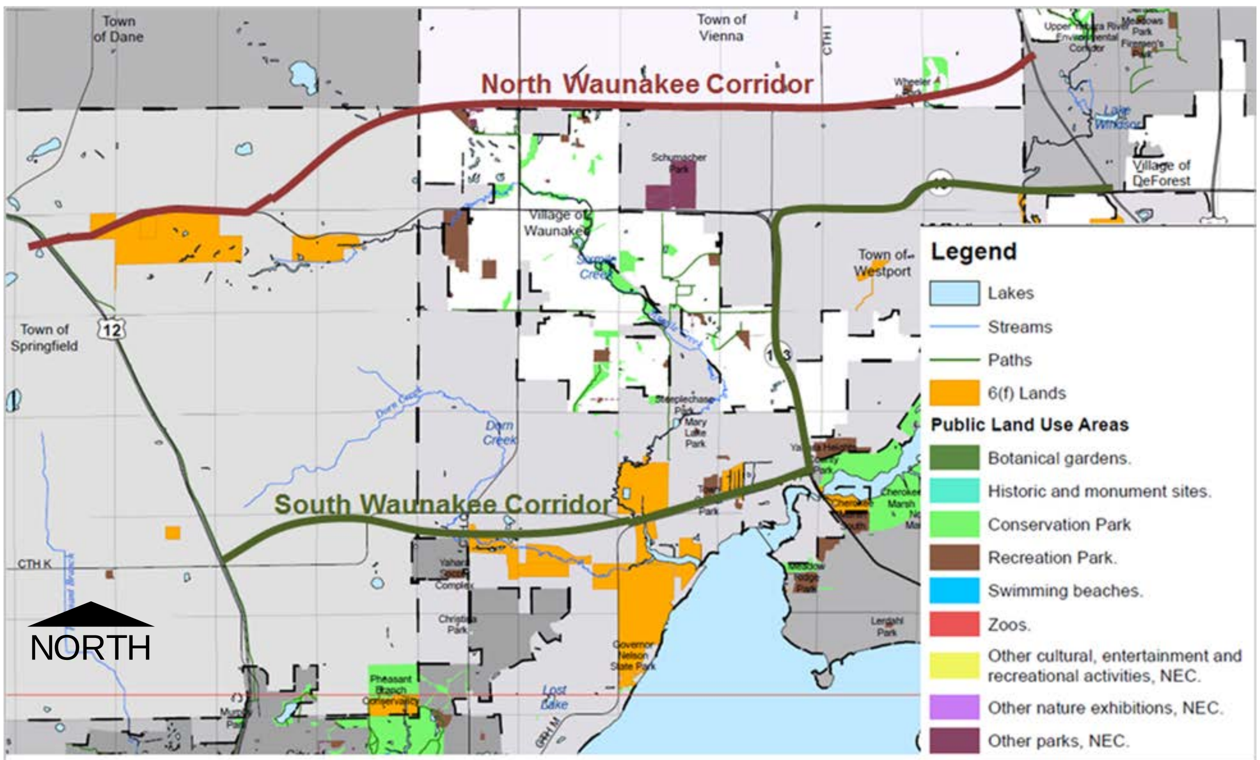


Figure 2.05-1 Public Resource Areas North Mendota

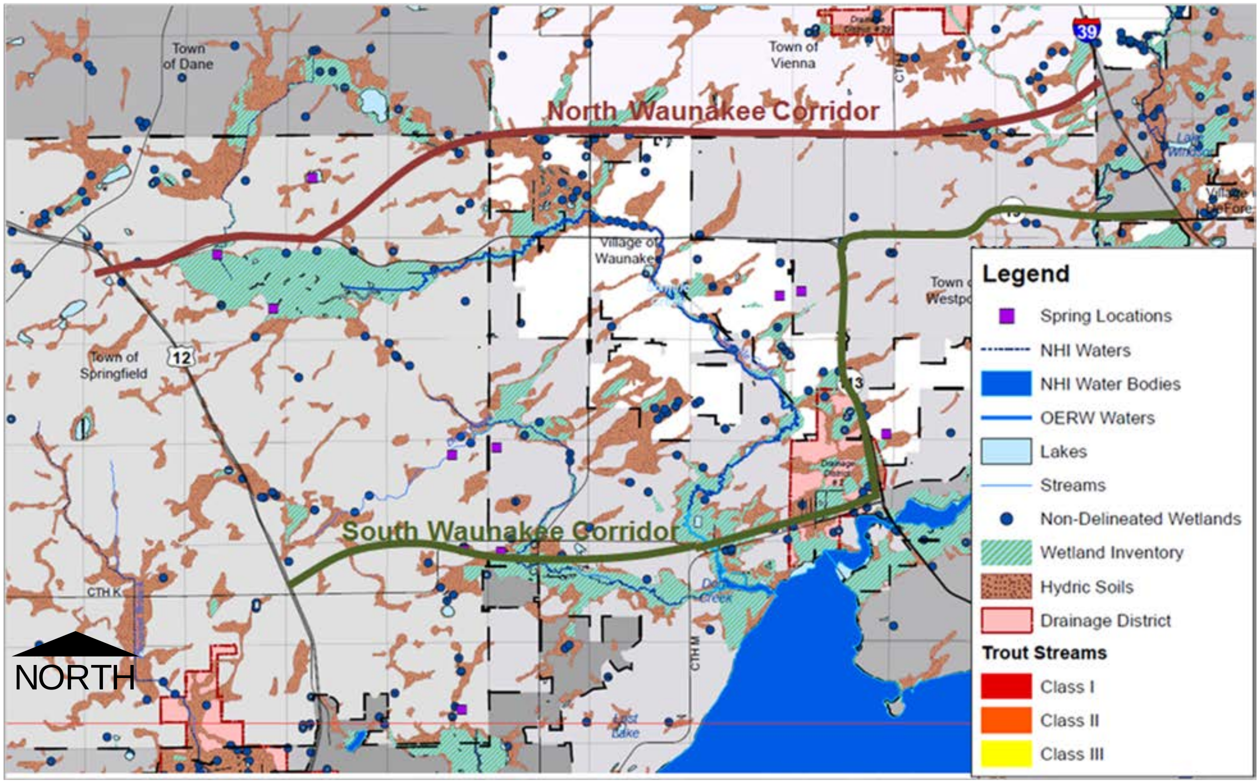


Figure 2.05-2 Water Resource Areas North Mendota

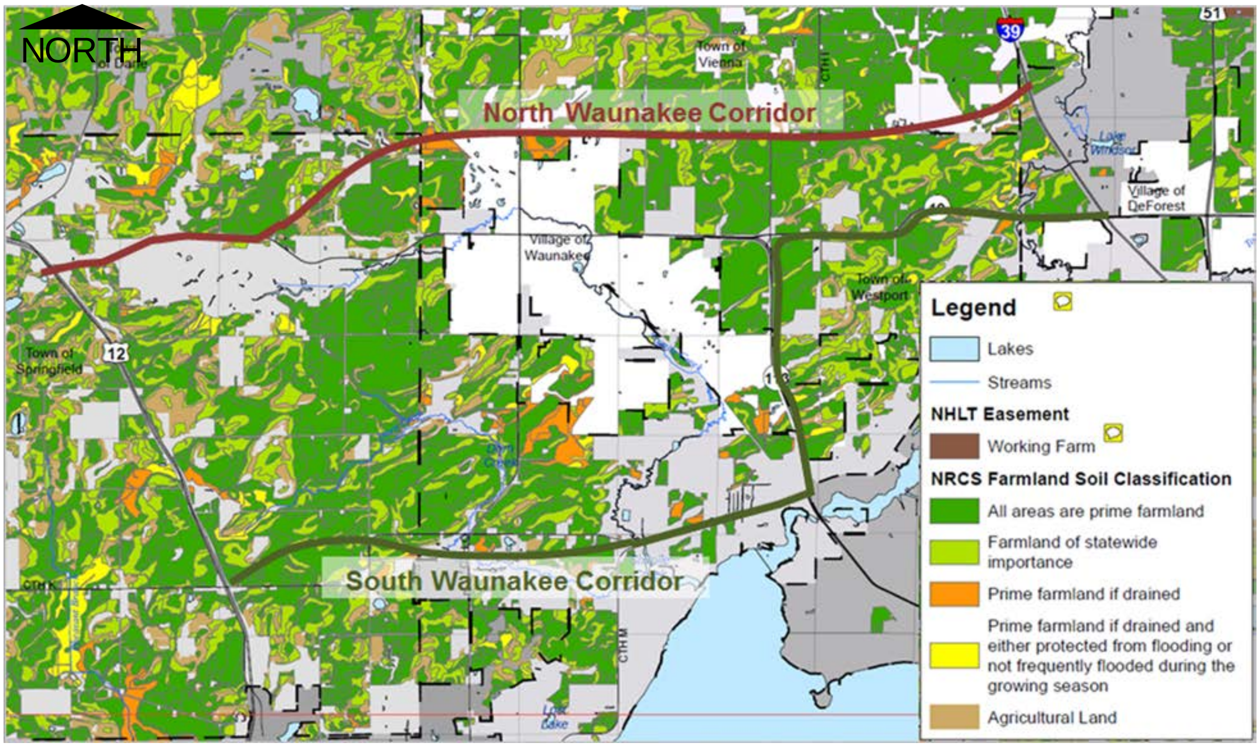


Figure 2.05-3 Agricultural Resources North Mendota

B. South Waunakee Corridor

Near the US 12 and County K intersection, the South Waunakee Corridor would travel off alignment 5.3 miles until it would reach the County K and County M intersection. Most of the land west of County Q is prime agricultural land; impacts would consist mainly of direct agricultural acquisition. Access changes, field severances, and triangulation would also occur since this portion of the roadway is off-alignment. East of County Q, the alignment would border the north edge of Dorn Creek until the alignment would connect with County M. Predominant impacts in this section would consist of direct R/W acquisition, along with some edge impacts to the riparian habitat of Dorn Creek. Once the alignment would connect with County M, it would follow the County M, WIS 113, and WIS 19 alignments until it would connect with I-39/90/94. Wetlands associated with Dorn and Sixmile Creeks are adjacent to County M on both sides in this area. Wetland impacts, because of widening, would be unavoidable. The expansion on WIS 113 and WIS 19 would require widening on one or both sides. The corridor would lie on primarily agricultural lands and would require direct acquisition but have limited severances or triangulation to farm properties since it is on-alignment. Creating a four-lane corridor on these roadways could require several residential relocations. No formal design has been completed, but a 300-foot-wide corridor would require an estimated 200 to 250 acres of new R/W from US 12 to County M. Table 2.05-1 provides the approximate impacts associated with Dane County's corridors that have been/are being officially mapped by local governments.[3] These corridors span from US 12 to the County M and County K intersection, a distance

[3] Draft North Mendota Parkway Report, 2009

of 4.4 miles. If the parkway also included expanding to four lanes along existing County M, WIS 113, and WIS 19 to I-39/90/94, another 170 to 210 additional acres could be required. This portion of the corridor from the US 12 and County K intersection to I-39/90/94 spans approximately 6.1 miles.

Possible North Mendota Alignment		Ag Land (acre)	Residential Land (acre)	Business Land (acre)	Environ Corridor (acre)	Total Land (acre)	Wetlands (acre)	Relocations
15W, 13E, AND CONNECTOR B	13E	70.5	7.2	3.5	5.0	86.2	2.3	4
	15W B	109.1	0.5	1.0	23.9	134.5	7.3	7
	TOTAL	179.6	7.7	4.5	28.9	220.7	9.6	12
14W, 13E, AND CONNECTOR B	13E	70.5	7.2	3.5	5.0	86.2	2.3	4
	14W B	111.6	0.0	2.2	10.2	124.0	5.4	6
	TOTAL	182.1	7.2	5.7	15.2	210.2	7.7	10

Table 2.05-1 South Waunakee Corridor Impacts, US 12 to County M (from 2009 Dane County Study)

2.06 SCREENING AND RESULTS

Tables 2.06-1 and 2.06-2 use the Stand-Alone Strategy screening questions described in Section 1 and evaluates the North Waunakee Corridor and the South Waunakee Corridor.

Root Objective	Stand-Alone Strategy Screening Question	North Waunakee Corridor Evaluation
1. Improve safety for all modes		
▪ Motor vehicles	Does the Stand-Alone Strategy address safety deficiencies on the Beltline or have the potential to reduce congestion-related motor vehicle crashes on the Beltline?	The North Waunakee Corridor does not specifically address Beltline safety deficiencies. It also does not reduce traffic volumes enough to reduce congestion-related crashes on the Beltline.
2. Address Beltline infrastructure condition and deficiencies.	Does the Stand-Alone Strategy preclude addressing Beltline infrastructure deficiencies?	The North Waunakee Corridor does not address Beltline infrastructure deficiencies, but it does not preclude these deficiencies from being addressed in a separate project. To satisfy this objective, another separate project would have to be planned for the Beltline.
3. Improve system mobility (congestion) for all modes		
▪ Transit	Does the Stand-Alone Strategy preclude improvements to transit facilities and routing?	The North Waunakee Corridor does not specifically address transit facilities or improve routing. It does not preclude transit facilities from being constructed.
▪ Motor vehicles (including passenger and freight)	Does the Stand-Alone Strategy decrease Beltline traffic, or increase Beltline capacity, enough to address conditions that lead to unstable traffic flow on the Beltline?	The North Waunakee Corridor makes no appreciable difference in Beltline traffic volumes. Therefore, it does not satisfy this key objective.

Table 2.06-1 North Waunakee Corridor Stand-Alone Strategy Screening Questions

Root Objective	Stand-Alone Strategy Screening Question	South Waunakee Corridor Evaluation
1. Improve safety for all modes		
▪ Motor vehicles	Does the Stand-Alone Strategy address safety deficiencies on the Beltline or have the potential to reduce congestion-related motor vehicle crashes on the Beltline?	The South Waunakee Corridor does not specifically address Beltline safety deficiencies. It also does not reduce traffic volumes enough to reduce congestion-related crashes on the Beltline.
2. Address Beltline infrastructure condition and deficiencies.	Does the Stand-Alone Strategy preclude addressing Beltline infrastructure deficiencies?	The South Waunakee Corridor does not address Beltline infrastructure deficiencies, but it does not preclude these deficiencies from being addressed in a separate project. To satisfy this objective, another separate project would have to be planned for the Beltline.
3. Improve system mobility (congestion) for all modes		
▪ Transit	Does the Stand-Alone Strategy preclude improvements to transit facilities and routing?	The South Waunakee Corridor does not specifically address transit facilities or improve routing. It does not preclude transit facilities from being constructed.
▪ Motor vehicles (including passenger and freight)	Does the Stand-Alone Strategy decrease Beltline traffic, or increase Beltline capacity, enough to address conditions that lead to unstable traffic flow on the Beltline?	The South Waunakee Corridor makes no appreciable difference in Beltline traffic volumes. Therefore, it does not satisfy this key objective.

Figure 2.06-2 South Waunakee Corridor Stand-Alone Strategy Screening Questions

2.07 CONCLUSION

Both North and South Waunakee Corridor strategies show merit in that they are able to capture a substantial amount of local traffic and increase mobility to travelers in this part of northern Dane County. The South Waunakee Corridor is projected to capture the greatest amount of traffic and has garnered the most public support to date.

Despite the merits of these two corridors, they do not satisfy the root PEL objectives for Stand-Alone Strategies of US 12 just north of Middleton. Further analysis of the corridor could occur as part of a separate project focused on the transportation needs north of Lake Mendota.

One component of the NMP, an interchange at County K, provides crash and operational benefits for the Beltline and improves east-west travel north of Lake Mendota. A County K interchange could be brought forward independent of or included within a Beltline Strategy Package.

SECTION 3
SR CORRIDORS

3.01 BACKGROUND

A. History

The potential for a high-mobility corridor on the south side of the Madison metropolitan area was first suggested by Madison constituents during development of the Verona Road Draft Environmental Impact Statement (EIS) in 2002 (see Figure 3.01-1). This resulted in a separate 2002 WisDOT study of a SR and a subsequent 2008 update to the study. The South Reliever Impact Analysis Summary was included in the Verona Road EIS as Appendix L.

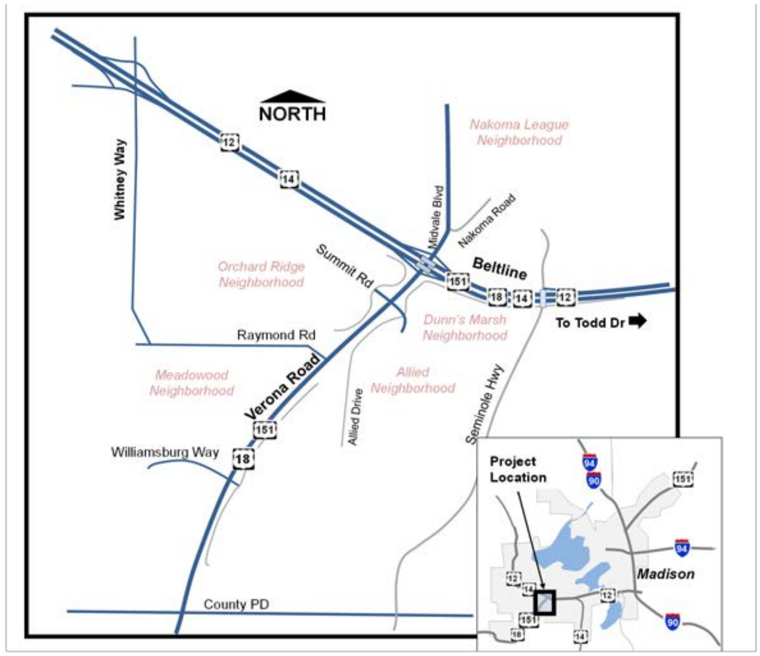


Figure 3.01-1 Verona Road EIS Study Corridor Location

Figure 3.01-2 shows the corridor that was analyzed as part of the study of a SR. The corridor was broken into three stages, which could be built individually or together. Stage 1 went from US 151 in the city of Verona (Verona) to US 14 and traveled approximately 1 mile north of County M. Stage 2 went from US 14 to US 51 and roughly followed the County B corridor. Stage 3 would travel from US 51 to I-39/90. This alignment was eliminated from further consideration in the 2011 Verona Road Final EIS because it:

- Did not provide substantial traffic volume relief to the Verona Road corridor.
- Was not likely to reduce congestion-related crashes on Verona Road.
- Did not address other components of the purpose and need, including neighborhood connectivity and improving metropolitan traffic movements.

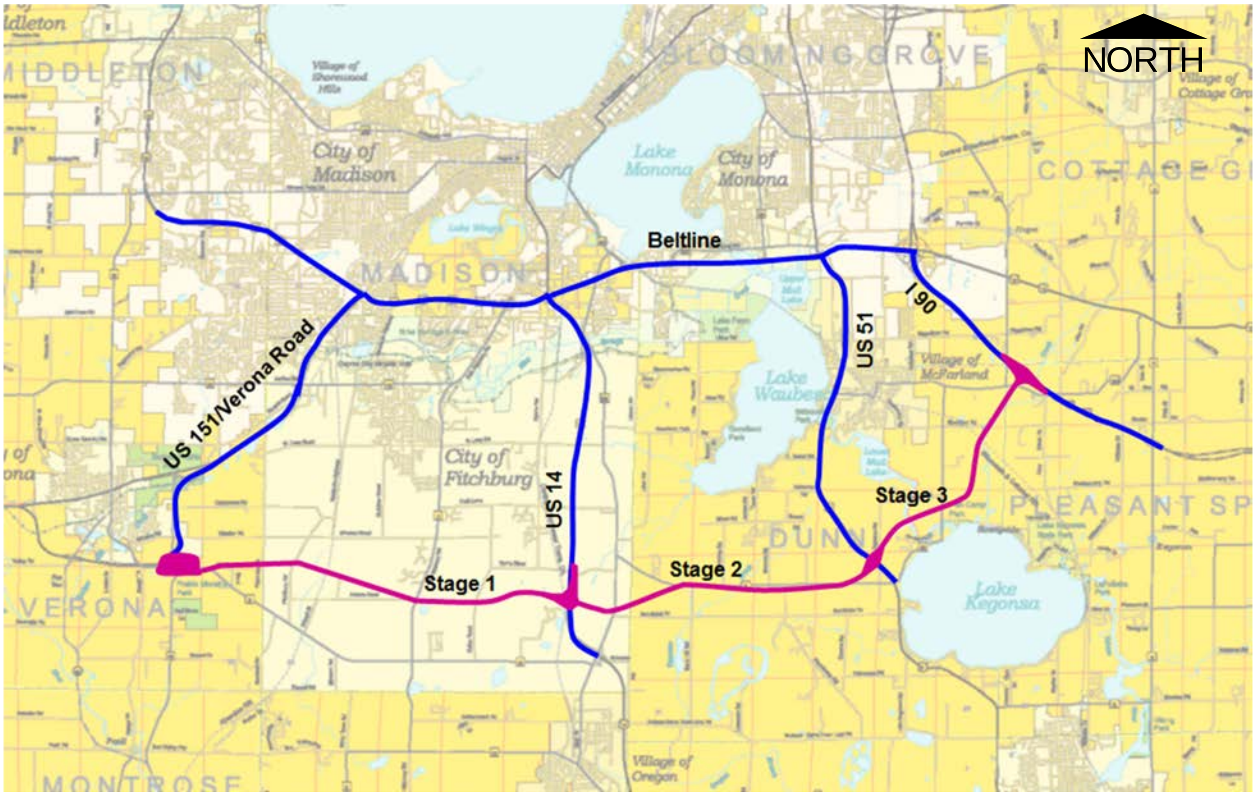


Figure 3.01-2 2002 SR Analysis Corridor from 2008 Verona Road EIS

B. Previous Government and Public Positions

A public meeting presented the SR concept on November 19, 2002. Comment forms and letters were returned from 382 people opposing the SR, with ten comments in favor of the SR. There was also a petition opposing the SR (714 signatures) and 98 copies of a form letter sent to WisDOT opposing the SR.

There appeared to be no formal resolutions of opposition to the SR, but various elected officials and organizations expressed their opposition in formal statements. Those opposed to the SR included the following:

- Kathleen Falk, Dane County Executive
- 1,000 Friends of Wisconsin
- John Volker, Verona Mayor
- Friends of Lake Kegonsa Society (FOLKS)
- Town of Dunn (Dunn)

The WDNR verbally expressed its opposition to the corridor because of the large R/W requirements and other land resource impacts.

The Madison Beltline PEL Study revisited the investigation of a SR to determine whether and to what extent it might reduce Beltline volumes. In July 2013, the Wisconsin State Journal provided an opinion page that supported the study of a SR.

3.02 TRAVEL PATTERNS

As stated in the North Mendota Corridors discussion, a SR would need to capture a larger portion of the east-west travel within the metropolitan area to satisfy core Beltline PEL objectives. This capture would need to relieve the Beltline of current travel demand, and improve operations.

As mentioned in Section 1, WisDOT performed a county-wide O-D study to understand regional travel patterns using both time-lapse aerial photography and Bluetooth detection. The data provides an understanding of travel patterns in the south metropolitan area. Understanding the number of daily trips traveling from US 151 in Verona to I-39/90 provides an indication of the amount of traffic that wants to bypass Madison in favor of regional designations such as the Fox Valley and Milwaukee metropolitan areas. Figure 3.02-1 shows the amount of daily traffic that travels from US 151 in Verona to I-39/90. Figure 3.02-2 shows the amount of traffic traveling from I-39/90 to US 151 in Verona.

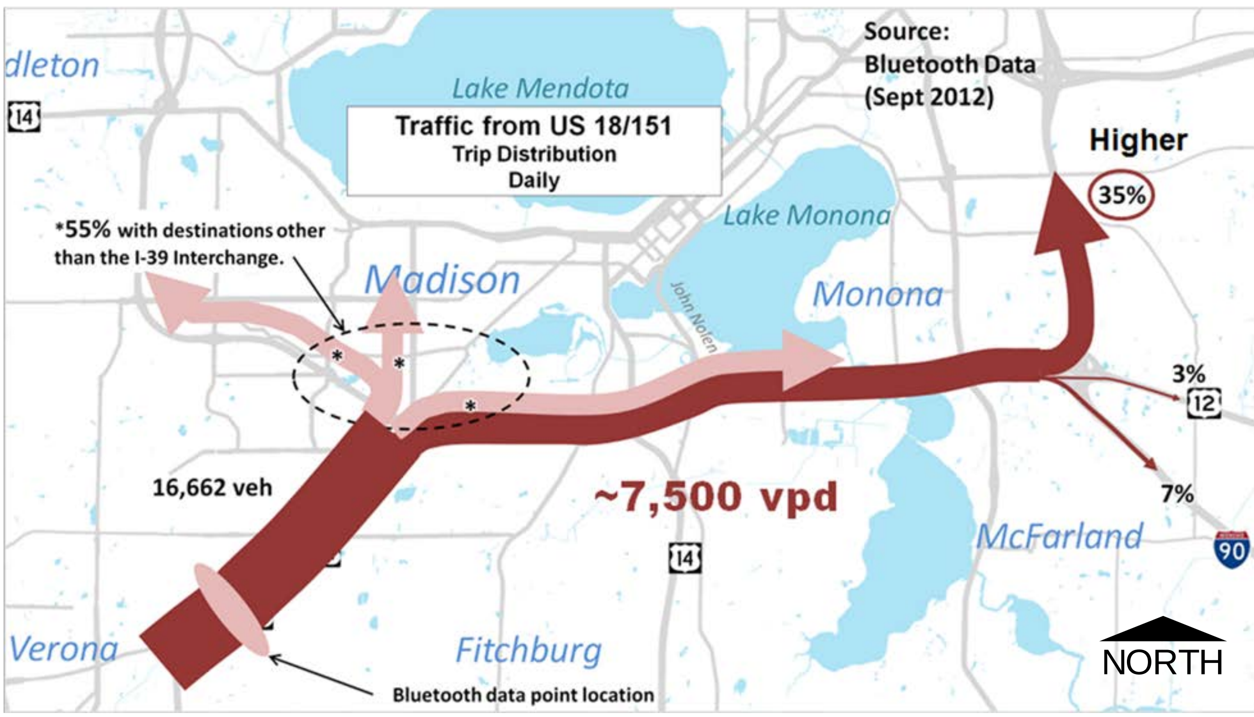


Figure 3.02-1 2012 Daily Traffic Traveling from US 151 in Verona to I-39/90

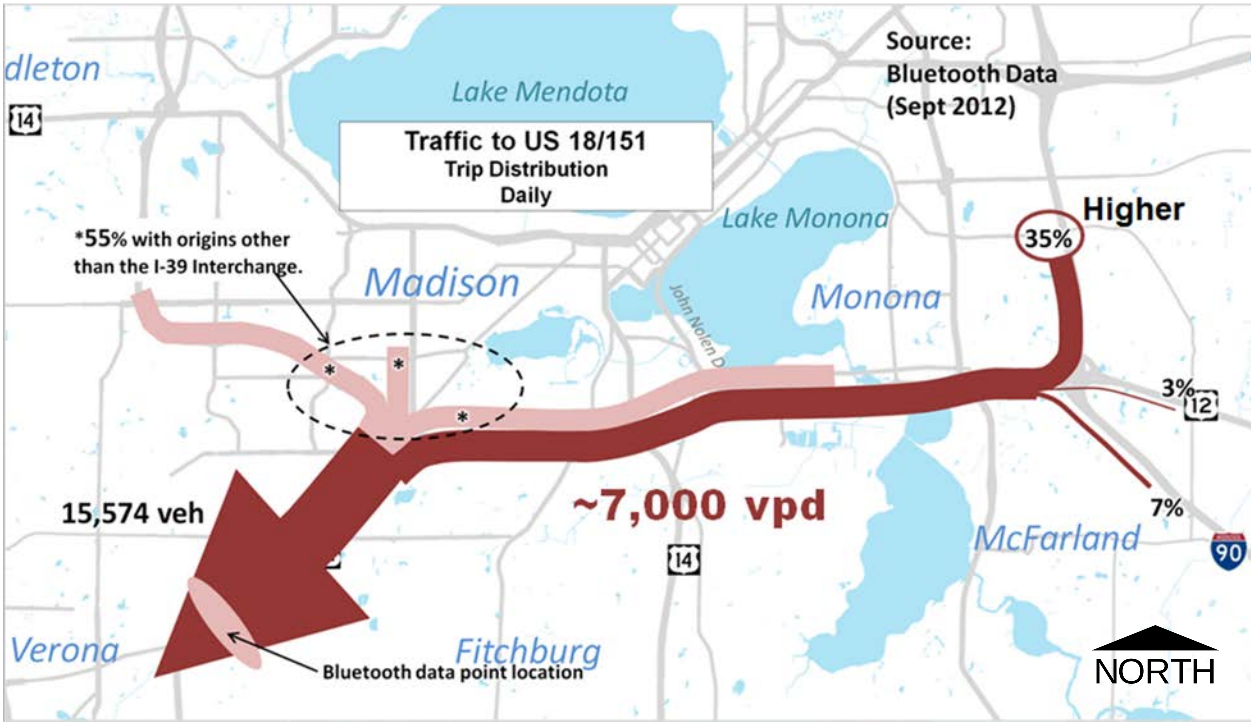


Figure 3.02-2 2012 Daily Traffic Traveling from I-39/90 to US 151 in Verona

Approximately 45 percent of the traffic on US 151 near Verona has origins and destinations traveling directly to or from I-39/90. The daily US 151 volumes to I-39/90 are approximately 7,500 vpd and from I-39/90 are approximately 7,000 vpd, providing approximately 14,500 trips that could be attracted to a SR. Almost 80 percent of the 14,500 daily trips are coming from or going to I-39/90 north of the Madison Beltline. A SR provides a less direct route to and from this part of I-39/90 for this traffic than the current US 151 and Beltline routes do, so it may not capture this full demand.

Most of the traffic on US 151 near Verona travels off-peak, meaning it occurs during the midday and evenings. Only approximately 26 percent of the total US 151 traffic travels during the six peak hours from 6 to 9 A.M. and 3 to 6 P.M. This is much lower than what would typically be experienced during these peak hours. This suggests that much of the traffic a SR would remove from the Beltline would be off-peak traffic, limiting the benefits to Beltline rush hour congestion. Conversely, much of the traffic does not experience the AM and PM Beltline peak congestion and, therefore, would not seek an alternate route.

A SR could attract other trips with intermediate destinations, such as those for US 14 and US 51. It could also capture trips from Oregon and Stoughton going to US 151, US 14, US 51, and I-39/90. To understand this phenomenon, a subsequent Bluetooth analysis was performed to understand these travel patterns. Figures 3.02-3, -4, and -5 show the number of daily trips traveling from Verona, Oregon, and Stoughton to US 151, US 14, US 51, and I-39/90. The orange shading in the graphics represents density per acre and shows the employment nodes in the Madison metropolitan area. The numbers do not exactly match the previous analysis because this analysis captures all the traffic originating from Verona, not just traffic on US 151.

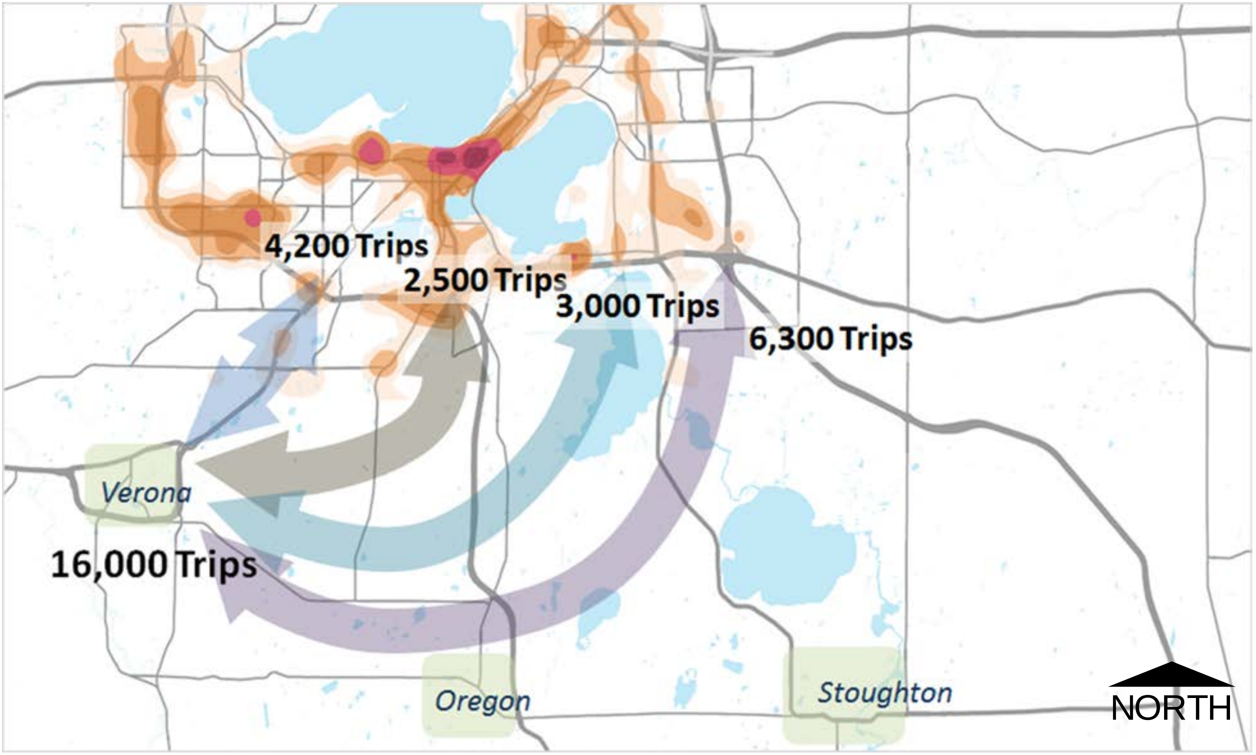


Figure 3.02-3 Traffic Oriented to Verona–Daily Trips

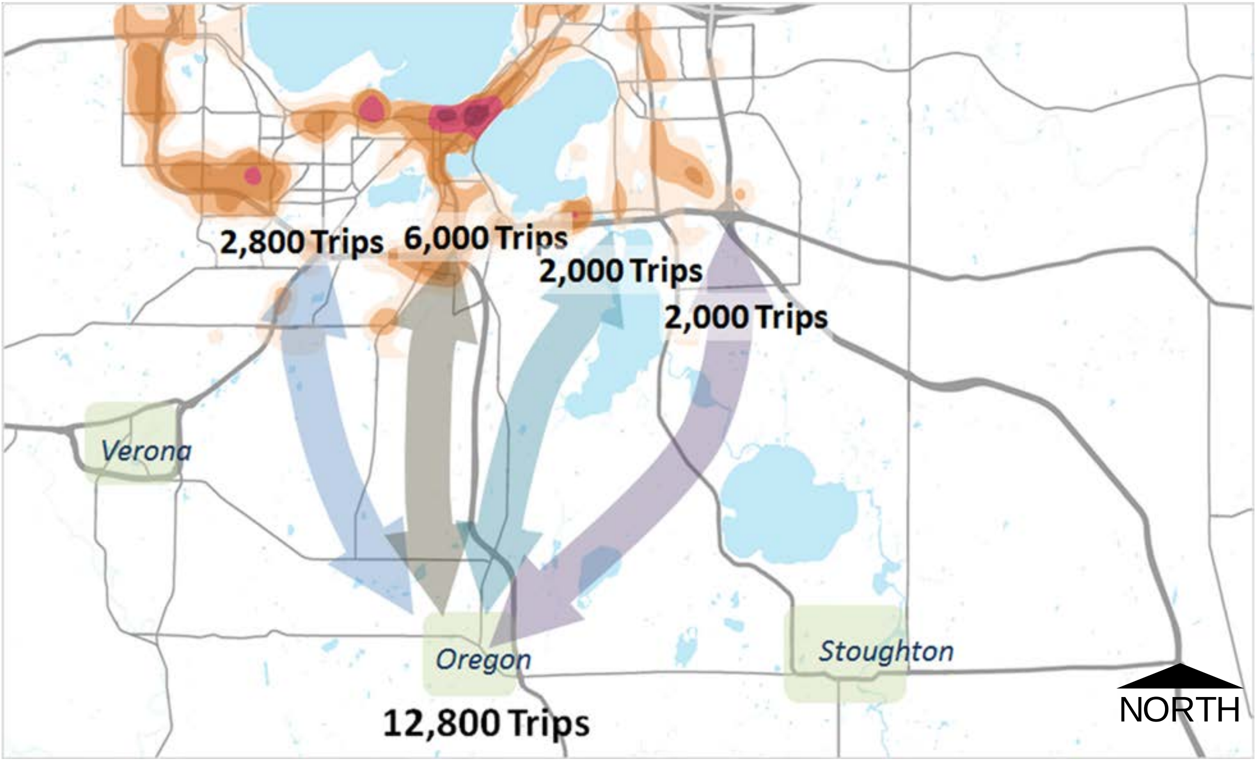


Figure 3.02-4 Traffic Oriented to Oregon–Daily Trips

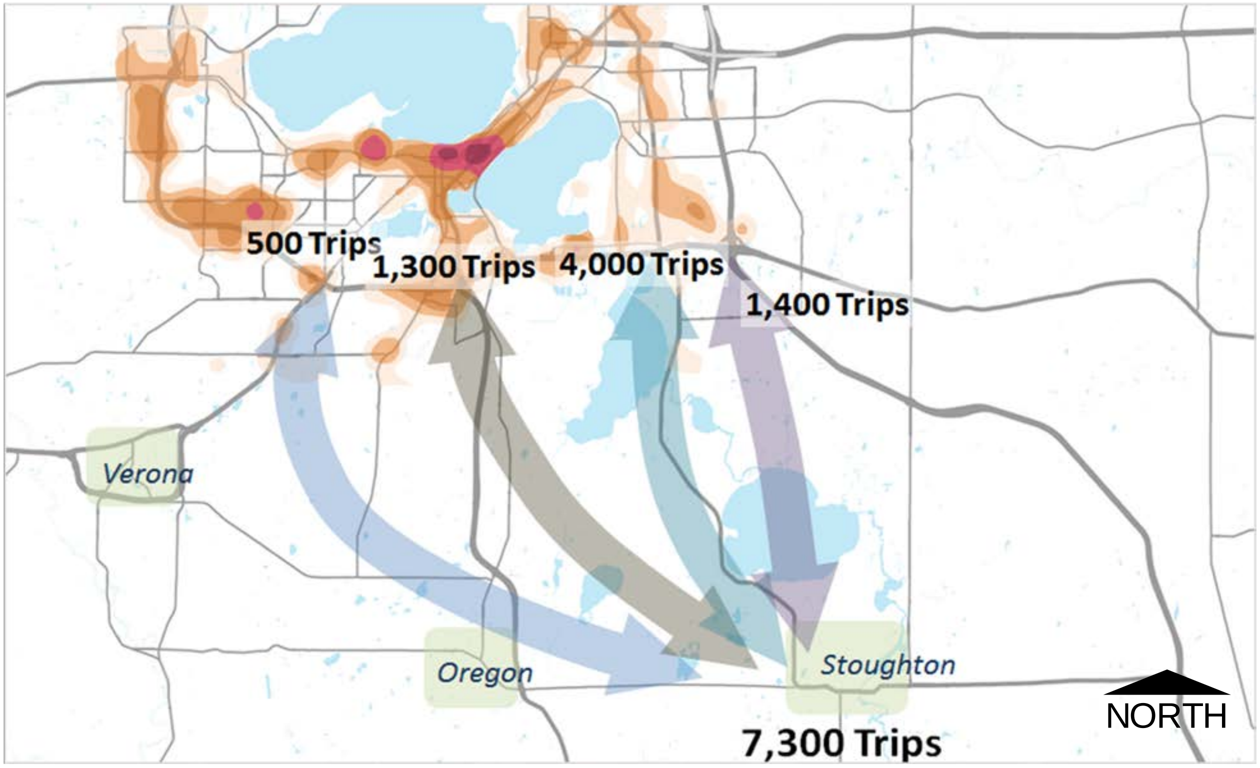


Figure 3.02-5 Traffic Oriented to Stoughton

Not all traffic originating from Verona, Oregon, or Stoughton would be attracted to a SR. For example, the 6,000 trips from Oregon destined for the US 14 and the Beltline interchange would have no need to travel on the SR. Similarly, the 2,800 trips destined for the Verona Road and the Beltline interchange would add considerable distance to their trip if they traveled on the SR and, therefore, are less likely to use the SR.

3.03 STRATEGY DESCRIPTION

Two SR conceptual alignments were initially tested. The two alignments are represented by Figure 3.03-1. Both alignments travel east from US 151 in Verona approximately 1 mile north of County M until they reach US 14. Both alignments continue east, in the vicinity of County B until they reach US 51. At US 51, one alignment traveled to the northeast and joined I-39/90 in the vicinity of County AB. The other alignment traveled more easterly and joined I-39/90 in the vicinity of County N. Both alignments had interchanges at Fish Hatchery Road (County D), US 14, US 51, and I-39/90. The speed on the SR was coded in the TDM at 65 mph. The northeasterly alignment captured more traffic and produced greater Beltline volume reductions, so it was the alignment carried forward for more detailed analysis.

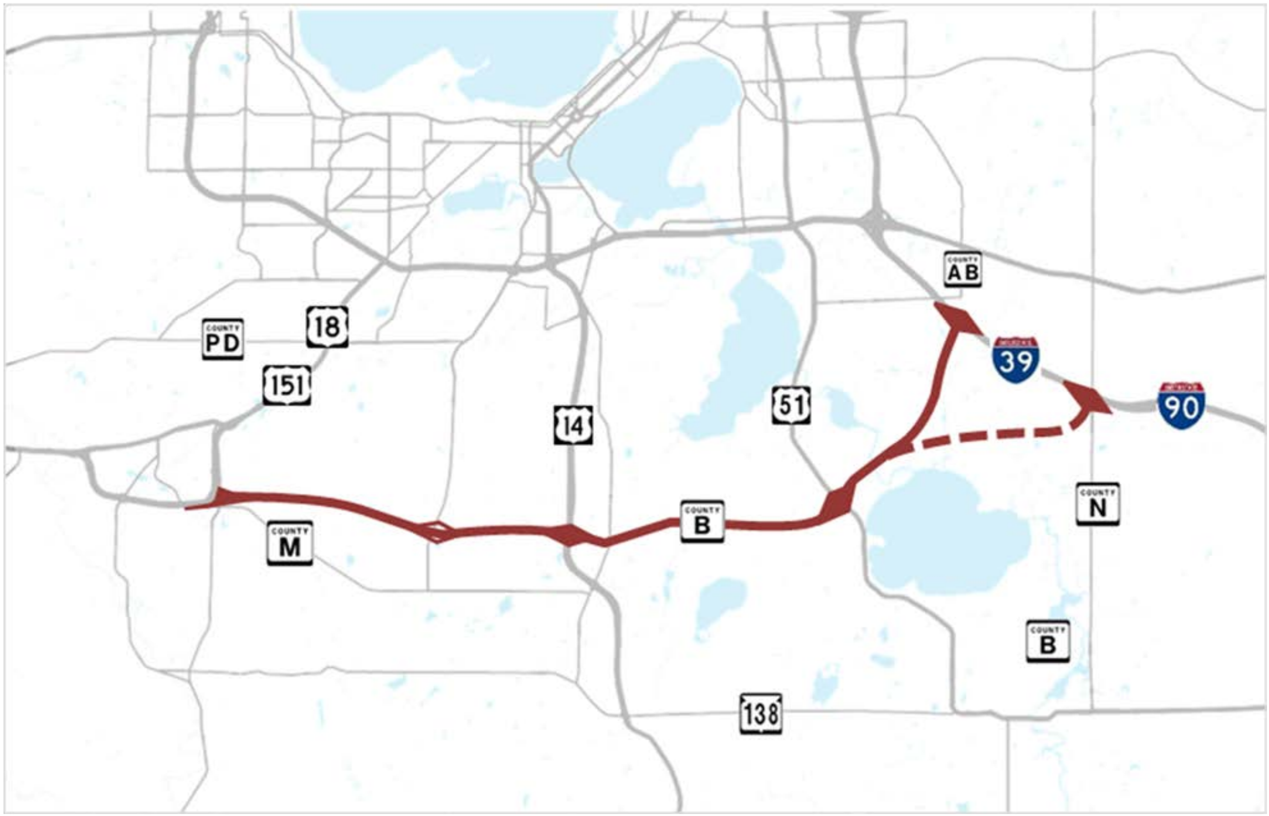


Figure 3.03-1 Strategy Alignments

3.04 TRAFFIC IMPACTS

As mentioned in Section 1, the Madison Beltline PEL Study uses the Greater Madison MPO's TDM to understand area traffic patterns and volumes. With the TDM, the SR was tested to determine how much traffic would use the SR and how much traffic would be removed from the Beltline.

Figure 3.04-1 shows the traffic volumes that a SR would capture in 2050, volumes range from 28,000 on the west end to 31,000 in the middle. Figure 3.04-2 illustrates how much potential traffic the SR captures for each segment from a 2016 analysis.

The SR captures less of the potential traffic on the west end than it does on the east end (see Figure 3.04-2). This is largely due to longer travel distances via a SR.

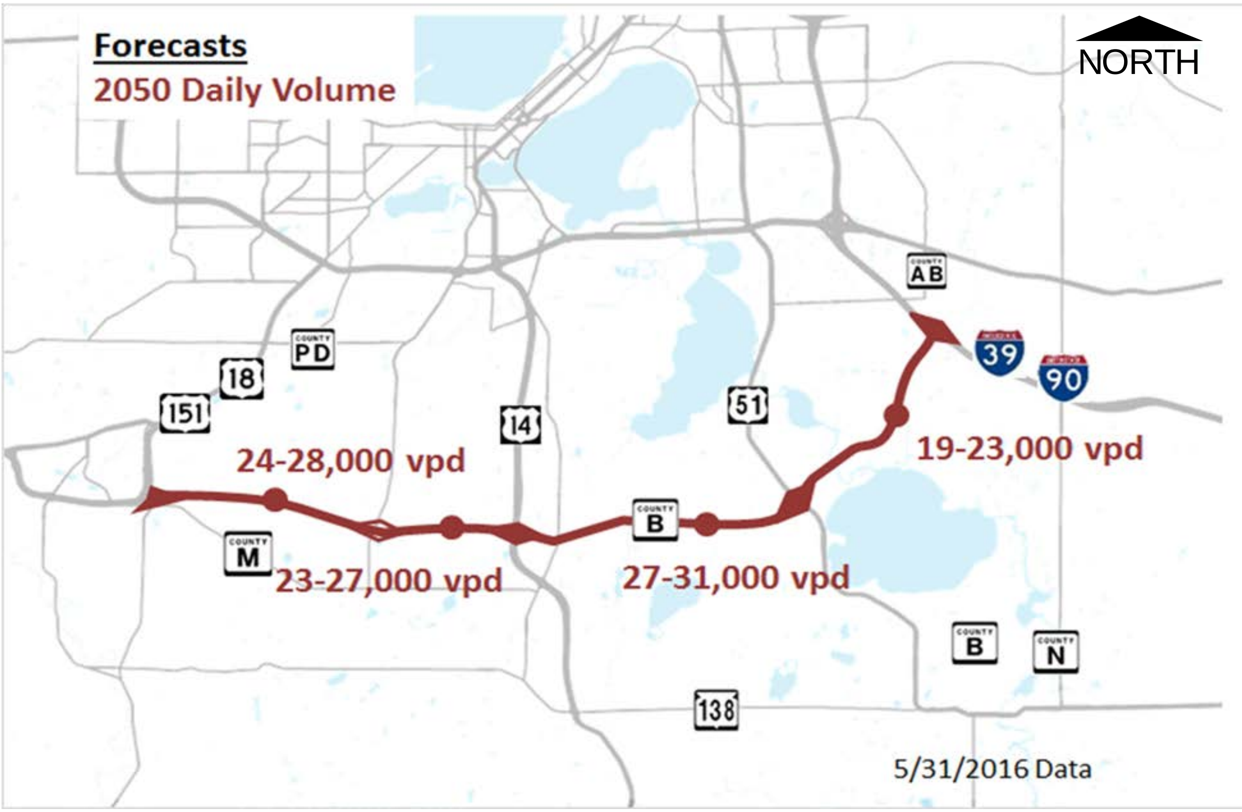


Figure 3.04-1 Projected SR Volumes

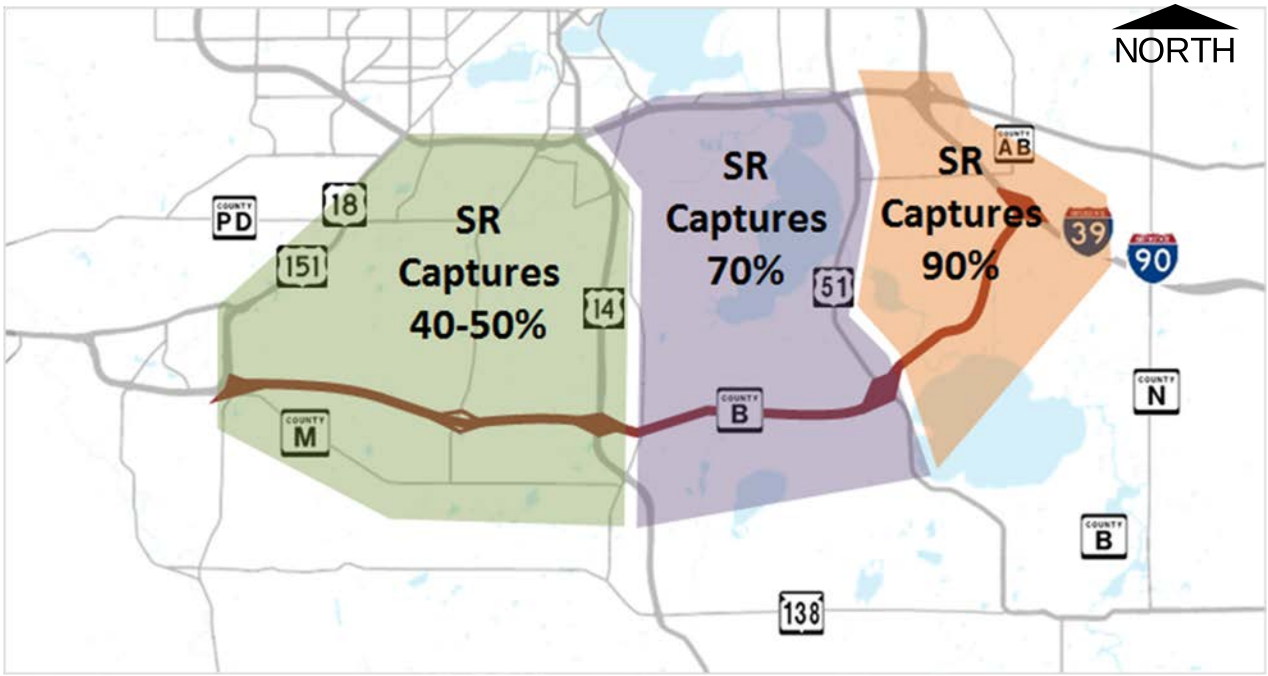


Figure 3.04-2 SR Capture Percentage

Figure 3.04-3 compares the distances of the SR from Verona to the Beltline and US 14 and the distances from Oregon to I-39/90. On the west portion, a trip on the SR is 30 percent longer than the current trip using US 151 and the Beltline. That means that a traveler on the SR would have to travel 30 percent faster to have the same travel time as using the currently available route. To attract trips to the SR, a better travel time is desired. This 30 percent increase in speed would be the difference between 55 mph and 72 mph.

Conversely, on the east portion, a trip using the SR is only 8 percent longer than currently available routes, meaning a traveler on the SR would have to travel only 8 percent faster to have the same travel time as currently available routes. This 8 percent increase in speed would be the difference between 55 mph and 59 mph.

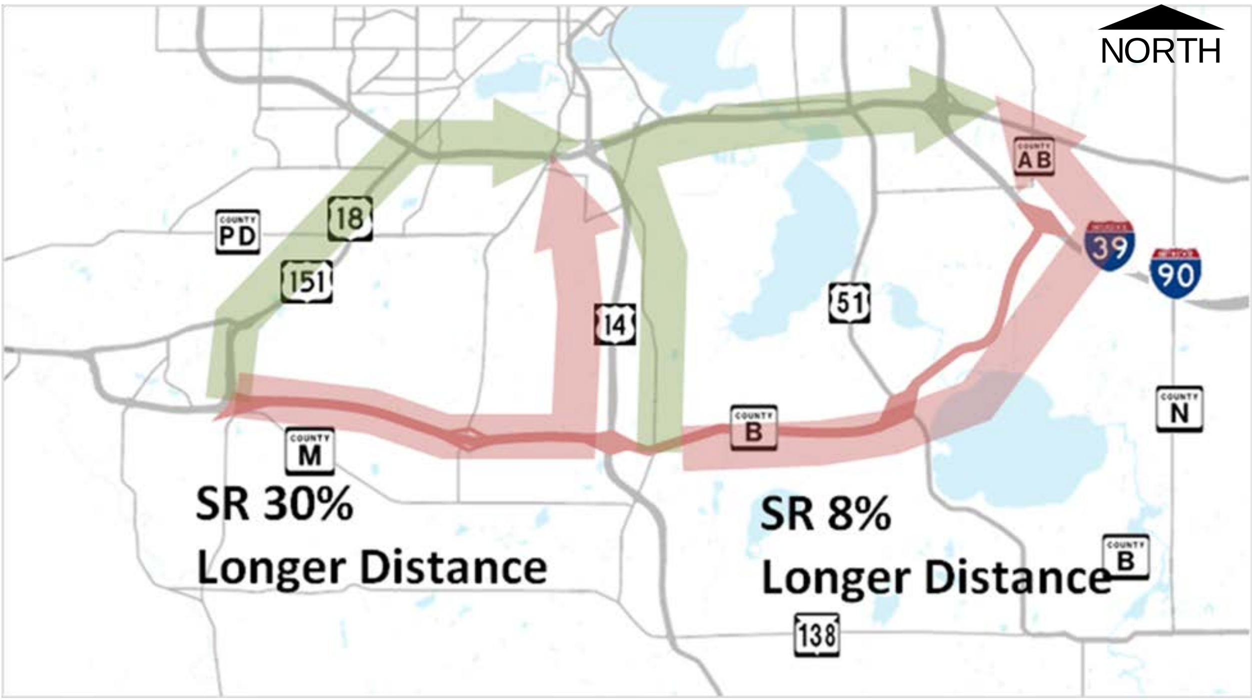


Figure 3.04-3 SR Distances

Figure 3.04-4 shows the traffic volume reductions on the Beltline that would occur with a SR. The volume reductions on the west end are modest, but grow to between 5,000 and 10,000 vpd in the center and east portions of the Beltline in 2010. This is consistent with the traffic captured by the SR; it is a longer route for trips on the west end. While a 5,000 to 10,000 vpd reduction is substantial, it represents approximately one-third of a lane of capacity on the Beltline.

The 2050 traffic reductions on the Beltline are less than those for the year 2010. This is because in 2050 the Beltline is capacity constrained. More traffic desires to use the Beltline than it is able to carry because of congestion. This traffic uses alternate routes primarily consisting of local arterials. As the SR removes traffic from the Beltline, traffic using alternate local arterials (latent demand) returns to the Beltline. This effect occurs both in the 2010 and 2050 TDM, yet it is more pronounced in the future 2050 model. Even with these traffic reductions, the 2050 Beltline traffic volumes would still be greater than existing (2012) traffic volumes. Therefore, the congestion that exists today resulting in LOS E and LOS F operations along the Beltline east of Verona Road during the peak commuting hours would still be worse in 2050 than current conditions even with the implementation of the SR.

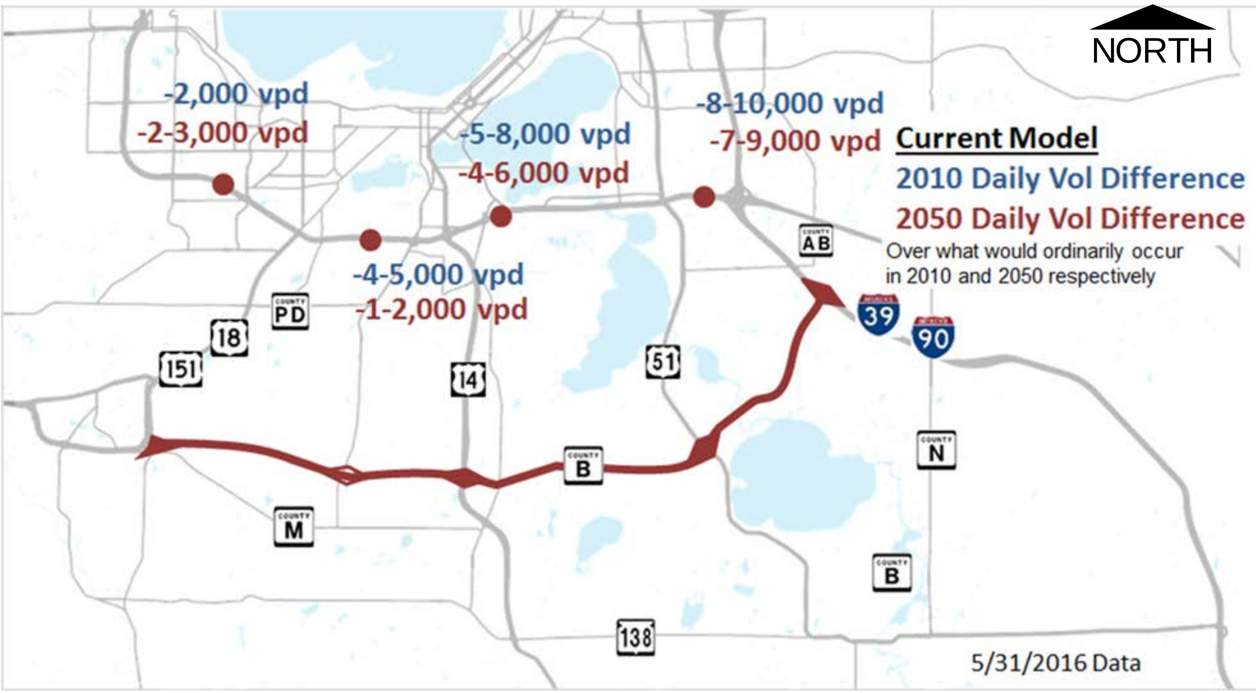


Figure 3.04-4 Beltline Volume Reductions with SR

A select link analysis was performed for a Beltline section between Park Street and John Nolen Drive in 2015. A select link analysis analyzes where all traffic going through a specific link in the model is coming from and going to. Figure 3.04-5 summarizes the findings of the select link analysis. It shows that with a SR, fewer regional trips use the Beltline. For example, in 2010 the Beltline carried approximately 8,550 vpd from US 151 at the county's border, yet with a SR this volume drops to 4,400 vpd. As the regional trips are removed from the Beltline, trips using alternate local arterials return to the Beltline.

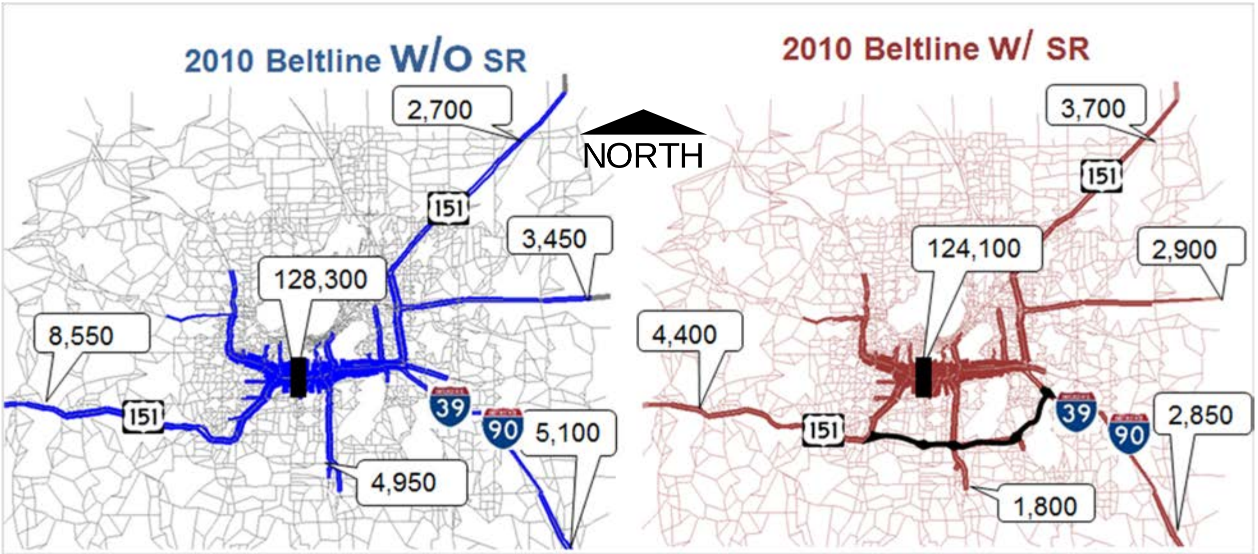


Figure 3.04-5 Beltline Select Link Analysis–Daily Volumes (2015)

The SR segment from US 51 to I-39/90 has many natural resources and properties that have special protections, such as conservation easements. Constructing a SR in this segment would have substantial wetland impacts and would require an additional bridge over the Yahara River. For this reason, the study investigated the effects of a SR that only spans from US 151 in Verona to US 51. Figure 3.04-6 shows the results of that analysis. The predicted volumes of the shortened SR are compared with the volumes with the full SR. Generally, the shortened route has from 5,000 to 11,000 vpd less than the full routing. Additional information is available within the South Reliever Impact Analysis Summary Study through the Verona Road project.

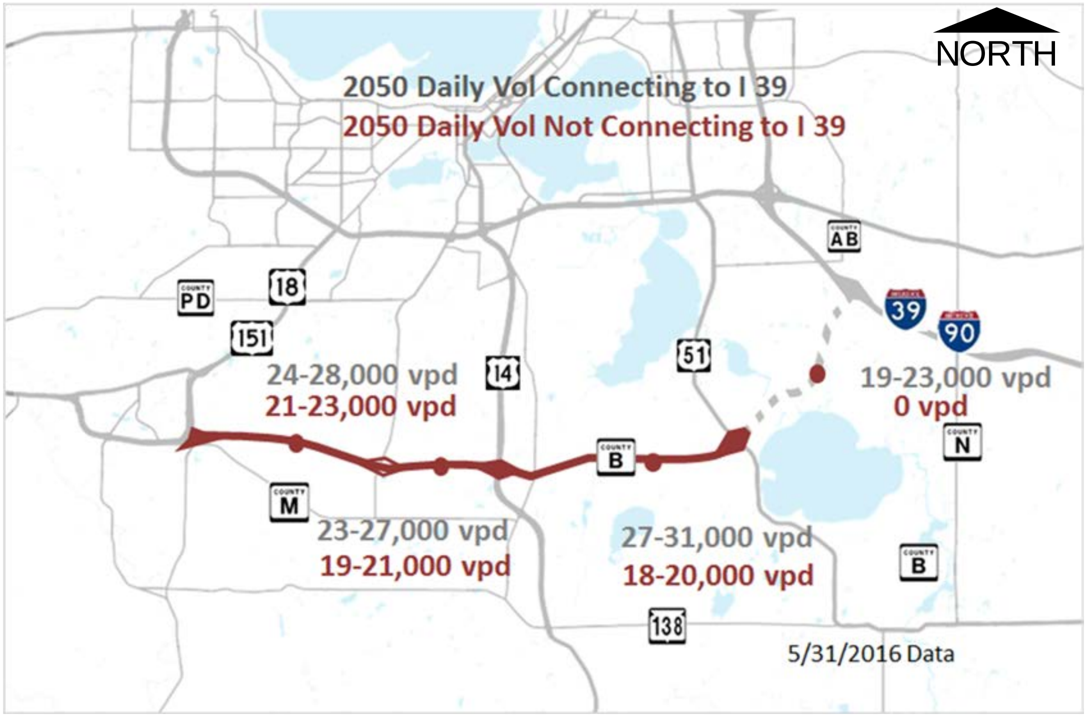


Figure 3.04-6 Shortened SR Projected Volumes

3.05 OTHER IMPACTS

Figure 3.05-1 shows the different public natural resource areas with the SR superimposed on them. Figure 3.05-2 shows the water resource areas with the SR superimposed on them. And Figure 3.05-3 shows the agricultural resource areas with the SR superimposed on them.

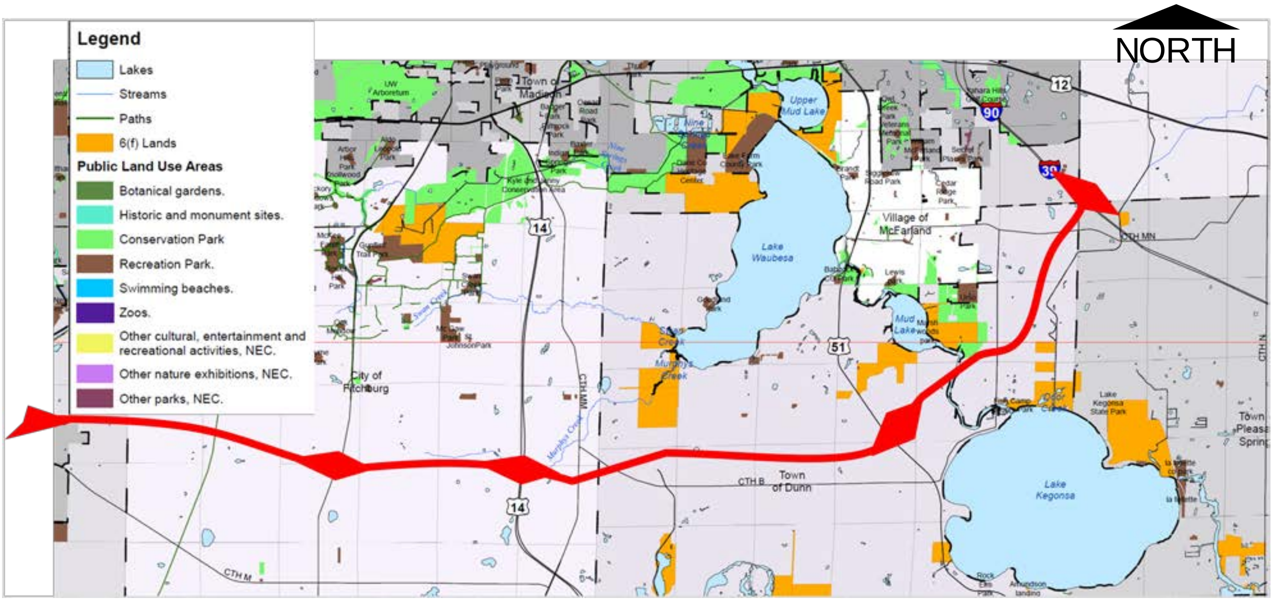


Figure 3.05-1 Public Natural Areas SR

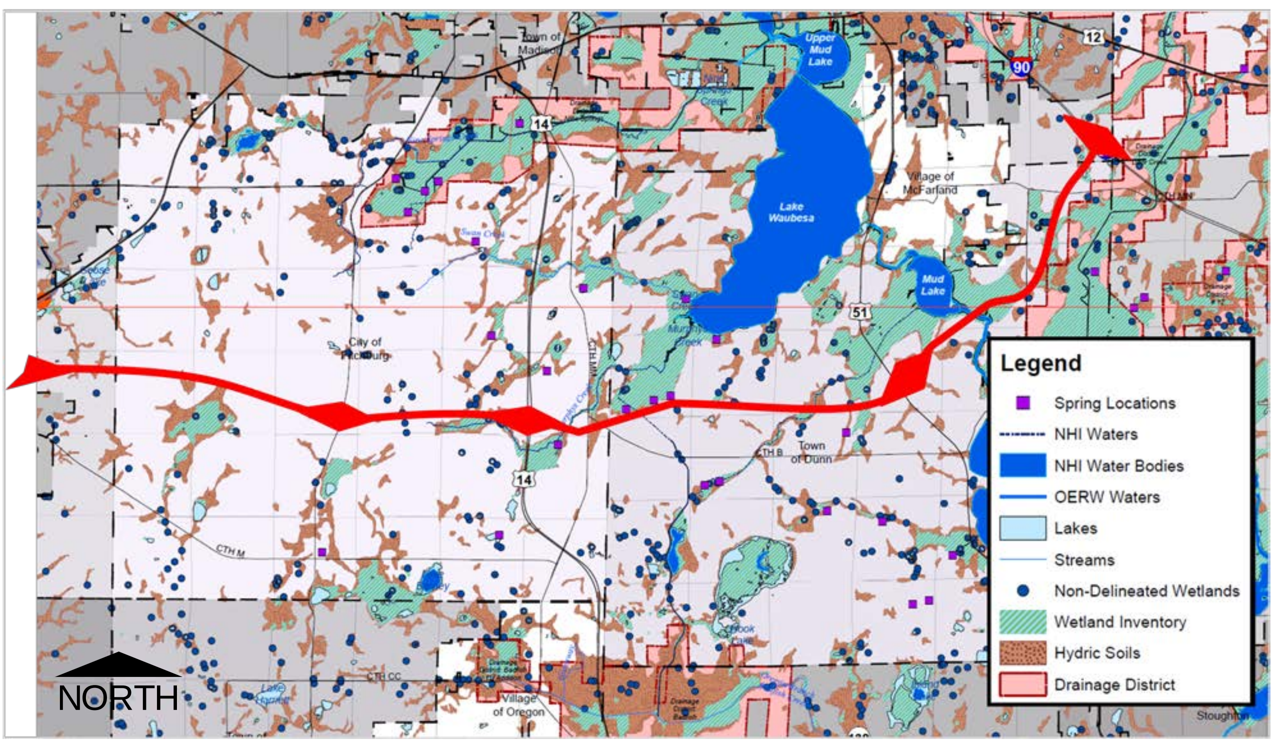


Figure 3.05-2 Water Resource Areas SR

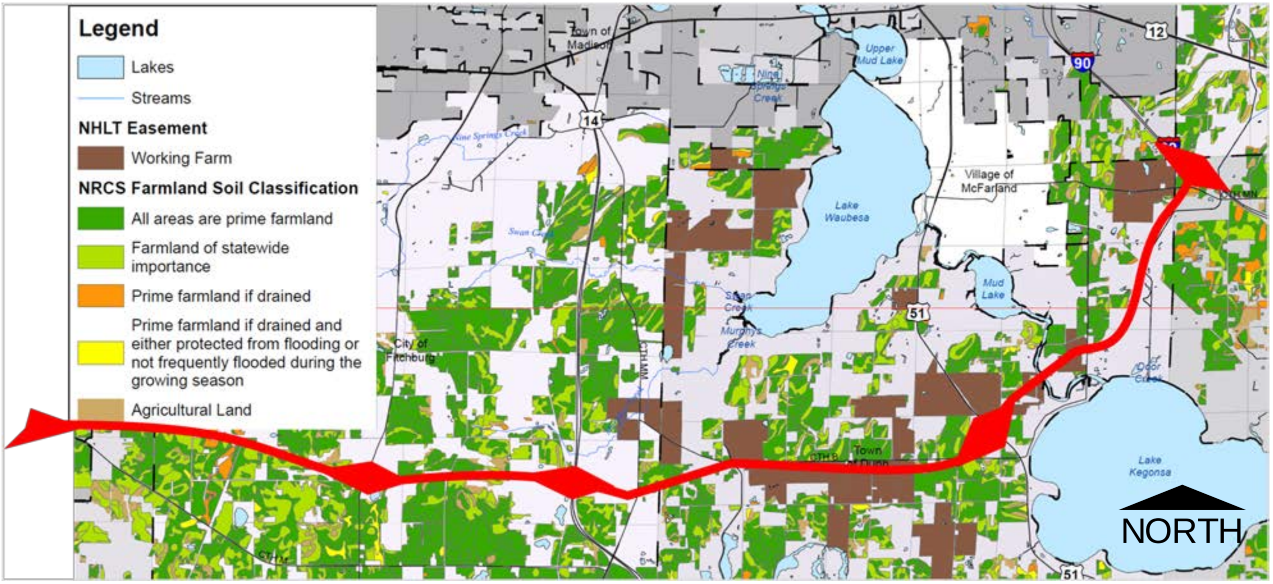


Figure 3.05-3 Agricultural Resource Areas SR

The SR would have significant impacts to private property. The 2002 and 2008 analysis completed for the Verona Road Project of the SR Corridor provided a preliminary impact analysis. Table 3.05-1 shows a summary of the estimated R/W requirements for each section of the SR. These figures do not include the R/W requirements to replace local roads that are displaced by the project.

	US 151 to US 14	US 14 to US 51	US 51 to I-39/90	Approximate Total
Miles	~6.5	~5.0	~4.0	15.5
R/W (Acres)				
Farm	330	224	82	636
Residential	19	17	7	43
Commercial	0	0	0	
Forested	104	19	16	139
Wetland	87	4	159	250
Park	0	0	0	
Other	0	0	0	
Total	**540**	**264**	**264**	**1,068**
Relocations				
Agricultural	1	2	0	3
Residential	3	7	3	13
Commercial	1	0	0	1
Other	2	1	0	3
Total	**7**	**10**	**3**	**20**

Table 3.05-1 Estimated Approximate R/W Requirements for SR (2002)

The 2002 and 2008 analysis indicated approximately 1,068 acres of R/W would be required to construct the full route from US 151 to I-39/90. Of this, approximately 636 acres would be farmland, 139 acres would be forested, and 250 acres would be wetlands or hydric soils. The greatest wetland impacts would occur in the section between US 51 and I-39/90 because of the presence of the Yahara Lakes, Yahara River, and adjoining wetlands.

3.06 SCREENING AND RESULTS

The following table uses the Stand-Alone Strategy screening questions described in Section 1 and evaluates the SR Corridor.

Root Objective	Stand-Alone Strategy Screening Question	SR Corridor Evaluation
1. Improve safety for all modes		
Motor vehicle	Does the Stand-Alone Strategy address safety deficiencies on the Beltline or have the potential to reduce congestion related motor vehicle crashes on the Beltline?	The SR does not specifically address Beltline safety deficiencies. If constructed, it could initially reduce Beltline volumes by 3 to 8 percent. But these Beltline traffic volume reductions diminish to 1 to 6 percent as the facility approaches the 2050 design year.
2. Address Beltline infrastructure condition and deficiencies.	Does the Stand-Alone Strategy preclude addressing Beltline infrastructure deficiencies?	The SR does not address Beltline infrastructure deficiencies, but it does not preclude these deficiencies from being addressed in a separate project. To satisfy this objective, another separate project would have to be planned for the Beltline.
3. Improve system mobility (congestion) for all modes		
▪ Transit	Does the Stand-Alone Strategy preclude improvements to transit facilities and routing?	The SR does not specifically address transit facilities or improve routing. It does not preclude transit facilities from being constructed.
▪ Motor vehicles (including passenger and freight)	Does the Stand-Alone Strategy decrease Beltline traffic, or increase Beltline capacity, enough to address conditions that lead to unstable traffic flow on the Beltline?	As mentioned, the SR could initially reduce Beltline traffic volumes by 3 to 8 percent. But these traffic volume reductions diminish to 1 to 6 percent as the facility approaches the 2050 design year.

Table 3.06-1 SR Corridor Stand-Alone Strategy Screening Questions

3.07 CONCLUSION

The SR is able to capture a substantial amount of traffic and provide greater mobility to the communities of southern Dane County. The greatest mobility increase occurs where the SR does not parallel County M or County B from US 51 to the interstate. The SR initially attracts Beltline traffic, reducing volumes on the Beltline by 3 to 8 percent, but the Beltline traffic reduction diminishes to between 1 and 6 percent as the facility approaches the 2050 design year. This marginal traffic volume benefit creates impacts and infrastructure costs that are greatly disproportionate to the benefits received.

The impacts and costs associated with the SR are unreasonable when compared to the benefits received. The SR would not satisfy root Beltline PEL objectives for the Beltline. Further analysis of the corridor could occur as part of a separate project focused on the transportation needs south of Lake Mendota.

SECTION 4
RAIL

4.01 BACKGROUND

A. Introduction

Since the 1980s, government entities have been exploring the possibility of rail transit in Madison. The three most notable studies that explored this possibility are the Madison Light Rail Transit (LRT) Study (1992), the Midwest Regional Rail Initiative (2004), and the Transport 2020 New Starts Application to the Federal Transit Authority (FTA) (2008). The following paragraphs summarize these studies.

B. Madison Light Rail Study

A LRT Study was prepared for Metro in 1992. The study evaluated a 13.2-mile light rail system using electrically powered vehicles with overhead power wires that ran from the East Towne Mall through the Isthmus and University of Wisconsin (UW) campus to the Hilldale and West Towne Malls. The estimated capital cost for the system was estimated to range from $183 million to $306 million. The LRT line would be located primarily in city streets. The selected line was based on modeling of travel patterns based on the 1985 Transit Priority Corridor Study as the corridor with the greatest potential ridership. Madison decided the transit corridor could not support the initial costs of new tracks, guideways, electrification, maintenance facilities, and stations at that time. This study has since been superseded by the Transport 2020 Study described in Section 4.01.D.

C. Midwest Regional Rail Initiative

In 2004, a consortium of nine midwest states including Wisconsin produced a high-speed rail feasibility study for the development of a Midwest Regional Rail System with passenger rail spokes connecting various midwest cities. One proposed rail spoke was from Chicago to Milwaukee to St. Paul with a stop in Madison among other smaller cities. The proposal included the potential for ten round trips between Milwaukee and Madison and seven round trips between Madison and St. Paul. This Chicago to Milwaukee to St. Paul section would be implemented in phases with the first phase providing 110-mph service between Madison and Milwaukee. The state of Wisconsin and local communities began to plan for implementation and the location of rail stations. Chapter 8 of WisDOT's Connections 2030 Report describes how Wisconsin's transportation system provides options for mobility and transportation choices. This report is available online at:

- http://wisconsindot.gov/Pages/projects/multimodal/c2030-plan.aspx

WisDOT's Wisconsin Rail Plan 2030 is available online at:

- http://wisconsindot.gov/Pages/projects/multimodal/railplan/chapters.aspx

The Greater Madison MPO began to plan for connections between the local transit system and the proposed high-speed rail system. For example, Transport 2020 proposed an extension of commuter rail service to the Dane County Regional Airport for direct linkage for future high-speed intercity passenger rail service. In 2010, Wisconsin won an $810 million federal grant to begin building the 110-mph route in

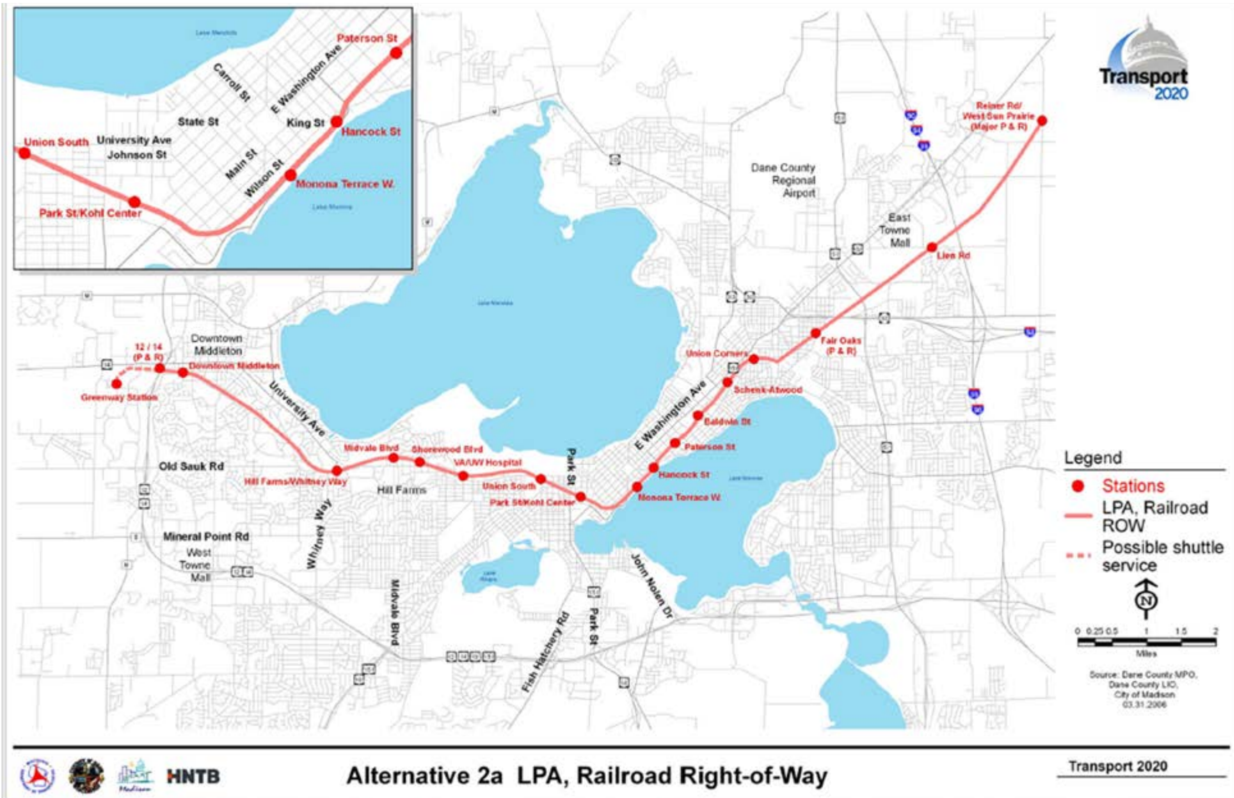
Wisconsin. However, the federal funds for high-speed rail were declined by the state of Wisconsin because of apprehension about future operating and maintenance costs and other concerns.

This rail initiative, while providing interregional mobility, does not address key Beltline PEL objectives because it focuses on interregional transportation needs rather than local metropolitan transportation needs. Therefore, it is not studied in detail as part of the Madison Beltline PEL Study process.

D. Transport 2020

Transport 2020 was a major transportation study designed to develop a long-term transportation solution for Dane County and Madison metropolitan area. It was sponsored by Dane County, Madison, and WisDOT with support from UW-Madison and the Greater Madison MPO. The Transport 2020 study proposed a system that included commuter rail, express bus services, park-and-ride lots, and improvements to local bus service.

In 2008, Transport 2020 submitted a New Starts Application to the FTA for financing to begin project engineering on the LPA. This application for federal funds was to begin the first piece of the project: a 16-mile east-west commuter rail line operating within an existing freight rail corridor between the city of Middleton and an area just southwest of Sun Prairie, directly through the Isthmus. The proposed Transport 2020 LPA is shown in Figure 4.01-1. This improvement was meant to relieve the congestion in the Isthmus area and provide service to the UW-Madison campus and downtown employment centers.



Source: http://www.transport2020.net/alts.html accessed 9/2013

Figure 4.01-1 Locally Preferred Alternative from Transport 2020 Study

Extensions of this commuter rail system to serve many communities in Dane County were anticipated over time. Such extensions might include Fitchburg, McFarland, Stoughton, Oregon, town of Cottage Grove (Cottage Grove), village of DeForest (DeForest), Waunakee, village of Cross Plains (Cross Plains), village of Black Earth (Black Earth), and village of Mazomanie (Mazomanie). In addition, a short near-term extension to the north would provide direct service to the Dane County Regional Airport. The proposed LPA would use diesel-multiple-unit (DMU) cars (or self-propelled coaches) or new hybrid technology commuter rail vehicles. The capital cost of the project was estimated to be approximately $255 million (2007 dollars), with an annual operating cost of $10 million (2007 dollars). The study estimated that an alternative BRT system with additional lanes in the corridor would have a capital cost of approximately $192 million. A base line bus system alternative would cost approximately $44 million.

With the implementation of the Transport 2020 LPA, it was estimated that ridership from the Isthmus corridor would increase by 11,000 riders per day in 2030 for work trips, or 3 million annually (including projected special event trips). The Transport 2020 LPA between Union Corners (corner of East Washington Avenue and Milwaukee Street) and Hill Farms neighborhood was projected to improve travel time by 15 percent compared to the baseline bus system alternative (Metro).

The report stated that it would be relatively easy to add track in the existing freight corridor because the state of Wisconsin already owned much of the corridor. The project would provide an opportunity to use an underused transportation corridor and provide relief to a congested area in a geographically constrained region. This opportunity, combined with a growing population and employment base, would support a successful investment in fixed-guideway transit.

In 2009, the FTA application was withdrawn because of the lack of both a Regional Transit Authority (RTA) and a local financial commitment for capital and operating costs. The project is currently on hold as other alternatives such as BRT are being investigated.

The LPA was evaluated as a Stand-Alone Strategy for the Madison Beltline PEL Study to see whether it meets the study's objectives.

4.02 TRAVEL PATTERNS

As mentioned in Section 1, WisDOT performed a county-wide O-D study to understand regional travel patterns using time-lapse aerial photography and Bluetooth detection. The analysis of travel patterns through the Isthmus during the morning peak period from 6 to 9 A.M. provides a good representation of work trip origins and destinations. Figures 4.02-1 and -2 show that of traffic coming from the east, almost 70 percent want to remain downtown. Of traffic coming from the west, which is three times greater, 90 percent remain within the Isthmus area.

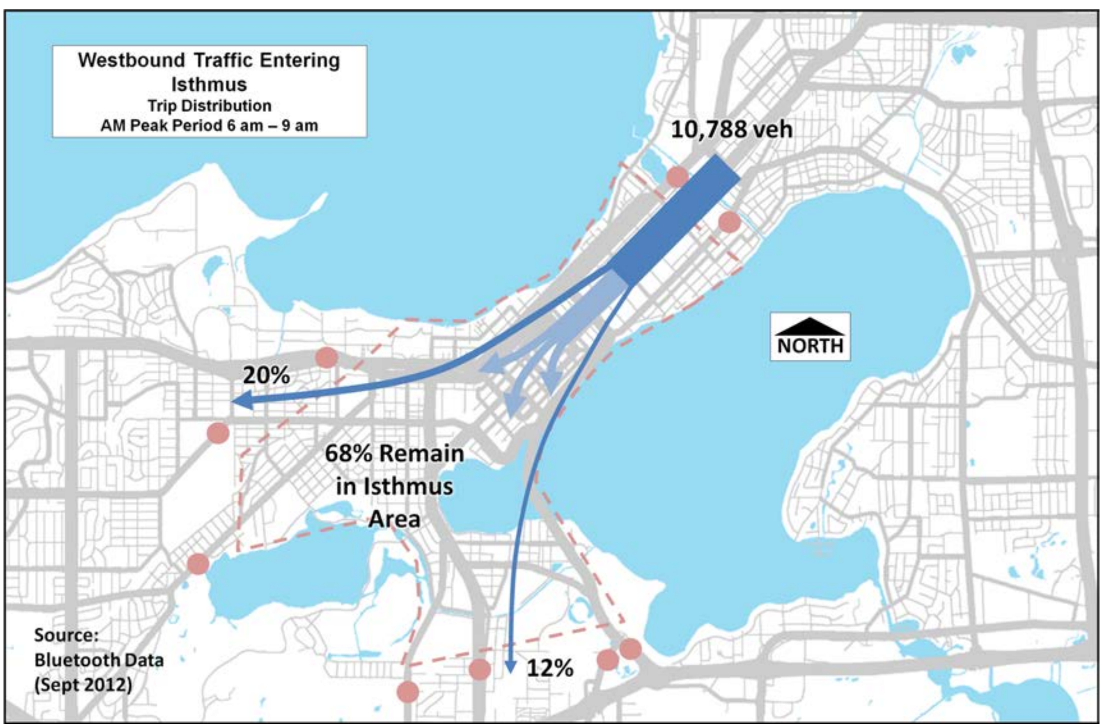


Figure 4.02-1 Isthmus Traffic Coming from the East

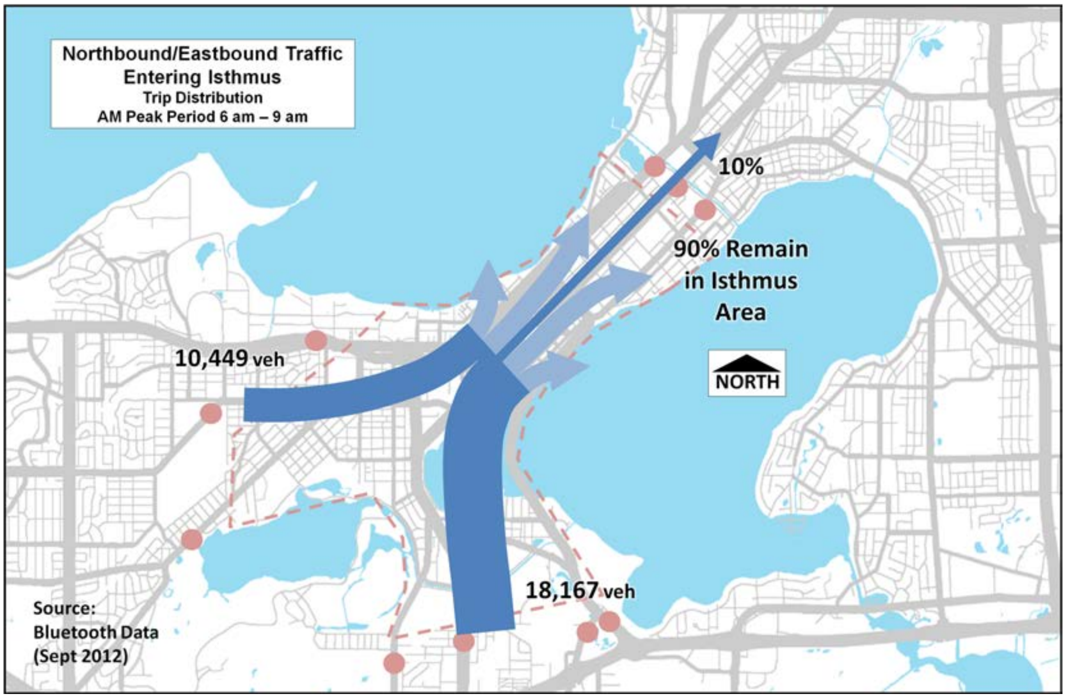


Figure 4.02-2 Isthmus Traffic Coming from the West

4.03 STRATEGY DESCRIPTION

To analyze the effects of a rail transit option, including its effects on the Beltline, the Madison Beltline PEL Study used the alignment proposed by the Transport 2020 New Starts application. It would be a 16-mile commuter rail line operating within an existing freight rail corridor between Middleton and an area just southwest of Sun Prairie, directly through the Isthmus. The rail line would have 17 stations, including the following from west to east:

1. The intersection of US 12 and 14
2. The Middleton Central Business District
3. Railroad intersection with Whitney Way
4. Railroad intersection with Midvale Boulevard
5. Railroad intersection with Shorewood Boulevard
6. UW and Veterans' Administration (VA) Hospitals
7. UW Union South
8. UW Kohl Center
9. Monona Terrace
10. Hancock Street
11. Railroad intersection with Paterson Street
12. Baldwin Street
13. Schenk-Atwood neighborhoods near Second Street and Winnebago Street
14. Union Corners (near East Washington Avenue and Winnebago Street)

15. Railroad intersection with Fair Oaks Avenue
16. Lien Road near the East Towne Mall
17. Reiner Road intersection north of Nelson Road

The modeled service levels include service in both direction with 20-minute peak headways, average operating speed of 23 to 26 mph.

4.04 TRAFFIC IMPACTS

As mentioned in Section 1, a TDM is a computerized network of roadway links and land use traffic generators meant to simulate the roadway network in Madison. In 2014, the Dane County's TDM underwent several revisions, which were performed by Cambridge Systematics and coordinated with the Greater Madison MPO and WisDOT Traffic Forecasting Section. These revisions included updating the model with information provided by the 2010 census and new population, household, and employment projections for the year 2040 extrapolated to the year 2050. It was also converted to a Time of Day model, in which modeled traffic volumes can be separated into four daily periods, rather than reported as a single daily volume. These attributes are different than those for the TDM used for Transport 2020. The TDM used for Transport 2020 was a daily model and had 2030 as a horizon year.

The modeling for Transport 2020 reconfigured the Metro bus route system so that there was no duplication of transit routing. Bus routes that paralleled the train route were truncated and fed to serve the Transport 2020 train. For the Madison Beltline PEL Study analysis, the Metro routes were not modified. Bus routes that paralleled the Transport 2020 route were left in the model. By modeling even greater transit capacity through the Isthmus, a conservative view of the effects of high capacity transit can be understood.

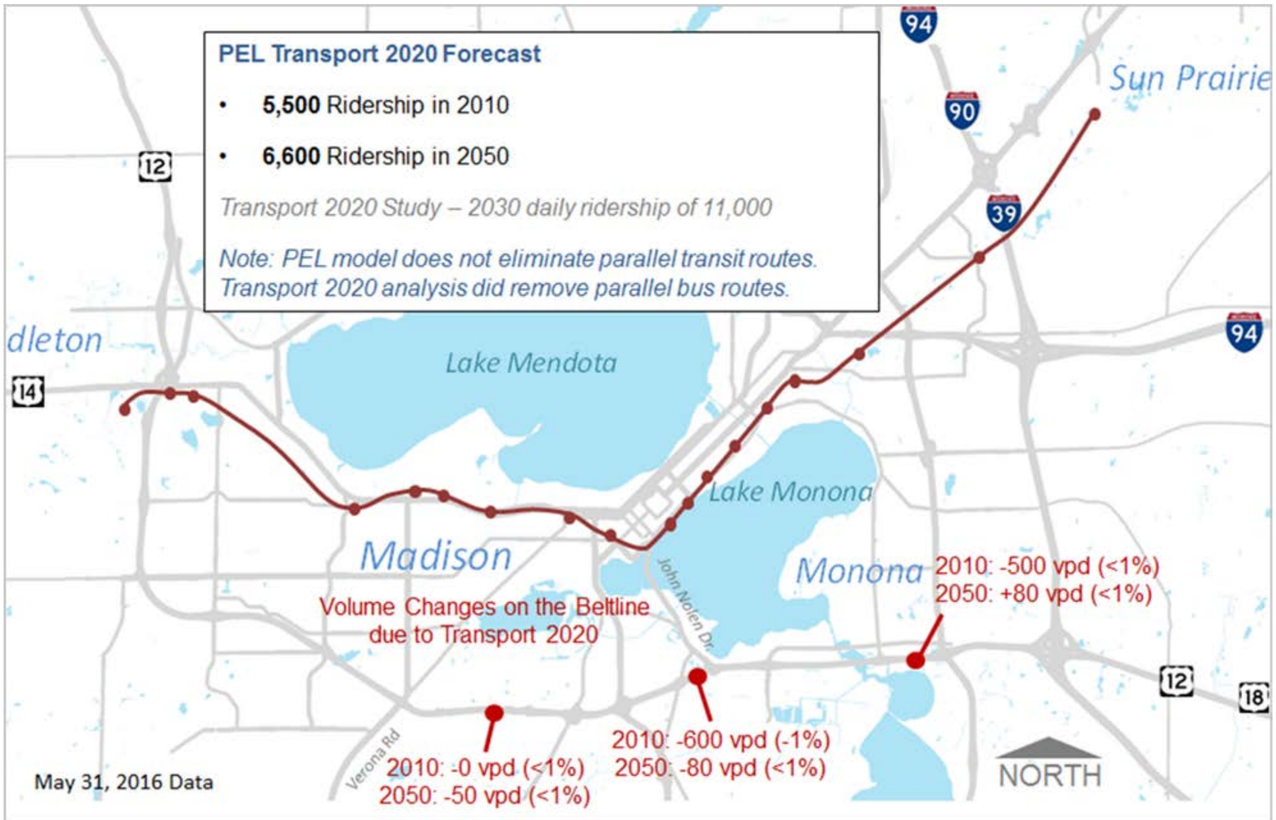


Figure 4.04-1 Projected Transport 2020 Ridership

The ridership forecasted by the Madison Beltline PEL Study analysis, shown in Figure 4.04-1, is lower than ridership forecasts contained in the Transport 2020 New Starts application. The primary reason for the reduced ridership is modeling for this alternative assuming the current Metro service routes and schedules were maintained.

The analysis indicated small changes in Beltline traffic volumes. This is consistent with findings from the O-D study. The large majority of trips toward the Isthmus are destined for the Isthmus and probably are not traveling on the Beltline.

4.05 OTHER IMPACTS

The LPA includes 17 stations. Of those stations, 15 are partially or fully within the boundaries of Madison. Improvements to pedestrian facilities would be needed at most or all 17 stations to provide interconnected street networks and continuous sidewalks to gain access to the stations. R/W in the areas of the stations may need to be acquired for the station, pedestrian improvements, and some parking. There are also several plans the study will use to minimize impacts to specific station areas. These plans may also be modified to promote transit-oriented development associated with the LPA.

1. University Avenue Subarea–Spring Harbor Neighborhood Plan (2006)

2. University Subarea–*Regent Neighborhood Plan (underway)*

3. Capitol Subarea–*First Settlement Neighborhood Master Plan (1995), Bassett Neighborhood Master Plan (1997), East Rail Corridor Plan (2004), Tenney-Lapham Neighborhood Plan (draft, September 2006), and Tenney-Lapham Old Market Place Neighborhood Plan (1995)*

4. East Isthmus subarea–*East Rail Corridor Plan, Tenney-Lapham Neighborhood Plan, Tenney-Lapham Old Market Place Neighborhood Plan, Emerson East-Eken Park Neighborhoods (1998), Schenk-Atwood-Starkweather-Worthington Neighborhood Plan (2000), and Schenk-Atwood Neighborhood Business District Master Plan (2000).*

5. East Towne Subarea–*Carpenter-Hawthorne-Ridgeway-Sycamore-Truax Neighborhood Plan (2001), Ridgewood Neighborhood East Central Development Plan (2002), Nelson Neighborhood Master Plan (2001).*

Noise and safety are other impacts that may be associated with the LPA. Overall, passenger rail is usually less noisy than freight rail because of the use of lighter vehicles. Safety issues are generally addressed through controlling crossings and corridor access.

Overall, other impacts from the LPA would be minimal because the corridor already exists. The LPA would be adding a track to the existing freight corridor requiring minimal R/W. The project costs for the light rail LPA are shown in Table 4.05-1.

Project Costs	**YOE Dollars (2007)**
Guideway and Track Elements (route miles)	$73,841,000
Stations, stops, terminals, intermodal (number)	$25,592,000
Support facilities: yards, shops, administration buildings	$14,744,000
Sitework and special conditions	$8,923,000
Systems	$77,991,000
R/W, land, existing improvements	$12,228,000
Vehicles (number)	$69,125,000
Professional services	$41,942,000
Unallocated contingency	$0
Finance charges	$12,718,000
Total Project Cost	**$337,106,000**

YOE=Year of Expenditure

Table 4.05-1 LPA Project Costs from New Starts Application

In the Transport 2020 New Starts application, the LPA was forecast to carry approximately 3 million riders annually in 2030. The high trip generating areas that would be served by the LPA include the following:

1. The State Capitol
2. Monona Terrace Community and Convention Center
3. The UW
4. Camp Randall Stadium
5. The VA Hospital
6. Hill Farms–including Hilldale Mall, federal government offices, and state offices

4.06 SCREENING AND RESULTS

The following table uses the Stand-Alone Strategy screening questions described in Section 1 and evaluates the Transport 2020 rail option for preliminary screening of alternatives.

Root Objective	Stand-Alone Strategy Screening Question	Transport 2020 Evaluation
1. Improve safety for all modes		
▪ Motor vehicle	Does the Stand-Alone Strategy address safety deficiencies on the Beltline or have the potential to reduce congestion-related motor vehicle crashes on the Beltline?	Transport 2020 does not specifically address Beltline safety deficiencies. It also does not reduce traffic volumes enough to reduce congestion-related crashes on the Beltline.
2. Address Beltline infrastructure condition and deficiencies.	Does the Stand-Alone Strategy preclude addressing Beltline infrastructure deficiencies?	Transport 2020 does not address Beltline infrastructure deficiencies, but it does not preclude these deficiencies from being addressed in a separate project. To satisfy this objective, another separate project would have to be planned for the Beltline.
3. Improve system mobility (congestion) for all modes		
▪ Transit	Does the Stand-Alone Strategy preclude improvements to transit facilities and routing?	Transport 2020 greatly improves transit service levels through downtown Madison; it represents a significant mobility increase.
▪ Motor vehicles (including passenger and freight)	Does the Stand-Alone Strategy decrease Beltline traffic, or increase Beltline capacity, enough to address conditions that lead to unstable traffic flow on the Beltline?	Transport 2020 makes no appreciable difference in Beltline traffic volumes. Therefore, it does not satisfy this key objective.

Table 4.06-1 Transport 2020 Stand-Alone Strategy Screening Questions

4.07 CONCLUSION

Transport 2020 captures a fair number of riders and would greatly enhance access to and through the Isthmus. The fiscal viability without a local funding mechanism caused local governments to withdraw the New Starts application from the FTA. This fiscal viability remains. A rail alternative such as Transport 2020 does not remove traffic volume from the Beltline and, therefore, does not satisfy root Beltline PEL objectives for Stand-Alone Strategies of the Madison Beltline PEL Study.

Because there are other high capacity transit alternatives currently being studied in the Madison area that appear to have greater viability and local support, a rail alternative will not be considered as a transit component of a larger strategy package. Further analysis of the corridor could occur as part of a separate project focused on the transportation needs of the Isthmus.

SECTION 5
BRT

5.01 BACKGROUND

A. History

After the withdrawal of the Transport 2020 New Starts application from the FTA, government officials began looking at other transit options with high service levels. The Greater Madison MPO investigated BRT and released a report, *Madison Transit Corridor Study Investigating Bus Rapid Transit in the Madison Area,* in May 2013. The report investigated routes, costs, and potential ridership for a BRT system in the metropolitan area. BRT is a corridor-based transit improvement intended to provide fast, frequent, reliable and comfortable service through key design components. These key design components are described in Table 5.01-1.

Design Component	Description of Design Component
Service frequency	Service typically runs every 15 minutes or sooner throughout most of the weekdays and weekends.
Alignment runningway	Dedicated or preferential lanes to allow buses to move more quickly through traffic.
Station location and design	Stations and stops are upgraded with enhanced amenities and information kiosks.
Vehicles	Vehicles often have a unique look, distinct from regular local and express service buses.
Connecting and parallel local bus service	Stations are generally spaced one stop every one-half mile to provide express service. Local bus service with stops every one-quarter mile can be still maintained along the BRT route.
Fare collection	Generally, use innovative fare collection methods such as electronic prepay smart cards and prepayment kiosks.
Advanced technology	ITS components such as transit signal priority and real-time arrival signs make the system faster, more reliable and more user friendly.
Identify and branding	A system brand is developed to differentiate BRT transitways from other transit service.

Table 5.01-1 Key BRT Design Components

An oversight committee was established and goals for BRT implementation in Madison were set. The following goals are listed in the BRT report:

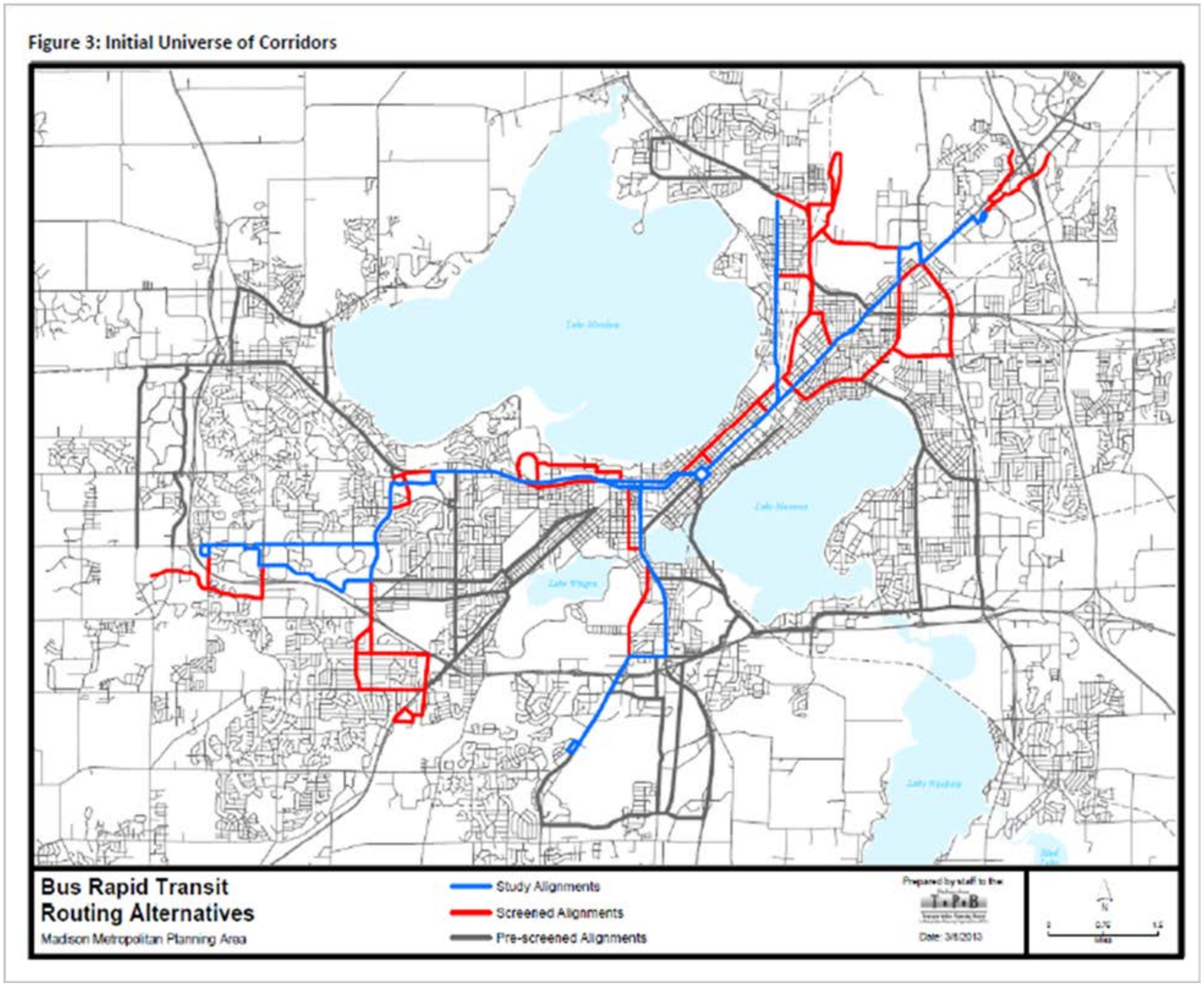
1. Reduce transit travel times.
2. Attract new transit riders.
3. Improve connections between low income and/or transit-dependent neighborhoods and centers of employment and activity.
4. Provide expanded transit carrying capacity.
5. Improve operational efficiencies.
6. Provide an enhanced image for transit service.
7. Improve the comfort and convenience of the transit experience.

8. Integrate well with the existing and planned transit system.
9. Enhance opportunities for transit-oriented development (TOD).

In February 2017, the Madison Common Council approved Madison in Motion. One of the major themes of Madison in Motion is to improve transit service with the most important recommendation being to develop and implement BRT in the next five years. In March 2020, the city of Madison identified a BRT LPA. The city of Madison is currently working with the FTA to initiate the NEPA process. Any future developments or progress made by the city of Madison within the BRT NEPA process will be included in any future Madison Beltline NEPA processes.

B. Investigated Corridors and Key Assumptions

Figure 5.01-1 graphically shows the routing options initially investigated from Figure 3 of the May 2013 BRT report. The BRT is intended to provide faster service and improved reliability of buses through a limited-stop bus system. During an initial screening process of the routing options, corridors such as Middleton, Midvale Boulevard, Monroe Street, and Monona Drive had insufficient all-day transit ridership or were impractical to construct and operate. As a result, these corridors were eliminated from further study. These corridors are labeled as Pre-screened Alignments and shown in gray in Figure 5.01-1. The remaining options were further refined using specific criteria. The corridors shown in red were subsequently screened out and the most promising corridors are shown in blue in Figure 5.01-1 and labeled Study Alignments



Source: *Madison Transit Corridor Study Investigating Bus Rapid Transit in the Madison Area,* May 2013

Figure 5.01-1 Corridors Investigated by the BRT Study

Figure 5.01-2 shows the key assumptions studied by the report.

BRT Component	Assumption for Madison BRT Study
1. Service	• 10 minute peak period • 15 minute middle of the day, weekdays and Saturdays • 7 day per week service • 19 hours per weekday
2. Runningways	• Median busway where reasonable conditions exist • Side running in reserved lane for transit, right turns, and bicycles • Mixed traffic
3. Stations	• Far-side of intersections where possible • Unique shelter design with accompanying amenities • 9-inch platform height
4. Vehicles	• Articulated 60-foot bus; low floor, 3 doors • Hybrid diesel
5. Route Structure	• Two BRT routes: north-south and east-west • Replace duplicating service with BRT • Make new connections • Move transfer points as needed
6. Fare Collection	• Off-board ticket vending machines at major stations • Compatibility with existing fare card system
7. Transit Signal Priority	• Transit signal priority where possible • Customer information at stations
8. Branding	• Unique appearance at stations and on vehicles

Source: *Madison Transit Corridor Study Investigating Bus Rapid Transit in the Madison Area,* May 2013

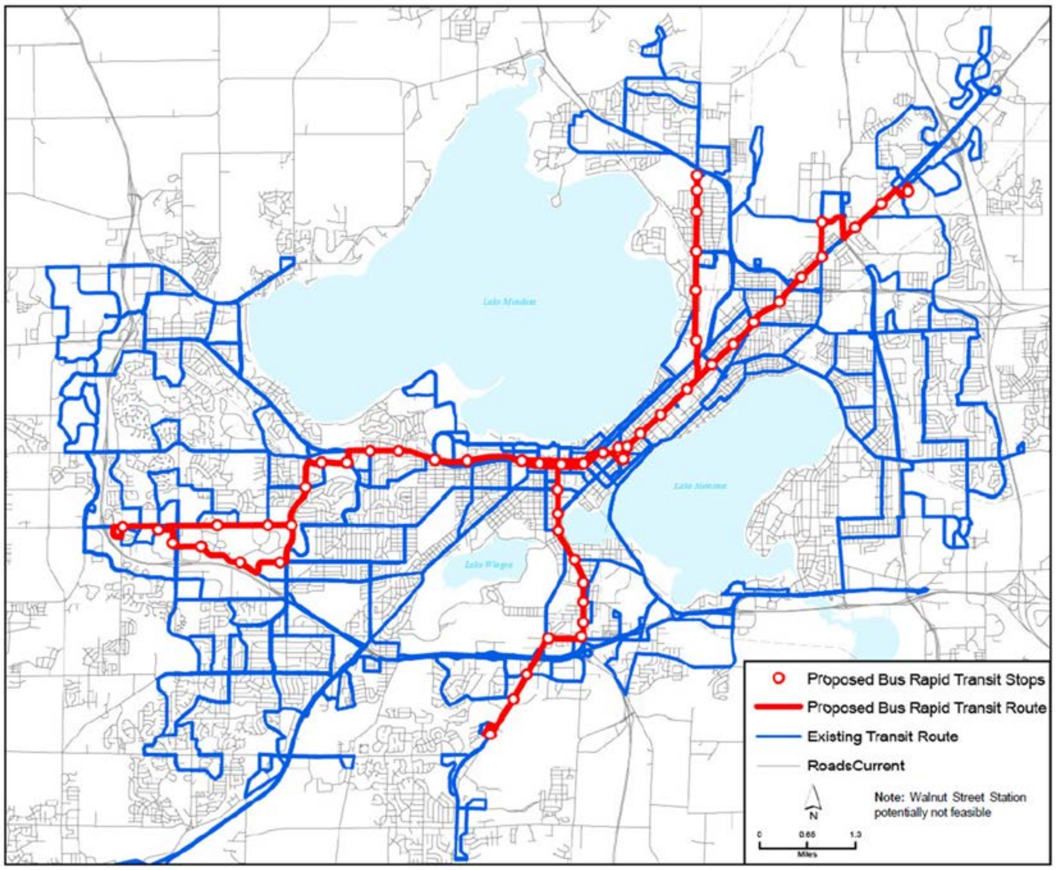
Figure 5.01-2 BRT Study Assumptions

The corridors studied in the BRT report had the BRT buses using a combination of mixed traffic lanes, and dedicated side running lanes. The study analyzed fixed guideway routes using the medians, mainly in the south and west corridor routes. The system would have three different station sizes, with two larger station sizes having equipment that allows the prepayment of fares. The study's proposed alternatives would provide a travel time savings to riders that would increase ridership. This would occur through a combination of measures, including dedicated runningways (lanes), transit priority through signals, and off-board payment of fares. Table 5.01-2 summarizes the travel time savings assumed by the report authors.

Capitol Square to:	BRT	Existing
West Towne Mall	34 to 36 minutes	51 minutes
Hatchery Hill	29 minutes	40 minutes
East Towne Mall	26 minutes	30 to 37 minutes
Warner Park	19 minutes	30 minutes

Table 5.01-2 Example Service Times

The study recommended replacing local routes along the BRT corridor to avoid duplication. Overall, when an existing route was eliminated or service reduced, the planned BRT system was intended to provide adjacent areas with more frequent service over a longer period throughout the day. Figure 5.01-3, Figure 18 of the report, illustrates how the BRT system is positioned in coordination with the existing local routes.



Source: *Madison Transit Corridor Study Investigating Bus Rapid Transit in the Madison Area,* May 2013

Figure 5.01-3 Proposed BRT Service and Existing Local Bus Service

The study also recommended the relocation of Metro's West Transfer Point to Mineral Point Road, the North Transfer Point closer to Sherman Avenue, and the expansion of the South Transfer Point. New park and ride facilities were recommended at the outer edges of the west, south, and east corridors in order to increase access to the system.

The Transit Corridor Study used an incremental pivoting method of forecasting to estimate ridership levels for 2016, and future ridership levels in the year 2035. The incremental pivoting method used existing transit ridership as a baseline and then applied growth factors to the baseline numbers to account for transit service improvements and sociodemographic growth. Figure 5.01-4 shows Table 55 from the report, which illustrates the projected ridership for each line of the BRT.

Table 55: Corridor Ridership Projections

	Average Daily Ridership			Annual Ridership		
Corridor	**Opening Year Ridership Projection (2016)**	**Future Ridership Baseline Projection (2035)**	**TOD Adjusted Future Ridership Projection (2035)**	**Opening Year Ridership Projection (2016)**	**Future Ridership Baseline Projection (2035)**	**TOD Adjusted Future Ridership Projection (2035)**
North	3,370	3,800	4,270	0.86 M	1.16 M	1.30 M
South	6,150	7,000	7,900	1.87 M	2.13 M	2.41 M
East	3,530	4,170	5,180	1.08 M	1.27 M	1.58 M
West: Mineral Point	8,780	9,670	10,650	2.27 M	2.95 M	3.25 M
West: Odana	8,930	9,790	10,760	2.72 M	2.99 M	3.28 M

Notes:

- Existing ridership is based on 2011 Metro Ridership data and used a 1/8 mile buffer around existing bus stops to create an existing baseline ridership for the proposed alignments.
- Opening Year (2016) and Future (2035) Ridership Projections are based on current land use patterns.
- TOD Adjusted Future Ridership Projections are based on transit oriented development (TOD) at key station areas.
- The West - Mineral Point Road alignment projections includes riders from the relocated West Transfer Point.

Figure 5.01-4 Proposed BRT Service and Existing Local Bus Service

Figures 5.01-5 and 5.01-6 are from the *Madison Transit Corridor Study Investigating Bus Rapid Transit in the Madison Area* report. They describe corridor attributes and capital costs for the studied BRT system.

Table 50: Corridor Attributes

Corridor	NORTH	SOUTH		EAST	WEST		
Type of Runningway	Corridor	Fixed Guideway	Corridor	Corridor	Mineral Point - Fixed Guideway	Mineral Point - Corridor	Odana - Corridor
One-way Corridor Length (miles)	4.31	5.50	5.50	6.28	7.76	7.76	8.61
Fixed Guideway Length (Miles)	0.30	3.40	-	-	4.30	-	-
Side Running Length (Miles)	1.50	1.10	4.20	3.00	2.10	5.10	2.70
Mixed Traffic Length (Miles)	2.51	1.00	1.30	3.28	1.36	2.66	5.91
Number of Stations per direction	11	16	16	15	17	17	19
Average distance between stations (miles)	0.43	0.37	0.37	0.45	0.49	0.49	0.48
Fleet Required (includes 20% spare factor)	7	9	9	7	11	11	11
Number of Intersections with TSP	13	17	17	16	20	20	24

Source: *Madison Transit Corridor Study Investigating Bus Rapid Transit in the Madison Area,* May 2013

Figure 5.01-5 BRT Corridor Attributes

Table 52: Capital Costs

Corridor	NORTH	SOUTH		EAST	WEST		
Type of Runningway	Corridor	Fixed Guideway	Corridor	Corridor	Mineral Point - Fixed Guideway	Mineral Point - Corridor	Odana - Corridor
Side Running Lane Improvements	\$0.65 M	\$0.48 M	\$1.79 M	\$1.27 M	\$0.9 M	\$2.18 M	\$1.15 M
Median Running Lane Improvements	\$2.36 M	\$18.59 M	\$0	\$0	\$21.37 M	\$0	\$0
TSP	\$0.6 M	\$0.7 M	\$0.7 M	\$0.69 M	\$0.76 M	\$0.76 M	\$0.79 M
ROW Acquisition	\$1.09 M	\$1.1 M	\$1.1 M	\$0.11 M	\$2.23 M	\$1.11 M	\$0.1 M
Station Costs	\$6.12 M	\$5.23 M	\$7.14 M	\$8.09 M	\$8.23 M	\$9.56 M	\$12.13 M
Fleet Costs (includes 20% spare factor)	\$8.27 M	\$12.76 M	\$10.64 M	\$8.27 M	\$15.6 M	\$13.0 M	\$13.0 M
Transfer Point Reconstruction Costs	\$2.16 M	\$2.16 M	\$2.16 M	\$0	\$2.16 M	\$2.16 M	\$2.16 M
Soft Costs	\$4.02 M	\$8.64 M	\$4.14 M	\$3.36 M	\$10.75 M	\$5.09 M	\$5.38 M
Unallocated Contingency Costs	\$2.55 M	\$5.53 M	\$2.56 M	\$2.03 M	\$6.96 M	\$3.13 M	\$3.26 M
Total Construction Costs (2016 \$)	**\$27.87 M**	**\$55.19 M**	**\$30.23 M**	**\$23.82 M**	**\$68.96 M**	**\$36.99 M**	**\$37.97 M**

Source: *Madison Transit Corridor Study Investigating Bus Rapid Transit in the Madison Area,* May 2013

Figure 5.01-6 BRT Capital Costs

5.02 TRAVEL PATTERNS INFLUENCING BRT RIDERSHIP

As mentioned in Section 1, WisDOT performed a county-wide O-D study to understand regional travel patterns using time-lapse aerial photography and Bluetooth detection. Of particular interest in the evaluation of both Transport 2020 and BRT in relation to the Beltline is the number of trips destined to and through the Isthmus. This is because all four legs of the BRT system studied serve the Isthmus employment centers. The analysis of travel patterns through the Isthmus during the morning peak period from 6 to 9 A.M. provides a good representation of work trip origins and destinations. This analysis was also shown in in Section 4 of this report because it has similar implications for rail service through the Isthmus. Figures 5.02-1 and 5.02-2 show that of traffic coming from the east, almost 70 percent remain downtown. Of traffic coming from the west, which is three times greater, 90 percent remain within the Isthmus area.

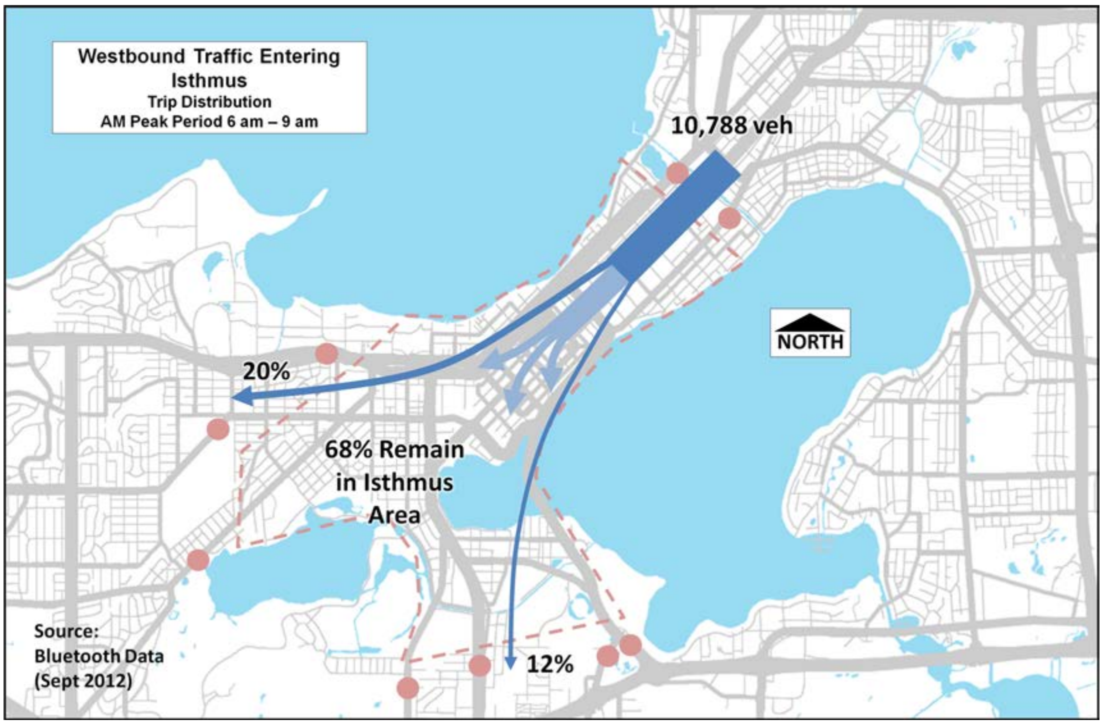


Figure 5.02-1 Isthmus Traffic Coming from the East

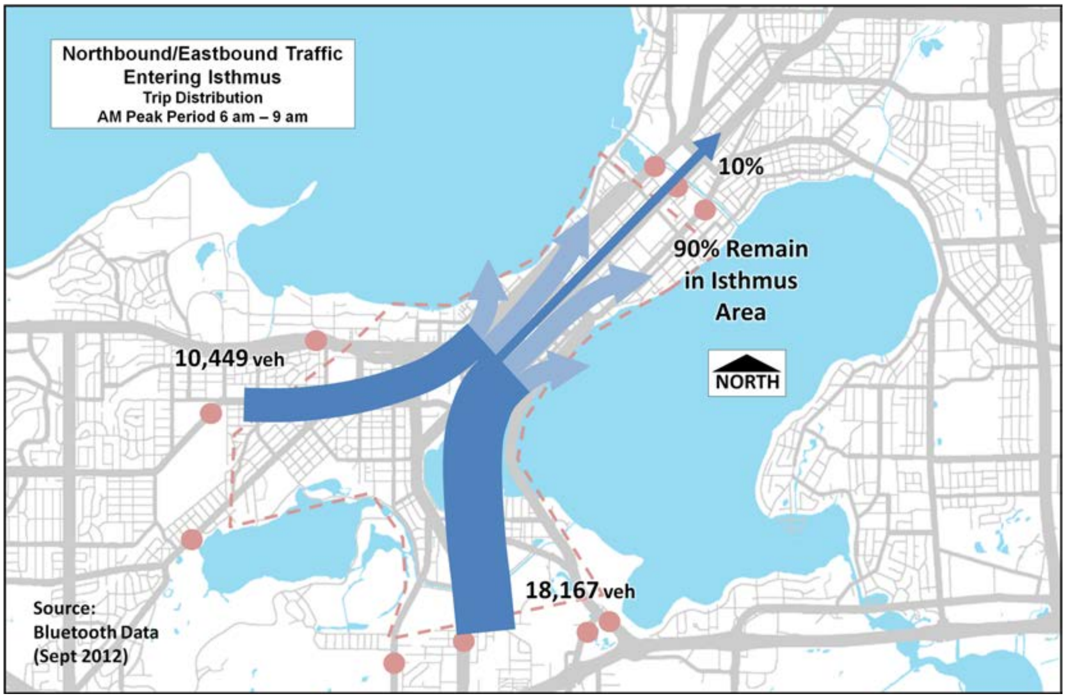
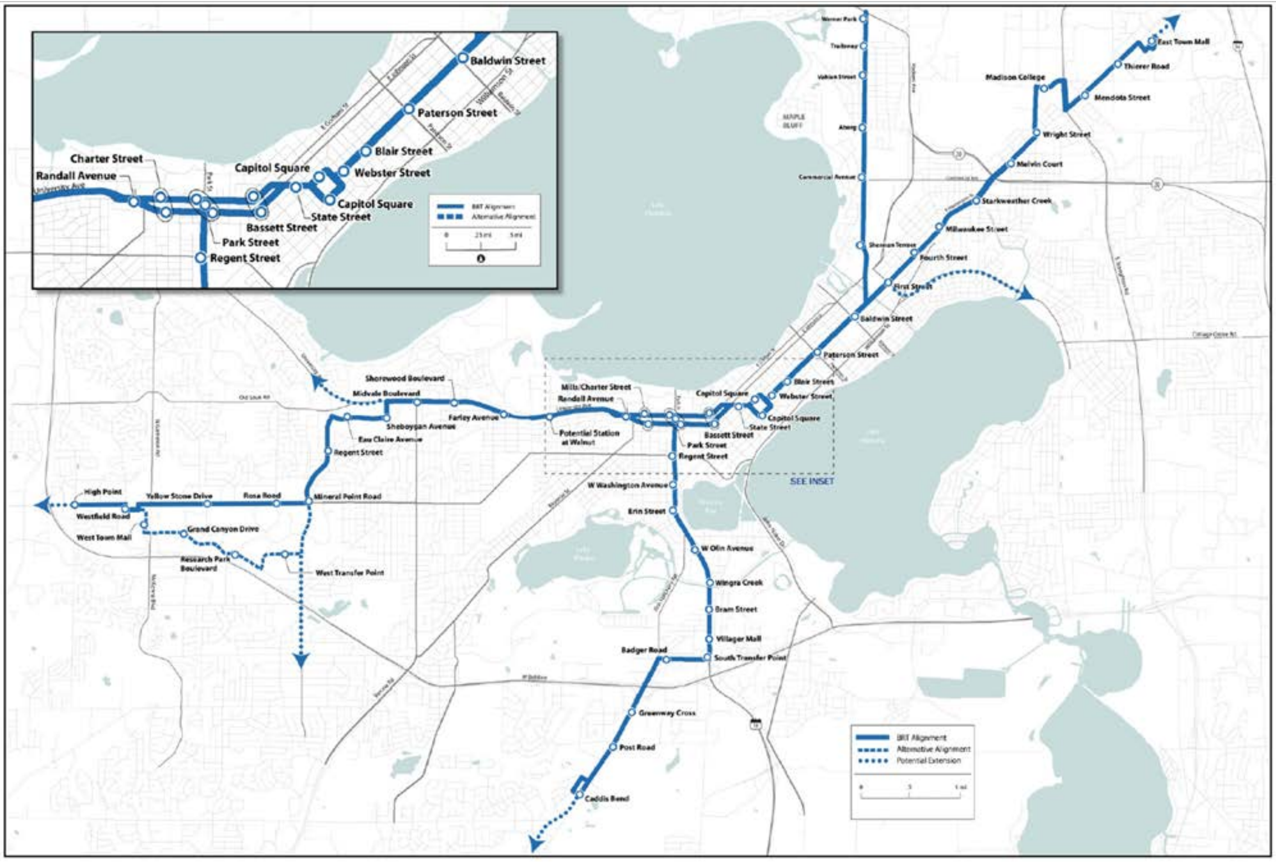


Figure 5.02-2 Isthmus Traffic Coming from the West

5.03 STRATEGY DESCRIPTION

The BRT strategy being evaluated in the Madison Beltline PEL Study is the same as that proposed in the 2013 *Madison Transit Corridor Study Investigating Bus Rapid Transit in the Madison Area* and shown in Figure 5.03-1. Additionally, the Madison Beltline PEL Study looked at extensions to these lines and their effect on ridership (shown in Figure 5.04-2).



Source: Madison Transit Corridor Study Investig*ating Bus Rapid Transit in the Madison Area,* May 2013

Figure 5.03-1 BRT Strategy Analyzed in PEL

5.04 TRAFFIC IMPACTS

A. Boardings and Ridership

The Madison Beltline PEL Study modeled the same BRT system outlined in the Greater Madison MPO 2013 report using the newly completed TDM. The analysis assumed a six-minute time advantage for the BRT, as compared to a conventional bus. The demand model also used a “premium mode” that accounted for attributes such as mode branding, better stop shelters, and known alignment/service frequency.

This analysis showed greater BRT ridership than the 2013 report. Figure 5.04-1 shows the analysis results superimposed on the routing described in the report. The north-south routing could capture 7,800 daily boardings in 2010[1] and 8,500 daily boardings in 2050. The east-west routing could capture 10,700 daily boardings in 2010 and 12,500 daily boardings in 2050. Both routes combined would capture

[1]The base year of the demand model is 2010, corresponding to the 2010 census data.

16,500 daily boardings in 2010 and 18,500 daily boardings in 2050. The BRT had a small effect on reducing traffic volumes on the Beltline, generally reducing Beltline daily volumes by less than 400 vpd and, in some instances, increasing Beltline volumes slightly. Possible reasons for the BRT's limited effect on the Beltline are revealed by the O-D data described in Section 5.02. This data indicates that most travelers on these radial corridors are traveling to the Isthmus, rather than through it. The potential BRT user likely has the Isthmus as a destination, indicating few of the potential BRT riders would likely to be traveling on the Beltline.

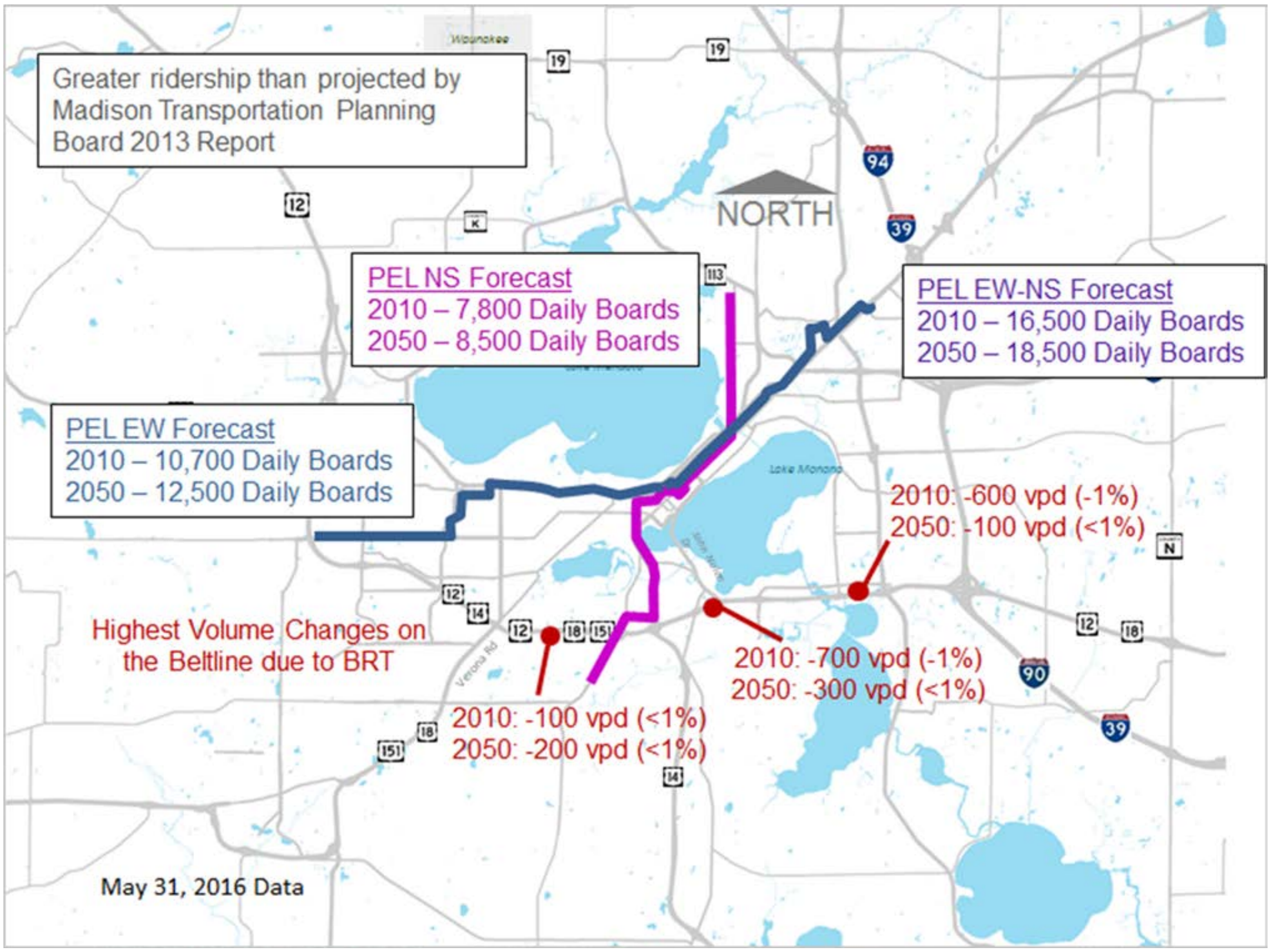


Figure 5.04-1 Potential Ridership in 2010 and 2050

B. Other Factors

Using the travel demand model, the Madison Beltline PEL Study performed a sensitivity analysis in 2015 to see how modifying different factors would affect ridership of the BRT. Table 5.04-1 illustrates the effect of these changes. One factor that had the greatest effect was treating the BRT route as just another bus route, which decreased ridership by almost one-half.

The modeling indicates that in order for BRT to capture maximum ridership, it must have key BRT characteristics, such as distinct buses, branding, boarding stations, and a time advantage. Treating the BRT as regular bus service decreased the ridership by almost one-half. BRT frequency also had a relatively high impact on ridership. When times between BRT vehicles increased, ridership decreased by more than one-quarter. BRT fare decreases, as well as time advantages, had more modest effects on ridership.

Modifying Measure	Percent Chance in Daily Ridership
Treat BRT as regular bus service	-49
Decrease fare by $0.25 (e.g., -20 percent)	+5
Change frequency from 10 minutes to 15 minutes in peak, 15 minutes to 30 minutes in off-peak	-27
Decrease time advantage from 6 minutes to 4 minutes	-3
Decrease time advantage from 6 minutes to 2 minutes	-6.5
Remove time advantage and time factor (perceived time advantage)	-14

Table 5.04-1 Change in Ridership Due to Factors (2015 analysis)

C. <u>Service Extension</u>

The Madison Beltline PEL Study also performed an analysis to see whether extending BRT service farther to the west and east would affect ridership. The west side extension would travel the Junction Road corridor and use the Beltline interchanges at either Old Sauk Road or Greenway Boulevard. The east side extension would extend beyond I-39/90/94 and travel near the American Center using American Parkway and Reiner Road. The maps in Figure 5.04-2 show the extensions that were modeled and about how many additional daily boards they would attract. While increasing ridership, the gains are relatively modest for the increase in routing (and associated cycle times) that they would incur.

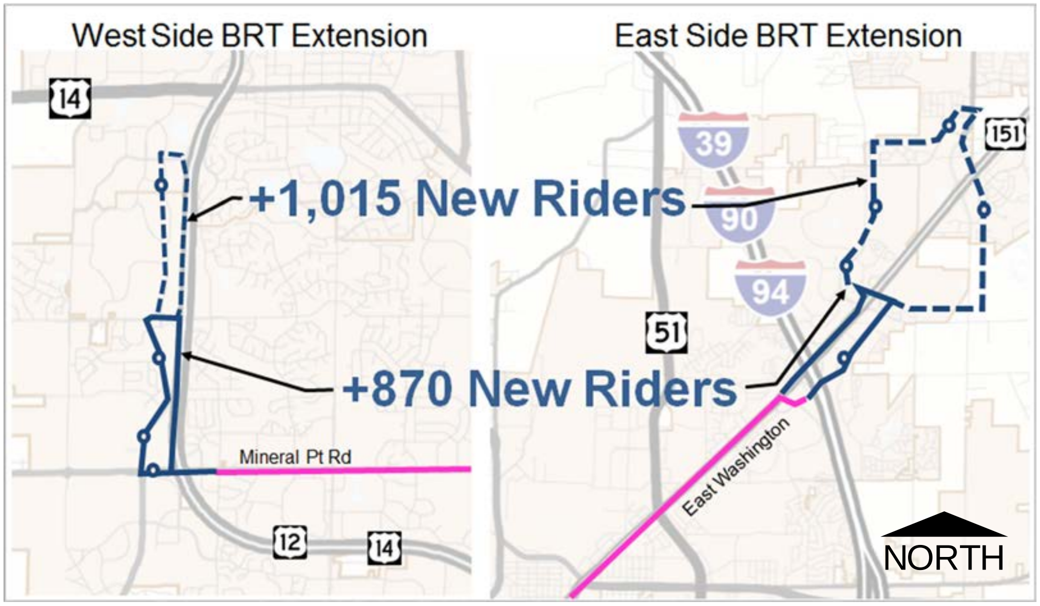


Figure 5.04-2 Extending BRT Service Effect on Ridership (2015 analysis)

5.05 SCREENING AND RESULTS

The Table 5.05-1 uses the Stand-Alone Strategy screening questions described in Section 1 and evaluates the BRT Study.

Root Objective	Stand-Alone Strategy Screening Question	BRT Corridor Evaluation
1. Improve safety for all modes		
▪ Motor vehicle	Does the Stand-Alone Strategy address safety deficiencies on the Beltline or have the potential to reduce congestion-related motor vehicle crashes on the Beltline?	The BRT Corridor does not specifically address Beltline safety deficiencies. It also does not reduce traffic volumes enough to reduce congestion related crashes on the Beltline.
2. Address Beltline infrastructure condition and deficiencies	Does the Stand-Alone Strategy preclude addressing Beltline infrastructure deficiencies?	The BRT Corridor does not address Beltline infrastructure deficiencies, but it does not preclude these deficiencies from being addressed in a separate project. To satisfy this objective, another separate project would have to be planned for the Beltline.
3. Improve system mobility (congestion) for all modes		
▪ Transit	Does the Stand-Alone Strategy preclude improvements to transit facilities and routing?	The BRT Corridor specifically addresses and provides considerably greater transit mobility.
▪ Motor vehicles (including passenger and freight)	Does the Stand-Alone Strategy decrease Beltline traffic, or increase Beltline capacity, enough to address conditions that lead to unstable traffic flow on the Beltline?	The BRT Corridor makes no appreciable difference in Beltline traffic volumes nor does it increase Beltline capacity.

Table 5.05-1 BRT Study Evaluation

5.06 CONCLUSION

The BRT strategy does not address enough root Beltline PEL objectives to preclude the need for Beltline improvements; therefore, it cannot satisfy root objectives as a Stand-Alone Strategy. BRT does, however, appreciably improve transit mobility. It also addresses other Beltline PEL objectives, including:

- Enhancing efficient multimodal access to economic centers.
- Enhancing transit ridership and routing opportunities.
- Complementing other major transportation initiatives and studies in the Madison area.
- Supporting infrastructure and other measures that encourage alternatives to single occupancy vehicle travel.

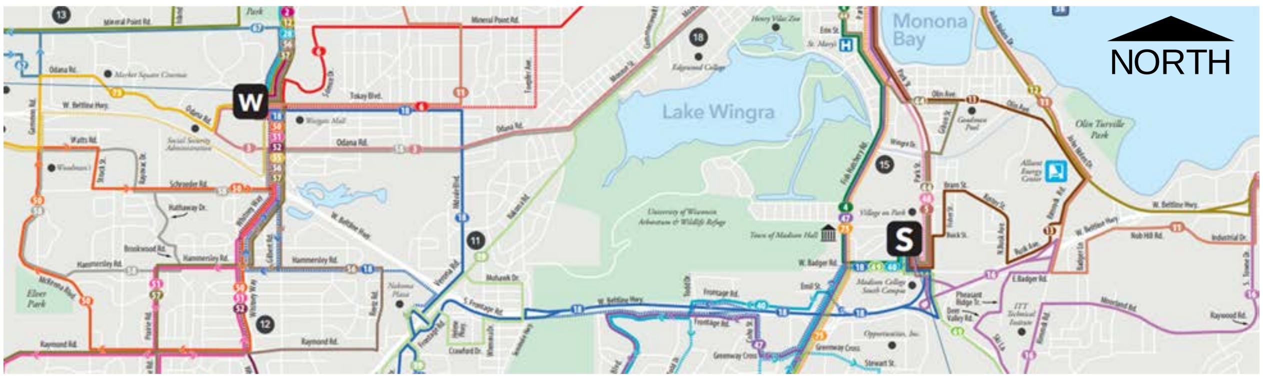
Although the BRT strategy would not satisfy enough of the root Beltline PEL objectives, the BRT could be evaluated for possible inclusion as a component in Strategy Packages. Madison has identified a BRT LPA and is working with the FTA to begin the NEPA process. Future studies should investigate infrastructure improvements that complement locally initiated BRT initiatives. These improvements could include measures that provide transit a time advantage as well as parking facilities.

SECTION 6
TRANSIT SERVICE ON THE BELTLINE

6.01 BACKGROUND

A. Routing

Metro is the primary transit provider in the Madison area. Metro runs more than 60 bus routes, using a node system with four transfer stations. Some transit advocates have suggested more extensive service on the Beltline, perhaps with priority lanes, would lead to increased ridership. Currently, only four Metro bus routes travel on the Beltline and these routes travel for only short distances (see Figure 6.01-1). This is partially due to the limited number of potential riders (limited residential land uses) and the variability of travel times on the Beltline.



Source: https://www.cityofmadison.com/metro/documents/WeekdayMap.pdf-2020

Figure 6.01-1 Existing Metro Routes on the Beltline

The following summarizes routes using the Beltline from west to east.

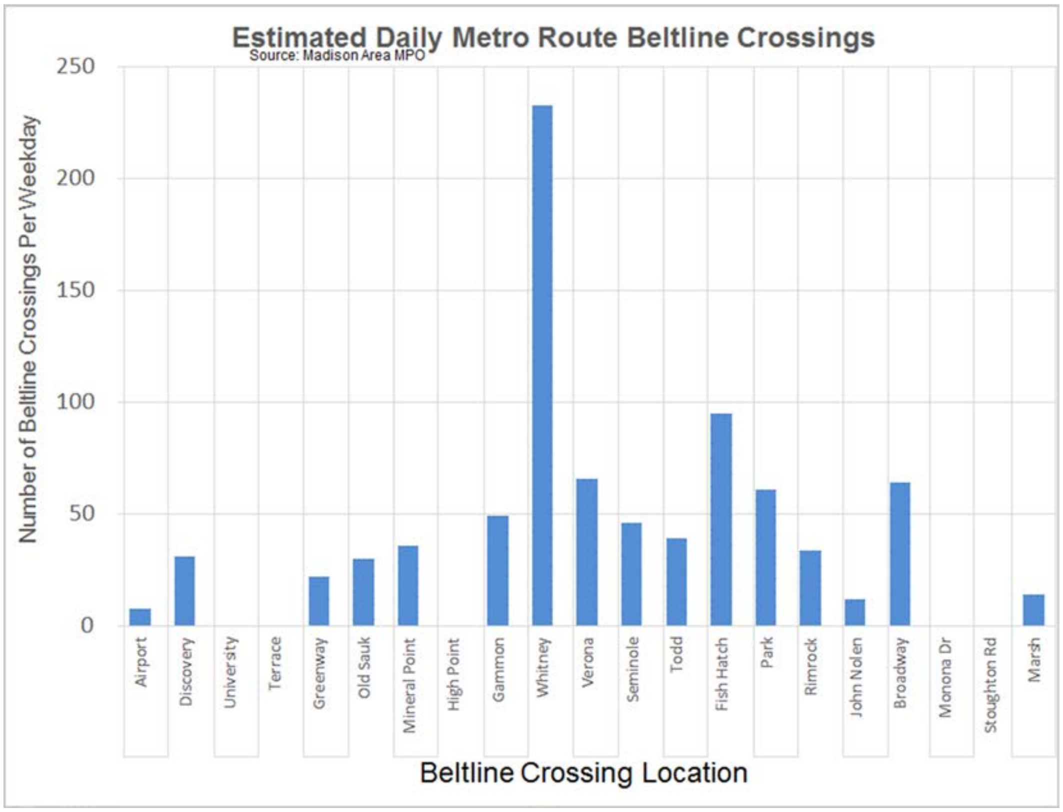
1. Route 55 runs between the West Transfer Point (off Whitney Way on Tokay Boulevard) and Epic Software Systems, Inc. (on the northwest side of Verona). It uses the Beltline to travel between Whitney Way and Gammon Road.

2. Route 18 runs between the West Transfer Point and the South Transfer Point (at Park Street and Badger Road). It uses the Beltline to travel between Seminole Highway and Park Street.

3. Route 16 runs between the South Transfer Point and the East Transfer Point including service to south Madison and Monona. It uses the Beltline to travel between Park Street and Rimrock Road.

4. Route 12 runs between the Capitol Square and Dutch Mill Park and Ride. It uses the Beltline to travel between John Nolen Drive and West Broadway.

While only four Metro routes travel on the Beltline, numerous routes cross the Beltline. Figure 6.01-2, provided by the Greater Madison MPO shows the number of route crossings of the Beltline in October 2015[1].



Source: Greater Madison MPO Staff–2015

Figure 6.01-2 Metro Beltline Crossing Frequency

The Greater Madison MPO prepared a Transit Development Plan (TDP) for 2013 through 2017. It recommends ten different service extensions to outlying portions of the urban area. Figure 6.01-3 graphically shows these extensions. Of these planned extensions, the extension to McFarland (shown in teal) has been implemented. A partial extension to Main Street in Sun Prairie (proposed routes shown in yellow and blue) has also been implemented.

It is notable that Madison will begin a study of local service (non-BRT service) in summer 2020 that may result in changes to the routes previously summarized.

[1] As of fall 2020, Metro Transit is completing a full review of local bus service. While the number of routes crossing the Beltline at the locations shown in Figure 6.01-2 may change, the relative importance of each (with Whitney Way and Fish Hatchery Road representing high priority transit corridors) is likely to remain similar to the 2015 data shown.

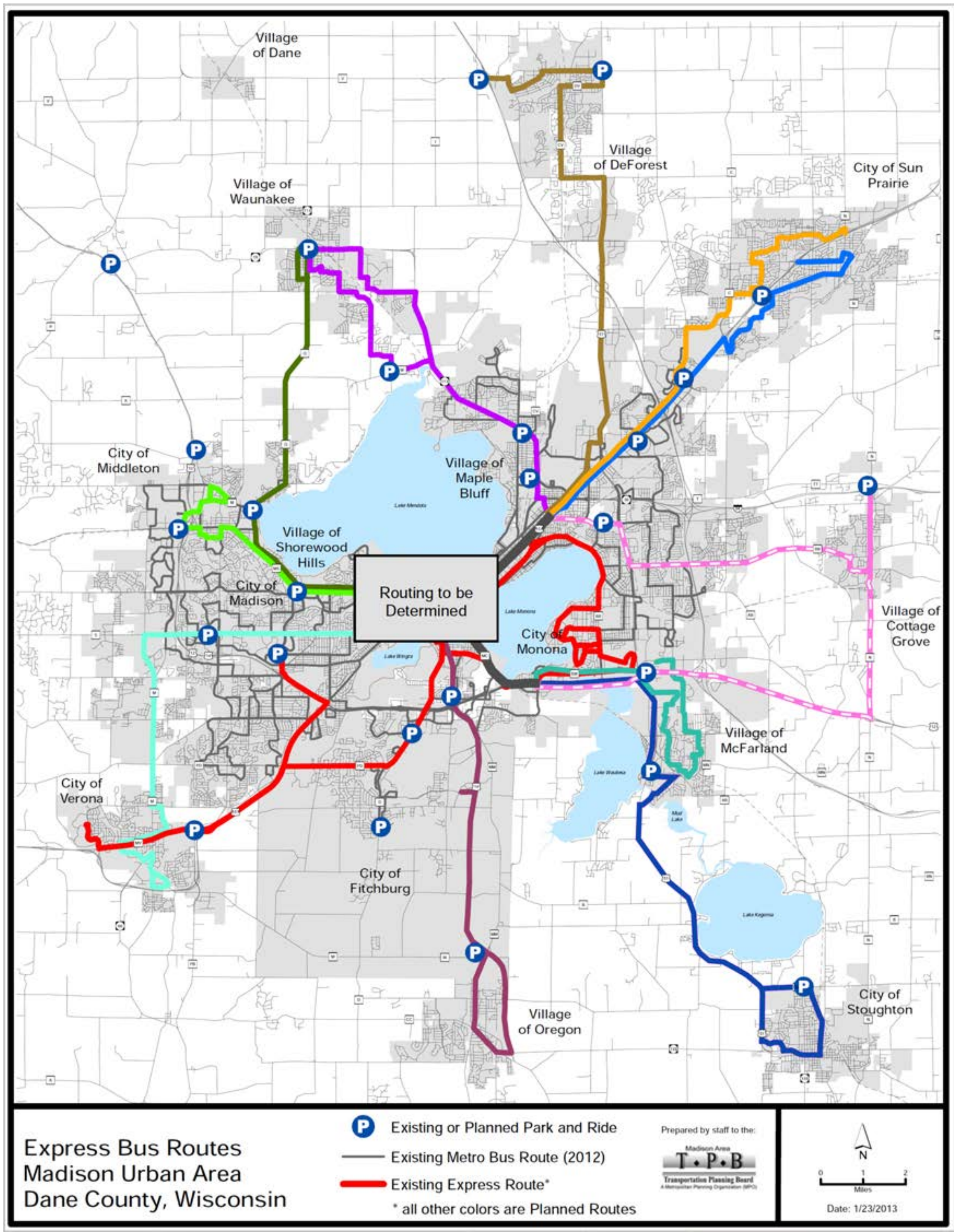


Figure 6.01-3 Possible Metro Express Bus Routes

6.02 TRAVEL PATTERNS

A. Beltline Traffic Volumes

The Beltline study corridor carries the highest amount of traffic per day of any road in Dane County, including the Interstates. Figure 6.02-1 shows average annual daily traffic (ADT) along the Beltline.

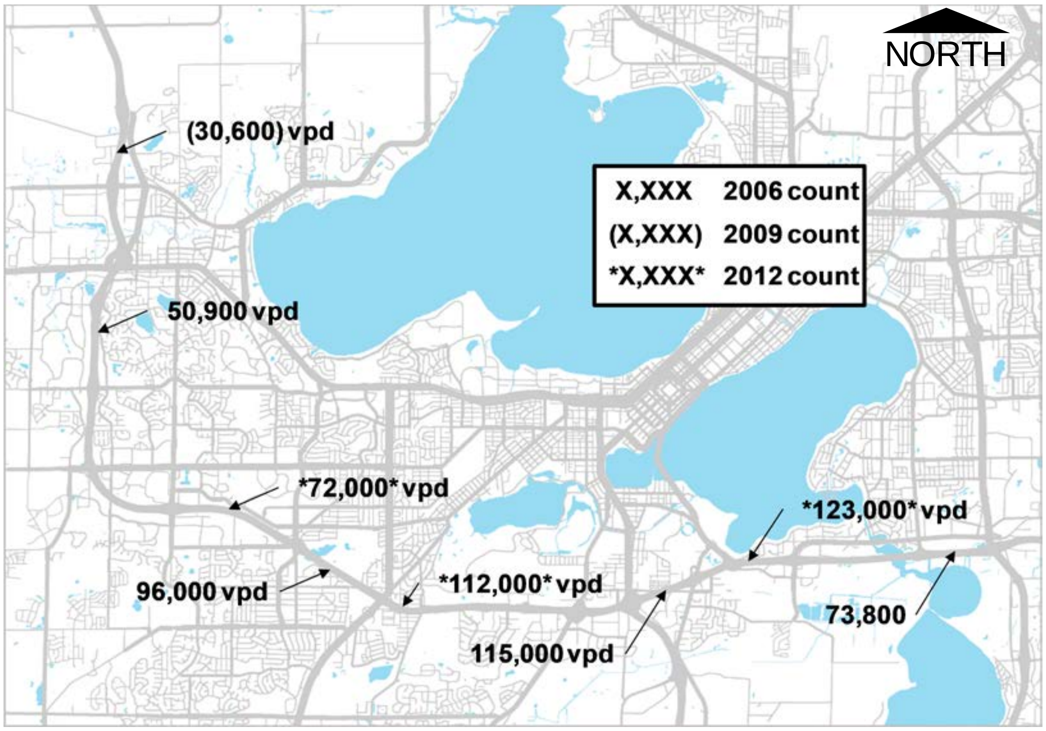
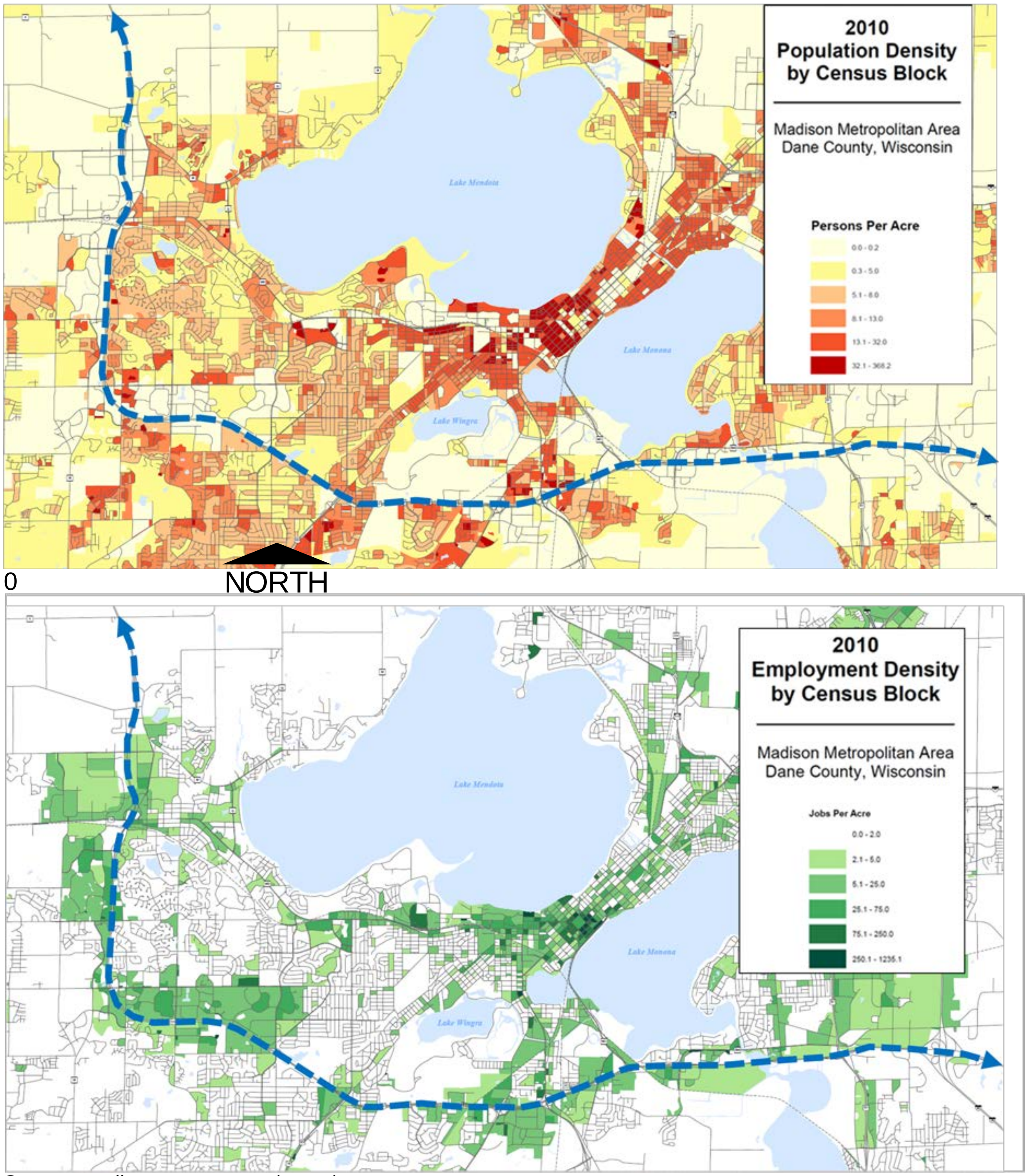


Figure 6.02-1 Beltline Traffic Volumes

Figure 6.02-1 displays 2012 traffic volumes, which was current as of the initial June 2016 writing of this report. More recent traffic volumes from 2018 are available and show a similar conclusion, where the Beltline carries the highest amount of traffic per day of any road in Dane County.

B. Metro Service

Transit routes that achieve high ridership typically provide convenient and direct connections between residential land uses and jobs or schools. Figure 6.02-2 shows the residential land uses and the employment and major education campuses in the Madison area. While there is significant employment density adjacent to the Beltline, the areas of higher population density tend to be farther away from the Beltline.



Source: madisonareampo.org/maps/

Figure 6.02-2 Land Use Patterns in the Madison Metropolitan Area

C. Travel Patterns

1. O-D Data Methodology

In order for transit on the Beltline to satisfy core Beltline PEL objectives, the routes would need to capture a portion of the east-west Beltline trips. This capture would need to be great enough to relieve the Beltline of current travel demand, improving operations. The study evaluated regional origins and destinations to understand the ability of Transit on the Beltline to capture east-west Beltline travel.

As mentioned in Section 1, WisDOT performed a county-wide O-D study to understand regional travel patterns. For the Beltline, WisDOT used Bluetooth detection and volume counts combined with time-lapse aerial photography. For the remainder of the county, WisDOT used Bluetooth detection and volume counts to understand regional travel patterns.

2. Beltline Travel Characteristics

One defining feature of the Madison area is the lakes, wetlands, and natural areas in Dane County. These valuable resources also create natural barriers to direct travel for many trips. Figure 6.02-3 illustrates the "wheel and spoke" analogy of Madison area travel. The Beltline, I-39/90/94, and County M serve as the "wheel rim" that travelers use to move from the "spoke" they begin their trip on to the "spoke" that can be used to reach their destination.

The O-D data confirms the wheel and spoke analogy. Figure 6.02-4 shows results from the Skycomp aerial photography data indicating that more than one-half of the trips along the Beltline travel four interchanges or less. This is confirmation that a large share of the vehicles on the Beltline are traveling between arterial streets, or between "spokes."

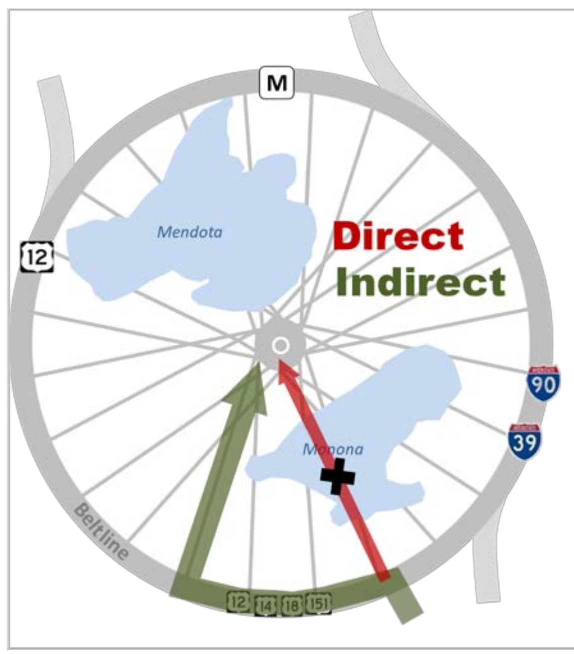


Figure 6.02-3 Madison Area Travel Characteristics

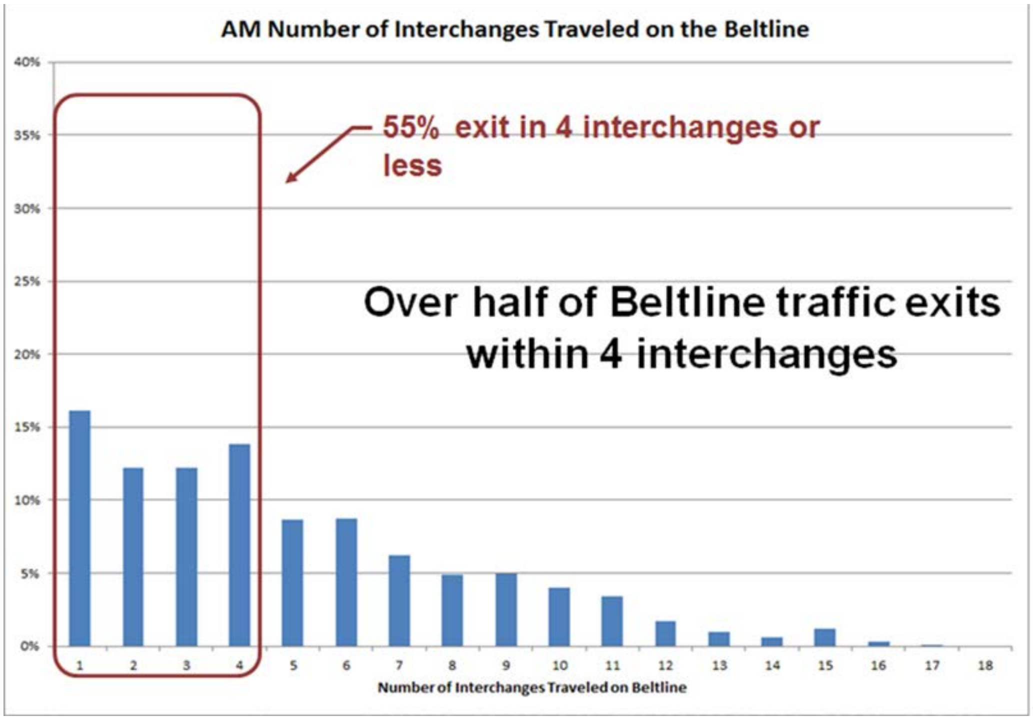


Figure 6.02-4 Beltline Traffic Patterns

6.03 STRATEGY DESCRIPTION

The Madison Beltline PEL Study modeled the traffic effects of routing buses on the Beltline for its full length using the Greater Madison MPO's TDM. The study team coded a new Metro bus route that uses the Beltline. This evaluation assumed the buses would travel in the general purpose lanes and experience the same operating conditions as other traffic. Section 10 includes discussion of High Occupancy Vehicle (HOV) lanes (bus only, or all HOV allowed) on the Beltline. Service assumptions included 15-minute peak-period frequency and 30-minute off-peak frequency. Three options were investigated.

Option 1 would start at the Middleton transfer point and run to the World Dairy Center on the east side, stopping at every transfer point and making at least one in-line stop (e.g., on Beltline) between transfer points. The in-line stop would be at employment centers along the Beltline (City Center West, Todd Drive, Wisconsin Physicians Service Health Solutions (WPS) and bus patrons would be able to get to both sides of the Beltline with some type of bridge system.

Option 2 would be similar to the On-Beltline system except that it would use local streets for a portion of the routes in order to collect more riders. This On- and Off-Beltline route would use John Q. Hammons Drive, Junction Road, Mineral Point Road, and Whitney Way on the west side and would use Broadway on the east side.

Option 3 is similar to Option 2 except that it also includes service to strategically placed Park and Ride lots in an effort to further increase ridership.

Figure 6.03-1 schematically represents the three strategy corridors. The circles represent stops where patrons can board and disembark.

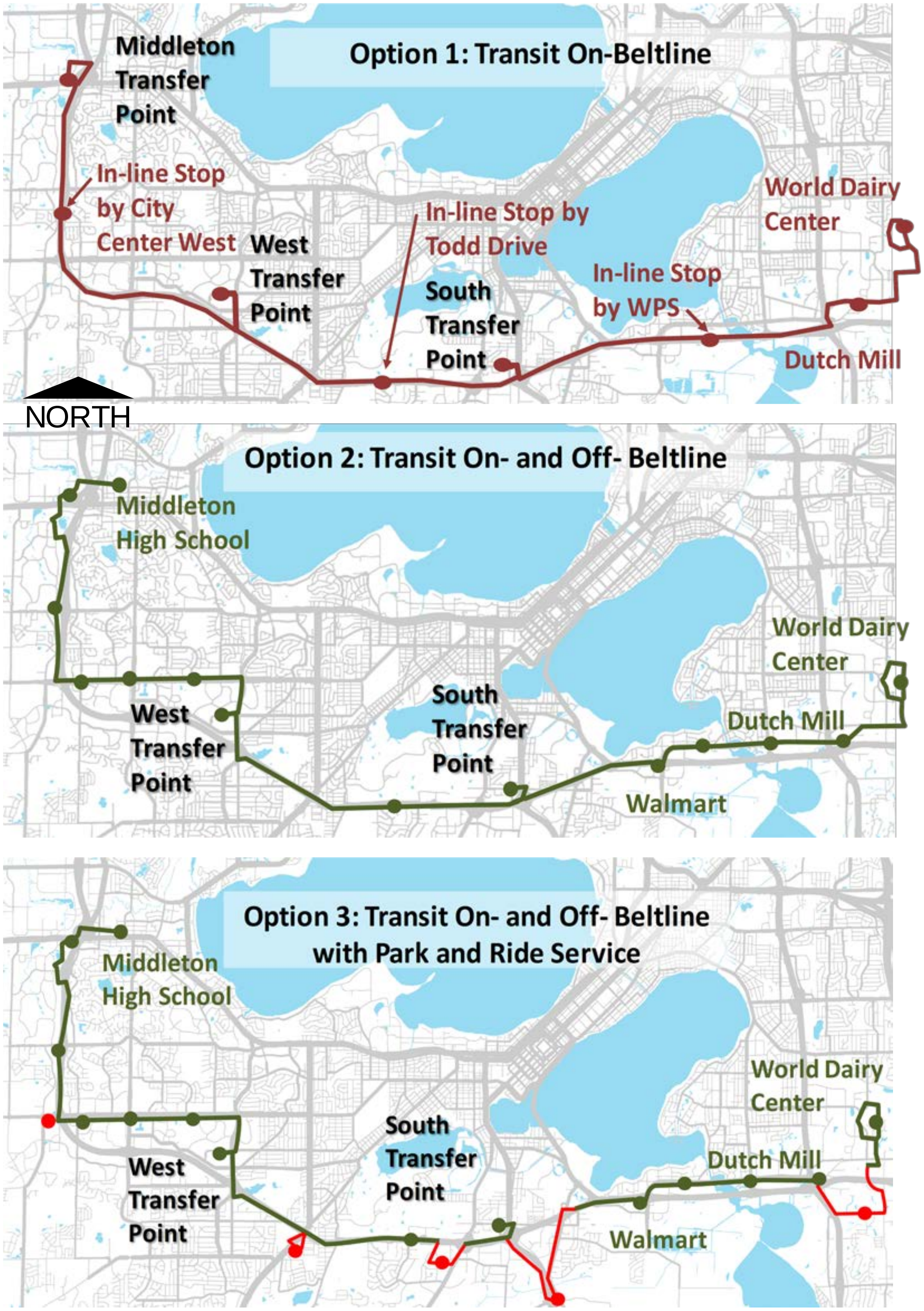


Figure 6.03-1 Transit Service on the Beltline Strategy Corridors

6.04 TRAFFIC IMPACTS

As mentioned in Section 1, the Madison Beltline PEL Study uses the Greater Madison MPO's TDM to understand area traffic patterns and volumes. The three strategy alignments were modeled in the 2010 and 2050 TDM models. Table 6.04-1 shows the results for the three options.

Option		Daily Boards	Daily New Transit Riders	Reduction in Beltline Traffic Volumes
1: On-Beltline	2010	1,200	640	-170
	2050	1,150	670	-200
2: On- and Off-Beltline	2010	1,700	560	-120
	2050	1,600	500	-120
3: On- and Off-Beltline with Park and Ride Service	2010	2,100	820	-360
	2050	2,500	1,100	-190

Table 6.04-1 Transit Service on the Beltline TOD Model Results 2010

The Beltline volume reduction, shown in Table 6.04-1, represents the location along the Beltline between Rimrock Road and John Nolen Drive. In many locations modeling indicates that the relief to the Beltline would be less or nonexistent. None of the three options considered have a substantial impact on Beltline traffic volumes. Adding service to park and ride facilities did not result in a substantial increase in ridership.

6.05 OTHER IMPACTS

A. <u>Traffic Operations</u>

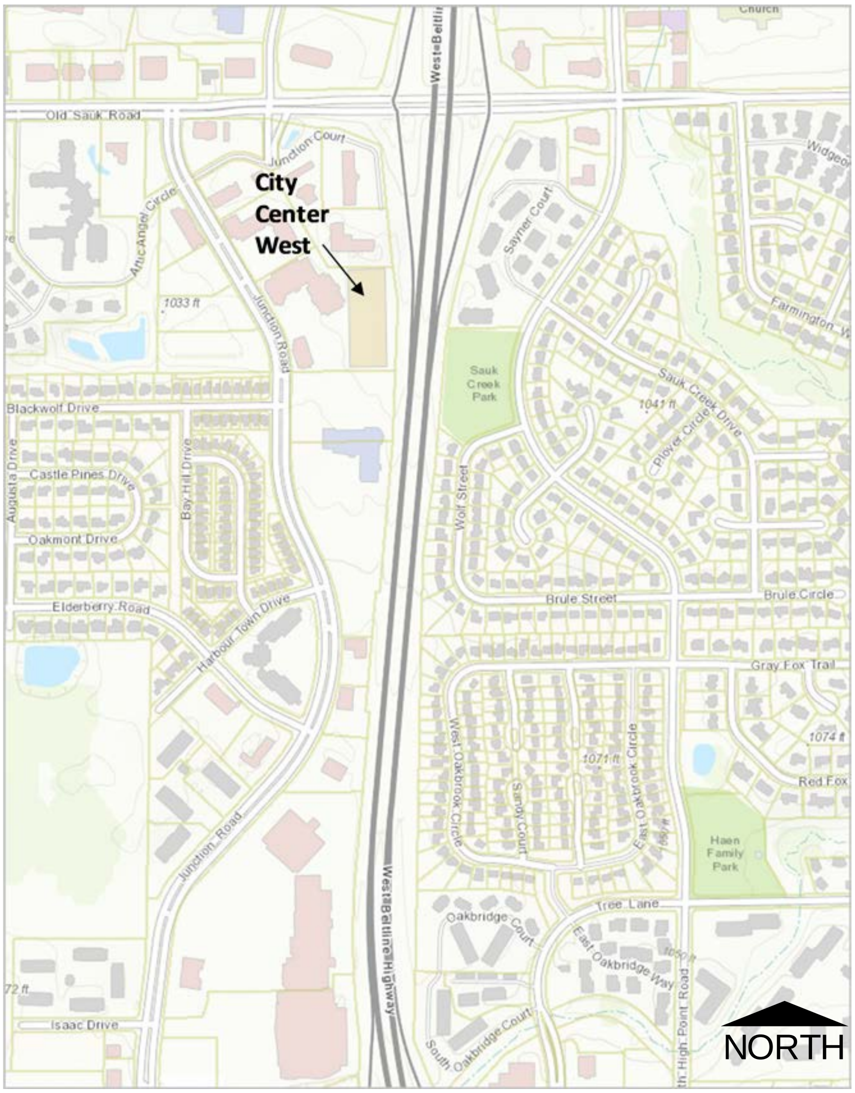
Adding a bus route along the Beltline would have minor impacts on traffic operations. Additional buses traveling on local streets and through controlled intersections may result in a minor increase in congestion and queuing at intersections that are near capacity, particularly for left turns at signals. The merging and weaving of bus traffic on the Beltline mainline associated with entering and exiting at interchanges and in-line stations could result in additional brake tapping and slowdowns in locations that are near capacity and operate in unstable flow conditions during peak periods.

B. <u>Impacts at In-Line Stations</u>

Constructing in-line stations near employment centers would have impacts. The following is a brief summary of the types of impacts that could occur at each potential in-line station location.

1. City Center West

Figure 6.05-1 shows the Beltline area between Old Sauk Road and Mineral Point Road where an in-line station could be constructed to serve the employment center surrounding and including the City Center West commercial building. The Beltline in this area includes a 60-foot median measured from edge of lane to edge of lane. A center station may fit within the existing median provided the area is not used for any future capacity expansion of the mainline. A pair of outside stations could require an increased infrastructure footprint of 40 to 80 feet.



Source: dcimapapps.countyofdane.com/dcmapviewer/

Figure 6.05-1 Resources Near City Center West In-Line Transit Stop

2. Todd Drive

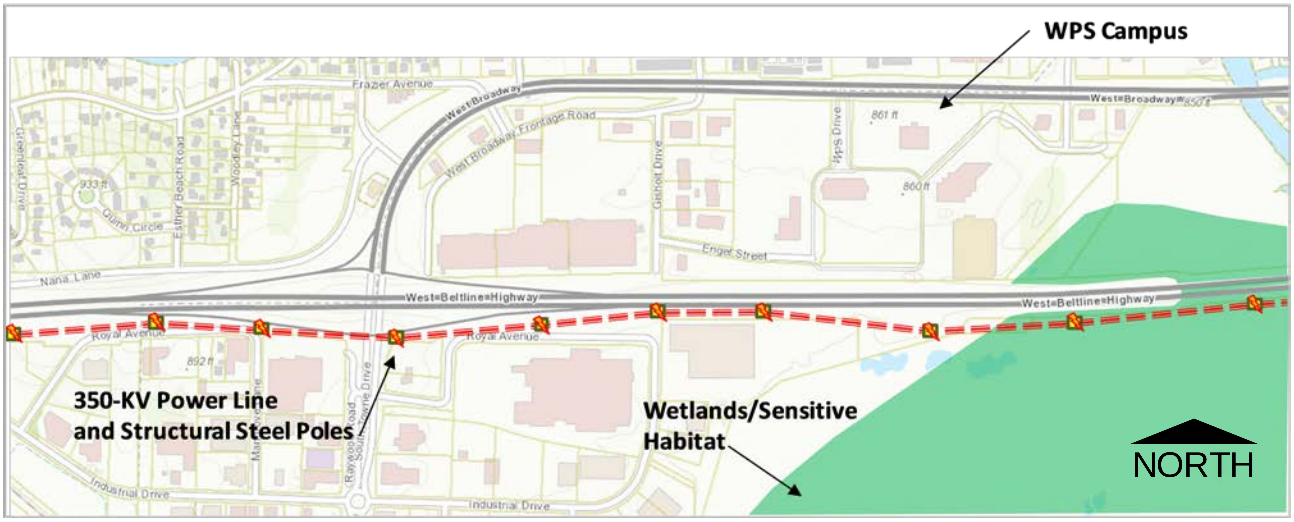
Figure 6.05-2 shows the Beltline area near Todd Drive where an in-line station could be constructed to serve the employment center between Todd Drive and Fish Hatchery Road including the Arbor Gate Business Center. The Beltline in this area includes a 25-foot median measured from edge of lane to edge of lane. Assuming the median area is not used for any future capacity expansion of the mainline, a center station could still require increasing the median width by 30 to 50 feet, which would also require shifting Beltline lanes to accommodate the median widening. A pair of outside stations could require an increased Beltline R/W footprint of 40 to 80 feet. Because of the closely spaced frontage roads by the Todd Drive location, impacts to adjacent properties, the Cannonball Path overpass, and American Transmission Company (ATC) utility lines are likely.

Source: dcimapapps.countyofdane.com/dcmapviewer/

Figure 6.05-2 Resources Near Todd Drive In-Line Transit Stop

3. WPS

Figure 6.05-3 shows the Beltline area near the WPS campus between Broadway and Monona Drive where an in-line station could be constructed to serve WPS and other larger employers nearby including Super Walmart and the businesses at South Towne Mall. The Beltline in this area includes a 27-foot median measured from edge of lane to edge of lane. Assuming the median area is not used for any future capacity expansion of the mainline, a center station could require increasing the median width from 30 to 50 feet. Realigning the Beltline lanes would accompany the increased median width. A pair of outside stations could require increasing the Beltline R/W by 40 to 80 feet. Nearby resources that could be impacted by an in-line station near WPS include commercial property, including the WPS parking structure and the ATC 345-kilovolt (kV) power lines and structural steel power poles.



Source: dcimapapps.countyofdane.com/dcmapviewer/

Figure 6.05-3 Resources Near WPS In-Line Transit Stop

6.06 SCREENING AND RESULTS

Table 6.06-1 uses the Stand-Alone Strategy screening questions described in Section 1 and evaluates the Transit Service on the Beltline scenarios.

Root Objective	Stand-Alone Strategy Screening Question	Transit Service on the Beltline Evaluation
1. Improve safety for all modes		
▪ Motor vehicle	Does the Stand-Alone Strategy address safety deficiencies on the Beltline or have the potential to reduce congestion-related motor vehicle crashes on the Beltline?	The Transit Service on the Beltline scenarios do not specifically address Beltline safety deficiencies. They also do not reduce traffic volumes enough to reduce congestion-related crashes on the Beltline.
2. Address Beltline infrastructure condition and deficiencies	Does the Stand-Alone Strategy preclude addressing Beltline infrastructure deficiencies?	The Transit Service on the Beltline scenarios do not address Beltline infrastructure deficiencies, but they do not preclude these deficiencies from being addressed in a separate project. To satisfy this objective, another separate project would have to be planned for the Beltline.
3. Improve system mobility (congestion) for all modes		
▪ Transit	Does the Stand-Alone Strategy preclude improvements to transit facilities and routing?	The Transit Service on the Beltline scenarios do not preclude but rather improve transit facilities and routing.
▪ Motor vehicles (including passenger and freight)	Does the Stand-Alone Strategy decrease Beltline traffic, or increase Beltline capacity, enough to address conditions that lead to unstable traffic flow on the Beltline?	The Transit Service on the Beltline scenarios make no appreciable difference in Beltline traffic volumes. Therefore, they do not satisfy this key objective.

Table 6.06-1 Transit Service on the Beltline Stand-Alone Strategy Screening Questions

6.07 CONCLUSION

The Transit Service on the Beltline scenarios improve transit facilities and routing, which is one of the root objectives being considered in the screening of Stand-Alone Strategies. However, the ridership served (between approximately 1,100 daily boards in 2010 up to 2,500 daily boards in 2050) and relief to Beltline traffic volumes (less than 400 vpd for each of the strategies considered) are both small.

The Transit Service on the Beltline scenarios do not adequately satisfy all of the root Beltline PEL objectives for Stand-Alone Strategies of the Madison Beltline PEL Study. Improvements to transit facilities and routing, possibly including Transit Service on the Beltline scenarios, could be considered as a component of a strategy package that would combine multiple improvement types to be moved forward for additional study. Additionally, Beltline capacity expansion options may provide measures that facilitate Beltline transit, such as bus on shoulder or high occupancy vehicle lanes.

SECTION 7
SCENARIO PLANNING FOR ALTERNATIVE LAND USES

7.01 SCENARIO PLANNING

A. Background

Scenario planning is the practice of considering alternative future conditions for factors that impact travel and mode choice in an area. FHWA Scenario Planning Handbook (2011) states,

> *"The hallmark of scenario planning is identifying land-use patterns as variables (rather than static inputs) that could affect transportation networks, investments, and operations. Other variables might include demographic, economic, political, and environmental trends."*

It goes on to say,

> *"Scenarios are narratives or sets of assumptions that explore plausible trajectories of change. They provide a means of visioning possible future changes and different policy and investment options."*

The Madison Beltline PEL Study used scenario planning to understand how different land use patterns, particularly more compact and centrally located land use patterns, would affect area transportation networks and the Beltline corridor.

In 2017, the city of Madison approved a new transportation plan, Madison in Motion. According to the plan, Madison in Motion, it is a framework for future transportation decisions in Madison to ensure improved walkability, bike-ability, and transit availability. In the plan, two future land use scenarios are considered. The Trend Scenario (A) is based on adopted plans and historic development trends and is represented by Dane County's current TDM maintained by the Greater Madison MPO and WisDOT. In Dane County, typically approximately 70 percent of the new development in the metropolitan area has been peripheral, occurring in open lands (generally agricultural) adjacent to urban centers. The remaining 30 percent of growth has been infill or redevelopment. The adopted land use plans generally forecast that this trend will continue.

The Infill Scenario (B) would reverse this planned development trend by focusing 70 percent of new development through 2050 in the urbanized areas as infill or redevelopment. The remaining 30 percent of new development would occur on the periphery. Figure 7.01-1 is a summary map of the current and future planned land uses in the area surrounding the study corridor collated by the Greater Madison MPO. The Infill Scenario (B) is discussed in more detail in Section 7.02.

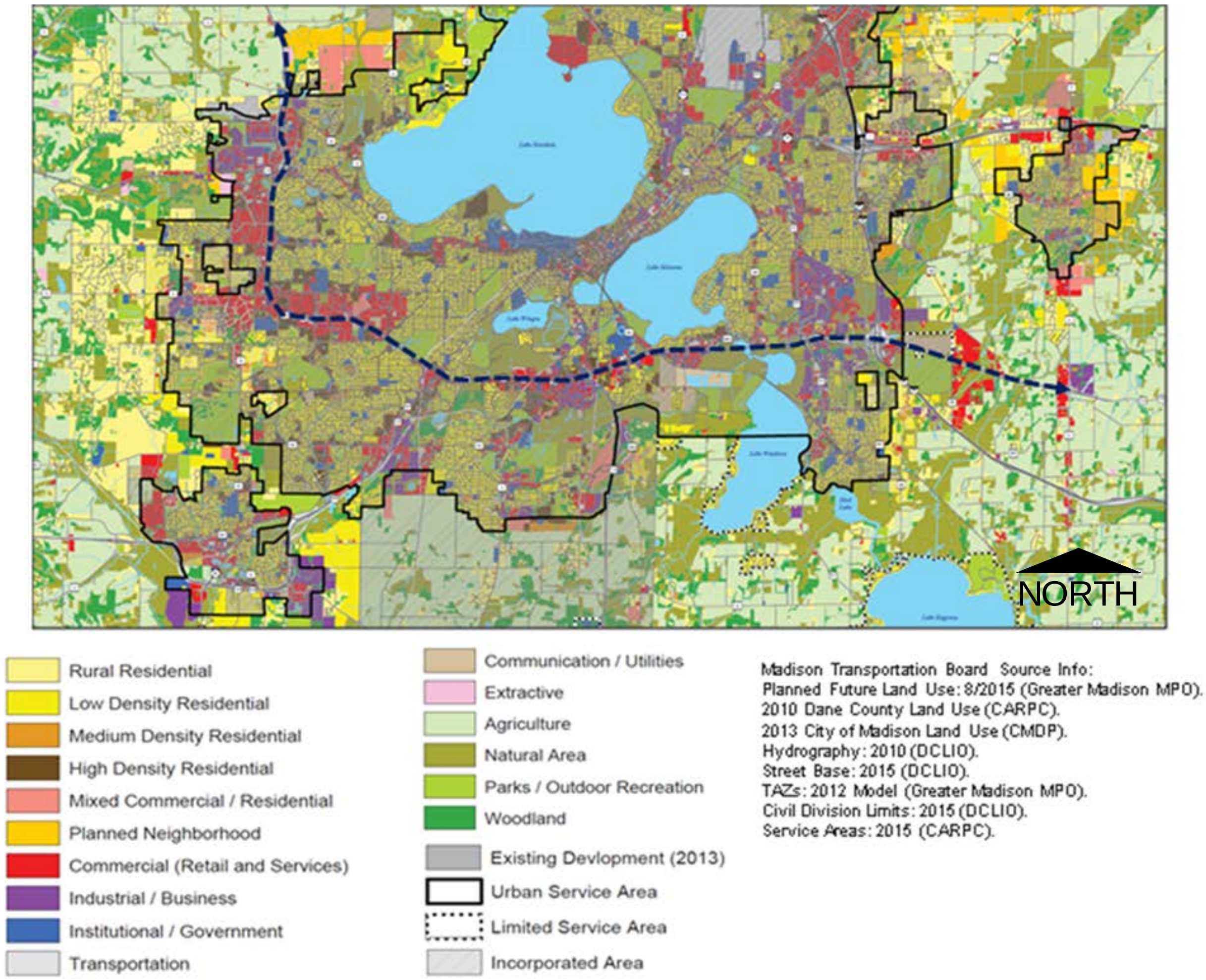
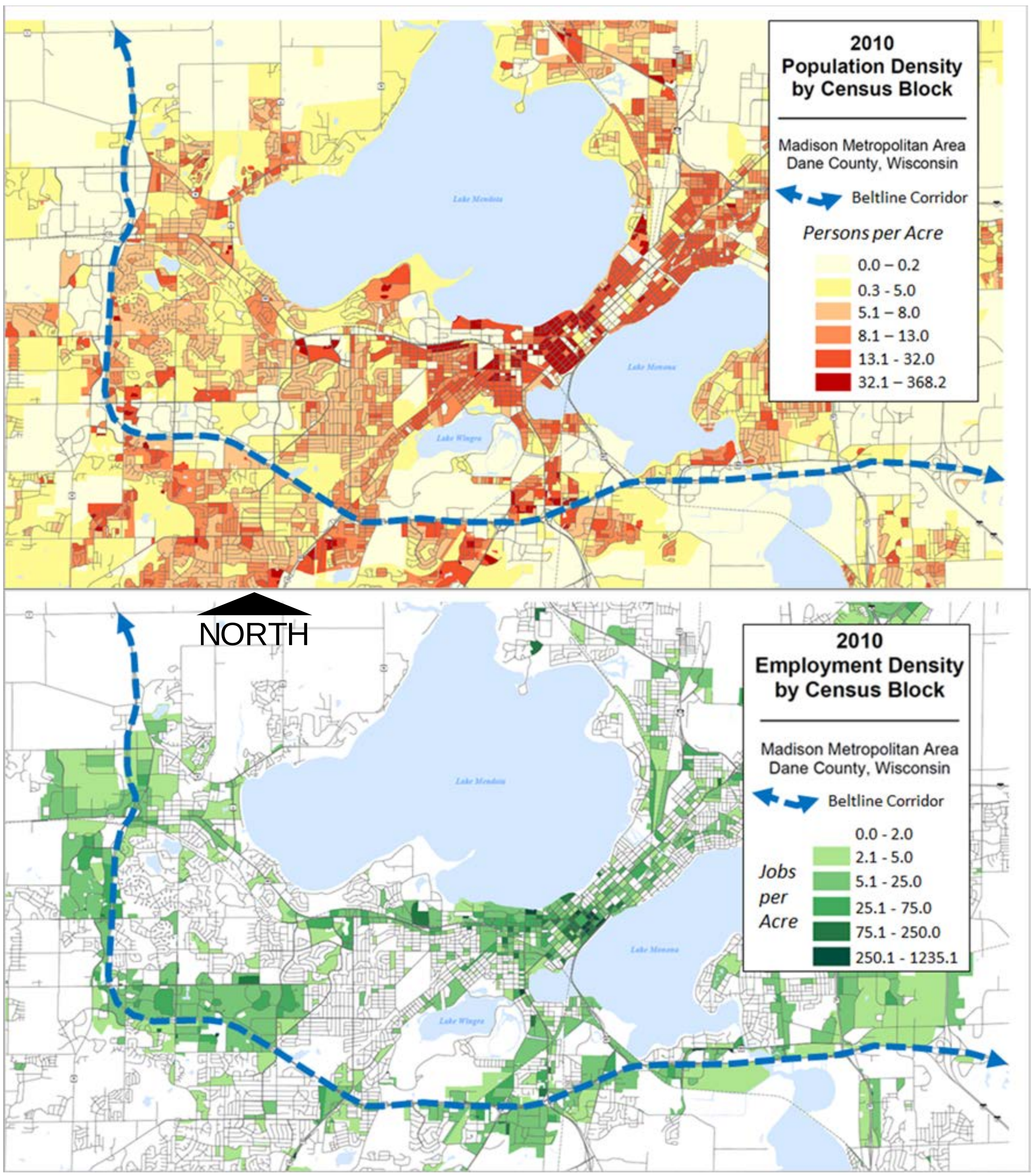


Figure 7.01-1 Existing and Future Land Use in the Study Area (Greater Madison MPO)

B. Existing Land Use Patterns

Households and employment are two variables used in the TDM to develop traffic assignments (see Section 1). Figure 7.01-2 shows the 2010 census block population density and the employment density per acre in the Madison area from the most recent census in 2010. There are higher employment densities both in the Isthmus area and in areas adjacent to the Beltline.



Source: madisonareampo.org/maps/ 2014

Figure 7.01-2 Land Use Patterns in the Madison Metropolitan Area

7.02 INFILL SCENARIO (B) DESCRIPTION

Madison in Motion's Infill Scenario (B) assumes infill growth and redevelopment would occur within "activity centers" that are within the city of Madison (but not the surrounding communities or greater Dane County). The activity centers identified in the Infill Scenario (B) are located in existing developed areas that could support higher levels of employment and housing. The activity centers sometimes include areas where the building stock is aging and nearing the end of its functional life. Figure 7.02-1 illustrates the proposed activity centers identified in the Infill Scenario (B).

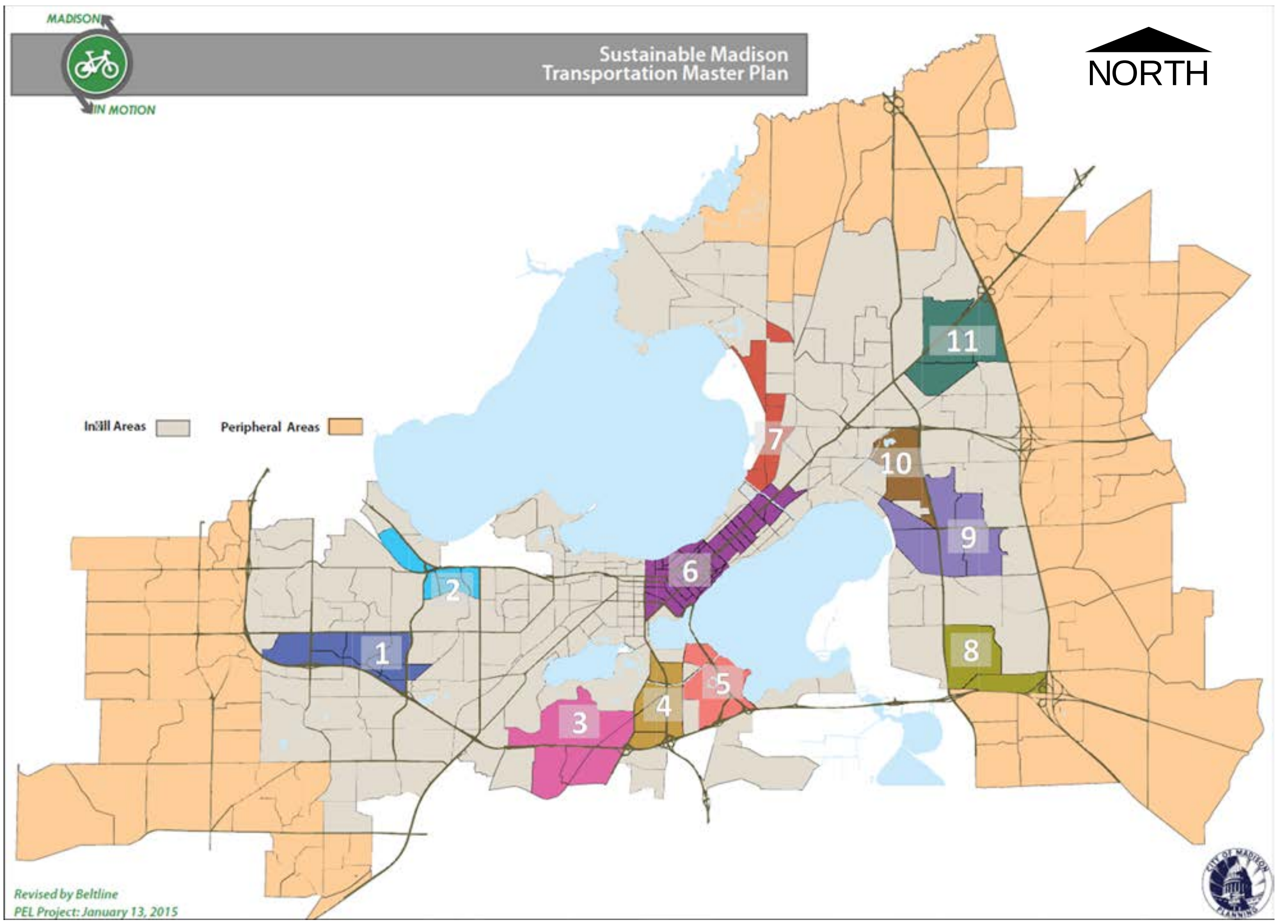


Figure 7.02-1 Activity Centers with Higher Growth in Madison in Motion Infill Scenario (B)

Activity centers include:

1. West Towne to Westgate
2. University Avenue and Hilldale Mall
3. Beltline and Todd Drive
4. Park Street
5. John Nolen Drive

6. Downtown to East Washington Avenue
7. Sherman Avenue
8. Dutch Mill
9. Cottage Grove Road
10. Milwaukee Street
11. East Towne Mall

Note that while the downtown (6) and Sherman Avenue (7) are centrally located, many of these activity center redevelopment areas border circumferential roadways such as the Beltline and Stoughton Road. The Infill Scenario would create a more dense, compact urban form within Madison that could be more pedestrian and bicycle friendly, support higher frequency transit, and reduce automobile dependency. For these reasons, the Madison Beltline PEL Study team evaluated the impact the Infill Scenario could have on Beltline traffic.

Madison in Motion performed scenario planning analysis using historic population growth trends that averaged 1.3 percent annually. The official population projections prepared by the WDOA project less population increase, and consequently fewer households in 2040 than the Madison in Motion plan. Population is related to households, which is a direct input into the TDM. To provide a consistent base population across all strategies being evaluated in the TDM, the Madison Beltline PEL Study proportionally adjusted Madison in Motion's population and household totals to match WDOA's population totals for 2040 (extrapolated to 2050) that were released in 2014. This was generally performed by using the same growth patterns assumed by Madison in Motion and using ratios to adjust each TAZ in the demand model. A detailed description is provided in the end notes in Section 7.06. These adjustments were then entered into the Greater Madison MPO's TDM. Figure 7.02-2 schematically illustrates the adjustments made to reduce Madison in Motion's population totals to match the WDOA population control totals.

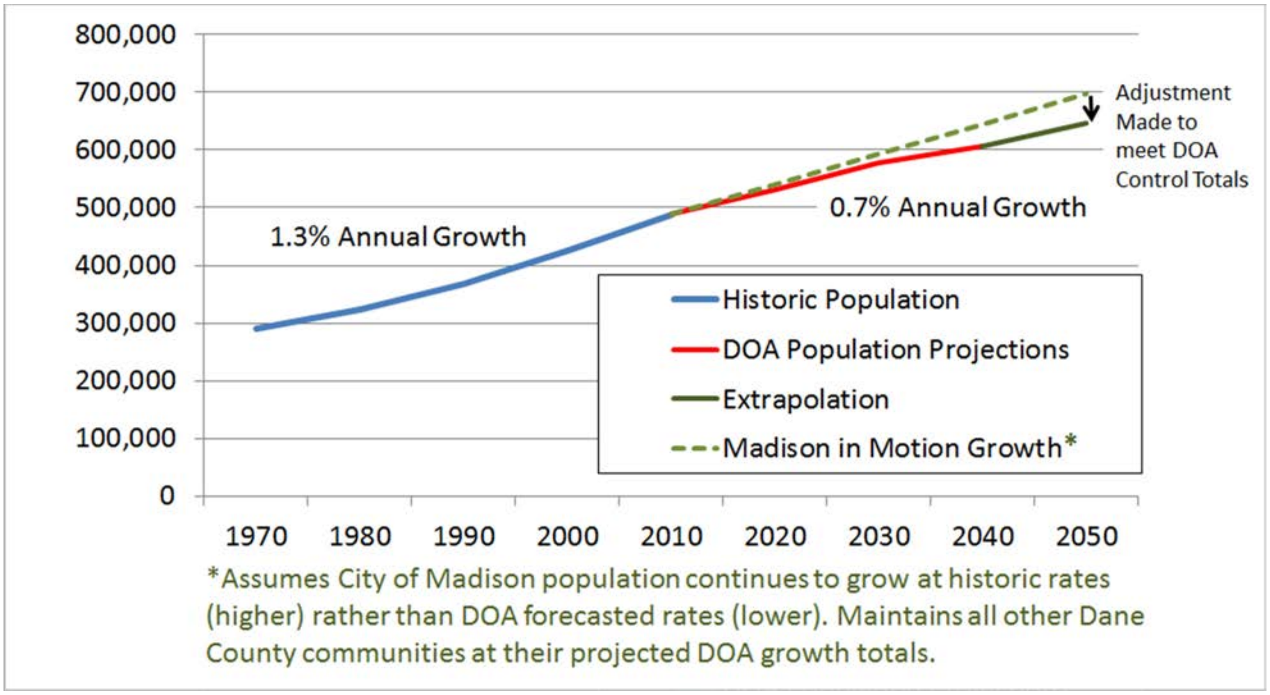


Figure 7.02-2 Adjustments Made to Madison in Motion Population Forecast to Match WDOA Control Totals

Figure 7.02-3 illustrates the adjustment in households from Madison in Motion to match the official DOA forecasts. These adjustments were applied to both the Trend Scenario (A) and the Infill Scenario (B). In the figure, the Greater Madison MPO's A and B represent the Trend Scenario (A) and Infill Scenario (B), respectively, used in the analysis.

Madison in Motion extrapolated employment growth to 2050 based on current trends. These employment totals were greater than the official employment projections developed jointly by CARPC and the Greater Madison MPO. The Madison Beltline PEL Study adjusted Madison in Motion employment totals to match the employment projections provided by CARPC and the Greater Madison MPO for both the Trend Scenario (A) and Infill Scenario (B). Figure 7.02-4 illustrates this adjustment per activity center.

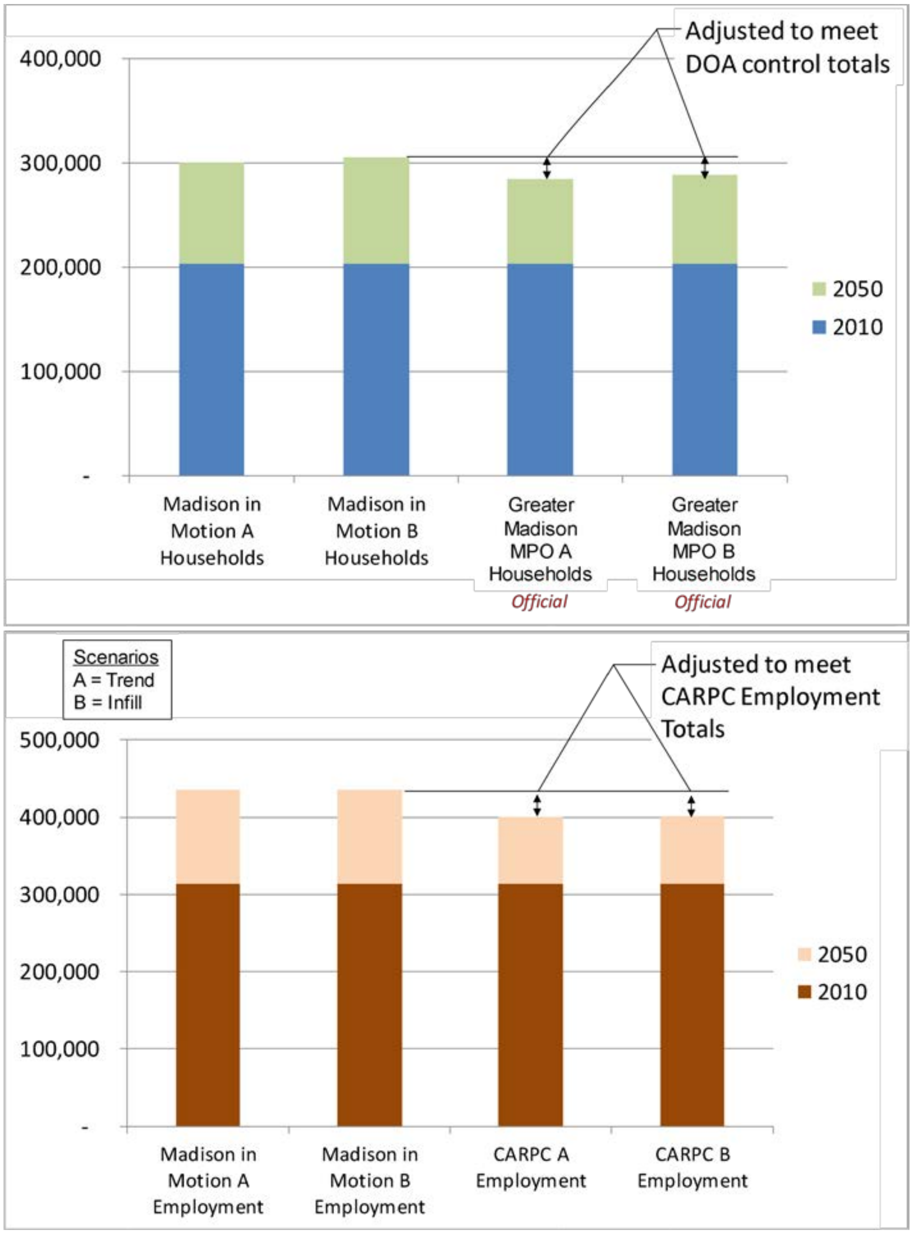


Figure 7.02-3 Household and Employment Projections for Dane County

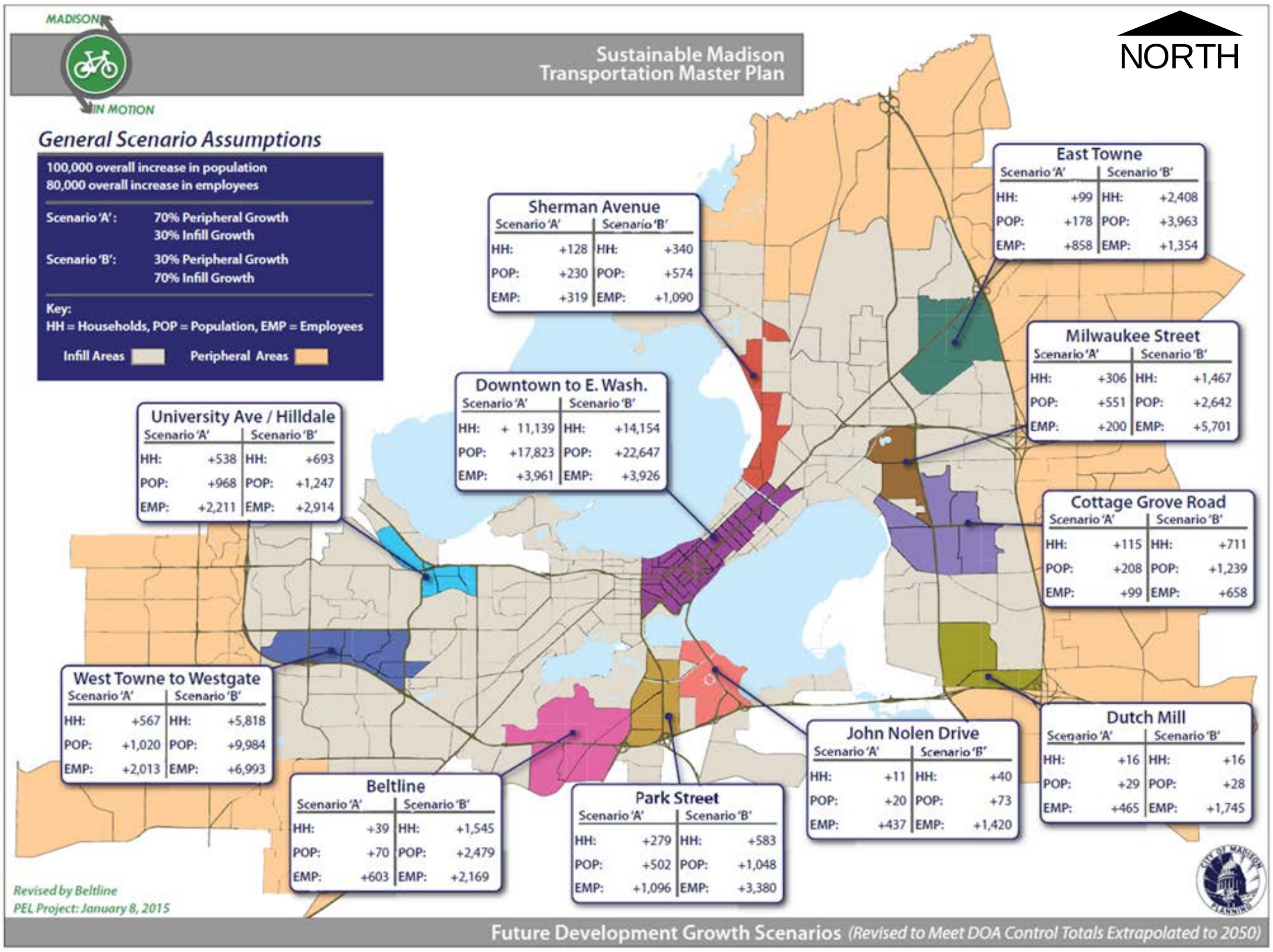


Figure 7.02-4 Differences in Households, Population, and Employment Forecasts Between Trend Scenario (A) and Infill Scenario (B) in 2050

Figure 7.02-5 shows where the activity centers are located and illustrates the difference in households between the Trend Scenario (A) and the Infill Scenario (B). It shows the differing development trends associated with each scenario when fewer households are added in peripheral areas (orange tones) and more are added to the Isthmus and the activity centers (green tones). Figure 7.02-6 illustrates the difference in employment between the two scenarios [Infill Scenario (B) minus Trend Scenario (A)]. It shows the differing development trends when less employment is added to the peripheral areas (orange tones) and more employment is added to the Isthmus and the activity centers (green tones). Areas with negative net change values in the figures indicate more households or jobs are added as part of the Trend Scenario (A) than the Infill Scenario (B), while areas with positive net change values indicate more households or jobs are added as part of the Infill Scenario (B) than the Trend Scenario (A). Note that greater densities of employment and households are placed adjacent to the Beltline in the Infill Scenario (B).

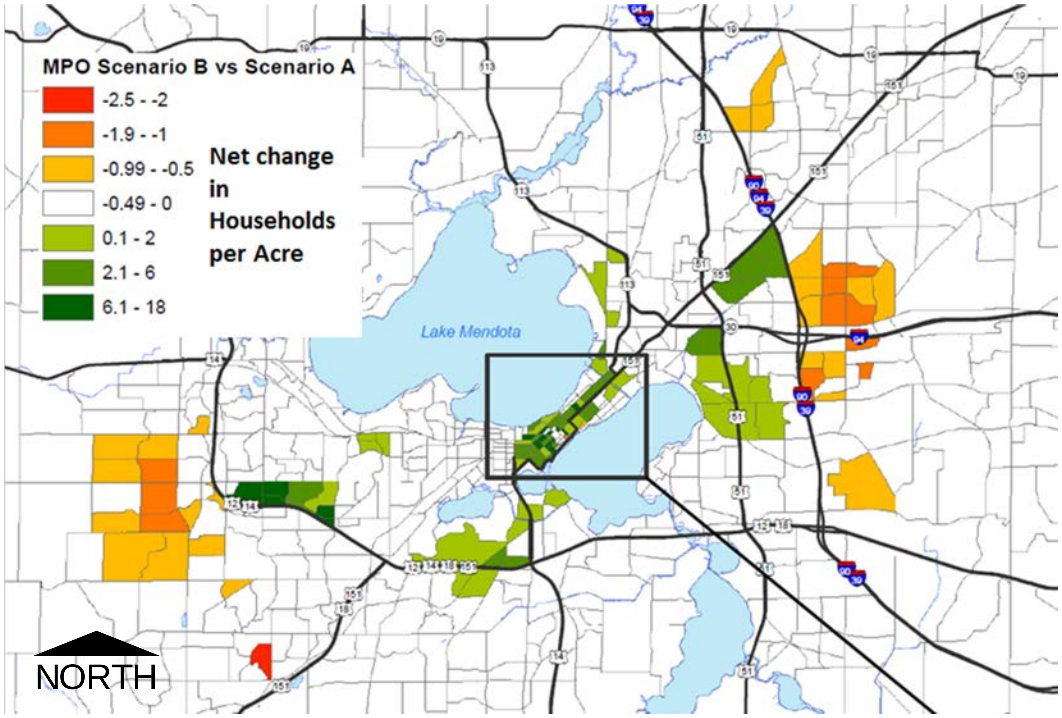


Figure 7.02-5 Net Change in 2050 Household in Infill Scenario (B) Minus Trend Scenario (A)

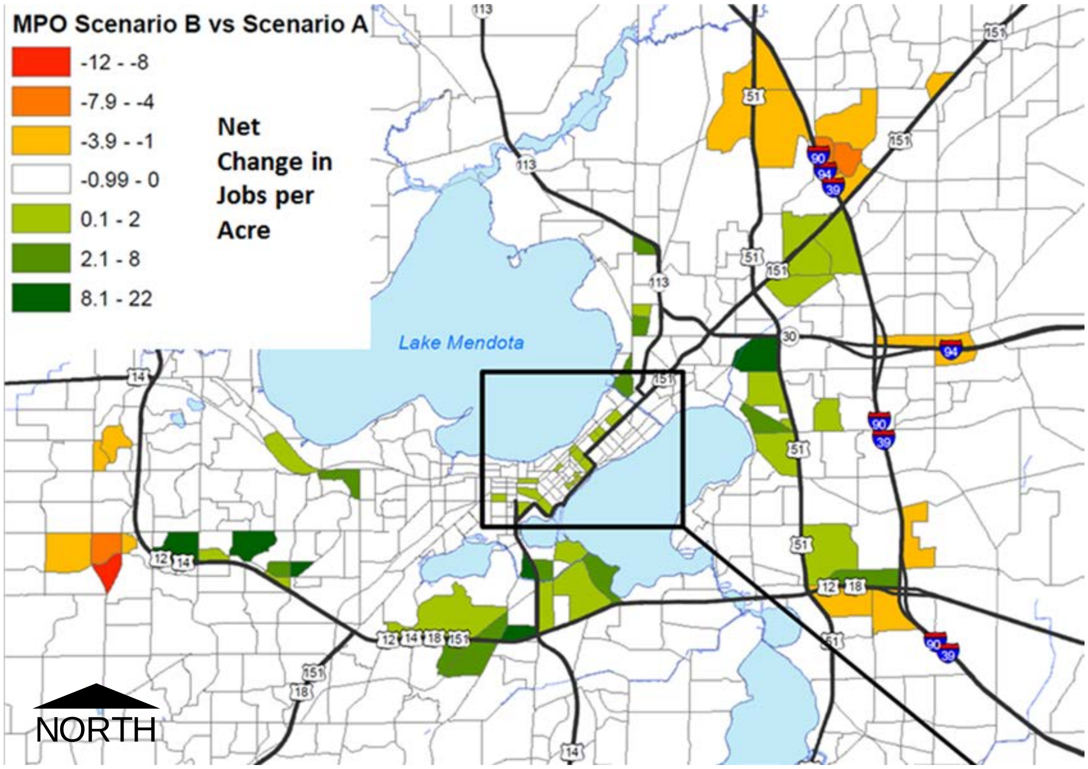


Figure 7.02-6 Net Change in 2050 Employment in Infill Scenario (B) Minus Trend Scenario (A)

Table 7.02-1 shows the different growth in households, population, and employment for the Trend Scenario (A) and the Infill Scenario (B).

Activity Center	Trend Scenario (A)			Infill Scenario (B)		
	Households	Population	Jobs	Households	Population	Jobs
1: West Towne Mall	+567	+1,020	+2,013	+5,818	+9,984	+6,993
2: University Avenue and Hilldale Mall	+538	+968	+2,211	+693	+1,247	+2,914
3: Beltline	+39	+70	+603	+1,545	+2,479	+2,169
4: Park Street	+279	+502	+1,096	+583	+1,048	+3,380
5: John Nolen Drive	+11	+20	+437	+40	+73	+1,420
6: Downtown to East Washington Avenue	+11,139	+17,823	+3,961	+14,154	+22,647	+3,926
7: Sherman Avenue	+128	+230	+319	+340	+574	+1,090
8: Dutch Mill	+16	+29	+465	+16	+29	+1,745
9: Cottage Grove Road	+115	+208	+99	+711	+1,239	+658
10: Milwaukee Street	+306	+551	+200	+1,467	+2,642	+5,701
11: East Towne Mall	+99	+178	+858	+2,408	+3,963	+1,354
Totals	**+13,237**	**+21,599**	**+12,262**	**+27,775**	**+45,925**	**+31,350**

Table 7.02-1 Trend Scenario (A) and Infill Scenario (B) Growth Forecasts within Activity Centers from 2010 to 2050

7.03 TRAFFIC IMPACTS

As noted, the Madison Beltline PEL Study used the Dane County TDM model to understand the transportation impacts of the Infill Scenario (B) compared to the Trend Scenario (A). Both scenarios were modeled in the 2050 TDM. The Madison Beltline PEL Study team reviewed the impacts to three specific types of travel.

As discussed in Section 5 of this report, Madison is considering a BRT system. The BRT system would be intended to provide fast, frequent, reliable and comfortable service through key design components. These key design components include 15-minute (or less) service intervals, transit priority measures, improved stations and vehicles, fewer stops, and system branding.

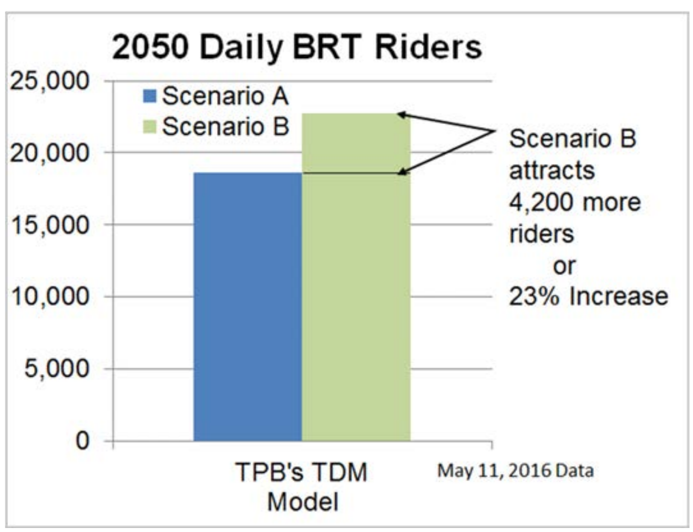


Figure 7.03-1 Difference in BRT Ridership, Trend Scenario (A) versus Infill Scenario (B)

In identifying the activity centers, the Madison in Motion plan sought to complement the potential BRT system. This is reflected in the demand modeling. With the Infill Scenario (B), BRT ridership would increase by approximately 4,200 riders daily in 2050 versus the Trend Scenario (A), a 23 percent increase (see Figure 7.03-1).

Section 6 of this report evaluated the feasibility of expanding Metro bus service along the Beltline corridor. The service would include stops at transfer points and selected in-line locations near major employers. As shown in Figure 7.03-2, the more compact Infill Scenario land uses make a small difference in Beltline bus ridership.

In addition to the two bus transit service scenarios, the general impact on traffic volumes was reviewed along the Beltline. The Infill Scenario (B) land use patterns increase traffic on the Beltline, and to a lesser degree increase traffic on the arterial streets that cross the Isthmus. Figure 7.03-3 illustrates the effect on Beltline and Isthmus traffic volumes.

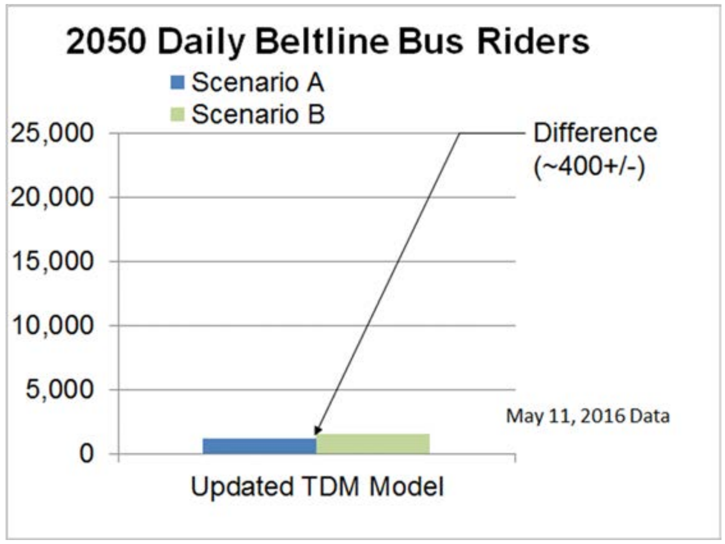


Figure 7.03-2 Difference in Beltline Bus Ridership, Trend Scenario (A) versus Infill Scenario (B)

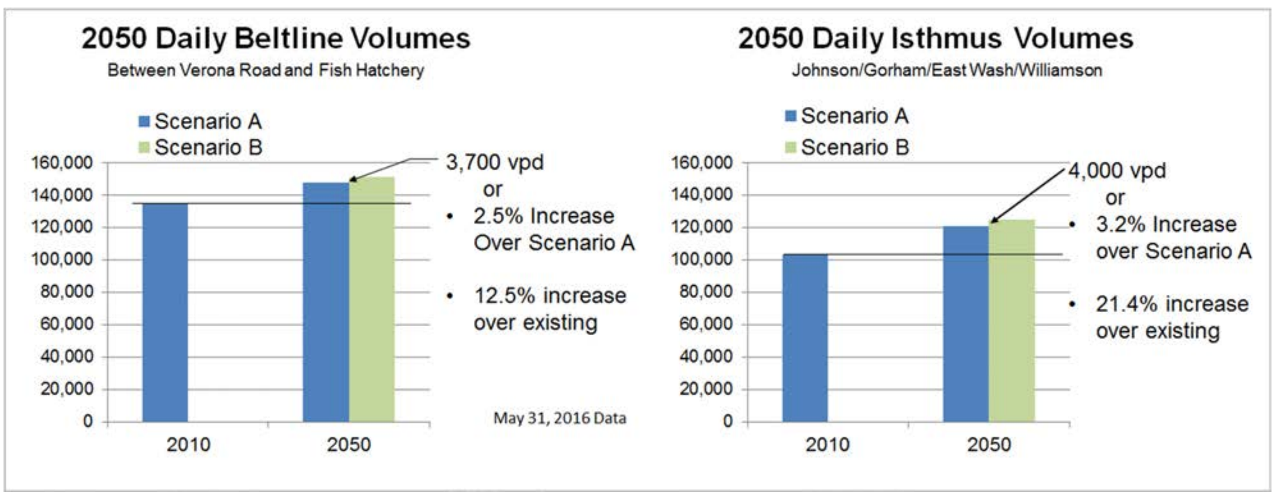


Figure 7.03-3 Difference in Beltline and Isthmus Volumes, Trend Scenario (A) versus Infill Scenario (B)

The increase on the Beltline is likely due (in part) to the fact that many of the activity centers identified in Madison in Motion's Infill Scenario (B) propose infill growth in areas that are located directly on the Beltline or are directly served by one of the "spokes" (arterial streets leading into and out of downtown Madison) in the Madison transportation system. As noted in Section 6 of this report, many people use the Beltline to travel from the spoke that they begin their trip on to the spoke that they use to travel to their destination.

Table 7.03-1 summarizes the differences between the Trend Scenario (A) and the Infill Scenario (B) land uses on bus transit ridership and other motor vehicle traffic volumes. Beltline traffic volumes are taken from the segment between Verona Road and Fish Hatchery Road, because this area had a substantial amount of planned infill development.

Scenario	BRT	Beltline Buses	Beltline Traffic*	Isthmus Traffic
	Daily Riders	Daily Riders	vpd	vpd
Trend Scenario (A): Existing Trends	18,600	1,600	147,500	121,000
Infill Scenario (B): Infill Growth	22,800	1,600	151,200	125,000
Impacts	**+4,200 (+22%)**	**No real change**	**+3,900 (+3%)**	**+1,100 (+1%)**

*Verona Road to Fish Hatchery May 11, 2016 data

Table 7.03-1 Trend Scenario (A) and Infill Scenario (B) Transportation Characteristics from 2050 TOD Model

7.04 OTHER IMPACTS

A. Mode Split

The increased densities within the activity centers as well as the mixed land use characteristics that would likely be included within them will lend themselves to creating a lower share of personal automobile trips and a higher share of walking, bicycling, and transit use. The TOD Model reflected a higher level of transit ridership in the results. Section 8 of this report summarizes a separate scenario planning effort that assumes the amount of transit and bicycle trips would triple by 2050. The assumption is based on engineering judgement to determine the effects that a substantial increase in transit and bicycle trips may have on traffic volumes on the Beltline and through the Isthmus.

B. Surrounding Infrastructure

While the intensity of the infill land uses would vary from activity center to activity center under the Infill Scenario (B), it is possible that some of the surrounding infrastructure may need to be improved to handle this increased population and employment. Municipal utilities including sanitary sewer, water service, and stormwater management will require capacity and service analyses. From a transportation standpoint, pedestrian, bicycle, and/or transit connections and service to the activity centers would need improvement to varying degrees for each activity center.

7.05 SCREENING AND RESULTS

Table 7.05-1 uses the Stand-Alone Strategy screening questions described in Section 1 and evaluates Scenario Planning for Alternative Land Uses.

Root Objective	Stand-Alone Strategy Screening Question	Infill Scenario (B) Land Use Evaluation
1. Improve safety for all modes		
▪ Motor vehicle	Does the Stand-Alone Strategy address safety deficiencies on the Beltline or have the potential to reduce congestion-related motor vehicle crashes on the Beltline?	Infill Scenario (B) land uses would not specifically address Beltline safety deficiencies. They also would not reduce traffic volumes enough to reduce congestion-related crashes on the Beltline.
2. Address Beltline infrastructure condition and deficiencies	Does the Stand-Alone Strategy preclude addressing Beltline infrastructure deficiencies?	Infill Scenario (B) land uses would not address Beltline infrastructure deficiencies, but they would not preclude these deficiencies from being addressed in a separate project. To satisfy this objective, another separate project would have to be planned for the Beltline.
3. Improve system mobility (congestion) for all modes		
▪ Transit	Does the Stand-Alone Strategy preclude improvements to transit facilities and routing?	Infill Scenario (B) land uses would improve BRT ridership. They would not impact on service along the Beltline.
▪ Motor vehicles (including passenger and freight)	Does the Stand-Alone Strategy decrease Beltline traffic, or increase Beltline capacity, enough to address conditions that lead to unstable traffic flow on the Beltline?	Infill Scenario (B) land uses would increase Beltline traffic. Therefore, they would not satisfy this key objective.

Table 7.05-1 Scenario Planning for Alternative Land Uses Stand-Alone Strategy Screening Questions

7.06 CONCLUSION

The Infill Scenario (B) Planning for Alternative Land Uses would increase BRT ridership compared to the Trend Scenario (A). This is compatible with one of the root objectives being considered in the screening of Stand-Alone Strategies. However, the remaining root Beltline PEL objectives would not be met. More compact land use development patterns would not eliminate the need for Beltline improvements. If implemented as being discussed in Madison's current planning effort, more compact land uses could increase the need for Beltline improvements. More compact land use, while not technically an improvement component, should be considered in the evaluation of Strategy Packages in future analyses.

SECTION 8
SCENARIO PLANNING FOR ALTERNATIVE MODE CHOICES

8.01 BACKGROUND

A. Background

As mentioned in Section 7, scenario planning is the practice of considering alternative future conditions for factors that impact travel and/or mode choice in an area. FHWA Scenario Planning Handbook (2011) states,

> *"The hallmark of scenario planning is identifying land-use patterns as variables (rather than static inputs) that could affect transportation networks, investments, and operations. Other variables might include demographic, economic, political, and environmental trends."*

Source: http://www.bikexprt.com/bikepol/facil/lanes/bikebus.htm

Figure 8.01-1 Increasing Nonmotorized Modes

Scenario planning is typically used with land use variables. However, the Madison Beltline PEL Study also used scenario planning to understand how mode selection would affect traffic volumes in the area. The study took the number of trips that were completed using transit and bike and tripled those trips to see how this would affect traffic on the Beltline and through the Isthmus.

According to the 2010 American Community Survey (US Census), Madison is No. 44 in the nation for number of trips that use transit to commute to work, with 8.57 percent of the trips using transit. Tripling the number of transit trips would put Madison closer to Chicago, Illinois, which is No. 10 in the nation for number of trips that use transit to commute to work. According to the 2014 American Community Survey, of cities with more than 65,000 people, Madison is No. 13 in the nation for number of trips that bike to work, with 5.3 percent. Tripling the number of work trips using bike would put Madison between Berkeley, California and Davis, California, which are Nos. 2 and No. 1, respectively.[1]

8.02 ANALYSIS METHOD

The analysis first looked at tripling transit trips, and then looked at tripling both transit and bike ridership. To understand the effects of tripling transit and bike ridership in the TDM, the study took the number of trips assigned to these modes and tripled them. The triple transit and bike trips were then subtracted from the motor vehicle trips in the model. The motor vehicle trips were removed from portions of the model

[1]Note that this discussion is for comparison purposes only and pertains to the city of Madison only. The actual analysis was performed using the Dane County TDM, which incorporates all the communities in Dane County, not just Madison. Consequently, the model also has slightly different mode split percentages than those shown in the American Community Survey.

that have existing bike trips and transit service. The TDM highway trip assignment was then run with the reduced trips. The official Dane County 2050 TDM, current as of January 2015, was used for the analysis (this corresponds to the Trend Scenario (A), or current and historic trends, in Madison in Motion).

No efforts were made within the model to determine what network, service, and policy changes would be needed to increase transit and bike ridership by a factor of three. Note that these measures could be considerable, including implementing BRT, improving transit service frequency, and increasing the amount of bicycle accommodations. The analysis assumes that incentives would be sufficient to implement the mode shift. The analysis then sought to understand how that shift would affect motor-vehicle volumes on routes in the metropolitan area.

8.03 TRAFFIC IMPACTS

A. Triple Transit

Figure 8.03-1 illustrates the effects of tripling the number of transit work trips on four arterials traveling through the Isthmus. In 2050, there would be a reduction of 7,400 vpd on these roadways, reducing volumes by approximately 6.1 percent lower than what would ordinarily occur in 2050. These arterials would still carry about 10.4 percent more traffic than they carried in 2010.

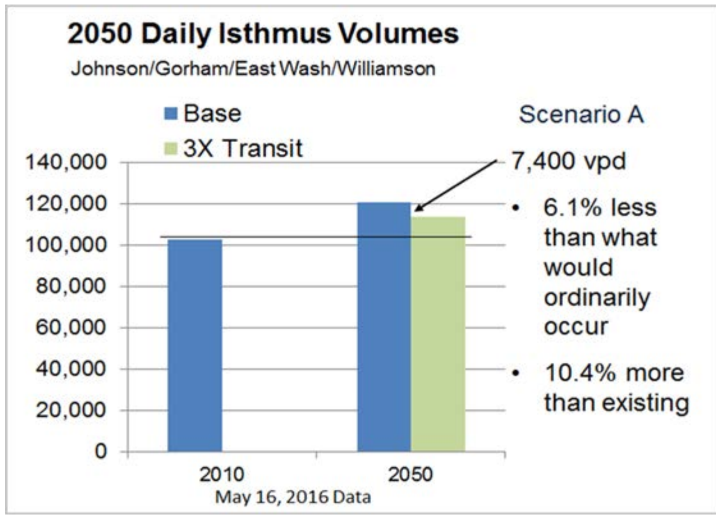


Figure 8.03-1 Triple Transit Trips Effect on the Isthmus

Figure 8.03-2 illustrates the effects of tripling the number of transit trips on one section of the Beltline east of Verona Road. Tripling transit would reduce trips on this section of the Beltline by 2,500 in 2050, resulting in Beltline traffic volumes that would be 1.7 percent below what would ordinarily occur in 2050. This smaller reduction is the result of having the mode shift traffic volume reductions occur where the majority of the transit service is. With this reduction, Beltline traffic volumes would still be approximately 7.9 percent greater than in 2010.

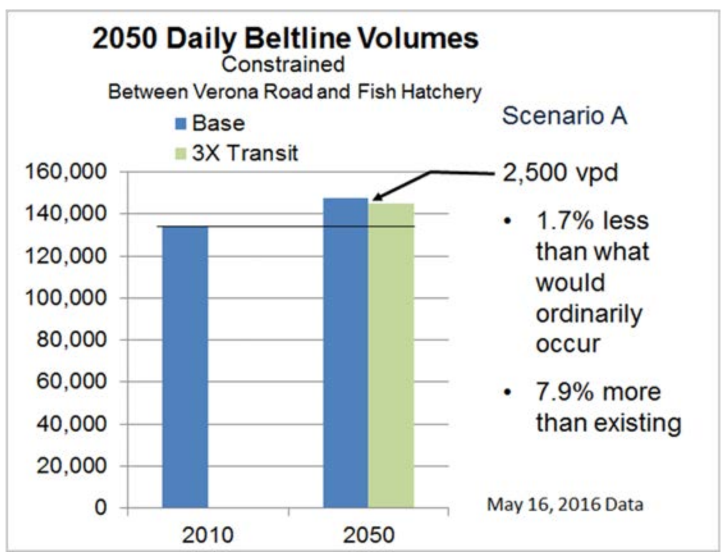


Figure 8.03-2 Triple Transit Trips Effect on the Beltline

B. Triple Transit and Bicycle

Figure 8.03-3 illustrates the effects of tripling the number of transit and bike work trips on four arterials traveling through the Isthmus. In 2050, there would be a reduction of 12,500 vpd on these roadways, reducing volumes by approximately 10.3 percent lower than what would ordinarily occur in 2050. These arterials would carry approximately 5.4 percent more traffic than they carried in 2010. This reduction is substantial and indicates that Isthmus traffic volume growth could be nearly eliminated by aggressive mode shift measures.

Figure 8.03-4 illustrates the effects of tripling the number of transit and bike trips on the section of the Beltline between Verona Road and Fish Hatchery Road. Tripling transit and bike would reduce trips on this section of the Beltline by 3,500 vpd in 2050, resulting in Beltline traffic volumes that would be 2.4 percent below what would ordinarily occur in 2050. This smaller reduction is the result of having the mode shift traffic volume reductions occur where the majority of the transit service is currently located. With this reduction, Beltline traffic volumes are still forecasted to be approximately 7.1 percent greater than in 2010.

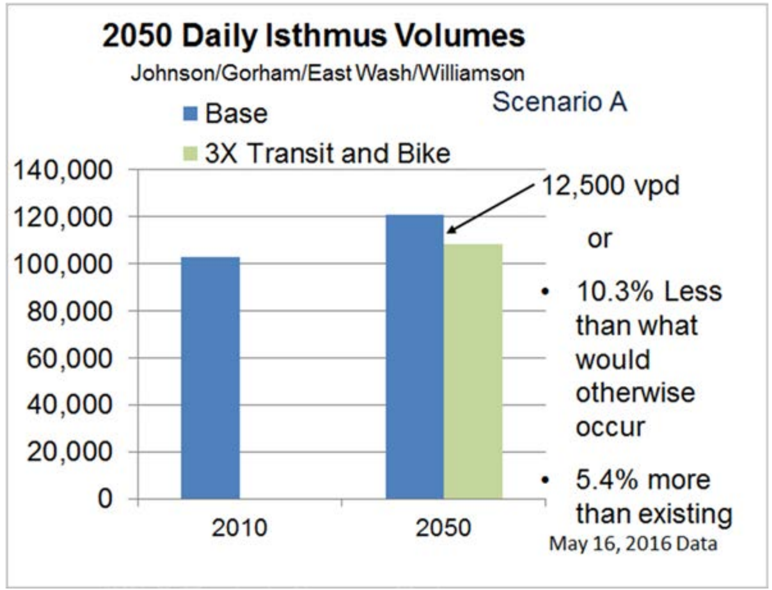


Figure 8.03-3 Triple Transit and Bike Trips Effect on the Isthmus

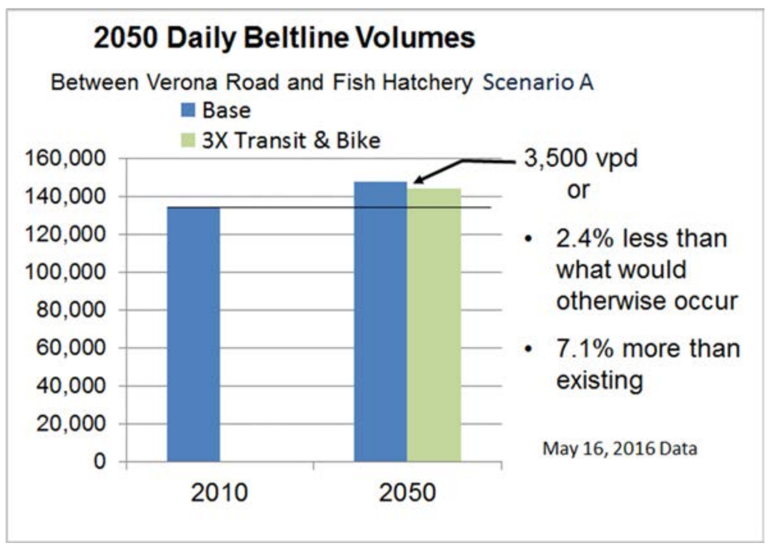


Figure 8.03-4 Triple Transit and Bike Trips Effect on the Beltline

Figure 8.03-5 provides another way of viewing the traffic reduction effects caused by tripling transit ridership and tripling both transit ridership and biking. The traffic reductions to the Beltline are nominal. Yet the traffic reductions through the Isthmus show merit. Effecting this mode shift would reduce automobile traffic growth through downtown Madison and help maintain congestion closer to 2010 levels.

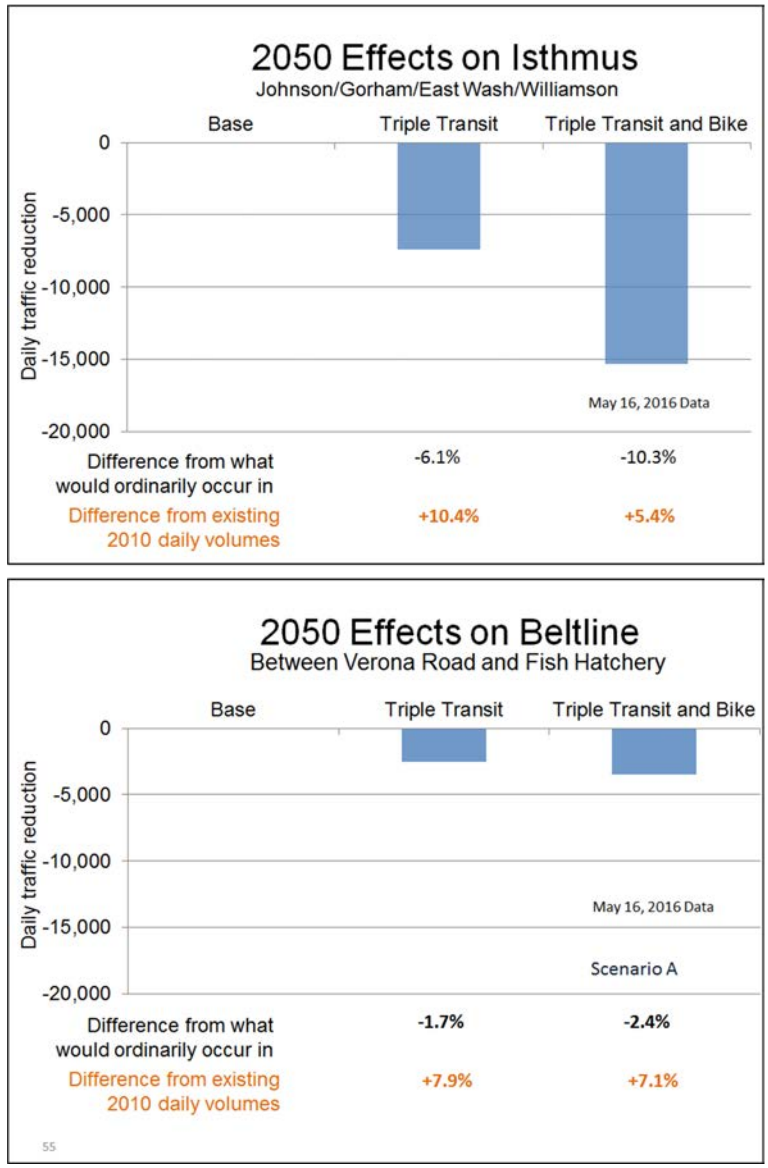


Figure 8.03-5 Triple Transit and Bike Ridership Traffic Reduction

8.04 OTHER IMPACTS

This analysis focused on the traffic volume effects of tripling transit and bike ridership but did not determine what measures would be needed to affect this mode shift. It is likely that measures would include increasing transit service frequency, possible implementation of BRT, as well as increasing the amount of bicycle and pedestrian accommodations. All these measures would have both monetary and physical impacts, which were not determined as part of this analysis.

8.05 SCREENING AND RESULTS

Table 8.05-1 uses the Stand-Alone Strategy screening questions described in Section 1 and evaluates Scenario Planning for Tripling Transit and Bike ridership and the corresponding reduction in motor vehicle traffic volumes.

Root Objective	Stand-Alone Strategy Screening Question	Triple Transit and Bike Ridership Evaluation
1. Improve safety for all modes		
▪ Motor vehicle	Does the Stand-Alone Strategy address safety deficiencies on the Beltline or have the potential to reduce congestion-related motor vehicle crashes on the Beltline?	Tripling transit and bike ridership does not specifically address Beltline safety deficiencies. It also does not reduce traffic volumes enough to reduce congestion-related crashes on the Beltline.
2. Address Beltline infrastructure condition and deficiencies.	Does the Stand-Alone Strategy preclude addressing Beltline infrastructure deficiencies?	Tripling transit and bike ridership does not address Beltline infrastructure deficiencies, but it does not preclude these deficiencies from being addressed in a separate project. To satisfy this objective, another separate project would have to be planned for the Beltline.
3. Improve system mobility (congestion) for all modes		
▪ Transit	Does the Stand-Alone Strategy preclude improvements to transit facilities and routing?	Presumably, the improvements necessary to triple transit ridership would provide significant improvements to transit facilities and ridership. Therefore, it is likely this objective would be satisfied.
▪ Motor vehicles (including passenger and freight)	Does the Stand-Alone Strategy decrease Beltline traffic, or increase Beltline capacity, enough to address conditions that lead to unstable traffic flow on the Beltline?	Tripling transit and bike ridership does not provide meaningful reductions on Beltline traffic. Therefore, it does not satisfy this key objective. Note that tripling transit and bike ridership provides substantial traffic reductions through the Isthmus.

Table 8.05-1 Scenario Planning Tripling Transit and Bike Ridership Stand-Alone Strategy Screening Questions

8.06 CONCLUSION

The Scenario Planning for Alternative Mode Choice satisfies one of the root Beltline PEL objectives being considered in the screening of Stand-Alone strategies-improving transit mobility. While not satisfying key mobility objectives for the Beltline, improvements that would be associated with shifting mode choice to transit, biking, and walking are part of several Beltline PEL objectives. Investigation of enhancements to improve existing transit and bicycle infrastructure should be part of Strategy Packages in future analyses.

SECTION 9
COMBINED OFF-CORRIDOR STRATEGIES

9.01 BACKGROUND

A. Development of Combined Strategies

The Madison Beltline PEL Study team evaluated multiple off-corridor Stand-Alone Strategies combined to see whether multiple major infrastructure investments could eliminate the need for Beltline capacity expansion. This strategy included:

- A NMP corridor
- A SR corridor
- BRT service

These three Stand-Alone Strategies were selected as part of the Combined Strategy because they provide a high mobility corridor north of the urban area, a high mobility corridor south of the urban area, and high mobility transit through the center of the urban area. Adding other elements to the Combined Strategy would be duplicative of the function these three elements serve.

The NMP corridor generally followed the alignment endorsed by Dane County and called the South Waunakee Corridor in Section 2 of this report. This alignment starts at US 12 in the vicinity of the US 12/County K intersection. It then travels easterly, off-alignment to the intersection of County K and County M. Here it follows County M to WIS 113 and travels north on WIS 113 to WIS 19 and I-39/94. The speed on the NMP was evaluated in the TDM as a 60-mph roadway for this Combined Strategy. Figure 9.01-1 schematically represents the strategy corridor.

Figure 9.01-1 NMP Corridor Alignment Used in Combined Off-Corridor Strategies Evaluation

The SR corridor travels east from US 151 in Verona approximately 1 mile north of County M until it reaches US 14. The alignment continues east, in the vicinity of County B until it reaches US 51. At US 51, the alignment travels to the northeast and joins I-39/90 in the vicinity of County AB at a new interchange. The SR route evaluated has interchanges at Fish Hatchery Road (County D), US 14, US 51 and I-39/90. The speed on the SR was evaluated in the TDM as a 65-mph roadway. Figure 9.01-2 shows the SR alignment used in the Combined Off-Corridor Strategies evaluation.

Figure 9.01-2 SR Corridor Alignment used in Combined Off-Corridor Strategies Evaluation

The BRT strategy used in the Combined Off-Corridor Strategies Madison Beltline PEL Study is the same as that proposed in the 2013 *Madison Transit Corridor Study Investigating Bus Rapid Transit in the Madison Area* and shown in Figure 9.01-3.

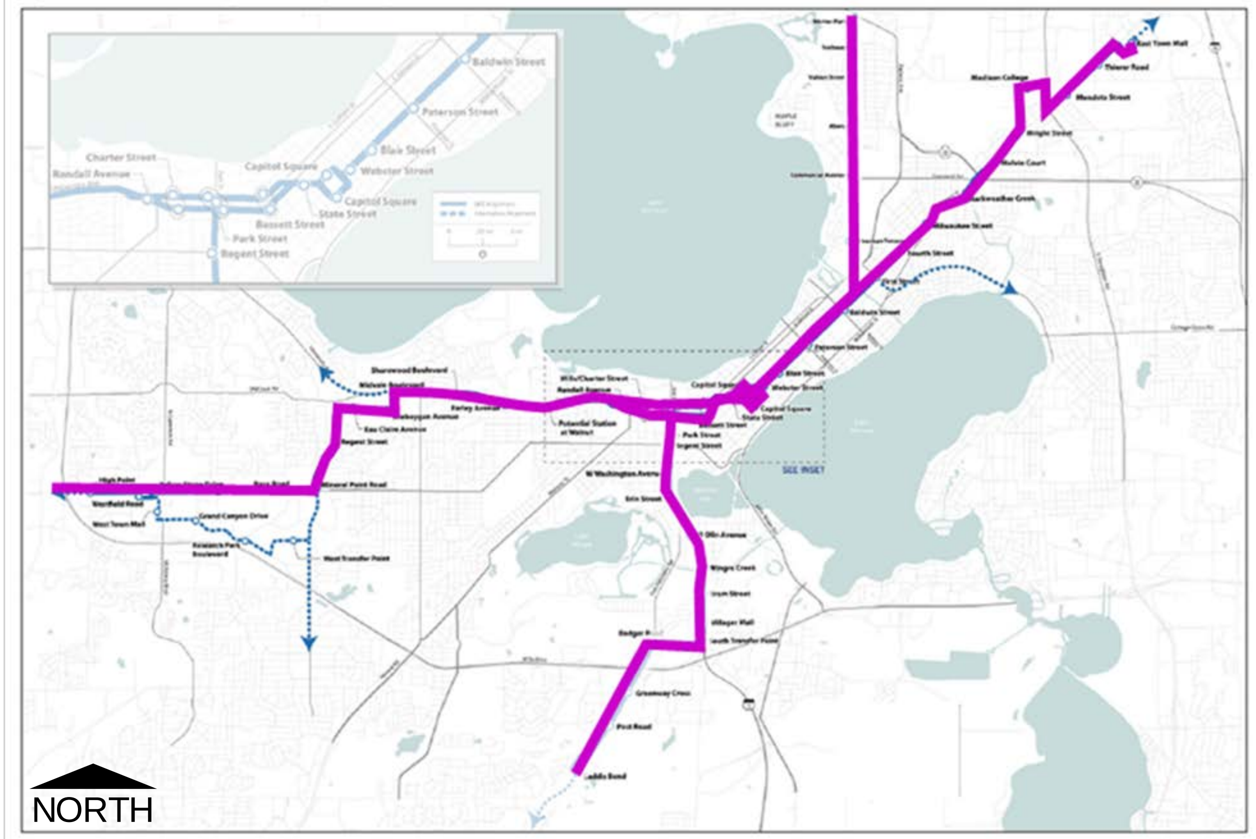


Figure 9.01-3 BRT System Used in Combined Off-Corridor Strategies Evaluation

9.02 TRAFFIC IMPACTS

As with the other stand-alone strategies, the Madison Beltline PEL Study team used the TDM maintained by WisDOT and the Greater Madison MPO to evaluate the traffic impact these combined strategies would have. Figure 9.02-1 illustrates the combined strategies along with the modeled 2050 daily traffic reductions through the Isthmus and on the Beltline.

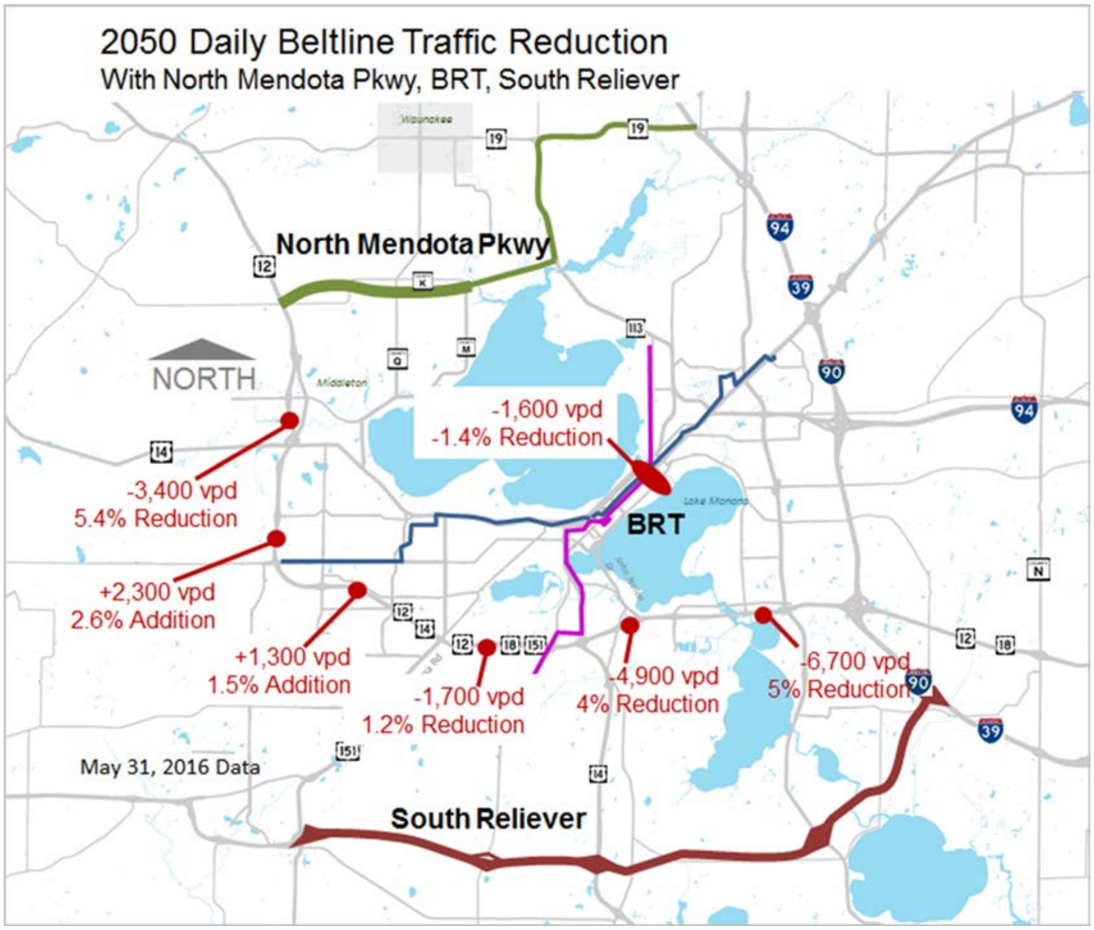


Figure 9.02-1 Traffic Impact of Combined Off-Corridor Strategies

The model indicates modest traffic volume reductions across the Isthmus. All three strategies combined can change 2050 Beltline traffic volumes from a reduction of 6,700 vpd to an addition of 2,300 vpd. This represents 2050 traffic volume reductions of up to 5 percent. The largest reduction occurs between Monona Drive and Stoughton Road with a reduction of approximately 6,700 vpd (approximately 5 percent) noted in Figure 9.02-1. Even with the traffic reductions from these strategies, the 2050 Beltline traffic volumes would still be greater than current (2012) traffic volumes. Therefore, the congestion that exists today resulting in LOS E and LOS F operations along the Beltline east of Verona Road during the peak commuting hours would still be worse in 2050 than it is today even with the implementation of these three initiatives.

9.03 OTHER IMPACTS

The NMP and SR would both potentially impact public natural resource areas, water resource areas, and agricultural resource areas. The following paragraphs summarize the broad impacts each strategy alignment would have on resource areas.

The Combined Off-Corridor Strategies analysis assumed the NMP would follow the South Waunakee Corridor alignment. Near the US 12 and County K intersection, the South Waunakee Corridor would travel off-alignment 5.3 miles until it reaches the County K and County M intersection. Most of the land west of County Q is prime agricultural land; impacts would consist mainly of direct agricultural acquisition. Access changes, field severances, and triangulation would also occur because this portion of the roadway is off-alignment. East of County Q, the alignment would border the north edge of Dorn Creek until the alignment connects with County M. Predominant impacts in this section would consist of direct R/W acquisition, along with some edge impacts to the riparian habitat of Dorn Creek. Once the alignment connects with County M, it follows the County M, WIS 113, and WIS 19 alignments until it connects with I-39. Wetlands associated with Dorn and Sixmile Creeks are adjacent to County M on both sides in this area. Wetland impacts, due to widening, will be unavoidable. The expansion on WIS 113 and WIS 19 would require widening on one or both sides. It would occur on primarily agricultural lands and would involve direct acquisition but would have limited severances or triangulation to farm properties since it is on-alignment. Creating a four-lane corridor on these roadways could require several residential relocations. No formal design has been performed, but a 300-foot-wide corridor could require in the range of 200 to 250 acres of new R/W from US 12 to County M.

The SR would have substantial impacts to private property. A 2002 and 2008 analysis (see Section 3) of the corridor provided preliminary impacts. The analysis indicated approximately 1,068 acres of R/W would be required to construct the full route from US 151 to I-39/90. Of this, approximately 636 acres would be farmland, 139 acres would be forested, and 250 acres would be wetlands or hydric soils. The greatest wetland impacts would occur in the section between US 51 and I-39/90 because of the presence of the Yahara River, lakes, and adjoining wetlands.

The BRT system studied by the Greater Madison MPO would complement the existing Metro bus service. It would include 21 to 22 miles of BRT routing, 50 to 52 BRT specially equipped stations, $138 to $192 million in capital cost (higher capital costs include fixed guideway sections), and $9.8 million in annual operating cost.

9.04 SCREENING AND RESULTS

Table 9.04-1 use the Stand-alone Strategy screening questions described in Section 1 and evaluates the Combined Off-Corridor Strategies.

Root Objective	Stand-Alone Strategy Screening Question	NMP, SR, BRT Corridor Evaluation
1. Improve safety for all modes:		
▪ Motor vehicle	Does the Stand-Alone Strategy address safety deficiencies on the Beltline or have the potential to reduce congestion-related motor vehicle crashes on the Beltline?	The Combined Off-Corridor Strategies do not specifically address Beltline safety deficiencies. They also do not reduce traffic volumes enough to reduce congestion-related crashes on the Beltline below current conditions (traffic volumes in 2050 would be similar to traffic volumes today).
2. Address Beltline infrastructure condition and deficiencies.	Does the Stand-Alone Strategy preclude addressing Beltline infrastructure deficiencies?	The Combined Off-Corridor Strategies do not address Beltline infrastructure deficiencies, but do not preclude these deficiencies from being addressed in a separate project. To satisfy this objective, another separate project would have to be planned for the Beltline.
3. Improve system mobility (congestion) for all modes		
▪ Transit	Does the Stand-Alone Strategy preclude improvements to transit facilities and routing?	The Combined Off-Corridor Strategies specifically address transit facilities and improve routing by implementing BRT. This key objective is satisfied.
▪ Motor vehicles (including passenger and freight)	Does the Stand-Alone Strategy decrease Beltline traffic, or increase Beltline capacity, enough to address conditions that lead to unstable traffic flow on the Beltline?	The Combined Off-Corridor Strategies result in traffic volumes in 2050 that are similar to existing volumes. The Beltline experiences unstable traffic flow during typical peak periods today, and therefore, would be expected to experience similar unstable flow in 2050 even with implementation of the Combined Off-Corridor Strategies. Therefore, they do not satisfy this key objective.

Table 9.04-1 Combined Off-Corridor Strategies

9.05 CONCLUSION

The combined NMP, SR, and BRT strategies show merit in that they are able to capture a large amount of local traffic and transit ridership and increase mobility for travelers in Dane County. However, they do not satisfy the root Beltline PEL objectives for Stand-Alone Strategies for the Beltline corridor, and the three strategies together have considerable cost and impacts.

SECTION 10
BELTLINE CORRIDOR STRATEGY

10.01 BACKGROUND

Congestion on the Beltline occurred in both directions during the existing morning and evening peak periods in 2012 and continues today. During the morning peak hour, congestion is worse in the westbound direction particularly from I-39 west to South Towne Drive with speeds routinely dropping to 20 mph or less. West of South Towne Drive speeds vary from approximately 20 to 40 mph to Verona Road. During the evening peak hour, congestion is worse in the eastbound direction with rolling queues apparent from Whitney Way east to Monona Drive where speeds routinely drop below 30 mph.

There are several locations that trigger congestion for the whole corridor. These "bottlenecks" are typically a result of high ramp traffic volumes merging into already high traffic volumes on the Beltline. The resulting weaving and high density of vehicles leads to slow speeds and/or stopped vehicles on the mainline, which produces a shockwave or rolling queue of vehicles that negatively impacts operations upstream of the bottleneck. Locations during the morning peak hour that trigger congestion include the Park Street, South Towne Drive, and US 51/Stoughton Road interchanges. Similarly, during the evening peak hour, the John Nolen Drive eastbound freeway merge and Todd Drive westbound freeway merge experience substantial congestion. Extensive queueing is also observed on many exit ramps and arterials in the morning and evening peak hours throughout the study area, with some queues occasionally reaching the Beltline mainline.

Conditions in 2012 at intersections at the Beltline ramp terminals and nearby adjacent intersections ranged from acceptable with low delay to unacceptable with volumes that exceed the intersection capacity, resulting in long delays and motor vehicle backups. During the morning peak hour, the poorest operations occur at the County K and County AB intersections and the Whitney Way, Verona Road, West Broadway, and US 51/Stoughton Road interchanges. During the evening peak hour, the poorest conditions occur at the County K, Millpond Road, and County AB intersections, and the County M/Airport Road, Mineral Point Road, and John Nolen Drive interchanges.

In 2021, WisDOT will be implementing Dynamic Part Time Shoulder-Use (DPTSU) on the Beltline from Whitney Way to the Beltline interchange with I-39/90 (BIC), to be known as the Flex Lane. DPTSU is anticipated to provide better operations for all vehicles on the Beltline. Allowing the median shoulder to be used for travel would provide an operational benefit compared to a No Build condition, but the projected increasing traffic volumes would ultimately still result in congestion and poor reliability after about 2032.

10.02 DESCRIPTION OF STRATEGY

The Beltline Corridor strategy would expand the motor vehicle capacity of the Beltline mainline and interchanges by location to the extent needed. This mainline expansion could be via managed through lanes (such as HOV lanes), continuing to use the Flex Lane (shoulder area) as a through lane during the most congested periods (Part-Time Shoulder Use [PTSU]), and/or through conventional expansion. This strategy increases projected Beltline daily traffic volumes compared to an alternative that does not add capacity. This is because when the capacity constraint is removed, vehicles that would be seeking alternate routes return to the Beltline corridor. This is sometimes called "latent demand". In addition, providing additional capacity on the Beltline may lead to "induced demand," which can include shifts from other modes, longer trips, and/or new trips. This strategy would improve Beltline operations by providing sufficient capacity (in whatever form is deemed necessary) to accommodate the baseline, latent, and/or induced travel demand through the horizon year of 2050.

10.03 TRAFFIC IMPACTS

The growth in Dane County population will create more travel demand. Figure 10.03-1 shows the projected amount of new traffic from the TDM that will use each section of the Beltline between 2010 and 2050 if the Beltline remained as is (without the planned DPTSU). The information in this graphic is from the Dane County TDM and does not represent official WisDOT forecasts. Official WisDOT forecasts use the TDM, and other historic traffic information, to arrive at horizon year traffic volumes. The figure does illustrate that planned land uses and population gains will place more travel demand on the Beltline, causing some sections to have traffic growth of 15 percent or more.

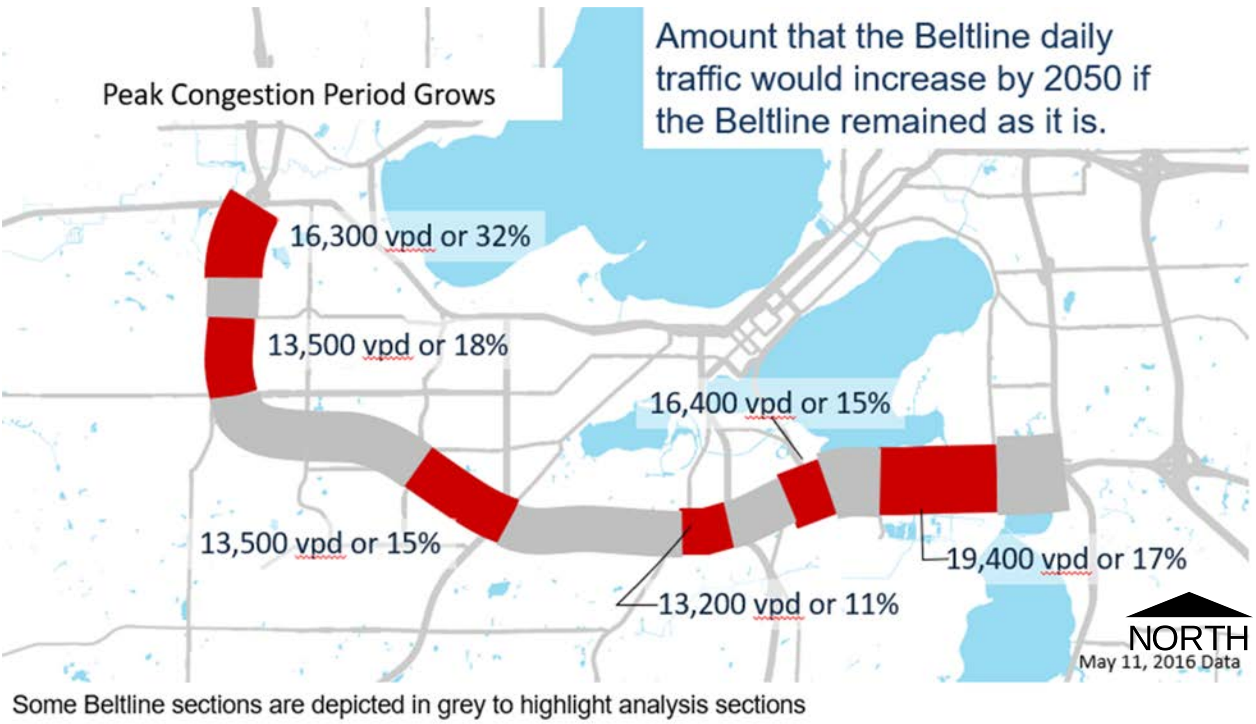


Figure 10.03-1 Predicted Daily Traffic Growth 2010 to 2050 from Demand Model

Adding capacity to the Beltline has the effect of removing the existing (without DPTSU) capacity constraints reflected in Figure 10.03-1. To understand the future demand desiring to use the Beltline, the Madison Beltline PEL Study performed analyses using the Dane County TDM. Figure 10.03-2 shows the amount of 2050 traffic that would like to use the Beltline with capacity constraints (red), and the additional amount without capacity constraints (green). The additional unconstrained traffic (green) would use other routes because of congestion that is occurring on the Beltline with capacity constraints. Note that these are not official WisDOT traffic forecasts, they are only the difference of daily 2050 Beltline traffic with a capacity constraint, and without a capacity constraint as shown in the Dane County TDM[1].

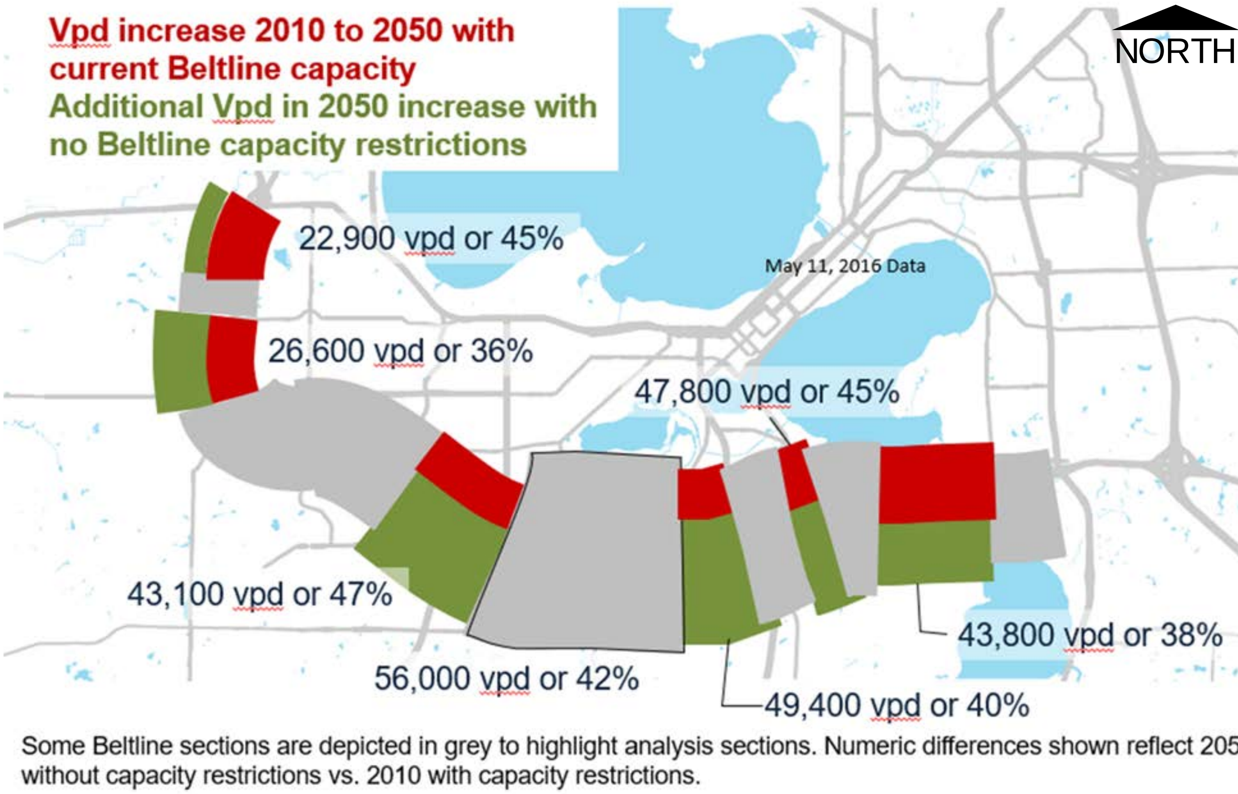


Figure 10.03-2 2050 Beltline Demand Model Volume and Percentage Increases Compared to 2010, with and without Constraints

If capacity constraints are removed, some portions of the Beltline would have up to 30 percent more traffic in 2050 than they would with existing capacity constraints (percentage increases in Figure 10.03-2 minus those in Figure 10.-03-1). In the TDM with capacity constraints, this traffic is traveling on other routes. Increasing the capacity of the Beltline would increase the amount of traffic that uses the Beltline (latent demand). An expanded Beltline would also draw traffic off other routes, although it is distributed among many different arterials and collectors so the traffic reduction effect is subtle. Figure 10.03-3 shows the traffic reduction effect through the Isthmus from removing Beltline capacity constraints. Removing capacity constraints on the Beltline (adding capacity) would increase Beltline traffic volumes but would have little impact on Isthmus arterials, such as East Johnson Street, East Washington Avenue, and Williamson Street.

[1]As the Beltline Corridor Strategy continues to be studied during the PEL, official WisDOT forecasts will be developed for various types of capacity expansion.

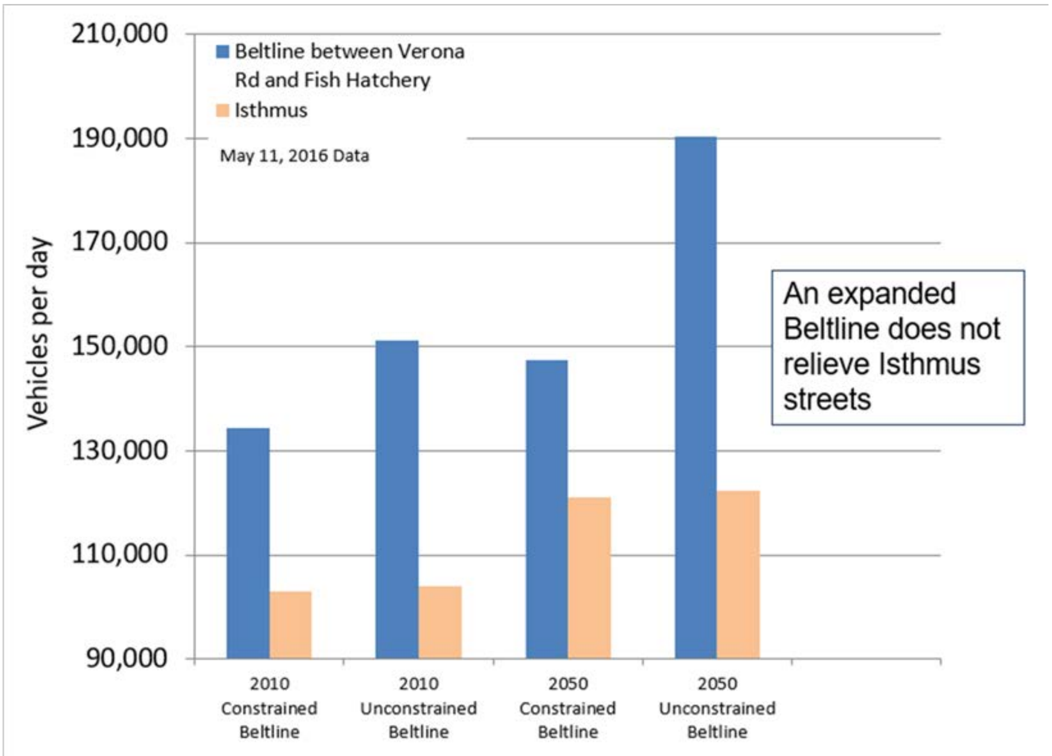


Figure 10.03-3 Beltline Capacity Expansion Effect on Isthmus Arterials

10.04 OTHER IMPACTS

Because this is a screening report with no preliminary design of strategies, detailed R/W and environmental impact information is not available for the Beltline Corridor strategies[2]. Some types of added capacity on the Beltline could require R/W and/or have other impacts. These impacts would be most likely with conventional expansion but could also occur as part of additionally managed lane project(s) or other improvements occurring after the DTPSU project scheduled for 2021. These R/W impacts would likely affect the UW Arboretum, a resource protected by both Section 4(f) and Section 106. They would also likely affect the Capitol Springs State Recreation Area of which some of, if not all, is protected by Section 4(f). The R/W impacts would likely be orders of magnitude less than the Stand-Alone Strategies that made use of an alternate corridor, such as the NMP and SR Corridors.

[2]Additional analysis has been completed for some Stand-Alone Strategies under other studies, such as the NMP and SR Corridors, and is cited in this report.

10.05 SCREENING AND RESULTS

The following table uses the Stand-Alone Strategy screening questions described in Section 1 and evaluates the Beltline Corridor Strategy.

Root Objective	Stand-Alone Strategy Screening Question	Beltline Corridor Evaluation
1. Improve safety for all modes:		
▪ Motor vehicle	Does the Stand-Alone Strategy address safety deficiencies on the Beltline or have the potential to reduce congestion-related motor vehicle crashes on the Beltline?	The Beltline Corridor Strategy would specifically address Beltline safety deficiencies. This strategy would not reduce Beltline volumes but would provide capacity to reduce Beltline congestion. This would have the potential to reduce congestion-related crashes on the Beltline below current conditions. With this strategy there would also be the opportunity to address site specific safety deficiencies.
2. Address Beltline infrastructure condition and deficiencies	Does the Stand-Alone Strategy preclude addressing Beltline infrastructure deficiencies?	The Beltline Corridor Strategy would directly address Beltline infrastructure deficiencies.
3. Improve system mobility (congestion) for all modes		
▪ Transit	Does the Stand-Alone Strategy preclude improvements to transit facilities and routing?	The Beltline Corridor Strategy does not preclude improvements to transit facilities. Depending on how capacity is provided to the Beltline, it could directly improve transit routing.
▪ Motor vehicles (including passenger and freight)	Does the Stand-Alone Strategy decrease Beltline traffic, or increase Beltline capacity, enough to address conditions that lead to unstable traffic flow on the Beltline?	The Beltline Corridor Strategy directly addresses Beltline capacity, providing the ability to alleviate unstable flow on the Beltline.

Table 10.05-1 Beltline Corridor Strategy

10.06 CONCLUSION

The Beltline Corridor Strategy addresses three root Beltline PEL objectives and one that can be paired with other components. However, the Beltline Corridor Strategy is unable, on its own, to address other Beltline PEL objectives. Specific Beltline PEL objectives that the Beltline Corridor Strategy does not fully satisfy include:

1. Improve safety for all travel modes (modes other than motor-vehicle).
3. Address system mobility (congestion) for all travel modes.
    a. Pedestrian
    b. Bicycle
    c. Transit

6. Improve connections across and adjacent to the Beltline for all travel modes.
9. Enhance transit ridership and routing opportunities (depending on the type of capacity added to the Beltline).
10. Improve pedestrian and bicycle accommodations.
12. Support infrastructure and other measures that encourage alternatives to single occupancy vehicle travel (depending on the type of capacity added to the Beltline).

Therefore, the Beltline Corridor Strategy should be coupled with other components focusing on alternate modes to create Strategy Packages. These Strategy Packages, with many different components, should be better able to satisfy Beltline PEL objectives.