DEPARTMENT OF TRANSPORTATION

Northwest Metro Mississippi River Crossing

Feasibility Analysis

September 10, 2021

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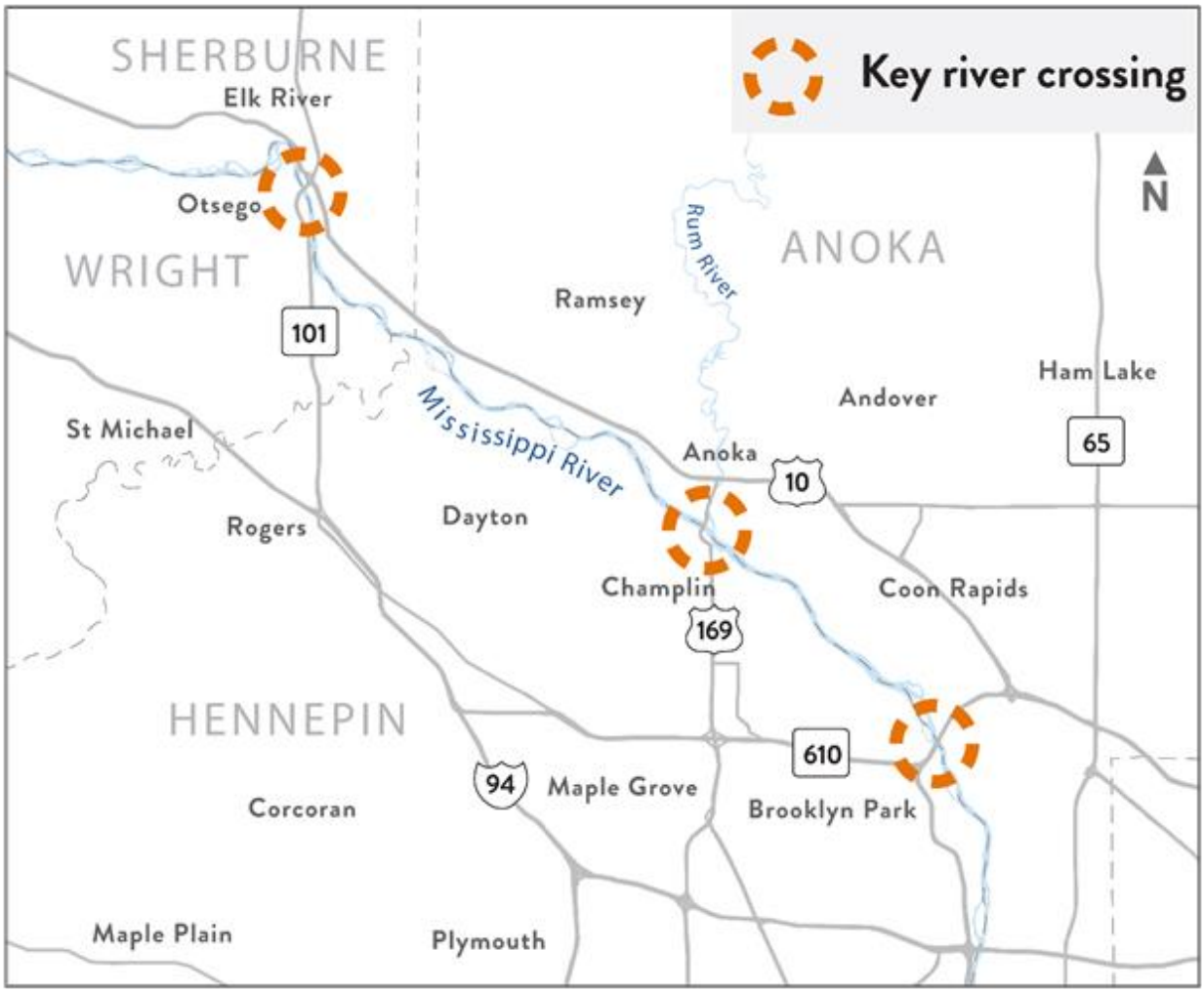
I. Introduction

The Twin Cities Northwest Metropolitan Area has experienced considerable growth over the last several decades. As a result, existing Mississippi River crossings on Highways 101, 169, and 610 are approaching or exceeding capacity and experience several hours of congestion every day. This congestion impacts hundreds of thousands of commuters, freight haulers, and recreational travelers, as well as countless residents making local trips between northwest metro communities. Furthermore, communities in this area are expected to experience residential and employment growth in the coming years that will place additional pressure on the highway network.

Figure 1: Existing Mississippi River Crossings in the Northwest Twin Cities Metropolitan Area



The Northwest Metro Mississippi River Crossing Feasibility Analysis explores regional travel patterns and considers whether a new Mississippi River crossing is a feasible solution to existing and anticipated mobility challenges. It combines past river crossing studies with up-to-date land use data, population forecasts, traffic modeling techniques, and civil engineering to develop four highway improvement concepts. These concepts are evaluated for traffic impacts and cost effectiveness.

Analysis Goals

As a feasibility analysis, this study does not include project recommendations. It is a fact-finding investigation and the first of several steps in the project development process. At this stage of the process, MnDOT's primary goals are to assess the community and transportation context, identify the locations and sources of congestion, understand stakeholder perspectives, and define a range of potential solutions to mobility challenges. Specifically, the analysis seeks to:

- **Understand Land Use and Growth** – The Northwest Metropolitan Area has experienced considerable growth. Identifying and compiling community plans provides an understanding of long-term population and employment growth along the corridors and the mobility and access needed to accommodate it.
- **Understand Past Efforts** – The idea of additional Mississippi River crossing capacity has been studied numerous times over the past three decades. Understanding how project partners have planned for improved crossing capacity serves as a baseline for this analysis.
- **Understand Travel Patterns** – This study details where people are, where they are going, and how they get there to understand the role of Mississippi River crossings in regional travel.
- **Understand System Performance** – This study evaluates the severity, duration, and extent of highway congestion. These metrics establish a baseline against which to measure performance, assess significance, and evaluate the effectiveness of highway improvements.
- **Understand Community Perspectives** – This study includes a strategic engagement process where the team listens to concerns, explore the facts, and presents clear and consistent findings. Communities in the influence area of this effort are engaged and informed.
- **Develop Improvement Concepts** – This study develops concepts that address operational issues and maximize the value of existing infrastructure. These concepts include improvements to existing highways and new river crossings.
- **Evaluate Concept Feasibility** – This study evaluates concept feasibility based on land use, system benefits, overall cost/benefit analysis, and return on investment.

Impacts of the COVID-19 Pandemic

The timeframe during which this analysis was conducted coincided with the COVID-19 pandemic. During this health crisis, lower traffic volumes were observed in response to social gathering restrictions, school and business closures, and increased telecommuting. Lower traffic volumes on study area highways meant that system performance in 2020 and 2021 was very different than performance reflected in the pre-COVID traffic data collected for this feasibility analysis.

In recognition of this difference, and in response to uncertainty about how future traffic volumes will respond, this study includes a review of year 2020 congestion and sensitivity analysis to compare forecasts based on pre-COVID traffic conditions to forecasts based on conditions observed during the pandemic. This analysis showed that existing and forecasted congestion at several locations was reduced or eliminated due to increased levels of telecommuting. Other locations, however, remain congested under forecasts with increased telecommuting, including segments with traffic signals on Highways 10, 101, and 169.

The study's traffic sensitivity analysis is presented in Sections VI: Traffic Forecasts & Analysis; Section VII: Benefit Cost Analysis; and Section VIII: Operation Analysis. Sensitivity analysis findings are used to test the sensitivity of traffic volumes, congestion, and concept effectiveness with respect to telecommuting assumptions.

Report Structure

The Northwest Metro Mississippi River Crossing Feasibility Analysis technical report is organized in nine sections:

- **Section I: Introduction.** Provides background on the study's purpose and goals.
- **Section II: Context Analysis.** Defines the study area and describes northwest metro land use and transportation systems. This section also summarizes results of relevant plans and studies.
- **Section III: Origin-Destination Analysis**. Describes how people and communities use existing river crossings on Highway 101, Highway 169, and Highway 610.
- **Section IV: Congestion Analysis**. Evaluates the extent, intensity, duration, and causes of congestion on highways in the northwest metro.
- **Section V: Concept Development.** Describes the process used to identify improvements and develop concepts to address current and future mobility challenges. Introduces four concepts as the basis for traffic, benefit-cost, and operational analysis.
- **Section VI: Traffic Forecasts & Analysis.** Forecasts year 2040 traffic volumes and patterns under no-build and build scenarios and evaluates concept impact on year 2040 no-build congestion. This section also evaluates the sensitivity of year 2040 congestion and concept effectiveness with respect to telecommuting assumptions.
- **Section VII: Benefit Cost Analysis.** Evaluates the cost effectiveness of improvement concepts developed for this analysis by comparing their present value of benefits to present value of costs.
- **Section VIII: Operational Analysis.** Evaluates operational benefits and disbenefits of improvement concepts at four study area locations. This section also evaluates the sensitivity of intersection delay and concept effectiveness with respect to telecommuting assumptions.
- **Section IX: Conclusions and Next Steps.** Summarizes conclusions and identifies actions to advance study concepts for further analysis and environmental review.

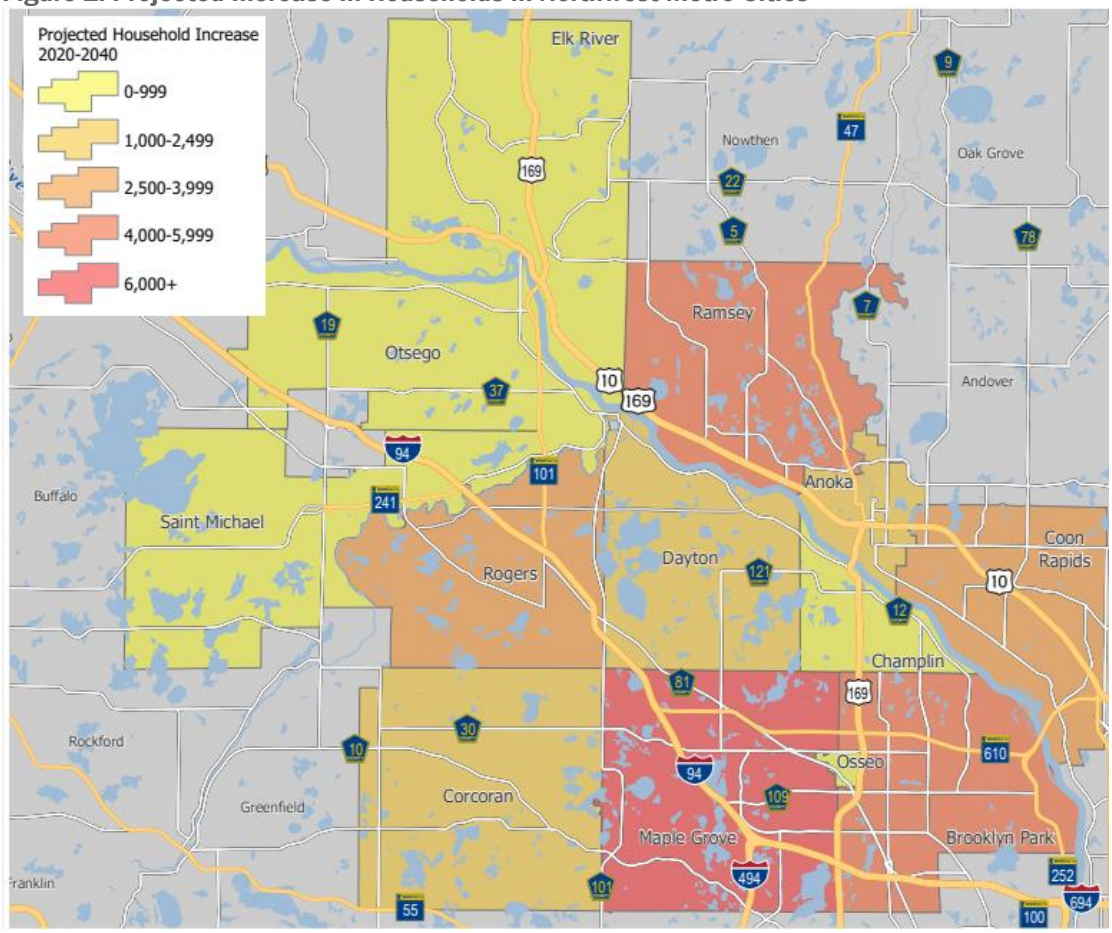
II. Context Analysis

The northwest region of the Twin Cities Metropolitan Area is one of the fastest growing areas in Minnesota. The Mississippi River runs through the heart of it, forming a natural barrier to intra and interregional travel. It is critical, therefore, to understand northwest metro river crossings in the context of local and regional transportation needs.

Study Area

The study area for the Northwest Metro Mississippi River Crossing Feasibility Analysis extends from northeast Wright County and southeast Sherburne County to western Anoka County and northern Hennepin County. Within this area are the fast-growing cities of St. Michael, Elk River, Ramsey, Anoka, Coon Rapids, Brooklyn Park, Maple Grove, Champlin, Dayton, and Rogers. Anticipated development trends for population, household, and employment have the potential to reshape cities on both sides of the river. According to the Metropolitan Council, northwest metro communities experienced a 39% increase in households and a 54% increase in jobs over the last twenty years. This growth is expected to continue, with a further 23% increase in households and a 17% increase in jobs expected by 2040.

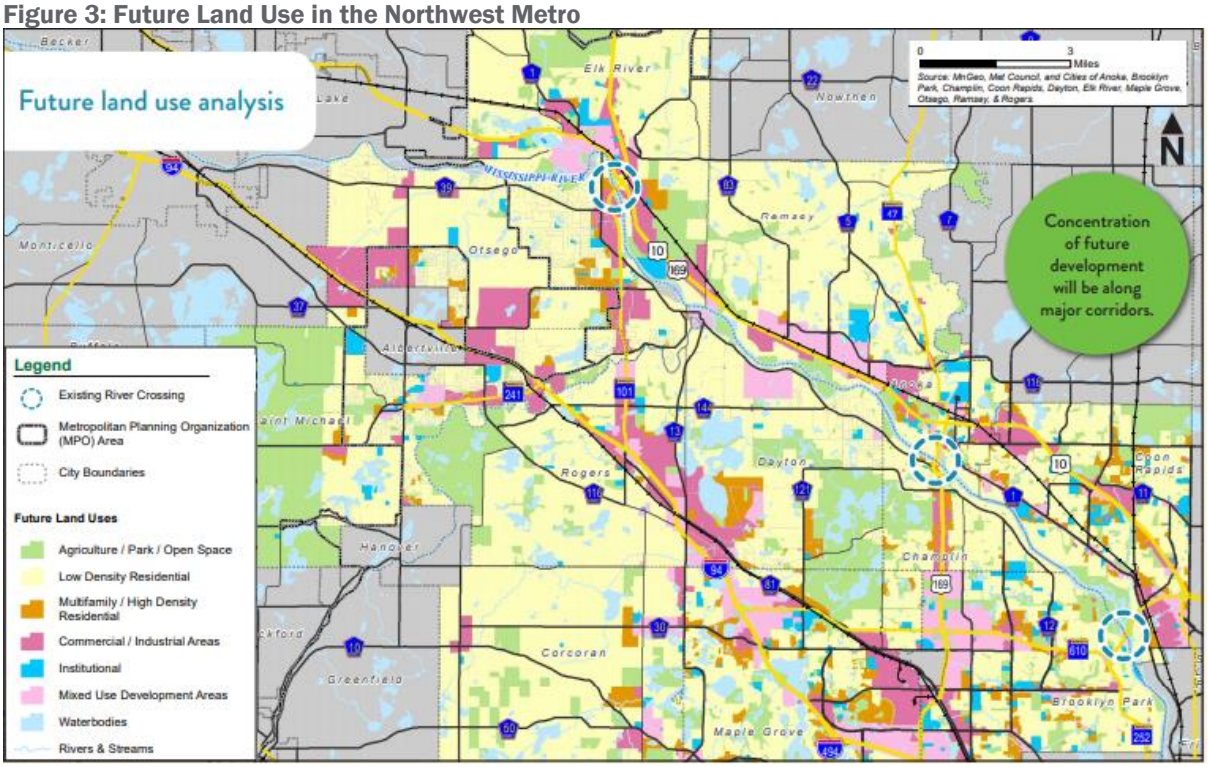
Figure 2: Projected Increase in Households in Northwest Metro Cities



Land Use and Transportation Network

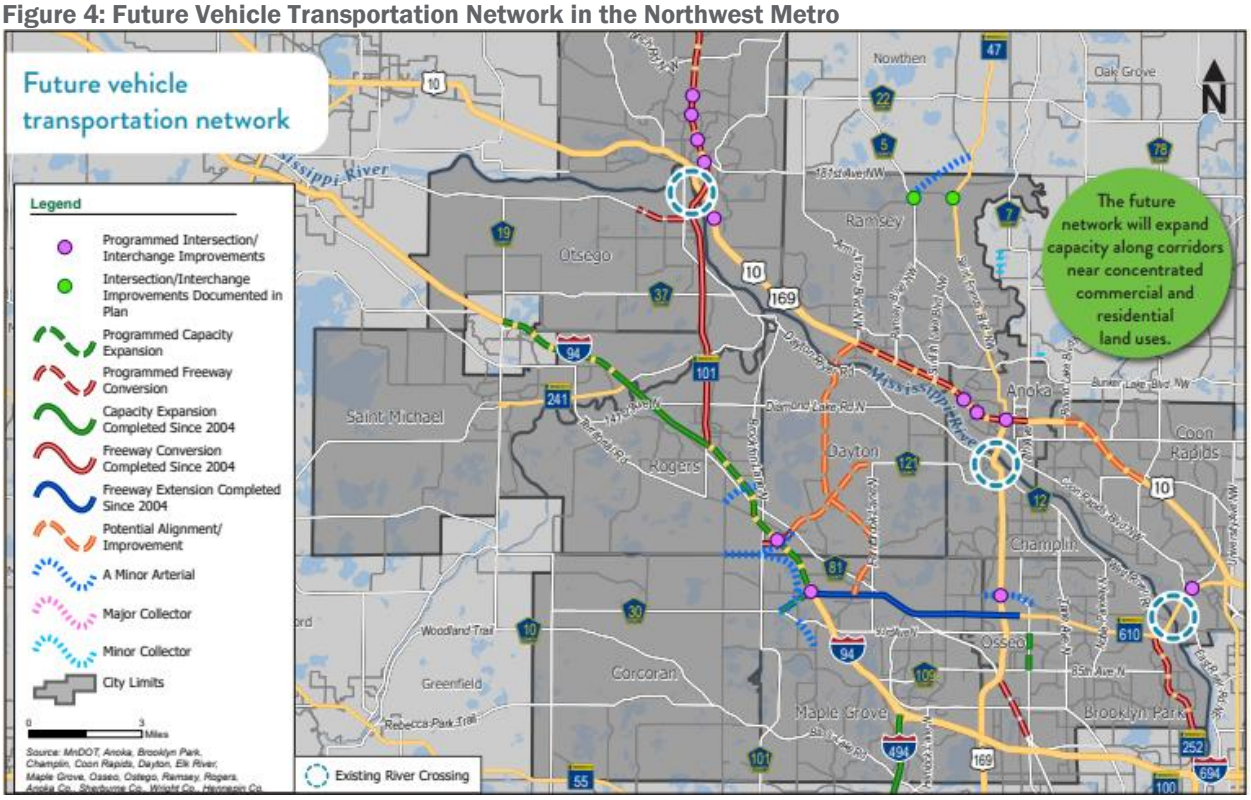
The feasibility analysis team conducted an analysis of future land use within the study area using city comprehensive plans. Land use categories for each city were generalized into six categories for easier comparison. Figure 3 shows a concentration of commercial and mixed-use activity along major corridors. Some areas are targeted for mixed-use development and urbanization. These areas include the Center of Ramsey (COR) on the north side of Highway 10/169, central Anoka surrounding the Northstar Commuter Rail Station, the I-94 corridor from Maple Grove to Highway 101, areas adjacent to Highway 101 within Hennepin County, and large areas in and around central Elk River.

Figure 3: Future Land Use in the Northwest Metro



The future vehicle transportation network shows programmed and planned improvements along I-94 and Highway 10, as well as potential improvements and new alignments identified in past studies and local comprehensive plans is shown in Figure 4. This network has changed significantly since the creation of the 2004 Northwest Metro Corridor and River Crossing Scoping Decision Document. The overall intent of these changes is a transportation network that provides increased capacity and connections at key locations within the study area.

Figure 4: Future Vehicle Transportation Network in the Northwest Metro



Past Studies

Context analysis provides a look back at studies and plans that have been completed in the northwest metro over the last three decades. This work sheds light on what communities expect to happen in the future and how they are planning and positioning for this change to occur.

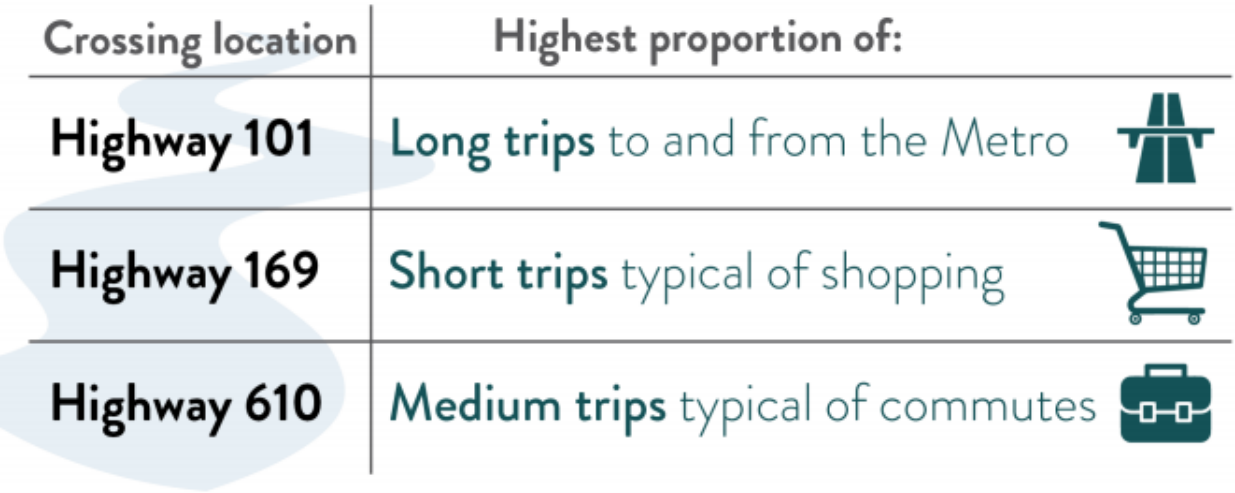
The Northwest Metro Mississippi River Crossing Feasibility Analysis considered 10 transportation studies by state/metro agencies, four county comprehensive plans, and 13 city comprehensive plans. Key takeaways from this analysis include:

- Growth is anticipated to continue throughout the northwest metro. Ramsey, Corcoran, and Dayton are among the fastest growing communities in the Twin Cities.
- County and city comprehensive plans in the region call for mixed use and higher density development along major corridors.
- Northwest metro highways have been studied multiple times over the last 30 years. Most of these studies identify the need for additional highway capacity.
- Investments have been made to address congestion and support future growth. Some communities have invested north of the Mississippi River to accommodate a future crossing.

III. Origin-Destination Analysis

The Northwest Metro Mississippi River Crossing Feasibility Analysis included an origin-destination (OD) analysis of trips crossing the Mississippi River on Highway 101, 169, and 610. The purpose of this analysis was to understand how travelers and communities use existing river crossings in the northwest metro. Understanding the demand for river crossing trips – where the trips come from and where they are going – sheds valuable light on the potential impact of a new river crossing on regional travel patterns and congestion.

Figure 5: Origin-Destination Analysis Summary of Trips Crossing the Mississippi River



Methodology

The OD analysis performed for this study was conducted using the StreetLight Insights software platform. StreetLight is a private company that compiles anonymized location records from smart phones and navigation devices in connected vehicles and transforms these location records into travel pattern data. This allows transportation analysts to develop helpful information about how vehicles, bicycles, and pedestrians move through the transportation network.

Two types of data were extracted from StreetLight for the OD analysis: Origin-Middle-Filter-Destination (OMD) trips and Top Routes data. This data was used to identify the origins (Os) and destinations (Ds) of the trips using the river crossings via different highways (Top Routes).

The OD analysis was conducted primarily for person trips during the AM peak period (6:00 to 10:00 am), the PM peak period (3:00 to 7:00 pm) and daily during weekdays (Monday – Thursday) from April 1st to 30th and September 1st to October 31st, 2019. A comparative analysis was conducted later between weekdays and the Friday afternoon before Memorial Day to investigate how travel patterns change entering a holiday weekend.

Additional information about OD analysis methodology is available in Appendix B.

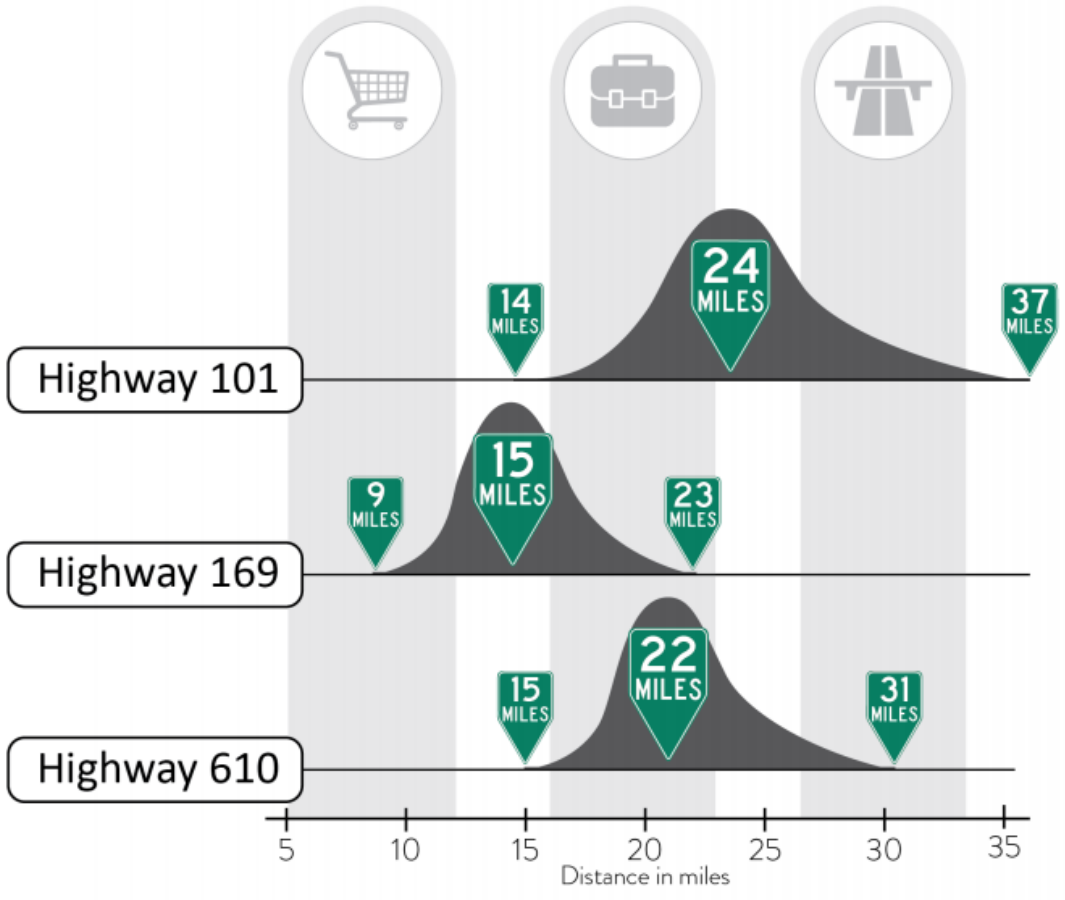
Trip Volume and Length

OD analysis of trips crossing the Mississippi River in the northwest metro indicates that the Highway 101, 169 and 610 river crossings serve the region in unique and important ways. Highway 610 carries over half the river crossings in the study area and serves the highest portion of trips between 20 and 30 minutes in length. This trip profile is consistent with work commutes. Highway 101 carries about one-fourth of the river crossings in study area and serves the highest proportion of trips over 30 minutes. Highway 169 carries the fewest and shortest trips, with most of the trips crossing on Highway 169 less than 20 minutes. These profiles suggest Highway 101 plays an important role carrying trips into and out of the Twin Cities and Highway 169 is a critical connection between the Cities of Champlin (Hennepin County) and Anoka (Anoka County).

Table 1: Distribution of Daily Trips on Northwest Metro Mississippi River Crossings

	Hwy 101		US 169		Hwy 610		Total	
	SB	NB	SB	NB	SB	NB	SB	NB
AM (6:00 to 10:00 am)	10,200	5,000	6,400	4,100	20,900	11,800	37,600	20,800
PM (3:00 to 7:00 pm)	8,600	13,600	5,000	8,500	17,600	27,600	31,300	49,600
Daily	32,100	32,300	20,900	22,000	66,700	66,000	119,700	120,300
	64,500 (27%)		42,900 (18%)		132,700 (55%)		240,000 (100%)	

Figure 6: Median and Range of Daily Trips on Northwest Metro Mississippi River Crossings



Communities Served

In addition to different trip volume and length, northwest metro Mississippi River crossings also serve different trip origins and destinations. Figures 7-9 show the density of trips using a northwest metro Mississippi River crossing by traffic analysis zone (TAZ). The distribution of river crossings by TAZ indicates the Highway 610 river crossing serves trips originating or arriving at locations throughout the northwest metro, while the origins and destination of Highway 169 crossing are concentrated in adjacent communities. The distribution of Highway 101 crossing origins and destinations is more dispersed, with approximately 35 percent of trips beginning or ending in the Cities of Elk River or Otsego and the rest distributed across the region.

Figure 7: Origin and Destination of Trips Crossing the Mississippi River on Highway 101, by TAZ

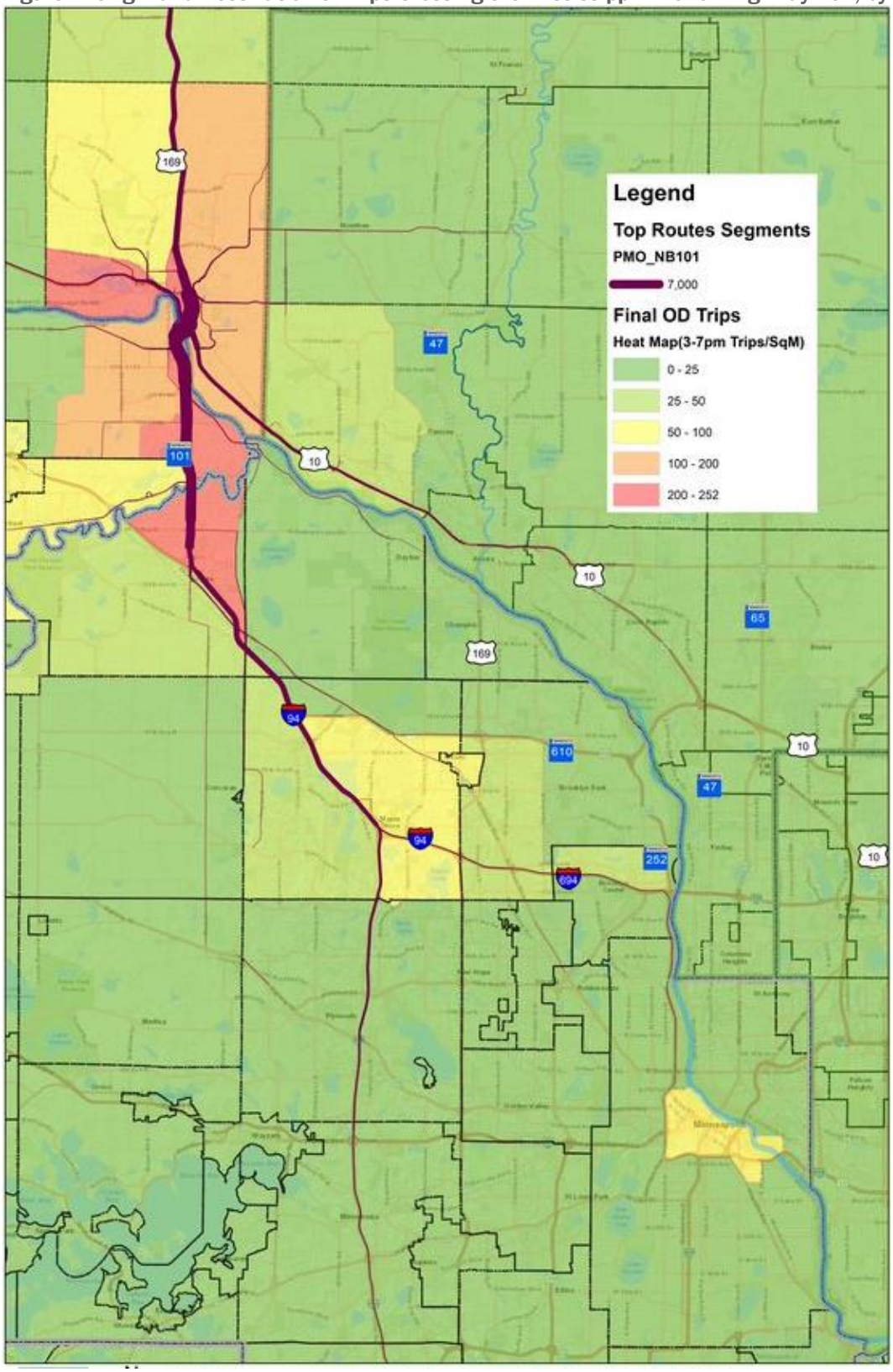


Figure 8: Origin and Destination of Trips Crossing the Mississippi River on Highway 169, by TAZ

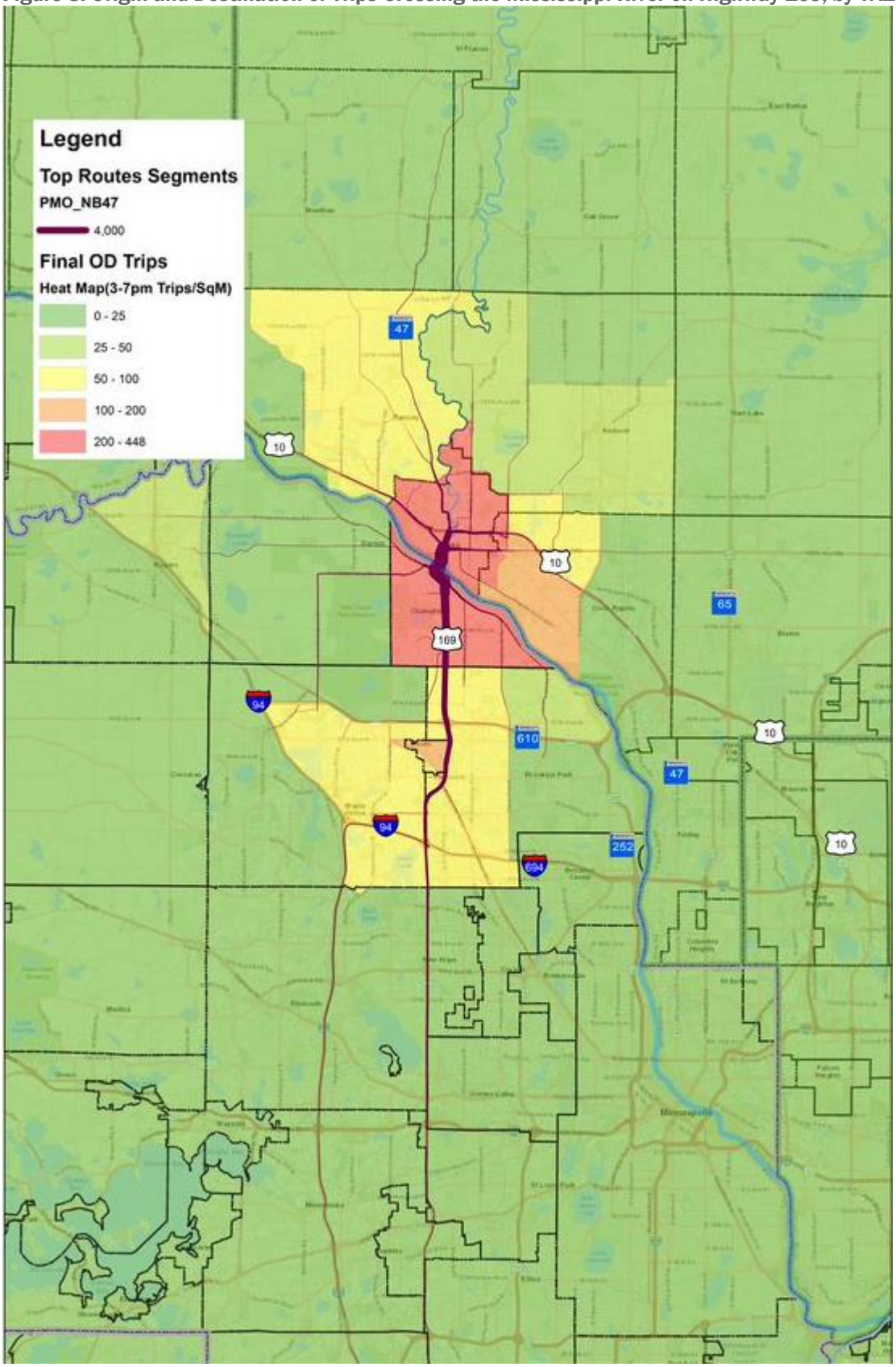
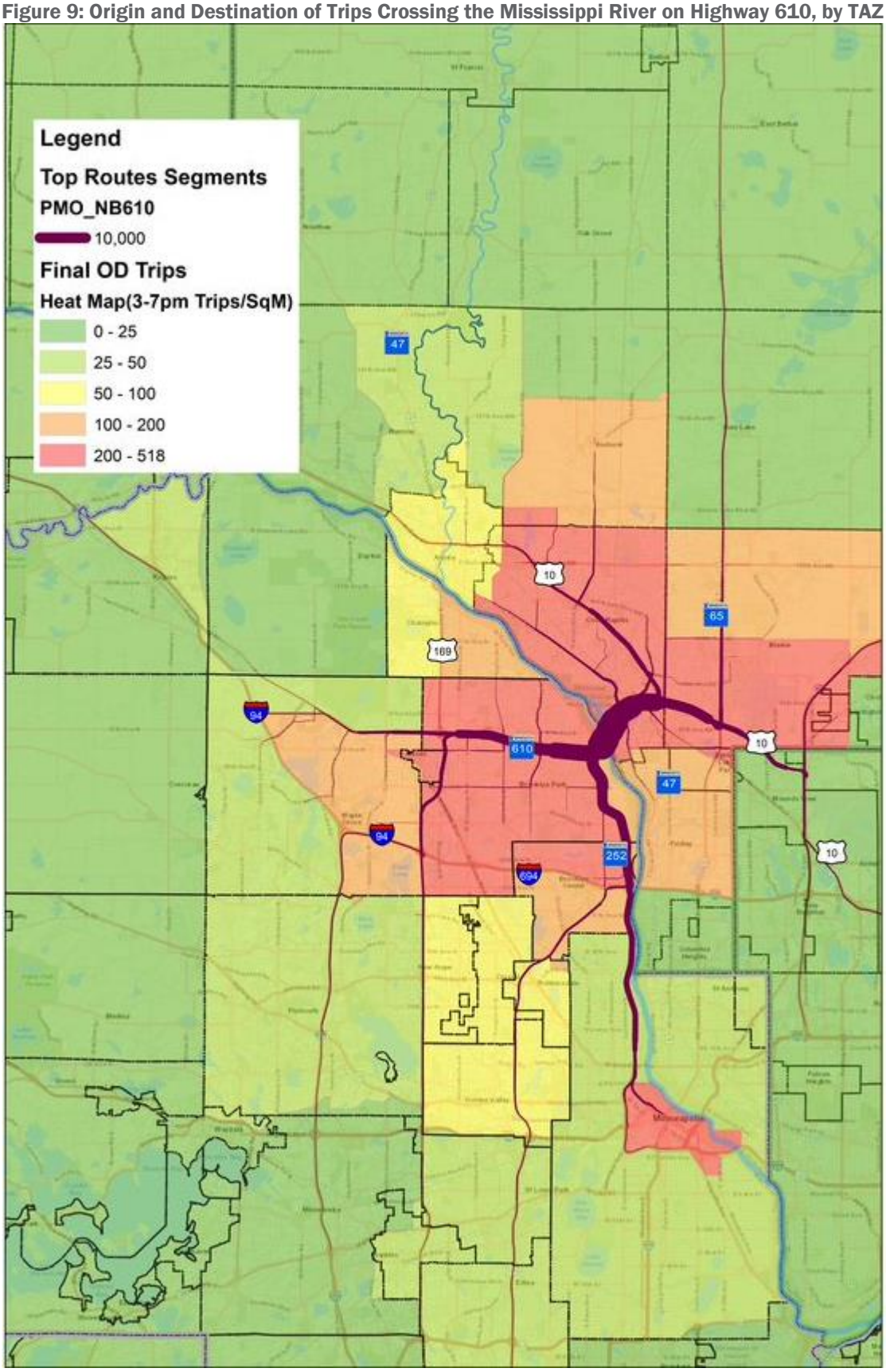


Figure 9: Origin and Destination of Trips Crossing the Mississippi River on Highway 610, by TAZ



Holiday Travel

The OD analysis of trips crossing the Mississippi River in the northwest metro also considered recreational travel on Highway 101. Weekday PM peak period travel was compared to PM peak period travel on the Friday before Memorial Day 2019. This analysis indicated the Highway 101 crossing carries similar trip volumes and patterns on holiday weekends compared to a typical weekend, but average trip length is longer.

Figure 10: Highway 101 Bridge Long-Distance Holiday Trips

Additional Findings

Several additional key findings are summarized below. In addition, detailed OD analysis results are available in Appendix B.

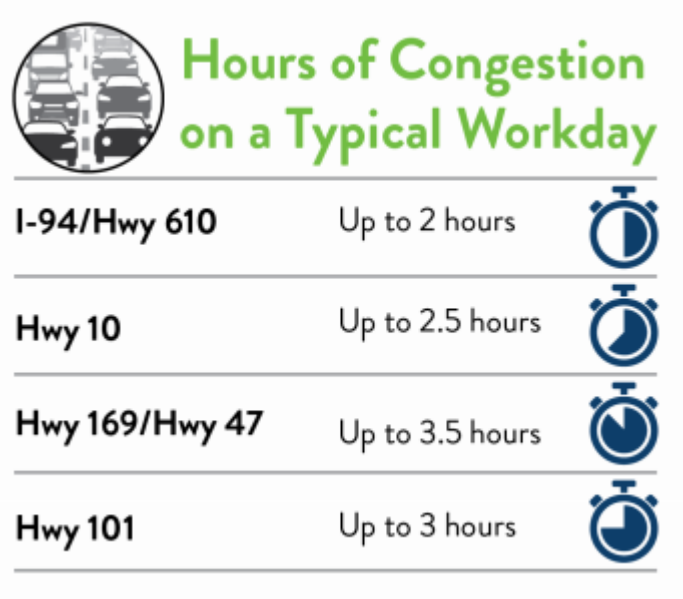
- Mississippi River crossing in the northwest metro carry nearly 240,000 average daily vehicle trips (weekdays in April, September, and October 2019).
- Approximately 70 percent of trips using the crossings serve communities within the immediate river crossing area, while approximately two percent of trips are interregional trips. Most of these interregional trips use the Highway 101 crossing.
- The top five destination cities of trips using northwest metro area crossings are Coon Rapids (9.9 percent), Brooklyn Park (9.7 percent), Blaine (7.3 percent), Elk River (6.7 percent) and Maple Grove (5.9 percent).
- The area between the Highway 610 and Highway 169 crossing has a much higher density of trips crossing the Mississippi River (greater than 700 trips per square mile) than the area located between the Highway 101 and Highway 169 crossing (less than 350 daily trips per square mile).

IV. Congestion Analysis

Traffic congestion is a condition that exists on roadway facilities whenever traffic flows at slower than intended speeds. This condition is caused by bottlenecks, which are locations where travel demand approaches or exceeds roadway capacity. Traffic congestion is a concern because it causes delay to travelers, increases safety risks, reduces highway throughput, and has negative environmental impacts from wasted fuel and increased emissions.

Congestion analysis seeks to understand congestion's extent (where does it occur); intensity (how bad is it); duration (how long does it last); and causes. The congestion analysis performed as part of the Northwest Metro Mississippi River Crossing Feasibility Analysis shows that travelers regularly experience congestion in the study area. The primary causes of regional congestion are high traffic volumes and signal interference at key locations.

Figure 11: Hours of Congestion on a Typical Workday



Methodology

The congestion analysis completed as part of this study uses speed data derived from GPS-enabled devices to locate where and when congestion is happening. The GPS speed data was accessed through MnDOT's subscription to the ClearGuide web platform. This data was collected during the AM and PM peak hours from different days in April, May, September, and October 2019. Speed data was analyzed at both the regional and corridor level. See Appendix C for additional information about how the study's congestion analysis was conducted.

Regional Congestion

A typical workday sees some form of congestion on portions of basically all the state highways in the Northwest Metro study area. Figure 12 and Figure 13 map this congestion and its causes. There is heavy AM and PM congestion in both directions on Highway 169 north of the Mississippi River. This congestion extends south of the river for northbound traffic in the afternoon. There is also heavy AM and PM congestion in both directions on Highway 101 north of the Highway 101/I-94 interchange. In the afternoon, Highway 101 NB is congested north of I-94 and around the Highway 10/101/169 interchange.

Highway 610 is congested at different locations at different times of day. In the AM peak, Highway 610 WB is congested east of the Highway 169/610 interchange and west of the Highway 10/610 interchange. In the PM peak, Highway 610 EB is congested east of the Highway 169/610 interchange. Congestion on I-94 and Highway 10 is driven by commute patterns into and out of the metro core. There is AM peak hour congestion on I-94 EB and PM peak congestion on I-94 WB near the I-94/Highway 610 interchange. The heaviest congestion on Highway 10 occurs during the PM peak west of the Highway 10/Highway 610 interchange.

Figure 12: AM Peak Hour Congestion and Issues

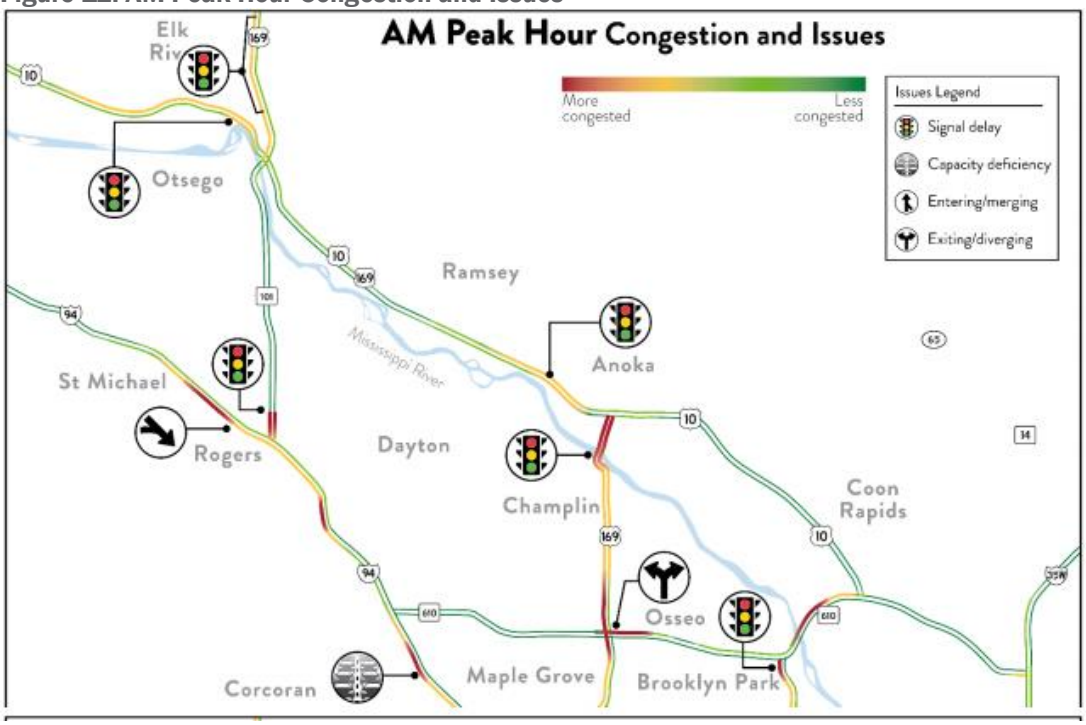
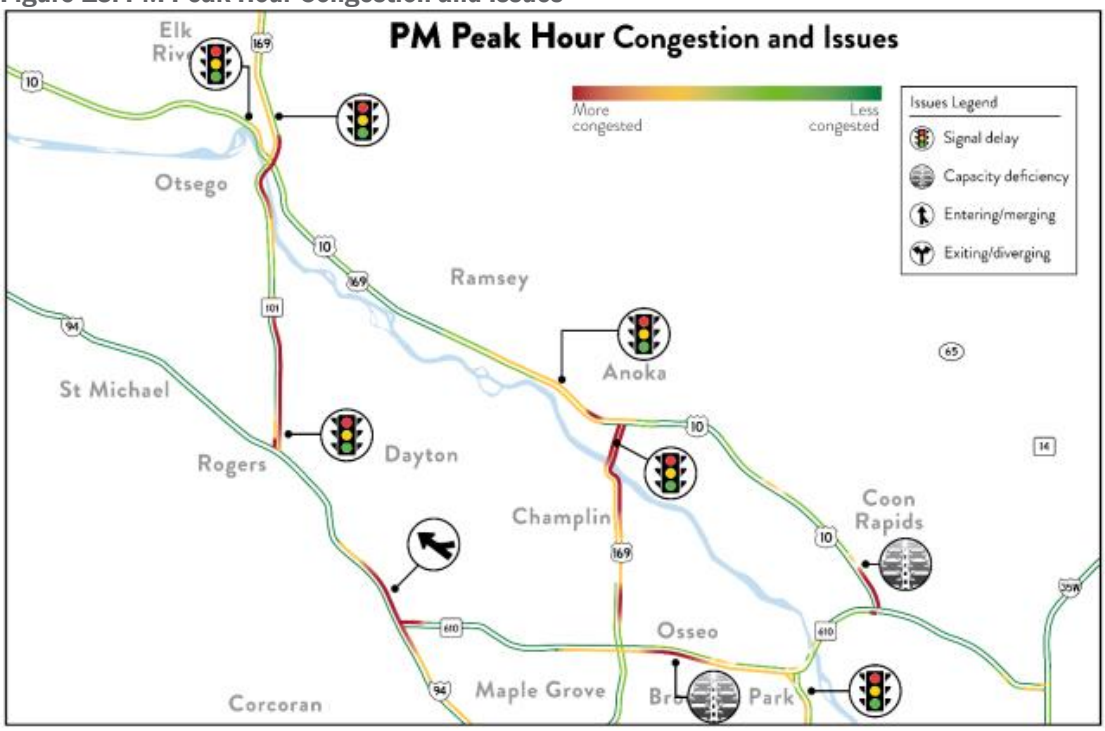


Figure 13: PM Peak Hour Congestion and Issues



Corridor Bottlenecks

Table 2 identifies traffic bottlenecks on major corridors in the northwest metro, along with an approximate congestion duration associated with each bottleneck. The four corridors are:

- I-94/Highway 610 between Highway 241 in St Michael and Highway 65 in Blaine
- Highway between Orono Lake Bridge in Elk River to Highway 65 in Blaine
- Highway 169 between Bunker Lake Blvd in Anoka and Highway 610 in Brooklyn Park
- Highway 101 between 193rd Ave in Elk River and I-94 in Rogers

Freeway bottlenecks on I-94, Highway 610, and Highway 10 are caused by merging and diverging traffic and capacity constraints at key locations. Other bottlenecks in the region are the result of traffic signals. The worst corridor bottlenecks for congestion duration are on Highway 169 SB between Bunk Lake Blvd and Dayton Road, Highway 169 NB between Bunker Lake Blvd. and Hayden Lake Road, and Highway 101 SB between 193rd Ave. and Diamond Lake Road.

Table 2: Traffic Bottlenecks on Major Highway Corridors in the Northwest Metro

Highway Corridors	Dir.	AM Peak	PM Peak
I-94/Hwy 610 between Hwy 241 and Hwy 65	EB	Hwy 101 (2 hours), Hwy 610 (1 hour), Hwy 252 (1.5 hours)	Hwy 252 (2.5 hours)
	WB	Hwy 252 (2 hours), Hwy 169 (1.5 hours)	Hwy 252 (1.5 hours), Zane Ave (1 hour), Hwy 101 (2.5 hours)
Hwy 10 Between Orono Lake Bridge and Hwy 65	EB	Traffic signals in Elk River and congestion (1.5 hours) in Ramsey	Traffic signals in Elk River and congestion (1.5 hours) in Ramsey
	WB	Traffic signals in Elk River and congestion (1 hour) in Ramsey	Traffic signals in Elk River and congestion in Ramsey (2.5 hours) and Coon Rapids (2 hours)
Hwy 169/Hwy 47 between Bunker Lake Blvd and Hwy 610	SB	Traffic signals between Bunker Lake Blvd and Dayton Rd and congestion on Hwy 610 (2 hours)	Traffic signals between Bunker Lake Blvd and Dayton Rd
	NB	Traffic signals between Bunker Lake Blvd and Dayton Rd	Traffic signals and congestion between Bunker Lake Blvd. and Hayden Lake Rd. (3.5 hours); 109th Ave. (1.5 hours)
Hwy 101 Between 193rd Ave and I-94	SB	Traffic signals between 193rd Ave and Hwy 10 and congestion at Diamond Lake Rd (3 hours)	Traffic signals between 193rd Ave and Hwy 10 and at Diamond Lake Rd
	NB	Traffic signals at Diamond Lake Rd and between 193rd Ave and Hwy 10	Traffic signals at Diamond Lake Rd and congestion between 193rd Ave and Hwy 10 (2 hours)

Hours of congestion provided in parenthesis for bottlenecks caused by traffic movements and capacity constraints

Holiday Congestion

Holiday weekend traffic increases the extent, severity, and duration of congestion on highways in the northwest metro. It also shifts where congestion occurs, with I-94 and Highway 10 experiencing much more severe congestion on a Friday afternoon before a holiday weekend than during a typical afternoon rush hour. Highway 101 also experiences a significant amount of holiday related congestion due to a four-fold increase in interregional traffic and the traffic signals on Highway 169 north of the Highway 10/101/169 intersection.

Figure 14: Highway 101 Mississippi River Crossing Congestion

V. Concept Development

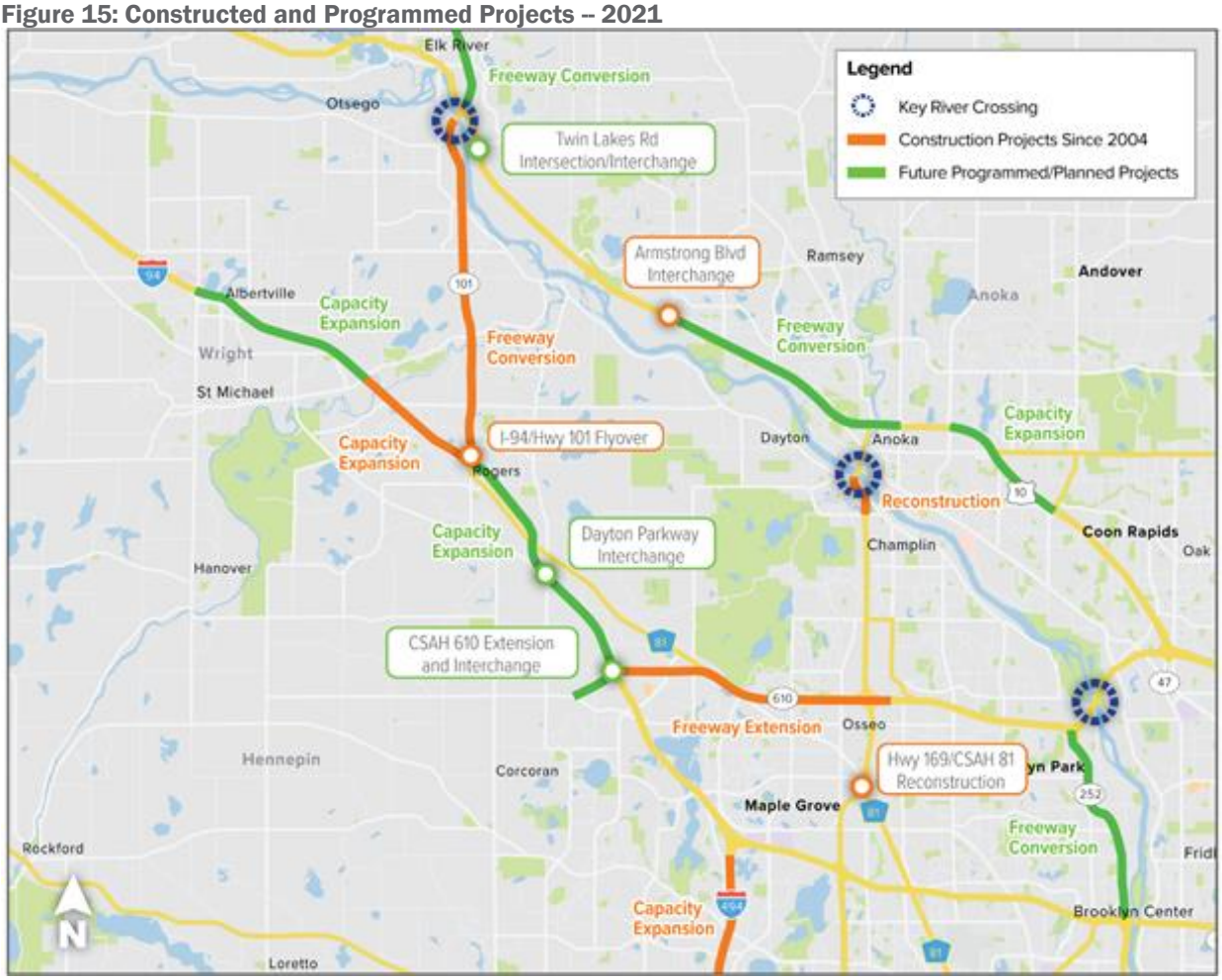
For the purposes of the Northwest Metro Mississippi River Crossing Feasibility Analysis, an improvement refers to a highway enhancement with the potential to improve highway mobility. A concept is a combination of improvements working together to address regional congestion. This section describes the process used to identify improvements and develop improvement concepts. This process has four steps.

- Step 1: Brainstorm ideas.
- Step 2: Narrow the range of feasible improvements.
- Step 3: Develop improvement concepts.
- Step 4: Review concept effectiveness.

Step 1: Brainstorm Ideas

The first step in the concept development process was to brainstorm ways to meet demand for north-south trips across the Mississippi River in the northwest metro. This brainstorm considered potential improvements to existing corridors as well as new river crossings, some consistent with those that were reviewed in the 2004 Northwest Metro Corridor and River Crossing Scoping Decision Document. The feasibility analysis team also reviewed construction projects in the region as shown in Figure 15. Accounting for programmed projects, the analysis assumed three expressway segments in the study area would remain in 2040: Highway 10/169 from Elk River to Ramsey, Highway 101 southbound in Rogers, and Highway 169 from Anoka to Champlin.

Figure 15: Constructed and Programmed Projects – 2021



A total of 14 ideas were put forward at this stage in the feasibility analysis. Nine ideas were improvements to existing corridors, and five ideas were new river crossings. As shown in Figure 16 and Table 3, the ideas included high and low-cost alternatives at two locations: Highway 10 from Ramsey to Elk River and the Highway 101/I-94 interchange. Asterisks indicate the status of improvements in the planning process. One asterisk indicates the location is under study (outside of this study). Two asterisks indicate a project in design.

Figure 16: Range of Possible Improvements on Highway Corridors in the Northwest Metro

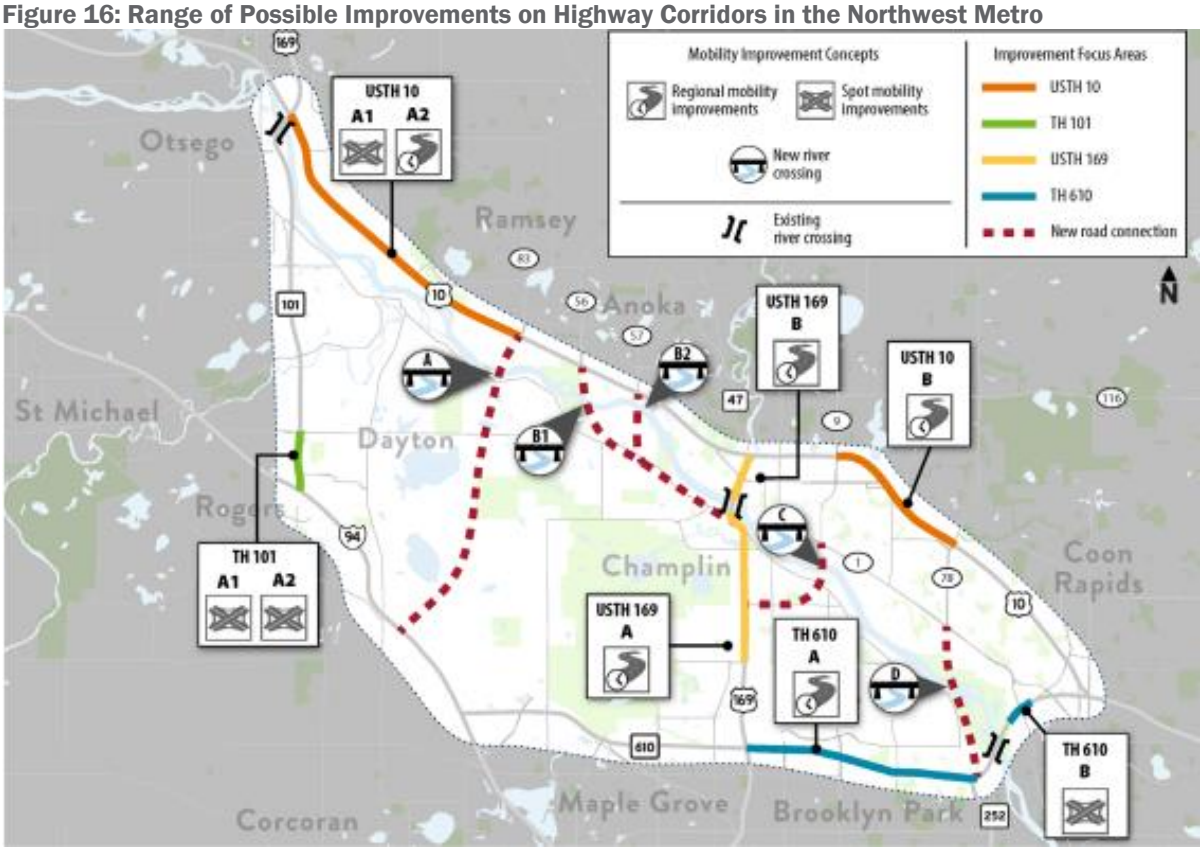


Table 3: Range of Possible Improvements on Highway Corridors in the Northwest Metro

Highway	Improvement	Start	End
Highway 10	A1. At grade improvements*	Armstrong Blvd. (Ramsey)	Hwy 101 (Elk River)
	A2. Grade separated corridor*	Armstrong Blvd. (Ramsey)	Hwy 101 (Elk River)
	B. Lane addition**	Hanson Blvd. (Coon Rapids)	Round Lake Blvd. (Elk River)
Highway 101	A1. Diverging Diamond Conversion	Hwy 101/I-94 interchange	Hwy 101/I-94 interchange
	A2. Hwy 101 SB to I-94 EB flyover	Hwy 101/I-94 interchange	Hwy 101/I-94 interchange
Highway 610	A. Mobility improvement	Hwy 169 (Maple Grove)	Hwy 252 (Brooklyn Park)
	B. Hwy 610/E River Rd Interchange	Hwy 610/E River Rd interchange	Hwy 610/E River Rd interchange
Highway 169	A. Mobility improvement	101st Ave.	W. River Road
	B. Mobility improvement	W. River Road	Hwy 10
New River Crossing	A. Zanzibar/Armstrong Alignment	Hwy 10/169 and Armstrong Blvd	I-94 and Dayton Pkwy
	B1. Ramsey Blvd. Alignment	Hwy 10/169 and Ramsey Blvd	Hwy 169 (south of river)
	B2. Sunfish Lake Blvd. Alignment	Hwy 10/169 and Sunfish Lake Blvd.	Hwy 169 (south of river)
	C. Round Lake Blvd. Alignment	Hwy 10 and Round Lake Blvd.	Hwy 169 (south of river)
	D. Hwy 252 Ext. to Hanson Blvd.	Hwy 10 and Hanson Blvd.	Hwy 252/610

* Location under study; ** Project in design

Step 2: Narrow the Range of Feasible Improvements

Having considered the mobility impacts of MnDOT's capital program and identified a range of possible improvements to the future highway network, the next step in the analysis was to evaluate the feasibility of improvement ideas on four factors:

1. *Will it improve traffic flow across the Mississippi River?* Traffic modeling was conducted to determine how well a potential concept would improve congestion and traffic flow.
2. *Is the project consistent with local and regional plans?* Each potential improvement was considered based on city and county comprehensive plans, regional plans, and projects in the area planned or currently under construction.
3. *What is the residential and community impact?* Concepts were evaluated based on right of way needs for the project and the potential for residential and commercial property acquisition and disruption.
4. *What is the impact to natural resources?* Each concept was evaluated based on effects to local parks, lakes, and the Mississippi River.

This analysis eliminated seven ideas from further analysis. The eliminated ideas included both mobility improvement ideas on Highway 169 and all new river crossings except for the Zanzibar/Armstrong Alignment. These improvements were eliminated from consideration due to inconsistency with local plans and the likelihood for high residential, community, and natural resource impacts. In addition, the Highway 610/East River Road Interchange was eliminated from further analysis because it was found to be a local access improvement, not a regional mobility improvement.

Table 4 summarizes the results of the screening analysis to narrow the overall list of improvements to the range of feasible improvements. This shows the assessment of each of the four factors shown above, and concludes with the determination of locations carried forward or eliminated with a "thumbs up" or "thumbs down", respectively.

Table 4: Feasibility Assessment of Possible Improvements to MnDOT Highways in Study Area

		Range of Possible Improvements	Improves traffic flow across Mississippi River	Consistent with local & regional planning	Potential residential & community impacts	Natural resources impact considerations	Eligible for inclusion in Concept Development
	NO BUILD		✗	✗	▮▮▮	▮▮▮	👍
I-94	Do nothing		✗	✓	▯▯▯	▯▯▯	👎
USTH 10	USTH 10 A1*	**Ramsey to Elk River** - Spot mobility improvements from Armstrong Blvd (Ramsey) to TH 101 (Elk River) | (6 miles)	✓	✓	▮▯▯	▮▯▯	👍
USTH 10	USTH 10 A2*	**Ramsey to Elk River** - Convert to 4-lane grade-separated corridor from Armstrong Blvd (Ramsey) to TH 101 (Elk River) | (6 miles)	✓	✓	▮▮▯	▮▯▯	👍
USTH 10	USTH 10 B**	**Coon Rapids Lane Add** - Add lane from Hanson Blvd to Round Lake Blvd (2.5 miles)	✓	✓	▮▯▯	▮▯▯	👍
TH 101	TH 101 A1	**TH 101 SB Capacity Improvements** - Signals remain. Ideas include adding an additional right turn lane dedicated to WB I-94 or I-94 interchange could be converted to a DDI	✓	✓	▮▯▯	▮▯▯	👍
TH 101	TH 101 A2	**SB 101/94 System Interchange Improvements** - Introduce a southbound TH 101 to eastbound I-94 flyover	✓	✓	▮▮▯	▮▯▯	👍
TH 610	TH 610 A***	**TH 610 Mobility Improvement** - From TH 169 to TH 252 (4 miles)	✓	✗	▮▯▯	▮▯▯	👍
TH 610	TH 610 B	**TH 610 East River Rd Interchange** - Reconfigure interchange to provide full movements (today ramps only on west side)	✗	✓	▮▮▯	▮▯▯	👎
	USTH 169 A***	**USTH 169 Mobility Improvement** - 101st to W. River Road (3 miles)	✓	✗	▮▮▮	▮▮▯	👎
	USTH 169 B***	**USTH 169 Mobility Improvement** - West River Road to TH 10 (1.5 miles)	✓	✗	▮▮▮	▮▮▯	👎
NEW RIVER CROSSING	A	**Zanzibar/Armstrong Alignment**	✓	✓	▮▮▯	▮▮▯	👍
NEW RIVER CROSSING	B1	**TH 169 to Ramsey Blvd Alignment**	✓	✗	▮▮▮	▮▮▮	👎
NEW RIVER CROSSING	B2	**TH 169 to Sunfish Lake Blvd Alignment**	✓	✗	▮▮▮	▮▮▮	👎
NEW RIVER CROSSING	C	**TH 169 to 117th Ave to Round Lake Blvd Alignment**	✓	✗	▮▮▮	▮▮▮	👎
NEW RIVER CROSSING	D	**TH 252 Extension to Hanson Blvd Alignment**	✓	✗	▮▮▮	▮▮▮	👎

Table 5 identifies improvements advanced for further feasibility analysis. Additional description of each improvement is provided in the pages that follow.

Table 5: Feasible Improvements on Highway Corridors in the Northwest Metro

Highway	Improvement	Start	End	Total Project Cost	
				L	H
Highway 10	A1. At grade improvements	Armstrong Blvd. (Ramsey)	Hwy 101 (Elk River)	$22M	$38M
	A2. Grade separated corridor	Armstrong Blvd. (Ramsey)	Hwy 101 (Elk River)	$115M	$290M
	B. Lane addition	Hanson Blvd. (Coon Rapids)	Round Lake Blvd. (Elk River)	$36M	$36M
Highway 101	A1. Diverging Diamond Conversion	Hwy 101/I-94 interchange	Hwy 101/I-94 interchange	$22M	$26M
	A2. Hwy 101 Southbound to I-94 Eastbound flyover	Hwy 101/I-94 interchange	Hwy 101/I-94 interchange	$107M	$129M
Highway 610	A. Mobility improvement	Hwy 169 (Maple Grove)	Hwy 252 (Brooklyn Park)	$8M	$35M
New River Crossing	A1. Arterial crossing using Zanzibar/Armstrong Alignment	Hwy 10/ Armstrong Blvd interchange	I-94 at the Dayton Pkwy interchange	$170M	$250M
	A2. Expressway crossing using Zanzibar/Armstrong Alignment	Hwy 10/ Armstrong Blvd interchange	I-94 at the Dayton Pkwy interchange	$190M	$250M

* Total Project Cost presented in year 2030 dollars

Highway 10

Highway 10 is a 6-lane freeway from I-35W to Hanson Boulevard, a 4-lane freeway from Hanson Boulevard to Fairoak Avenue, then a 4-lane expressway to Highway 169. The segment between Armstrong Boulevard to Fairoak Avenue will be converted to a freeway in the next four years. Two segments of Highway 10 were chosen for concept development.

- Segment A: 4-lane expressway from Armstrong Boulevard to the Highway 10/101/169 intersection, approximately 5.4 miles long and currently part of an Elk River led study.
- Segment B: 4-lane freeway from Hanson Boulevard to Round Lake Boulevard, approximately 2.8 miles long.

Highway 10-A1: At-grade improvements.

The Highway 10-A1 concept modifies and consolidates existing intersections and constructs a 2.5-mile frontage road to maintain local access to the highway. The lower cost assumes the five busiest intersections are converted to RCUTs and the other intersections become right-in-right-out. The higher cost assumes all seven intersections in the corridor become signalized.

Highway 10 is not assumed to be reconstructed in this concept. Frontage roads and associated right-of-way were estimated based on a 36' wide urban frontage road system that utilizes existing roads to connect businesses and residential areas to major intersections.

Figure 17: Highway 10-A1: At-Grade Improvements

Highway 10-A2: Grade-Separated Corridor

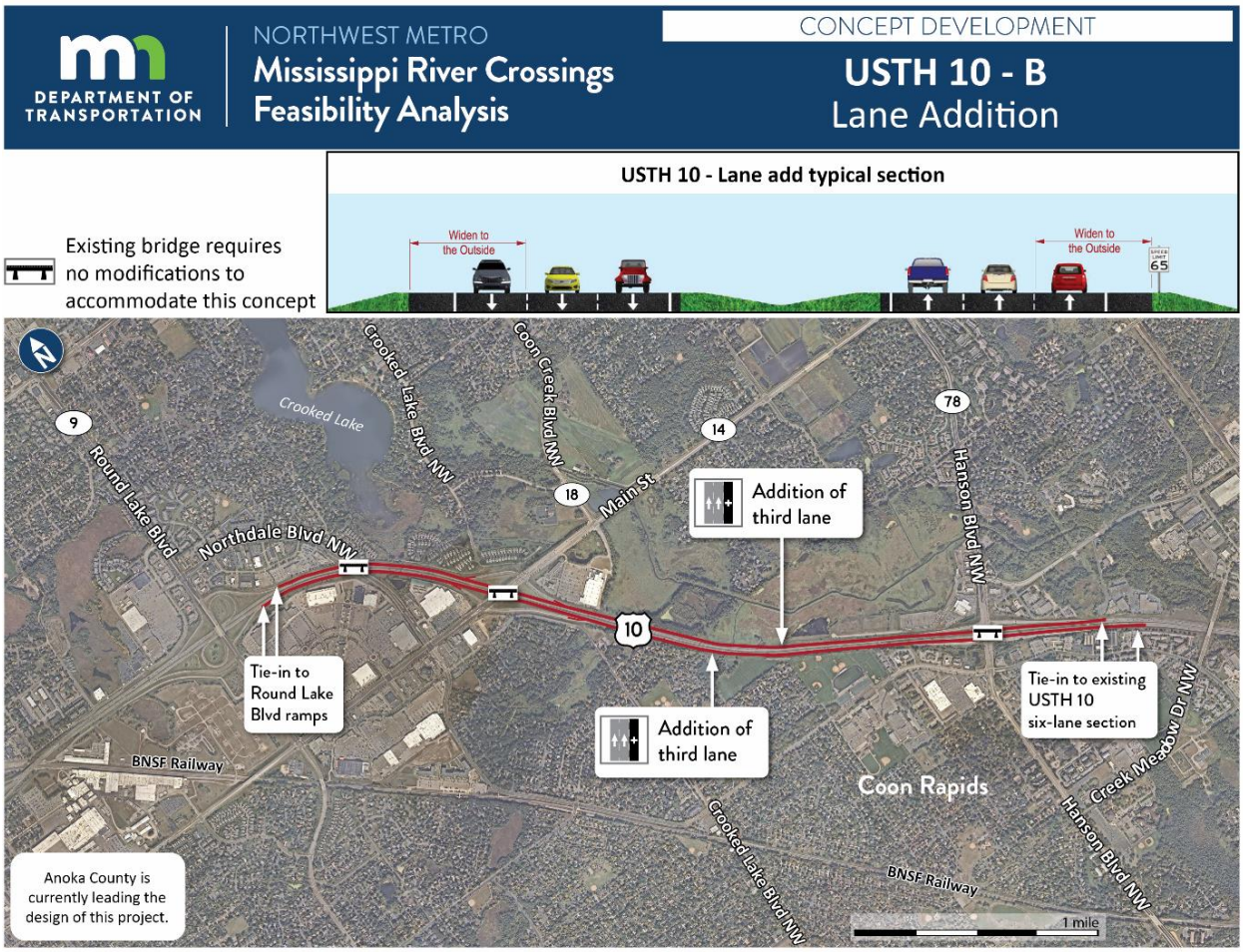
Highway 10-A2 includes a full reconstruction of Highway 10 from Armstrong Boulevard to the Highway 10/101/169 interchange. The typical roadway section matches the segment under design east of Armstrong Boulevard, a four-lane freeway with median barrier. This concept also includes the construction of two interchanges and 2.5 miles of frontage road to maintain local access to the new freeway. The cost for the interchanges including bridges, retaining wall, earthwork, drainage, and right of way needs were taken from the Ramsey Boulevard/Highway 10 interchange cost estimate. Improvements to the existing rest stop assume extensions of ramps in the lower cost option and an interchange construction in the higher cost option based on previous cost estimates. Frontage roads and associated right-of-way were estimated similarly to the Highway 10-A1 Concept.

Figure 18: Highway 10-A2: Grade-Separated Corridor

Highway 10-B: Lane Addition

Highway 10-B is the construction of a third lane in each direction of Segment B. The cost estimate was previously completed by Anoka County, which includes the construction of an outside lane and shoulder with associated grading, retaining walls, minor interchange modifications, and noise walls.

Figure 19: Highway 10-A2: Lane Addition



Highway 101

Highway 101 is generally a four-lane freeway connecting I-94 in Rogers, MN to Highway 169 in Elk River. Southbound Highway 101 is signalized in Rogers, at the interchange ramps and South Diamond Lake Road. The interchange of I-94 and Highway 101 is a diamond interchange with a free movement for the westbound I-94 to northbound Highway 101 movement with a flyover for the South Diamond Lake Road intersection and loop ramp for the southbound Highway 101 to eastbound I-94 movement.

Highway 101-A1: Diverging Diamond Conversion

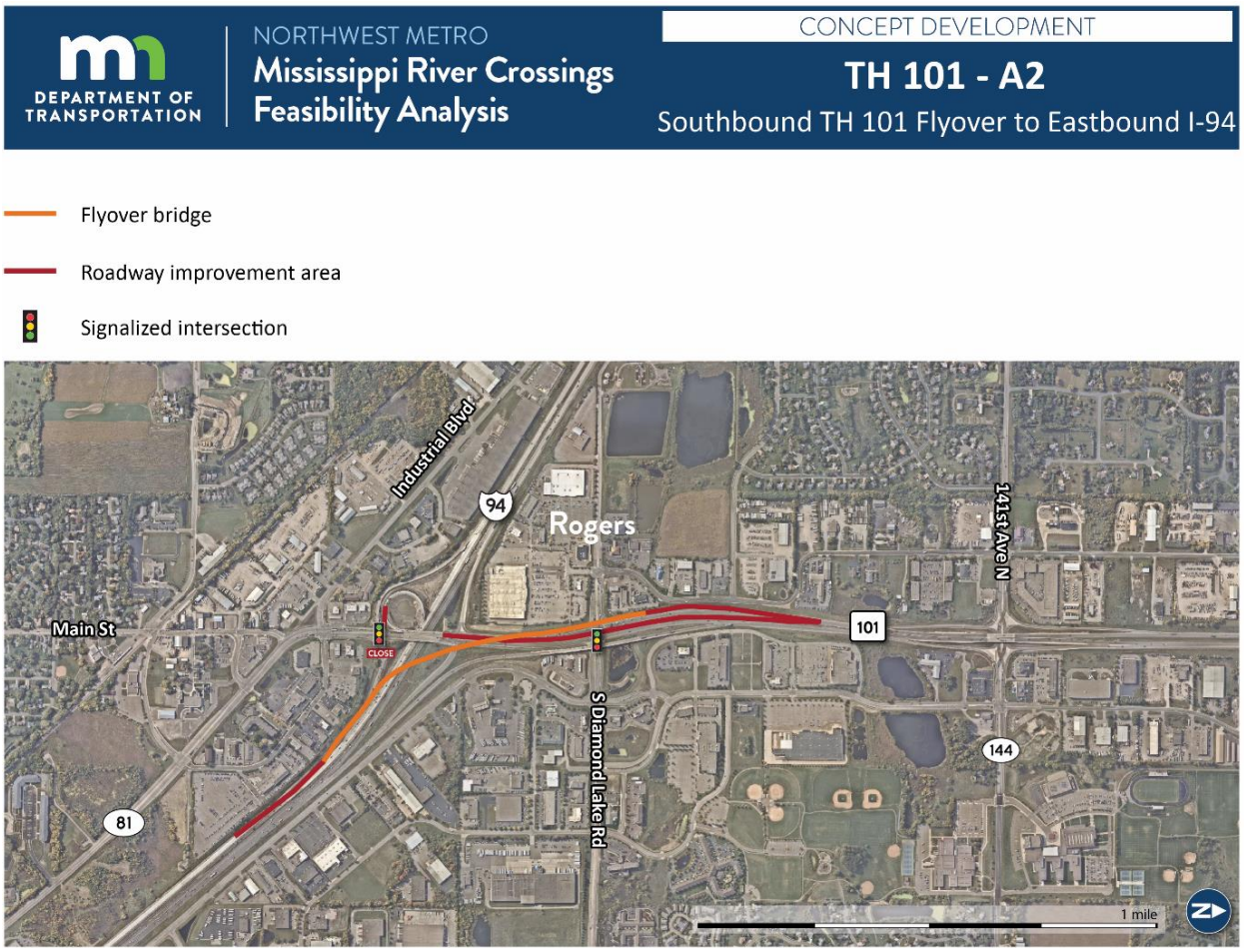
Highway 101-A1 converts the existing interchange into a diverging diamond interchange. This concept, which was previously studied by SRF, would re-deck the existing bridge, reconstruct portions of the ramp, and leave the existing eastbound to northbound free movement.

Figure 20: Highway 101-A1: Diverging Diamond Conversion

Highway 101-A2: SB Highway 101 to EB I-94 Flyover Ramp

Highway 101-A2 includes construction of a flyover ramp for southbound Highway 101 from north of South Diamond Lake Rd to eastbound I-94. This includes the construction of a 35-foot wide, 3,425-foot long flyover bridge requiring long curved steel beams along the structure and retaining walls to limit earthwork and right-of-way acquisition. Adjustments would be made to the existing interchange including removal of the existing northbound to eastbound on ramp and modifications to the southbound to eastbound loop ramp to accommodate NB and SB traffic with a signal. Low and high-cost estimates differ primarily on risks associated with the flyover bridge design.

Figure 21: Highway 101-A2: SB Highway 101 Flyover to EB I-94



Highway 610

Highway 610 is a four-lane freeway west of Highway 252 and six-lane freeway east of Highway 252. Highway 610 connects Highway 10 and I-94 through Blane, Coon Rapids and Maple Grove.

Highway 610 - A: Mobility Improvement

A wide range of concepts are recommended for future consideration for this corridor. This study has recommended an undetermined mobility improvement for Highway 610 between Highway 169 and Highway 252. Improvements to be considered in the future include active traffic management, spot mobility, MnPASS, and strategic capacity. Improvements to this corridor have not been previously identified in local or regional plans. For purposes of this study, the high estimate assumed a lane would be added in each direction between the Highway 169/610 and Highway 252/610 interchanges. The as-built plans show Highway 610 has been pre-graded for an additional lane in this area. The bridges were also built to accommodate the additional outside lane. The project would remove existing outside shoulders and replace with a 12-foot lane and 8-foot shoulder using existing subgrade and relocated overhead signs. The high-end cost estimate assumes the need for a potential retaining wall on each bridge to minimize right-of-way and drainage impacts.

Figure 22: Highway 610 – A1: Mobility Improvement

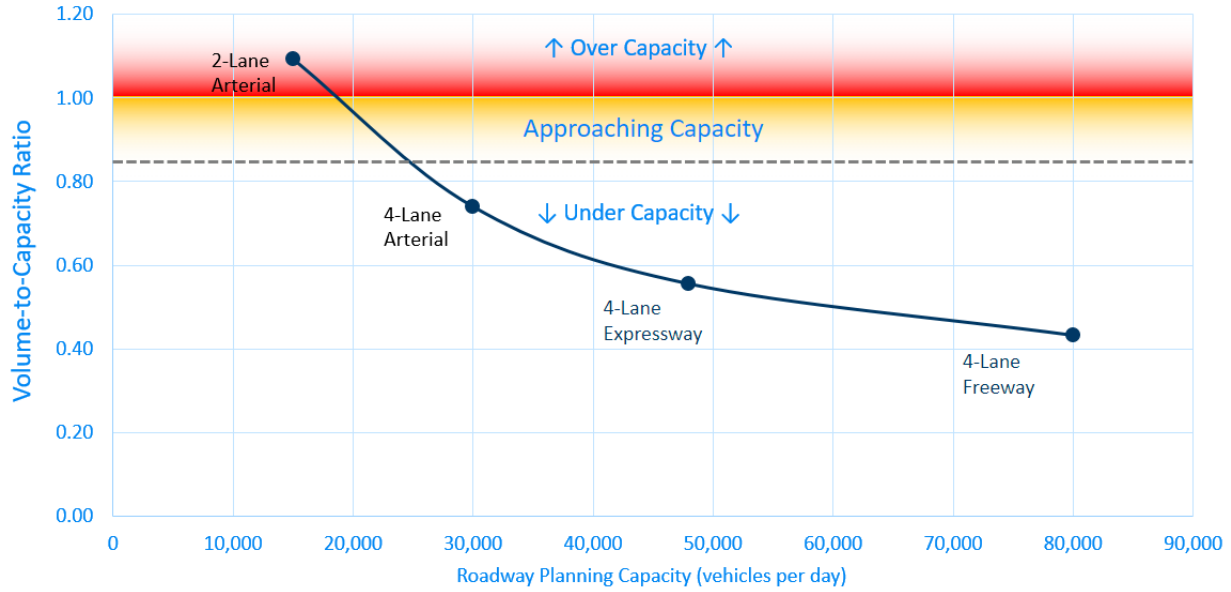
New River Crossing

The new river crossing alignment chosen for concept development connects Highway 10 at the Armstrong Boulevard interchange and I-94 at the Dayton Parkway interchange by way of Zanzibar Lane. This alignment necessitates about six miles of new roadway including the construction of a bridge in each direction over the Mississippi River. It assumes six major intersections along the corridor. A small box culvert is assumed over Diamond Creek and a pedestrian underpass to connect proposed commercial development in the north section of the project. Based on traffic analysis, two typical section concepts were chosen for this roadway called New River Crossing – A1 and New River Crossing – A2.

New River Crossing Capacity

A variety of facility types were evaluated for the new river crossing concept, including an arterial, expressway, and freeway. This evaluation centered on comparisons of projected 2040 traffic volumes to planning level facility capacities. Figure 23 shows the projected volume-to-capacity ratios for a two-lane arterial, a four-lane arterial, a four-lane expressway, and a four-lane freeway facility type. On the basis of this analysis, the project team eliminated a two-lane arterial facility (over capacity) and a four-lane freeway facility (significantly under capacity) from further consideration.

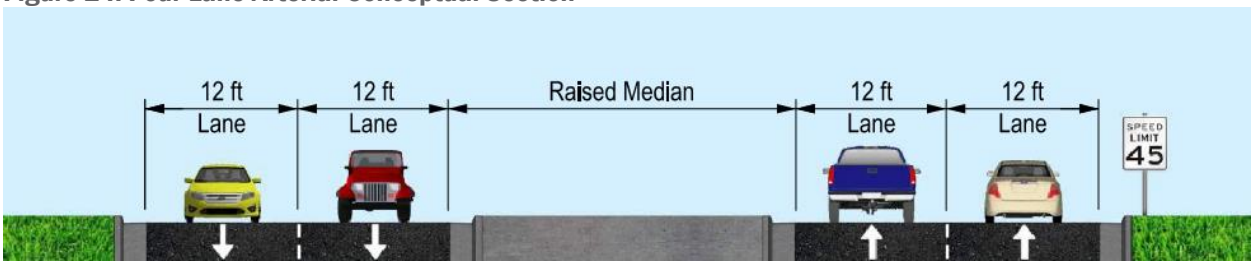
Figure 23: Planning-Level Capacity Needs for New River Crossing



New River Crossing – A1

New river crossing – A1 includes the construction of a 4four-lane urban divided arterial roadway along the proposed alignment. right-of-way needs were assumed to be 120-foot' wide to account for possible trails on each side and room for utilities. Low and high costs differ based on material and land cost ranges. The roadway itself was assumed to have a 45–mph speed limit and meet MnDOT standards shown in the figure below. Intersections along the arterial roadway were assumed to be spaced a minimum of one-quarter mile apart. Example intersection types include restricted crossing U-Turn intersections (RCUTs), traffic signalized intersections, side road stop intersections, Green-T intersections, or roundabouts.

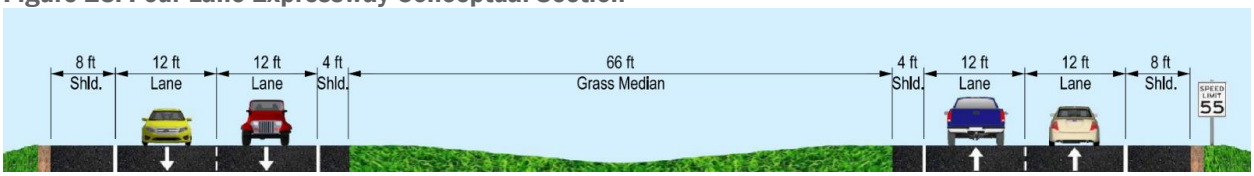
Figure 24: Four-Lane Arterial Conceptual Section



New River Crossing – A2

New river crossing – A2 includes the construction of a four-lane rural divided expressway along the proposed alignment. Right-of-way needs were assumed to be 160-foot' wide to account for grading and required clear zone. Low and high costs differ based on material and land cost ranges. The roadway was assumed to have a 55-mph speed limit and meet MnDOT standards shown in the figure below. Intersections along the expressway were assumed to be spaced a minimum of one-half mile apart. Example intersection types include restricted crossing U-Turn intersections (RCUTs), traffic signalized intersections, Green-T intersections, roundabouts, and grade separated side road crossings.

Figure 25: Four-Lane Expressway Conceptual Section



Step 3: Develop Improvement Concepts

The third step in the concept development process was to package feasible improvements into improvement concepts that could be evaluated for regional traffic impacts and cost effectiveness. This step produced four improvement concepts – two concepts comprised of improvements to existing highways, and two concepts that included a new river crossing following the Zanzibar/Armstrong alignment. Concepts comprised of improvements to existing highways were developed to assess improvement in north-south traffic movements relative to the option of building a new river crossing.

The Northwest Metro Mississippi River Crossing Feasibility Analysis concepts were identified as follows:

- Concept 1: Mobility improvements on Highway 10 and Highway 101
- Concept 2: Mobility improvements on Highway 10, Highway 101, and Highway 610
- Concept 3: Arterial Mississippi River crossing following the Zanzibar/Armstrong alignment
- Concept 4: Expressway Mississippi River crossing following the Zanzibar/Armstrong alignment

Concept 1: Mobility Improvements on Highway 10 and Highway 101

Concept 1 focuses investment on the existing system north of the Mississippi River. On Highway 10, the concept provides grade separation on the remaining expressway portion in Ramsey and Elk River. The concept also includes the Coon Rapids Lane add and the diverging diamond interchange conversion on Highway 101 at I-94.

Figure 26: Concept 1 – Mobility Improvements on Highway 10 and Highway 101

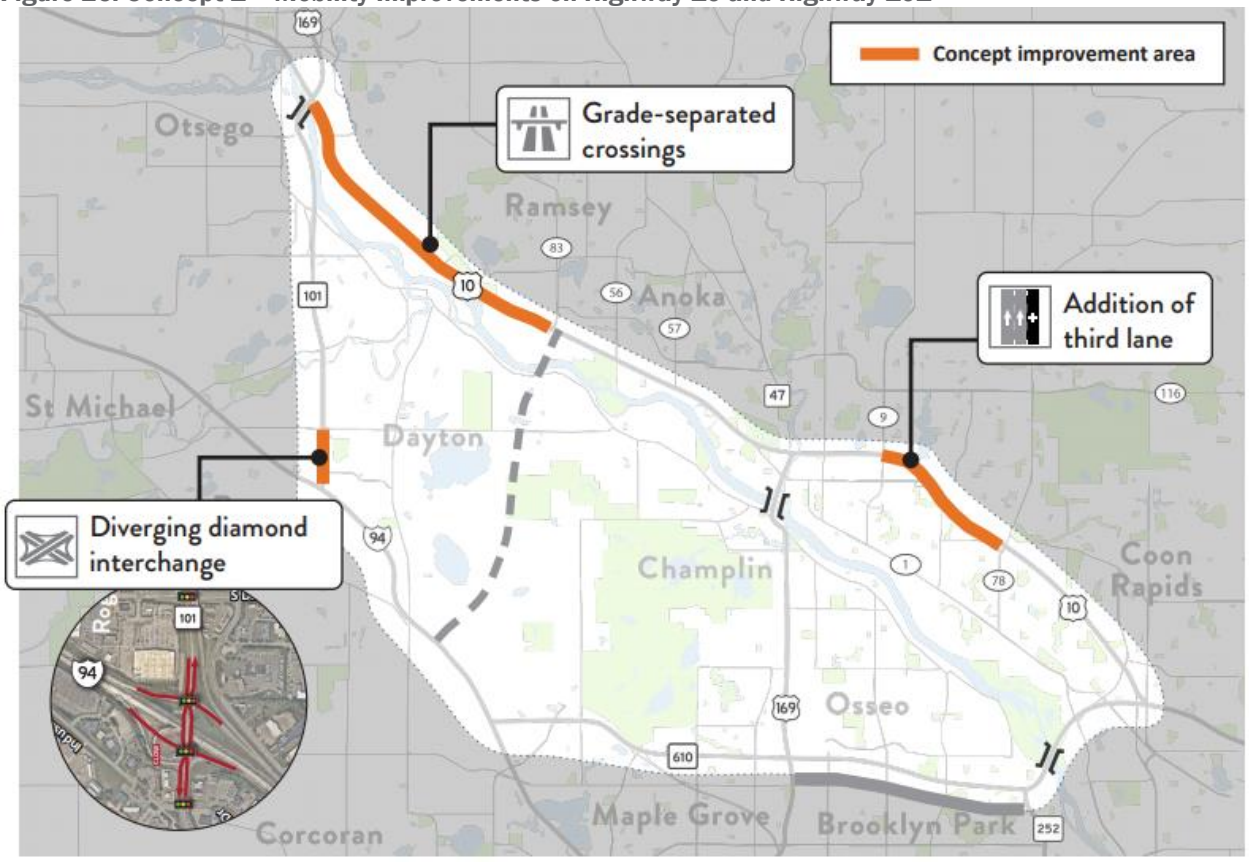


Table 6: Concept 1 Improvement Details and Cost Range

Highway	Improvement	Segment	Total Project Cost (2030 dollars)
Highway 10	Grade separated crossing	Hwy 169 (Elk River) to Armstrong Blvd. (Ramsey)	$115M – $290M
Highway 10	Lane addition	EB and WB lane add from Hanson Blvd. to Round Lake Blvd.	$36M
Highway 101	Diverging diamond interchange	Diverging diamond interchange at Hwy 101 and I-94	$22M – $26M
Net Cost			$175 – $350M

Concept 2: Mobility Improvements on Highway 10, Highway 101, and Highway 610

Concept 2 also focuses investment on the existing system. The expressway portion of Highway 10 will have at-grade improvements in Elk River and Ramsey. This concept also includes the Coon Rapids Lane add. This concept includes the southbound flyover from Highway 101 to eastbound I-94 and a mobility improvement on Highway 610.

Figure 27: Concept 2 – Mobility Improvements on Highway 10, Highway 101, and Highway 610

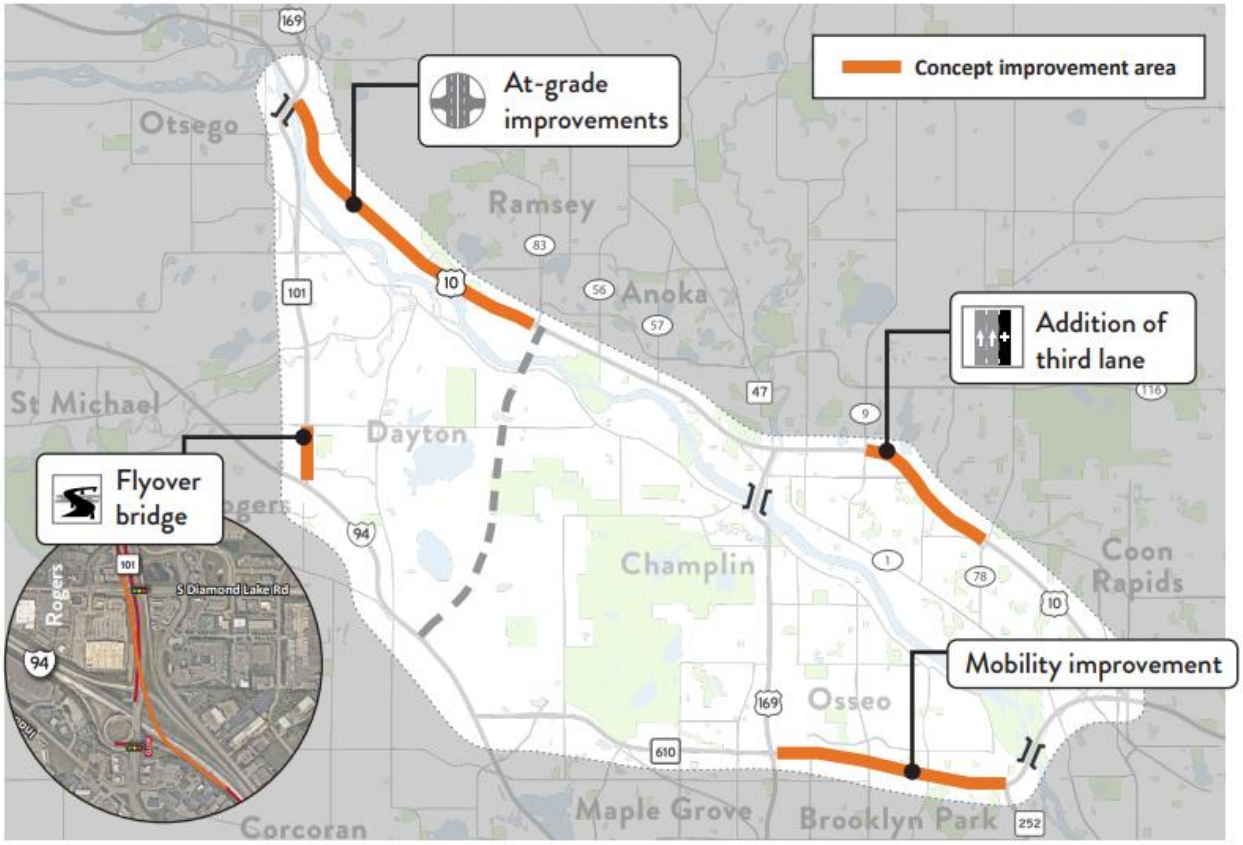


Table 7: Concept 2 Improvement Details and Cost Range

Highway	Improvement	Segment	Total Project Cost (2030 dollars)
Highway 10	At-grade improvements	Hwy 169 (Elk River) to Armstrong Blvd. (Ramsey)	$22M – $38M
Highway 10	Lane addition	EB and WB lane add from Hanson Blvd. to Round Lake Blvd.	$36M
Highway 101	Flyover	SB Hwy 101 to EB I-94 flyover, including realignment of Hwy 101	$107M -- $129M
Highway 610	Mobility improvement	Improvement undetermined. Consider active traffic management, spot mobility, MnPASS, and strategic capacity	$8M -- $35M
Net Cost			**$175 – $240M**

Concept 3: Four-lane Arterial River Crossing

Concept 3 is the first of two concepts involving a new Mississippi River crossing on the Zanzibar/ Armstrong alignment. Concept 3 consists of a four-lane urban divided arterial with a 120-foot right-of-way and a minimum one-quarter mile spacing between at-grade intersections. The concept assumes a 45-mph design speed and a 560-foot bridge span.

Figure 28: Concept 3 – Four-lane Arterial Following Zanzibar/Armstrong Alignment

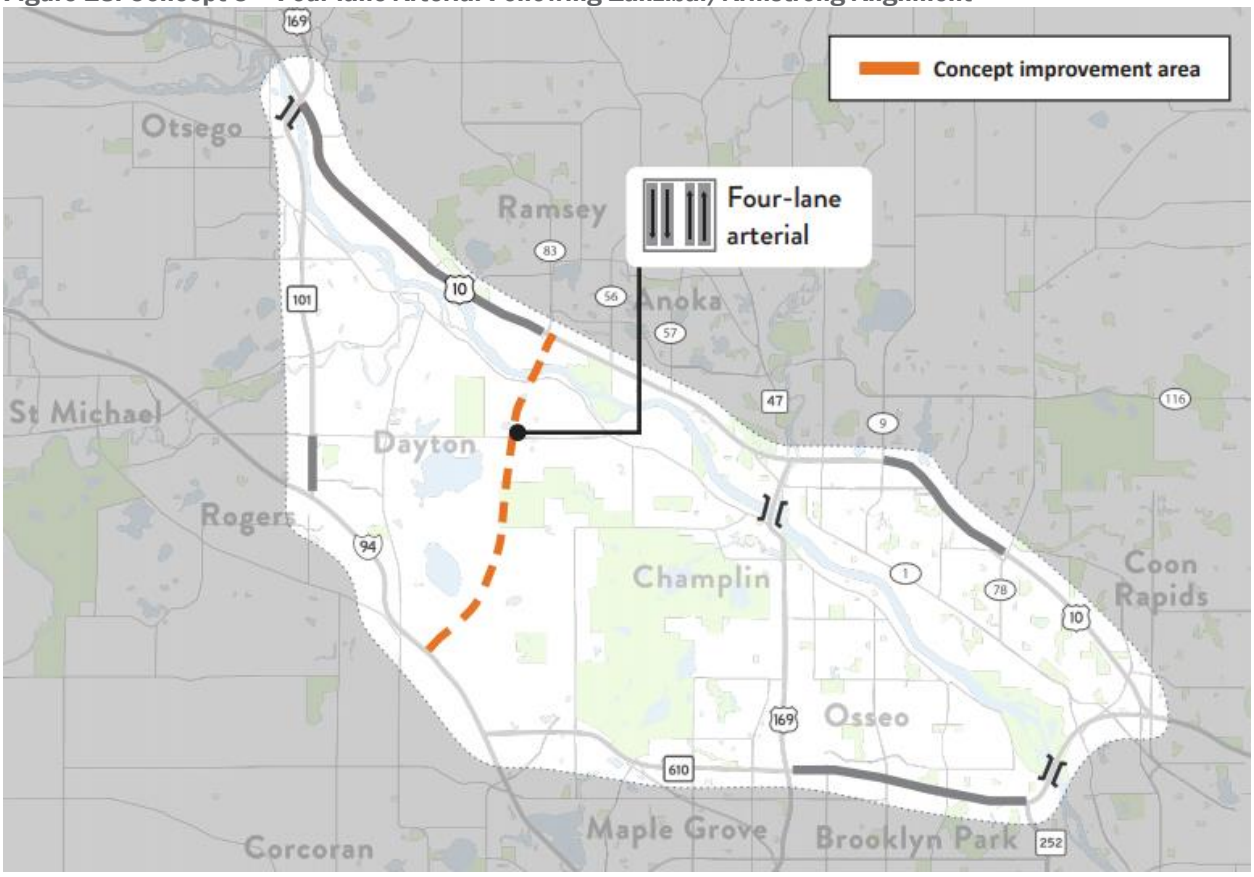


Table 8: Concept 3 Improvement Details and Cost Range

Improvement	Segment	Total Project Cost (2030 dollars)
New River Crossing	New river crossing designed as a 4-lane arterial roadway between I-94 to Highway 10	$170M – $250M
Net Cost		$170 – $250M

Concept 4: 4-Lane Expressway River Crossing

Concept 4 is the second of two concepts involving a new Mississippi River crossing on the Zanzibar/Armstrong alignment. Concept 4 consists of a four-lane rural divided expressway with a 160-foot right-of-way and a minimum one-half mile spacing between at-grade intersections. The concept assumes a 55-mph design speed and a 560-foot bridge span.

Figure 29: Concept 4 – Four-lane Arterial Following Zanzibar/Armstrong Alignment

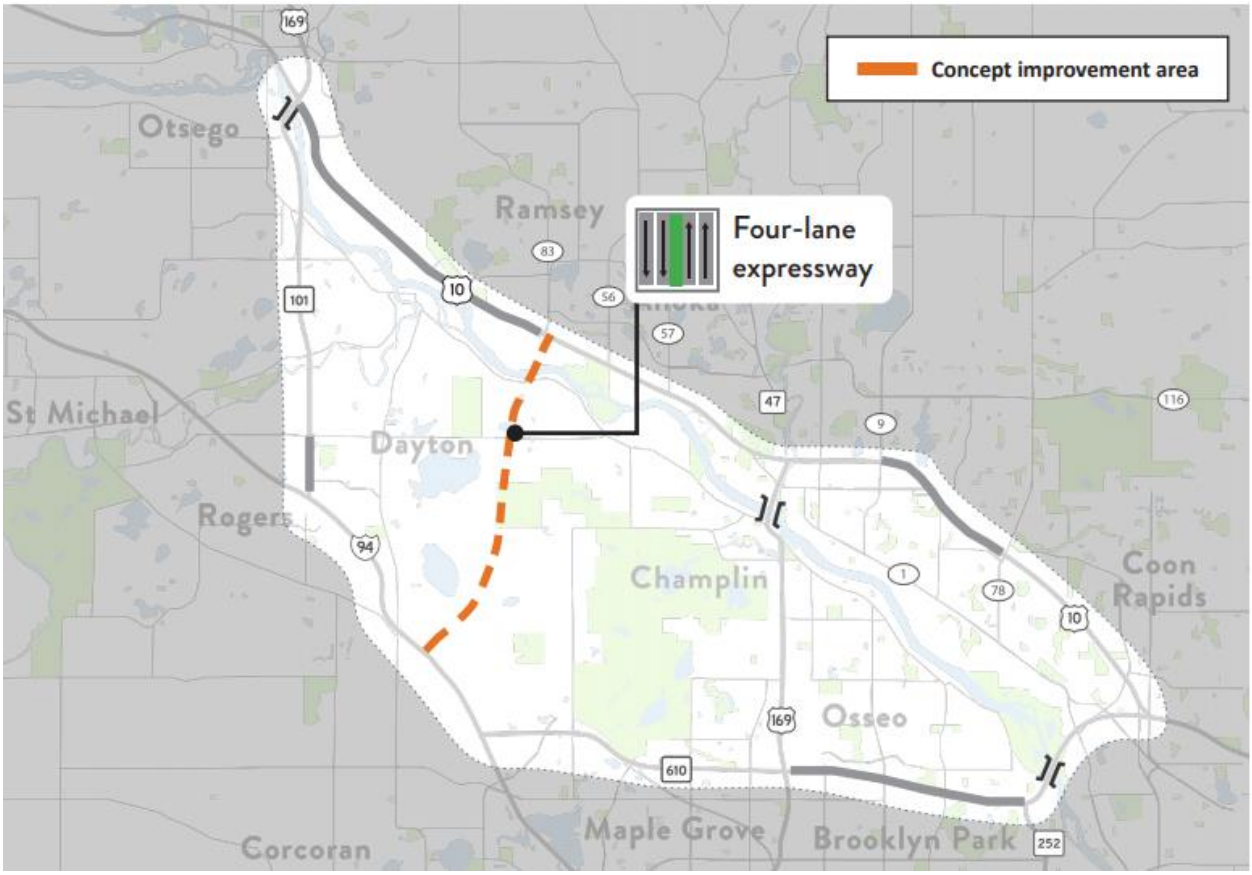


Table 9: Concept 4 Improvement Details and Cost Range

Improvement	Segment	Total Project Cost (2030 dollars)
New River Crossing	New river crossing designed as a 4-lane expressway between I-94 to Highway 10	$190M – $250M
Net Cost		**$190 – $250M**

Step 4: Assess Concept Effectiveness

The final step in concept development was to assess concept effectiveness. This assessment reviewed traffic volumes under 2040 no-build and build scenarios for each concept. Section VI: Traffic Forecasts and Analysis and Appendix D describe the no-build and build scenarios in detail. What follows here is a preliminary review of how each concept addresses congestion in the northwest metro.

The effectiveness of Concepts 1 and 2 was assessed by comparing 2040 peak-hour traffic volumes to 2040 peak-hour capacities on improved segments. As shown in Table 10, all four segments improved under Concepts 1 or 2 were found to be "under capacity" post improvement. In this table, under capacity means a volume-to-capacity ratio less than 0.85. This was an important finding as it suggests the improvements considered would continue to be effective under year 2040 traffic demand levels.

Table 10: 2040 Peak Hour Volume-to-Capacity Ratios at Improved Locations Under Concepts 1 & 2

Highway	Location	AM V/C EB / NB	AM V/C WB / SB	PM V/C EB / NB	PM V/C WB / SB
Highway 10	Armstrong Blvd to Highway 10/101/169 interchange	Under capacity	Under capacity	Under capacity	Under capacity
Highway 10	Hanson Blvd to Round Lake Blvd.	Under capacity	Under capacity	Under capacity	Under capacity
Highway 101	Highway 101/I-94 interchange	Under capacity	Under capacity	Under capacity	Under capacity
Highway 610	Highway 252 to Highway 169	Under capacity	Under capacity	Under capacity	Under capacity

Additional analysis of concept effectiveness, including the impact of Concepts 3 and 4 on Highway 169 congestion, is provided in the next three sections.

VI. Traffic Forecasts & Analysis

The Northwest Metro Mississippi River Crossing Feasibility Analysis developed year 2040 traffic forecasts to evaluate the impact of project concepts on future travel demand, traffic patterns, and congestion. These forecasts were developed for a no-build and four build scenarios, one for each project concept introduced in Section V: Concept Development. By comparing no-build and build traffic forecasts, the feasibility analysis team was able to determine how and to what extent the concepts change regional traffic patterns and traffic volumes at locations throughout the network. This analysis is a determinative factor in the study's assessment of concept feasibility.

The traffic forecasts used in this study were developed using the regional Activity Based Model (ABM). The ABM is maintained by the Metropolitan Council and uses socioeconomic and roadway system assumptions that are consistent with the regional development assumptions laid out in Thrive MSP 2040 and regional transportation policy plans. Information about 2040 forecast assumptions and model validation is available in Appendix D.

As part of the study's traffic analysis, the study team tested concept effectiveness under different assumptions about future travel behavior. The purpose of the test was to determine whether concepts developed in Section V: Concept Development remain effective if post COVID-19 telecommuting rates are above rates assumed in traditional traffic forecasts. Test results are summarized in this section under 2040 Traffic Sensitivity Test and detailed in Appendix D.

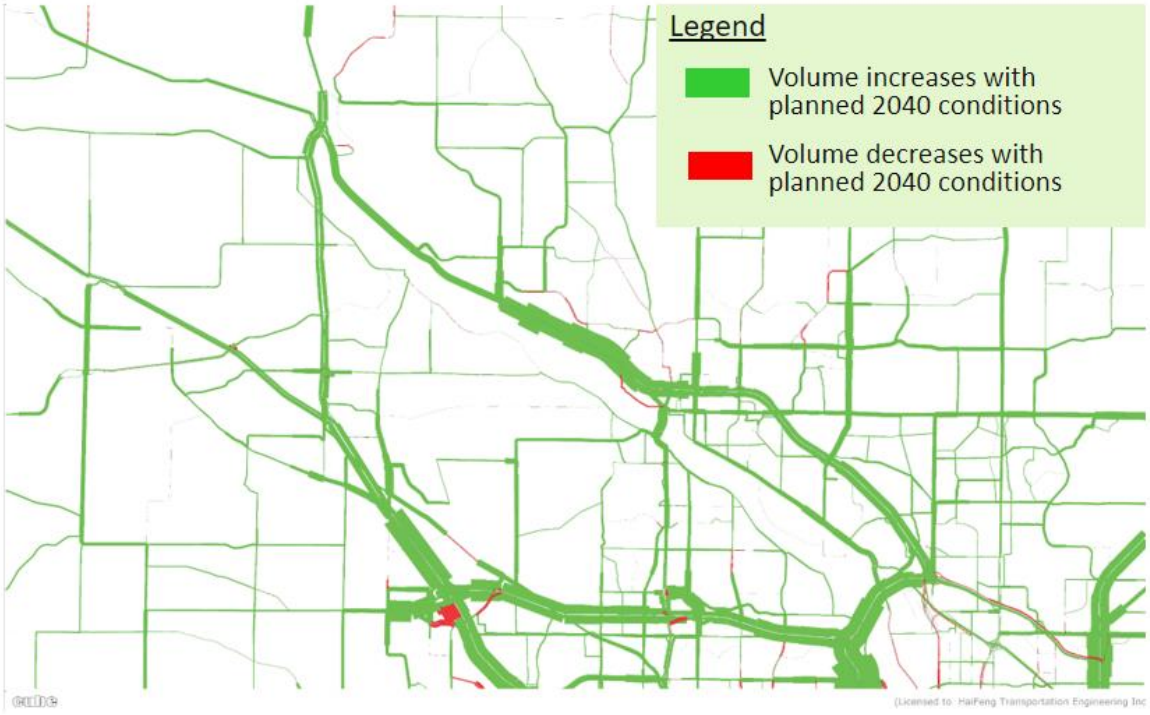
2040 Traffic Volumes

The feasibility analysis team produced year 2040 traffic forecasts under a no-build and four build scenarios, one for each concept described in the previous section. These forecasts were used to assess changes in average daily traffic (ADT) and volume-to-capacity ratios on key segments of the regional highway network.

2040 No-Build Scenario

Year 2040 traffic forecasts indicate a significant increase in traffic volumes on northwest metro area highways. Using traditional forecast methods, daily northwest metro highway traffic volumes increase an average of 22 percent between years 2018 and 2040. Under the no-build scenario, much of this increase occurs on I-94, Highway 610, Highway 252, and Highway 10. See Figure 30 for details.

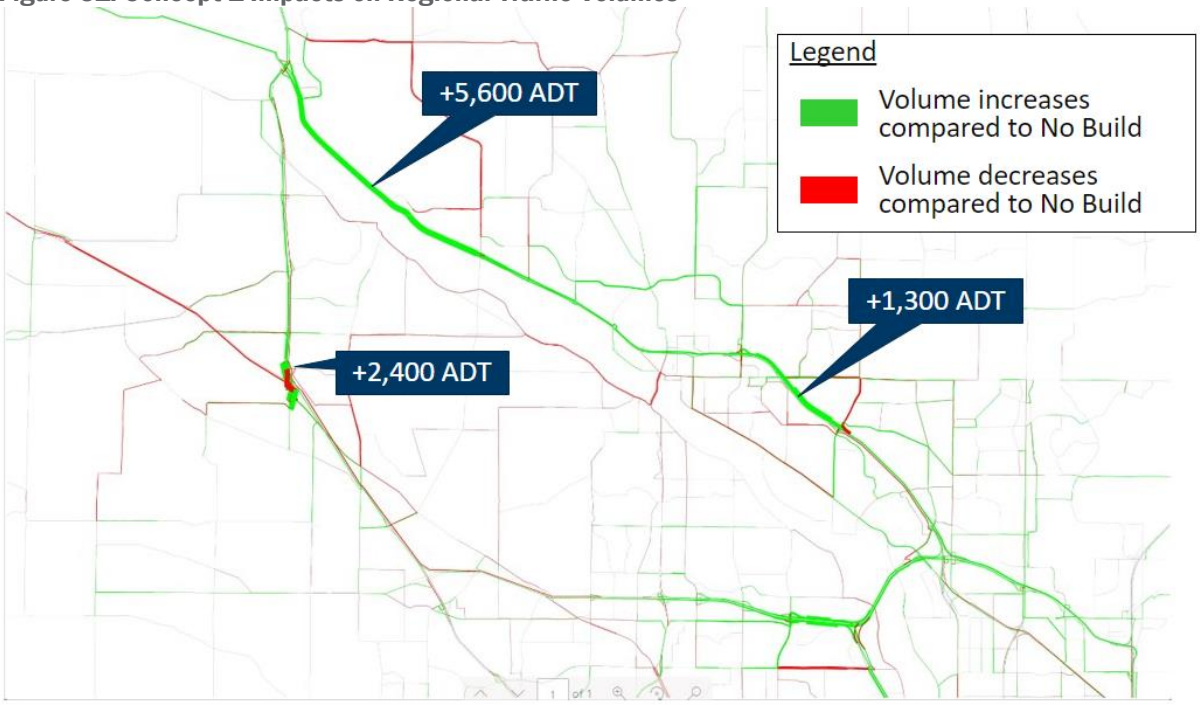
Figure 30: Year 2040 Traffic Volumes Under No-Build Scenario



2040 Build Scenario: Concept 1

Concept 1 consists of mobility improvement on Highway 10 and Highway 101. Year 2040 traffic forecasts indicate that Concept 1 improvements result in small traffic volume increases on improved corridors. As indicated in Figure 31, the Concept 1 scenario forecasts show increased traffic volumes on Highway 10 east of the Highway 10/101/169 interchange, on Highway 10 between Hanson Boulevard and Round Lake Boulevard, and Highway 101 north of the Highway 101/I-94 interchange. Corresponding decreases occur on I-94 and nearby local facilities.

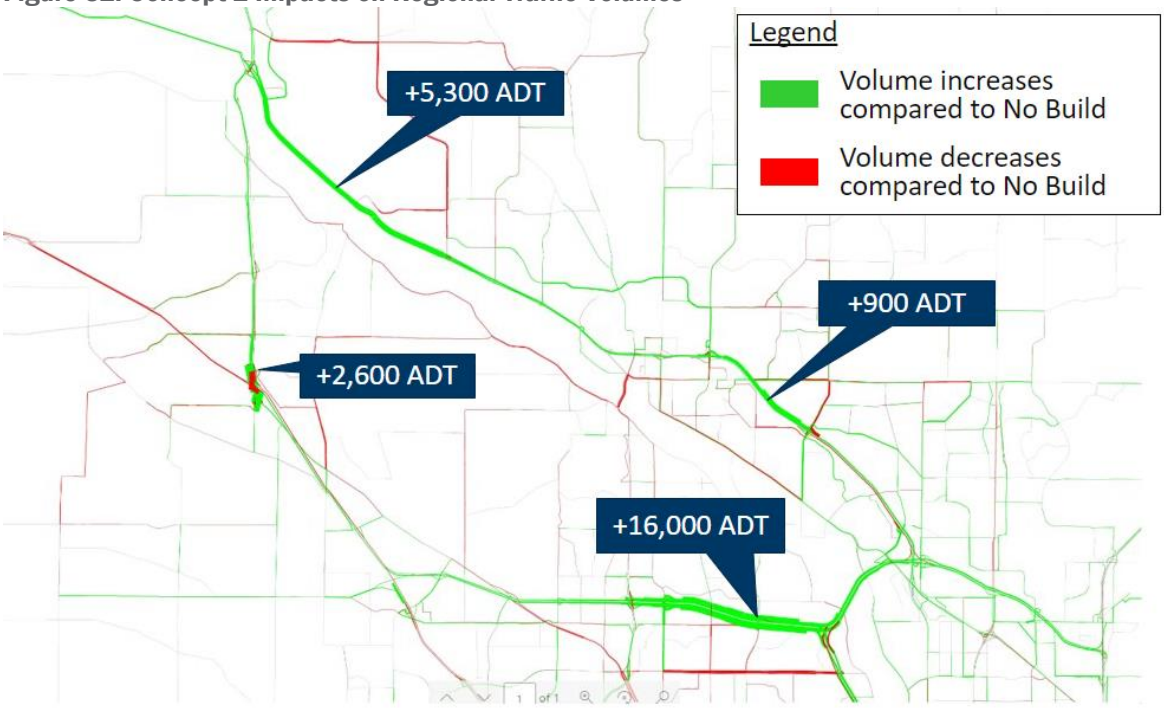
Figure 31: Concept 1 Impacts on Regional Traffic Volumes



2040 Build Scenario: Concept 2

Concept 2 consists of mobility improvement on Highway 10, Highway 101, and Highway 610. Year 2040 traffic forecasts under the Concept 2 scenario show small traffic volume increases on Highways 10 and 101, as well as a large (+16,000 vehicles per day(vpd)) increase on Highway 610. The increase in ADT on Highway 610 reflects local road traffic diverting onto an improved state highway.

Figure 32: Concept 2 Impacts on Regional Traffic Volumes

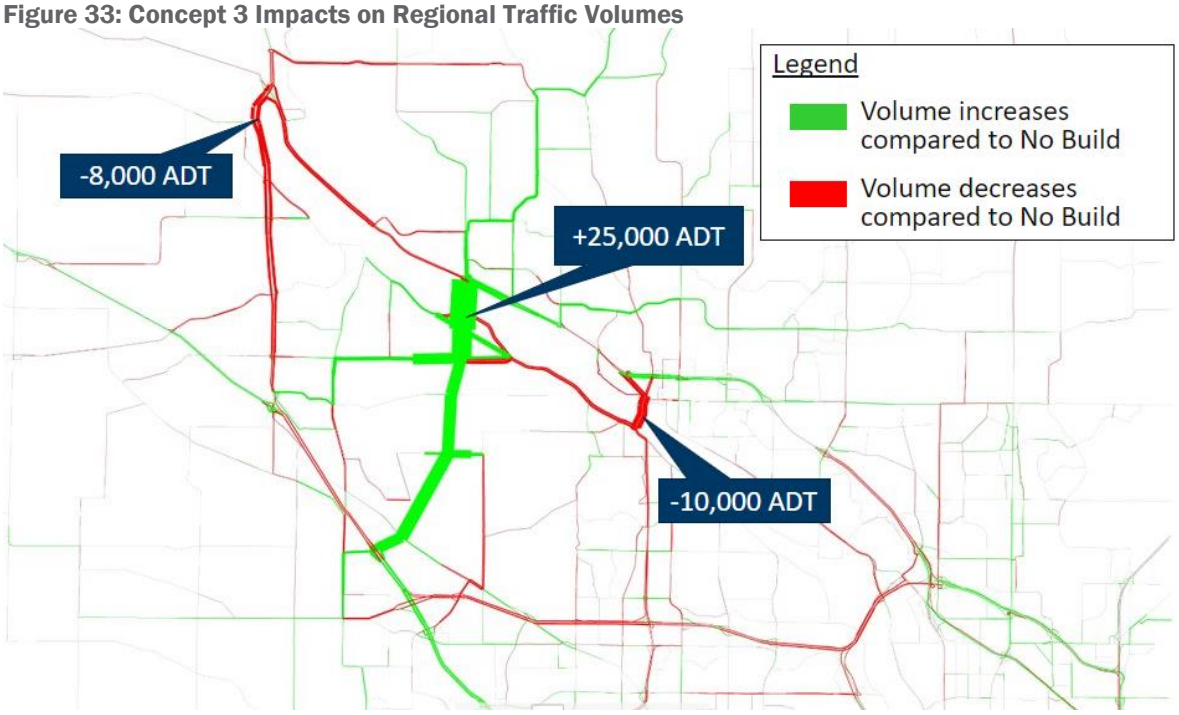


2040 Build Scenario: Concept 3

Concept 3 introduces a new Mississippi River crossing connecting the existing Armstrong Boulevard/Highway 10 interchange north of the river to the Dayton Parkway/I-94 interchange south of the river. The new facility is assumed to be a four-lane divided arterial roadway with a speed limit of 45-mph.

Year 2040 traffic forecasts under Concept 3 show an additional 25,000 vehicles using a new arterial Mississippi River crossing between the existing Highway 101 and Highway 169 crossings. This shift in traffic draws 8,000 vpd from the Highway 101 crossing and 10,000 vpd from the Highway 169 crossing.

Figure 33: Concept 3 Impacts on Regional Traffic Volumes

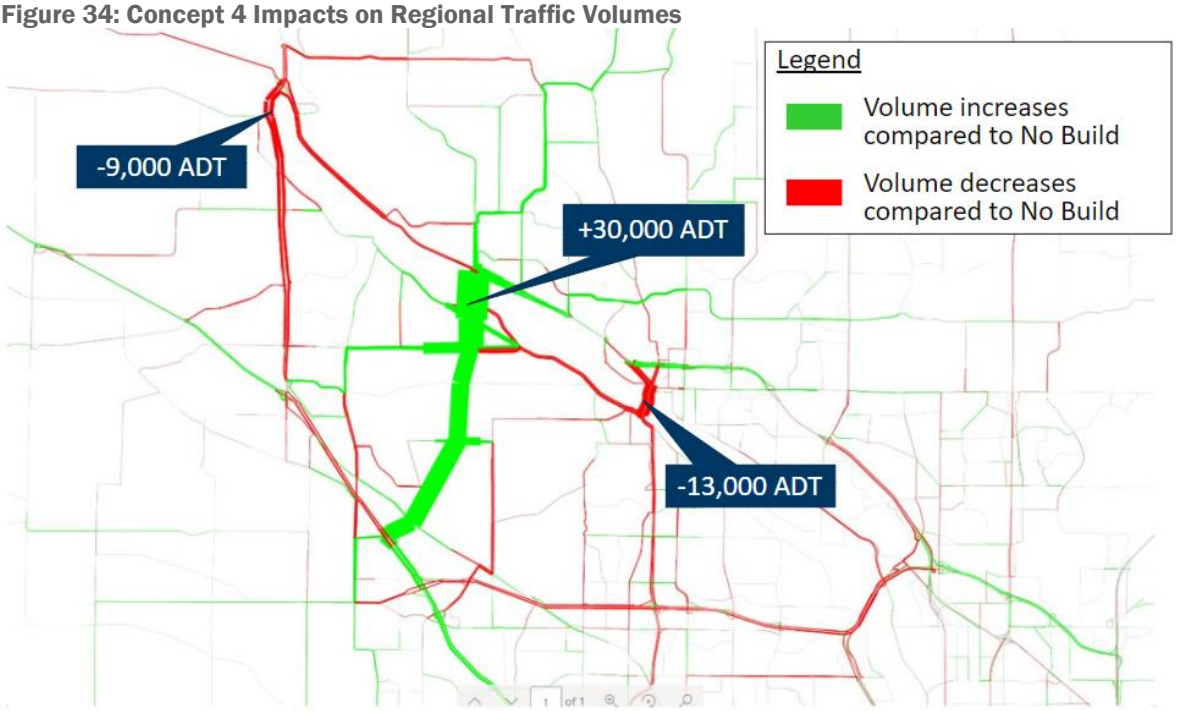


2040 Build Scenario: Concept 4

Concept 4 introduces a new Mississippi River crossing connecting the existing Armstrong Boulevard/Highway 10 interchange north of the river to the Dayton Parkway/I-94 interchange south of the river. The new facility is assumed to be a four-lane divided expressway with a speed limit of 55-mph.

Year 2040 traffic forecasts under Concept 4 show an additional 30,000 vpd using a new expressway Mississippi River crossing between the existing Highway 101 and Highway 169 crossings. This shift in traffic draws 9,000 vpd from the Highway 101 crossing and 13,000 vpd from the Highway 169 crossing.

Figure 34: Concept 4 Impacts on Regional Traffic Volumes



2040 Traffic Congestion

This study's traffic analysis also included an evaluation of year 2040 traffic congestion under the no-build and build scenarios. This evaluation uses year 2040 volume-to-capacity ratios to locate congestion under the no-build scenario and assess the congestion impacts of Concepts 1-4.

2040 Traffic Congestion Under No-Build Scenario

Increased traffic volumes under the 2040 no-build scenario result in increased congestion on northwest metro highways. Figure 35 illustrates that congestion worsens on Highways 10, 101, 169, 610, and I-94 under the 2040 no-build scenario. The causes of this congestion are identified in Table 11. In addition, segments currently under capacity become congested under the 2040 no-build scenario. These segments are Highway 10 west of the Highway 10/101/169 interchange, Highway 610 between I-94 and Highway 169, and Highway 610 between Highway 252 and Highway 10.

Figure 35: Congestion 2018 vs 2040 No-Build (AM Peak)

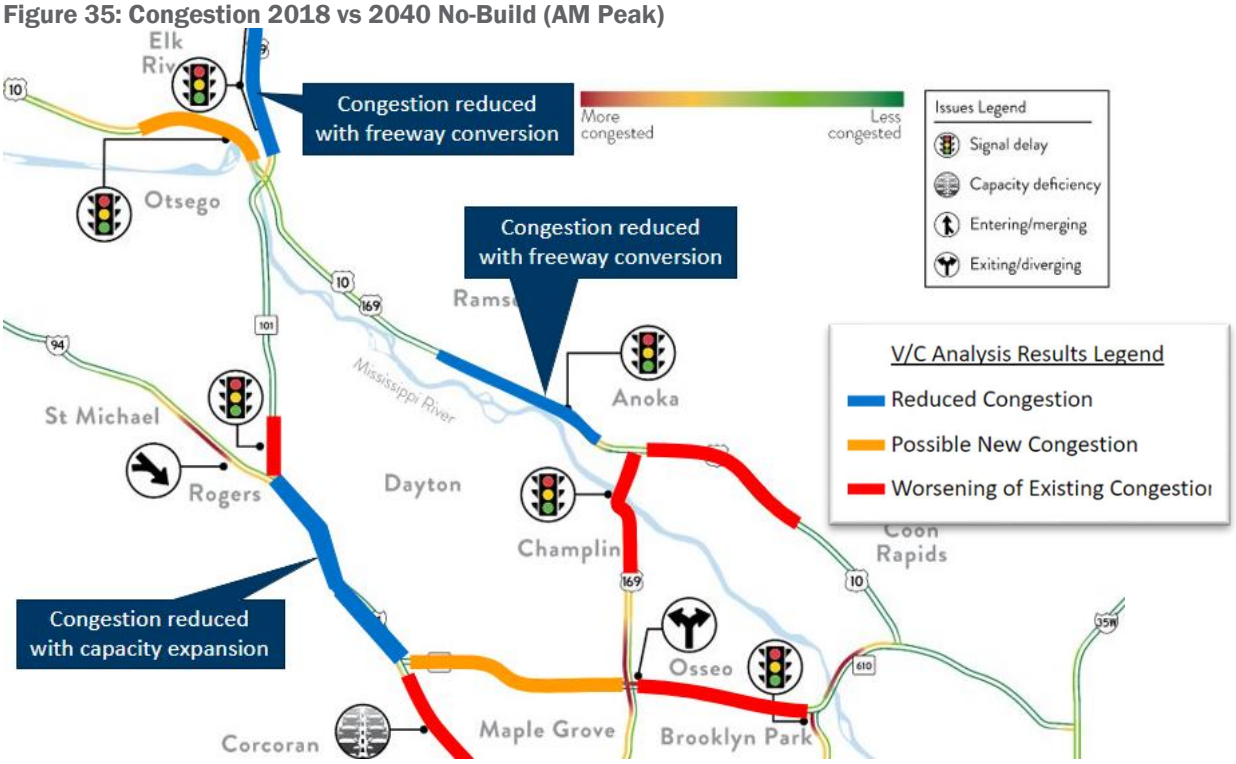


Table 11: AM Peak Hour Congestion and Issues Under the 2040 No-Build Scenario

Highway	Segment	Volume/Capacity Ratio	Issues
Hwy 10	Coon Rapids	Significantly Over	Capacity deficiency
Hwy 101	I-94/101 Interchange	Significantly Over	Signal delay
Hwy 169	Hwy 169 River Crossing	Significantly Over	Signal delay
Hwy 610	Hwy 169 to Hwy 252	Over Capacity	Capacity deficiency
I-94	East of Hwy 610	Over Capacity	Capacity deficiency

2040 Traffic Congestion Under Build Scenarios

Year 2040 traffic forecasts under Concept 1 and Concept 2 build scenarios reinforce the concept effectiveness conclusions presented in Section V: Concept Development. In both cases, the concepts are shown to be effective at reducing congestion on improved segments: Highway 10 in Coon Rapids, Highway 101 at the Highway 101/I-94 interchange, and Highway 610 between Highway 169 and Highway 252. However, 2040 traffic forecasts under Concept 1 and Concept 2 build scenarios indicate no change to congestion at the Highway 169 river crossing or I-94.

Year 2040 traffic forecasts under Concept 3 and Concept 4 build scenarios indicate lower V/C ratios on the Highway 169 river crossing and Highway 610 between Highway 169 and Highway 252, but no change to congestion on Highway 10, Highway 101, and I-94.

Table 12: AM Peak Hour Congestion and Issues Under 2040 Build Scenarios

Highway	Segment	2040 NB V/C	Concept 1	Concept 2	Concept 3	Concept 4
Hwy 10	Coon Rapids	Significantly Over	Improved	Improved	No Change	No Change
Hwy 101	I-94/101 Interchange	Significantly Over	Improved	Improved	No Change	No Change
Hwy 169	Hwy 169 Crossing	Significantly Over	No Change	No Change	Improved	Improved
Hwy 610	Hwy 169 to Hwy 252	Over Capacity	Improved	Improved	Improved	Improved
I-94	East of Hwy 610	Over Capacity	No Change	No Change	No Change	No Change

2040 Traffic Sensitivity Test

The Northwest Metro Mississippi River Crossing Feasibility Analysis included a traffic sensitivity analysis that tested concept effectiveness under different assumptions about future travel behavior. The purpose of the traffic sensitivity analysis was to determine whether concepts developed in Section V: Concept Development remain effective if post COVID-19 telecommuting rates are higher than rates assumed in traditional traffic forecasts.

The traffic sensitivity analysis was conducted with a year 2040 traffic forecast that assumed a 20 percent increase in telecommuting. The forecast, which used the region's Activity Based Model (ABM), implemented this assumption by eliminating 20 percent of "work tours". A work tour consists of multiple trip records associated with a work commute. For example, a work tour could include a trip to the coffee shop on the way to work or a trip to the grocery store on the way home. Tours eligible for telecommuting were selected at random and the entire work tour associated with them removed until a 20 percent reduction in work tours was achieved.

The year 2040 traffic forecast used in this sensitivity analysis is not a prediction of future travel behavior. Its purpose is to gauge the sensitivity of traffic impacts modeled under traditional forecasting assumptions. Traffic impacts with low sensitivity, those that are modeled under the traditional and sensitivity forecast, are likely to occur under a range of potential futures.

2040 No-Build Scenario

Figure 5.0 in Appendix D forecasts 2040 traffic volumes under a no-build scenario with increased telecommuting. On average, this forecast shows five percent fewer trips than the year 2040 forecast developed using traditional telecommuting assumptions. Roadway segments with the largest decrease in ADT are I-94 west of Highway 101 (87,000 to 81,100 vpd), the Highway 101 river crossing (61,600 to 56,000 vpd), and the Highway 610 river crossing (124,600 to 119,200 vpd). The total volume crossing the Mississippi River on the three bridges in the study area is expected to decrease from 246,500 to 231,000 vpd, representing a six percent decrease in volume.

Table 13 summarizes the sensitivity of year 2040 no-build congestion to increased telecommuting. It shows that congestion decreases on Highway 10, Highway 101, and Highway 610, but only Highway 610 has a V/C ratio under 1.0. The 2040 no-build traffic forecast with increased telecommuting shows continued congestion on Highway 169 and I-94. These results indicate that northwest metro highways will be congested in year 2040 even if telecommuting levels reflect those seen during the COVD-19 pandemic.

Table 13: Sensitivity of 2040 No-Build Congestion to Increased Telecommuting

Highway	Segment	2040 V/C Ratio (traditional telecommuting)	2040 V/C Ratio (increased telecommuting)
Hwy 10	Coon Rapids	Significantly Over	Over Capacity
Hwy 101	I-94/101 Interchange	Significantly Over	Over Capacity
Hwy 169	Hwy 169 River Crossing	Significantly Over	Significantly Over
Hwy 610	Hwy 169 to Hwy 252	Over Capacity	Under Capacity
I-94	East of Hwy 610	Over Capacity	Over Capacity

2040 Build Scenarios

Figures 5.1 – 5.3 in Appendix D forecasts 2040 traffic volumes under Concept 1, 2, and 3 build scenarios with increased telecommuting. On average, these forecasts show five percent fewer trips than the 2040 build scenario forecasts developed using traditional telecommuting assumptions. The following paragraphs identify roadway segments with the largest decrease in traffic volume under each build scenario.

Concept 1

Under the Concept 1 scenario, highways with the biggest change in year 2040 traffic volume due to increased telecommuting are the Highway 610 river crossing (126,900 to 120,600 vpd), I-94 west of Highway 101 (85,800 to 79,800 vpd), and I-694 west of US 169 (133,600 to 127,900 vpd). Total ADT using a northwest metro area bridge is expected to decrease from 248,500 to 232,300 vpd, representing a seven percent decrease in volume.

Concept 2

Under the Concept 2 scenario, highways with the biggest change in year 2040 traffic volume due to increased telecommuting are the Highway 101 river crossing (62,700 to 56,800 vpd), I-94 west of Highway 101 (85,900 to 80,000 vpd), and Highway 252 between Highway 610 and I-694 (126,800 to 120,900 vpd). Total ADT using a northwest metro area bridge is expected to decrease from 250,100 to 235,400 vpd, representing a six percent decrease in volume.

Concept 3

Under the Concept 3 scenario, highways with the biggest change in year 2040 traffic volume due to increased telecommuting are the Highway 610 river crossing (121,600 to 115,800 vpd), I-94 west of Highway 101 (88,100 to 82,700 vpd), and the Highway 101 river crossing (54,200 to 48,900 vpd). Total ADT using an existing northwest metro area bridge is expected to decrease from 226,700 to 211,000 vpd, representing a seven percent decrease in volume.

A daily traffic sensitivity analysis was not performed for Concept 4. It is assumed the sensitivity of year 2040 traffic volumes for Concept 4 reflect the sensitivity of year 2040 traffic volumes modeled for Concept 3.

Sensitivity Test Results

Table 14 presents the results of this study's analysis of whether and to what extent Concepts 1-4 reduce congestion if 2040 telecommuting levels reflect those seen during the COVD-19 pandemic. The analysis showed Concepts 1 and 2 reduce congestion on improved segments of Highway 10 and 101 under both traditional and increased telecommuting assumptions. Highway 610 is not improved by any of the concepts because it has a V/C ratio under 1.0 in the increased telecommuting scenarios. The analysis also showed that Concepts 3 and 4 continue to reduce congestion on Highway 169. None of the concepts reduce congestion on I-94.

Table 14: Improvement in 2040 V/C Ratios Under Build Scenarios with Increased Telecommuting

Highway	Segment	2040 NB V/C	Concept 1	Concept 2	Concept 3	Concept 4
Hwy 10	Coon Rapids	Over Capacity	Improved	Improved	No Change	No Change
Hwy 101	I-94/101 Interchange	Over Capacity	Improved	Improved	No Change	No Change
Hwy 169	Hwy 169 crossing	Significantly Over	No Change	No Change	Improved	Improved
I-94	East of Hwy 610	Over Capacity	No Change	No Change	No Change	No Change

The traffic sensitivity test presented above evaluates telecommuting's impact on daily congestion as measured using 2040 volume-to-capacity ratios on major highways in the northwest metro. Additional sensitivity analysis is provided in Section VIII: Operational Analysis. The sensitivity analysis in Section VIII evaluates delay at four key locations:

- I-94/Highway 101 interchange
- I-94/Dayton Parkway interchange
- Highway 10/Armstrong Boulevard interchange
- Highway 169 Mississippi River Crossing

VII. Benefit-Cost Analysis

Benefit-cost analysis (BCA) converts the benefits and costs of a transportation investment into a common measure (dollars) so a benefit-cost ratio may be calculated and used as an indicator of cost effectiveness. BCAs rely on net present value to calculate a single number representing benefits accruing over long periods of time. This allows long-term benefits to be directly compared to costs, which are incurred primarily in the initial years.

The principal benefits monetized in a BCA are travel time, changes in vehicle operating costs, vehicle crashes, and remaining capital value. Taken together, these benefits provide an indication of a project's economic desirability, which can be weighed against other considerations, effects, and impacts of the project. Projects are considered cost-effective if the benefit-cost ratio is greater than 1.0. The larger the ratio number, the greater the benefits per unit cost.

Methodology & Assumptions

MnDOT Benefit Cost Guidance

The methodology used for the Northwest Metro Mississippi River Crossing Feasibility Analysis BCA are in accordance with MnDOT Office of Transportation System Management methodology and 2021 guidance on assumed values.

The main components analyzed were:

- Travel time/delay
- Fuel consumption
- Crash rates by severity
- Initial capital costs
- Maintenance costs
- Remaining capital value (considered a reduction in cost)
- BCA methodology and assumed value guidance can be reviewed on the MnDOT website: https://www.dot.state.mn.us/planning/program/appendix_a.html

Analysis Years

The BCA assumed each alternative would be constructed in year 2025 and completed by year 2028. Therefore, year 2028 is the first full year project benefits are included in the analysis. The analysis focused on the twenty-year period from 2028 to 2047. The traffic analysis assumed study period between years 2019 and 2040.

Economic assumptions

The present value of all benefits and costs were calculated using year 2021 as the year of current dollars. The assumed discount rate for the analysis was 1.0 percent, per guidelines from the "Recommended standard values for use in B/C analysis in SFY 2021", Minnesota Department of Transportation, Office of Transportation System Management, July 2020. Value of time, vehicle operating costs, crash costs, and remaining capital value assumptions were also consistent with values published in MnDOT guidance. Benefits for years between 2028 and 2040 were interpolated based on a linear growth rate, and benefits for years after 2040 were extrapolated using the same growth rate.

Development of Vehicle Hours Traveled (VHT)

VHT was derived from the travel demand model over the analysis period.

- Analyses were performed for the year of opening (year 2025) and a horizon year of 2040. Delay for years between 2025 and 2040 was interpolated based on a linear growth rate, and delay for years beyond 2040 was extrapolated using the same rate.
- **Vehicle occupancy rates** were provided by MnDOT Office of Transportation System Management. Values for autos and trucks were 1.30 and 1.0, respectively. A truck percentage of 10.5 percent, which was determined from year 2012 vehicle classification counts provided by MnDOT, was applied to the study network.

Safety Analysis

Safety benefits were estimated based on the reduction in crash severity (type Fatal, A, B, C, or Property Damage) between the programmed and build alternatives.

- The analysis used VMT from the Twin Cities Regional Travel Demand Model data for years 2019 and 2040. Data between 2010 and 2040 was interpolated based on a linear growth rate.
- Crash statistics for different facility types were gathered from MnDOT Toolkit for 2009-2013. This information was used to find a crash rate per million vehicle miles and estimate crash data.
- Crash costs for each severity type were valued in accordance with "Recommended standard values for use in B/C analysis in SFY 2021", MnDOT Office of Transportation System Management, July 2020.

Remaining Capital Value

The remaining capital value of each alternative was subtracted from the initial capital cost to determine the alternative's net capital cost. In determining remaining capital value, the initial costs of the alternatives were separated into the following categories:

- Right-of-Way
- Major structures
- Grading and drainage
- Sub-base and base
- Surface
- Miscellaneous costs – includes mobilization, removal of temporary pavement and drainage, traffic control, project development/delivery, and design and engineering costs. These were assumed to be sunk costs and assigned zero remaining capital value.

Maintenance Costs

Annual maintenance costs between programmed and build alternatives were monetized based on typical values observed in Minnesota for all facility types. The programmed alternative wouldn't have any maintenance costs for this analysis while the Build alternative with a total roadway length of 24 miles would have an annual Routine maintenance cost of $10,700 per lane-mile according to MnDOT Benefit-cost guidance. These dollar amounts were inflated to year 2019 dollars using an inflation rate of 1.0, which was provided by the Consumer Price Index Inflation Calculator, Bureau of Labor Statistics.3 The maintenance costs were grown linearly from 2028 to 2047.

VMT-VHT Summary

The foundation of a BCA is the vehicle miles traveled (VMT) - vehicle hours traveled (VHT) summary. This summary describes how an improvement concept affects traffic volume, pattens, and congestion. A typical highway improvement facilities mobility, thus inducing longer trips and more VMT while simultaneously decreasing congestion and VHT.

Table 15 documents VMT and VHT changes modeled under Northwest Metro Mississippi River Crossing Feasibility Analysis Concepts. This tables shows the expected dynamic – all four concepts increase VMT while decreasing VHT. Concept 2 (mobility improvements to Highway 10, 101 and 610) has the greatest impact on VMT and a middling impact on VHT. Concept 4 (a new expressway river crossing) has less than half Concept 2's impact on VMT but produces significantly more travel time savings.

Table 15: Northwest Metro Mississippi River Crossing Feasibility Analysis; Daily VMT-VHT Summary*

Daily Travel Summaries	Facility Type	Concept 1	Concept 2	Concept 3	Concept 4
Vehicle-Miles Traveled (VMT)	Freeway	330,000	380,000	-50,000	-60,000
	Non-freeway	-270,000	-280,000	90,000	100,000
	Total	60,000	100,000	40,000	40,000
Vehicle-Hours Traveled (VHT)	Freeway	4,600	3,800	-1,500	-1,800
	Non-freeway	-5,900	-6,200	-800	-1,400
	Total	-1,300	-2,400	-2,300	-3,200

* Results presented in relation to 2040 no-build scenario – traditional telecommuting assumptions

Changes in VHT, or travel time savings, tend to be the dominant source of benefits for highway mobility projects. All four concepts have VHT savings exceeding 1,000 vehicle hours per day in year 2040. Concept 4 (four-lane expressway river crossing) provides the greatest VHT savings with over 3,000 hours per day. Concepts 2 and 3 provide slightly lower VHT savings at just over 2,000 hours per day.

Another important factor in user benefits is safety, which are captured in VMT since freeways are statistically safer than non-freeways. Shifts in VMT from non-freeways to freeways indicate improved safety. These results show Concepts 1 and 2 with a net shift in VMT from non-freeway to freeway. However, the reverse is true for Concepts 3 and 4.

Benefit-Cost Results

BCA Detail

Tables 16 – 19 provide itemized present value benefits and costs for each northwest metro improvement concept. These benefits and costs are used to calculate the concepts net present value and benefit-cost ratio defined as net project benefit divided by net project cost.

Table 16: Concept 1 Benefit-Cost Detail (millions of dollars)

Present Value of Itemized Benefits	VMT Savings	-$68.62
	VHT Savings	$138.50
	Accident Reduction Benefits	$95.96
	Present Value of Total Benefits	**$165.84**
Present Value of Itemized Costs	Capital Cost Differential	$237.86
	Maintenance Cost Differential	$4.37
	Remaining Capital Value Differential	$76.81
	Present Value of Total Costs	**$165.42**
Benefit-Cost	**Net Present Value**	**$0.41**
	Benefit/Cost Ratio	**1.00**

Table 17: Concept 2 Benefit-Cost Detail (millions of dollars)

Present Value of Itemized Benefits	VMT Savings	-$126.73
	VHT Savings	$232.32
	Accident Reduction Benefits	$187.42
	Present Value of Total Benefits	**$293.01**
Present Value of Itemized Costs	Capital Cost Differential	$319.02
	Maintenance Cost Differential	$4.37
	Remaining Capital Value Differential	$108.69
	Present Value of Total Costs	**$214.70**
Benefit-Cost	**Net Present Value**	**$78.31**
	Benefit/Cost Ratio	**1.36**

Table 18: Concept 3 Benefit-Cost Detail (millions of dollars)

Present Value of Itemized Benefits	VMT Savings	-$35.98
	VHT Savings	$242.15
	Accident Reduction Benefits	-$111.18
	Present Value of Total Benefits	**$95.00**
Present Value of Itemized Costs	Capital Cost Differential	$148.47
	Maintenance Cost Differential	$4.37
	Remaining Capital Value Differential	$69.83
	Present Value of Total Costs	**$83.02**
Benefit-Cost	**Net Present Value**	**$11.98**
	Benefit/Cost Ratio	**1.14**

Table 19: Concept 4 Benefit-Cost Detail (millions of dollars)

Present Value of Itemized Benefits	VMT Savings	-$59.05
	VHT Savings	$275.20
	Accident Reduction Benefits	-$100.77
	Present Value of Total Benefits	**$115.38**
Present Value of Itemized Costs	Capital Cost Differential	$170.70
	Maintenance Cost Differential	$4.37
	Remaining Capital Value Differential	$86.36
	Present Value of Total Costs	**$88.70**
Benefit-Cost	Net Present Value	$26.69
	Benefit/Cost Ratio	1.30

BCA Ratios

Table 20 summarizes the results of this study's benefit-cost analysis. It shows that all four concepts have a BC ratio greater than 1.0. The ratios presented in Table 20 were calculated using itemized benefits and costs derived from a year 2040 forecast with traditional assumption about telecommuting. Table 20 analyzes the sensitivity of these ratios to increased levels of telecommuting. It shows that additional telecommuting reduces the present value benefits of Concept 2, but all four concepts retain a BC ratio greater than 1.0.

Table 20: Northwest Metro Mississippi River Crossing Feasibility Analysis; Benefit Cost-Ratios

		Concept 1	Concept 2	Concept 3	Concept 4
Traditional Forecasts	Present Value of Benefits	$166M	$293M	$95M	$115M
	Present Value of Costs	$165M	$215M	$83M	$89M
	Benefit-Cost Ratio	**1.0**	**1.4**	**1.1**	**1.3**
Telecommute Forecasts	Present Value of Benefits	$168	$226	$97	$117
	Present Value of Costs	$165M	$215M	$83M	$89M
	Benefit-Cost Ratio	**1.0**	**1.1**	**1.1**	**1.3**

VIII. Operational Analysis

Having identified four technically feasible solutions to mobility challenges in the northwest metro, the Northwest Metro Mississippi River Crossing Feasibility Analysis went on to include a peak-hour operational analysis at four key locations in the study area: I-94/Highway 101 Interchange, I-94/Dayton Parkway Interchange, Highway 10/Armstrong Boulevard Interchange, and the Highway 169 River Crossing.

The purpose of the peak hour operational analysis at these locations was to address the following questions:

- What operational benefits would a reconfigured I-94/Highway 101 interchange experience?
- If a new Mississippi River crossing is constructed following the Zanzibar/Armstrong alignment, what operational benefit would the I-94/Highway 101 interchange and the Highway 169 river crossing experience?
- If a new Mississippi River crossing is constructed following the Zanzibar/Armstrong alignment, can the I-94/Dayton Parkway and Hwy 10/Armstrong Boulevard interchanges accommodate the increased traffic volumes?
- If COVID-19 has long term impacts on future traffic volumes, how do the benefits of this study's concepts change?

Methodology

Three locations were evaluated using Synchro peak hour (a.m. and p.m.) models: I-94/Highway 101 interchange, Dayton Parkway/I-94 interchange, and Armstrong Boulevard/I-94 interchange. At each location, daily forecasts were used to develop turning movement forecasts under no-build and build scenarios. Intersection delays and network delays were obtained from the Synchro models. The delays provided an understanding of potential operational improvement under each scenario.

The study's operational analysis also included an evaluation of congestion duration on the Highway 169 river crossing connecting Anoka and Champlin. Since the corridor is congested multiple hours per day, a maximum throughput in each direction at the river crossing was determined using the corridor's existing volume profile. The feasibility analysis team then used year 2040 traffic forecasts to calculate the number of hours northbound and southbound lanes would be at maximum throughput under no-build and build scenarios.

I-94/Highway 101 Interchange

The I-94/Highway 101 interchange is shown in Figure 36 below. There are currently several issues at this interchange, including heavy delay and long queues (mainly southbound Highway 101 during the AM peak hour), poor lane utilization on southbound Highway 101, and vehicles bypassing the queue and making U-turns south of the interchange to use the northbound-to-eastbound ramp. Additionally, during both peaks, the northbound-to-westbound turn lane can become congested with long queues and there are high numbers of heavy vehicles and uphill grades on southbound Highway 101 near the interchange.

Figure 36: I-94/Hwy 101 Interchange

Three conditions were evaluated for the I-94/Highway 101 interchange:

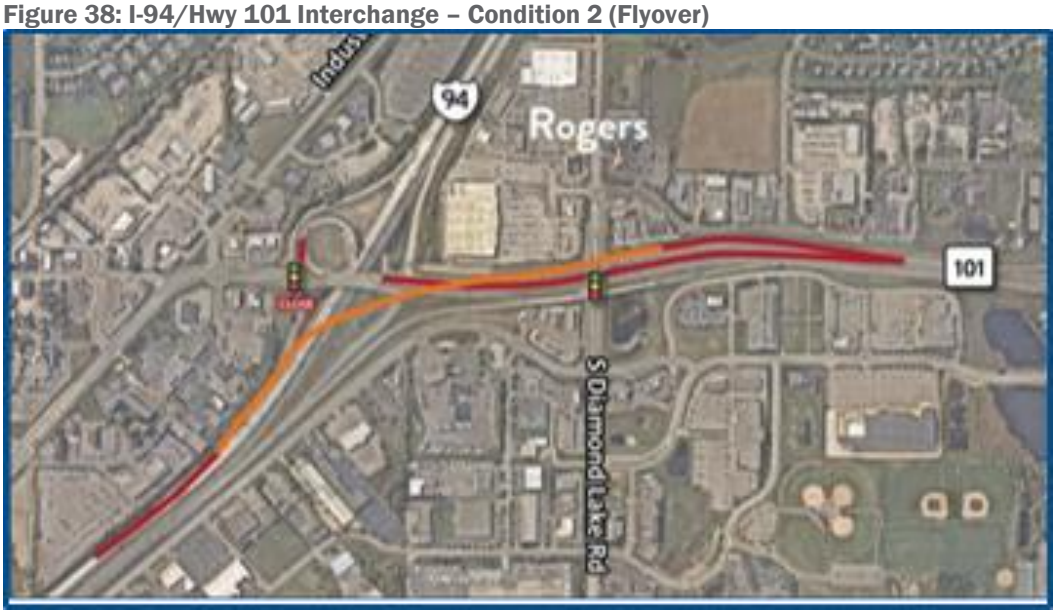
1. Conversion to Diverging Diamond Interchange with no new river crossing.
2. Addition of a new southbound-to-eastbound flyover with no new river crossing.
3. Existing configuration with a new river crossing.

Intersection Delay

The analysis for these conditions was conducted using Synchro/SimTraffic during future year peak hours. The schematic for Conditions 1 and 2 are shown in Figure 37 and Figure 38 below.

Figure 37: I-94/Hwy 101 Interchange – Condition 1 (DDI)

Figure 38: I-94/Hwy 101 Interchange – Condition 2 (Flyover)



This analysis indicated that Condition 1: DDI provides a 60 to 65 percent delay reduction compared to no-build. The estimated construction cost in current dollars for Condition 1 is $18 million. Condition 2: Flyover provides 75 to 80 percent delay reduction compared to no-build. The estimated construction cost in current dollars for Condition 2 is $90 million. For Condition 3, the analysis indicated a new river crossing (either Concept 3 or Concept 4 described in Section V) provides the least amount of benefit with 35 to 40 percent delay reduction compared to no-build. Under this condition, there is a reduction of trips to/from East I-94 and is an increase of trips to/from West I-94.

Operational analysis of the I-94/Highway 101 interchange highlights high demand for southbound Highway 101 to eastbound I-94 movements. With the current geometry of the interchange, in order to access eastbound I-94 from southbound Highway 101, southbound traveling vehicles need to be in the right-most lane. This results in poor southbound lane utilization north of the interchange and lengthy queues that effect the intersection of Highway 101 and South Diamond Lake Road.

Figure 39 and Figure 40 show that under the no-build forecast, AM and PM peak hour intersection delay is expected to more than double on South Diamond Lake Road. This delay is largely resolved by reconfiguring the I-94/Highway 101 interchange as in Concepts 1 and 2. A new river crossing does not solve the poor lane utilization issues present with the existing interchange configuration, but it still does improve delay at South Diamond Lake Road, especially during the AM peak.

Figure 39: I-94/Hwy 101 Intersection Delay; AM Peak Hour

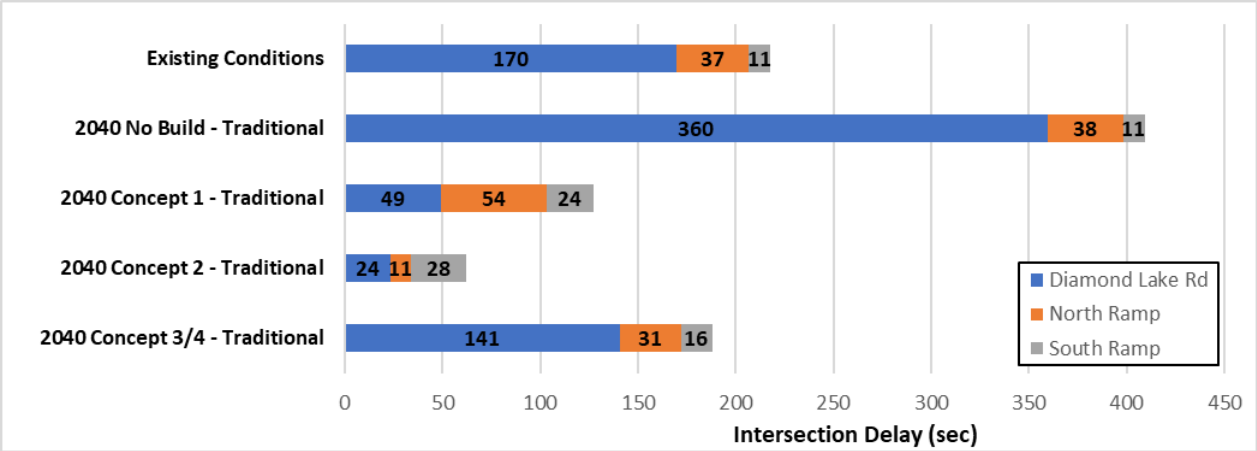
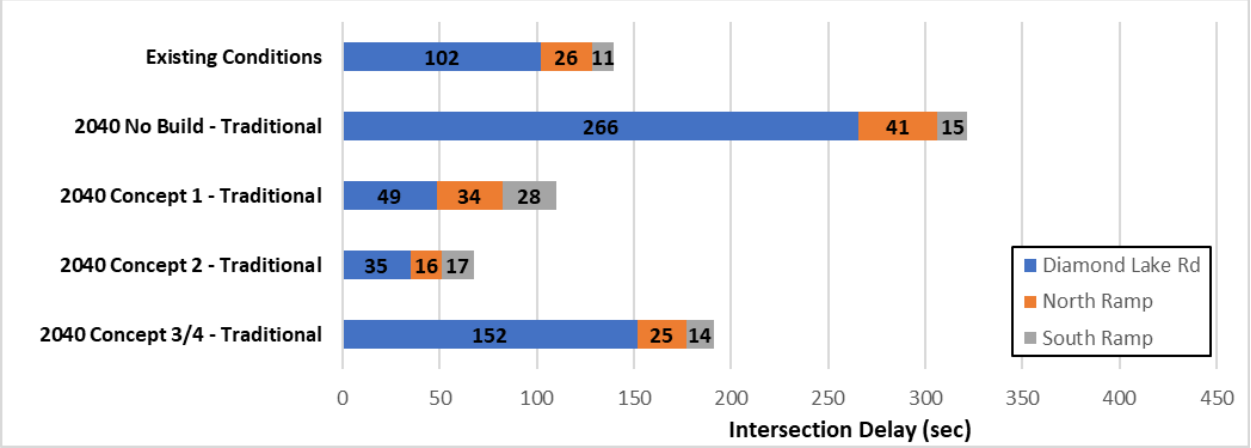


Figure 40: I-94/Hwy 101 Intersection Delay; PM Peak Hour



Intersection Delay Sensitivity Test

Peak hour operational analysis was also conducted for the I-94/Highway 101 interchange using forecasts assuming increased telecommuting. The same methodology was used to calculate intersection delay under the telecommute forecast as under the forecast with traditional travel behavior assumptions.

Figure 41 shows that AM peak hour intersection delay is similar under the traditional and telecommute forecasts, with slightly less intersection delay under the telecommute forecast and therefore less delay reduction benefit. PM peak hour intersection delay is shown in Figure 42. There is significantly less intersection delay under the telecommute no-build scenario than under the traditional no-build scenario.

Figure 41: I-94/Hwy 101 Intersection Delay with Increased Telecommuting; AM Peak Hour

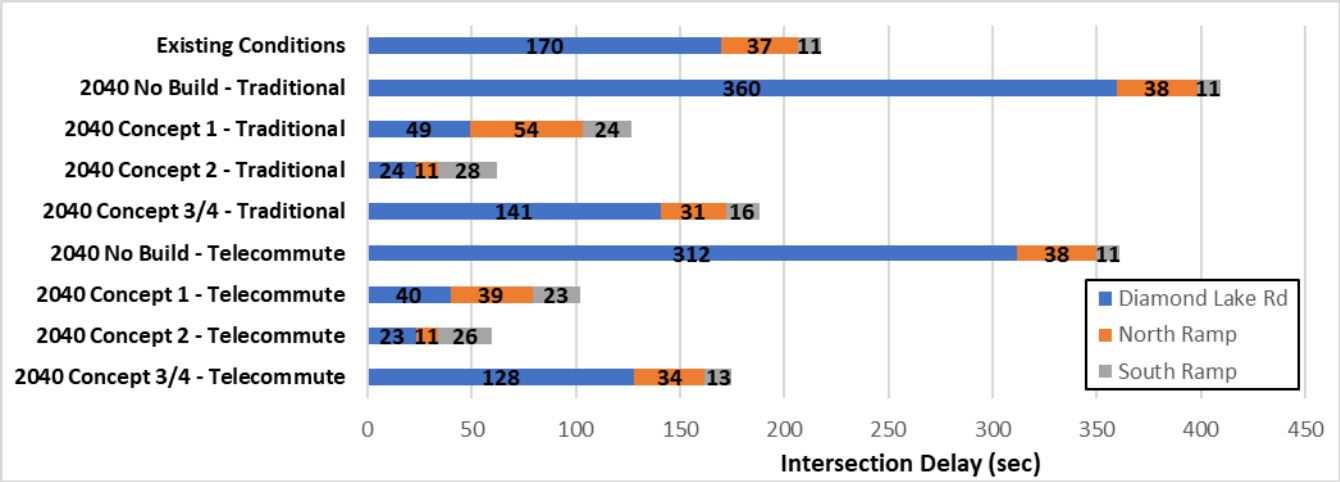
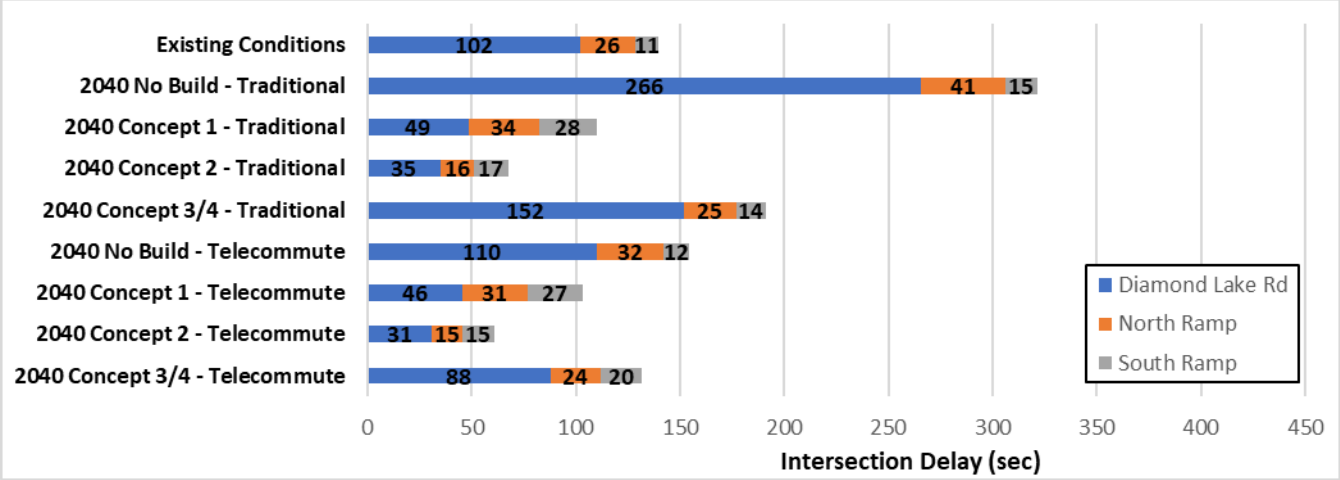


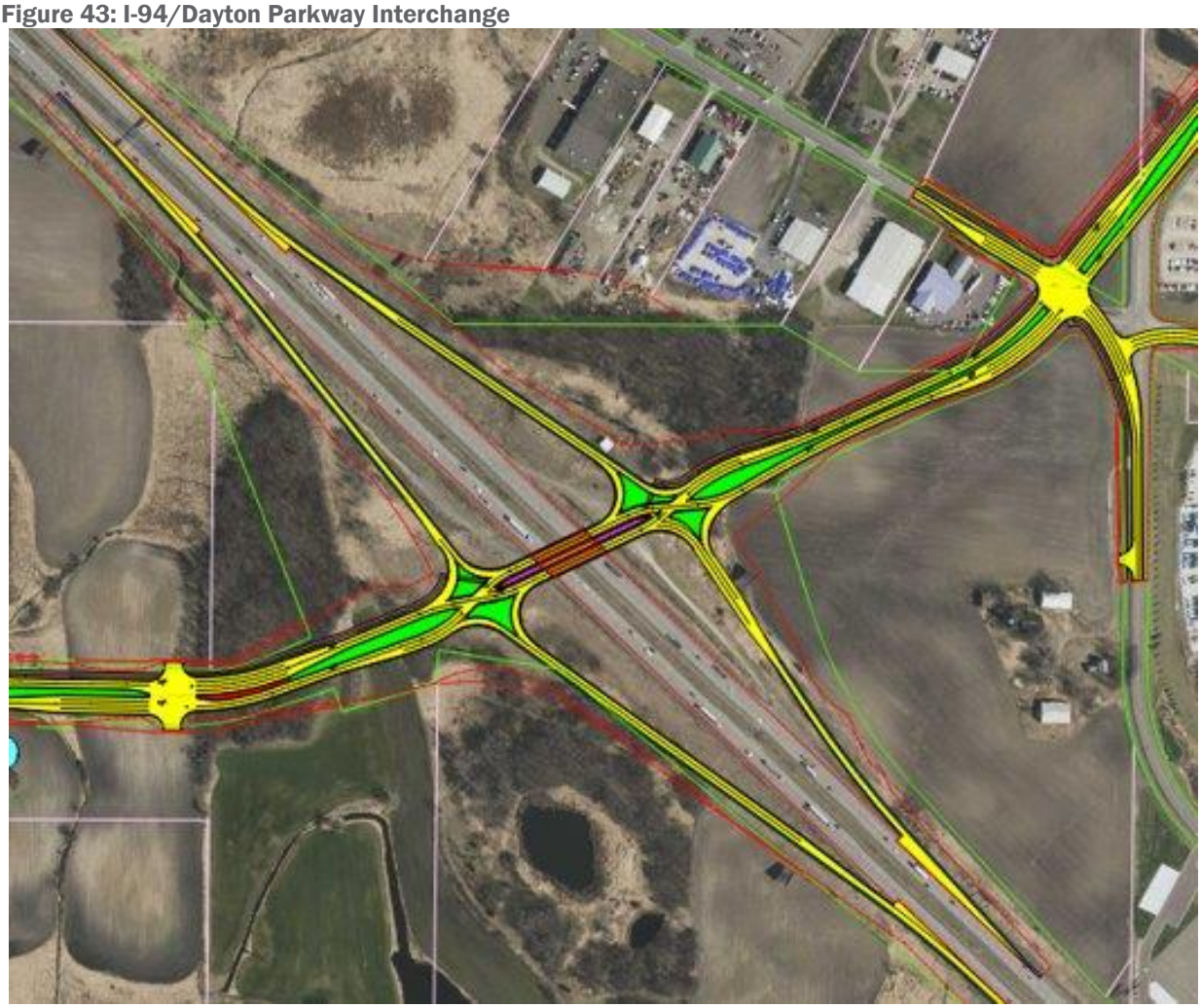
Figure 42: I-94/Hwy 101 Intersection Delay with Increased Telecommuting; PM Peak Hour



I-94/Dayton Parkway Interchange

The I-94/Dayton Parkway interchange is shown in Figure 43 below. This interchange was evaluated using the current configuration to determine if it can accommodate future traffic volumes expected with the new Mississippi River crossing.

Figure 43: I-94/Dayton Parkway Interchange



Intersection Delay

Analysis of operational benefits at the I-94/Dayton Parkway interchange was conducted using Synchro/SimTraffic during future year peak hours. The results of this analysis indicate that the existing interchange will operate well under 2040 no-build conditions if a new Mississippi River crossing is built as described in Concepts 3 and 4. Figure 44 and Figure 45 show the impact of the new river crossing on peak hour intersection delay at the I-94/Dayton Parkway interchange with the existing geometry. Peak hour intersection delay at the interchange with improved geometry is shown in Figure 46 and Figure 47.

Figure 44: I-94/Dayton Parkway Intersection Delay; AM Peak Hour – Existing Geometry

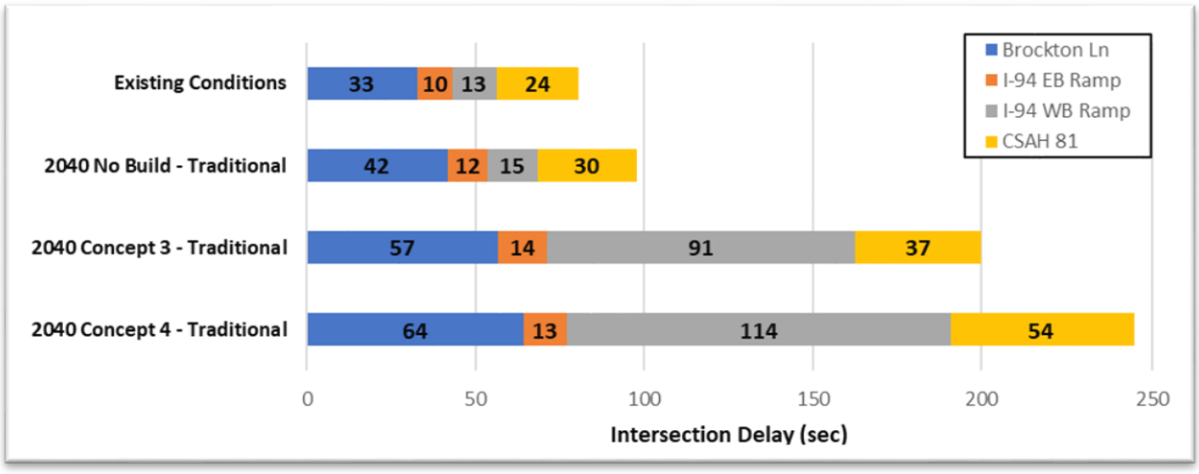


Figure 45: I-94/Dayton Parkway Intersection Delay; PM Peak Hour – Existing Geometry

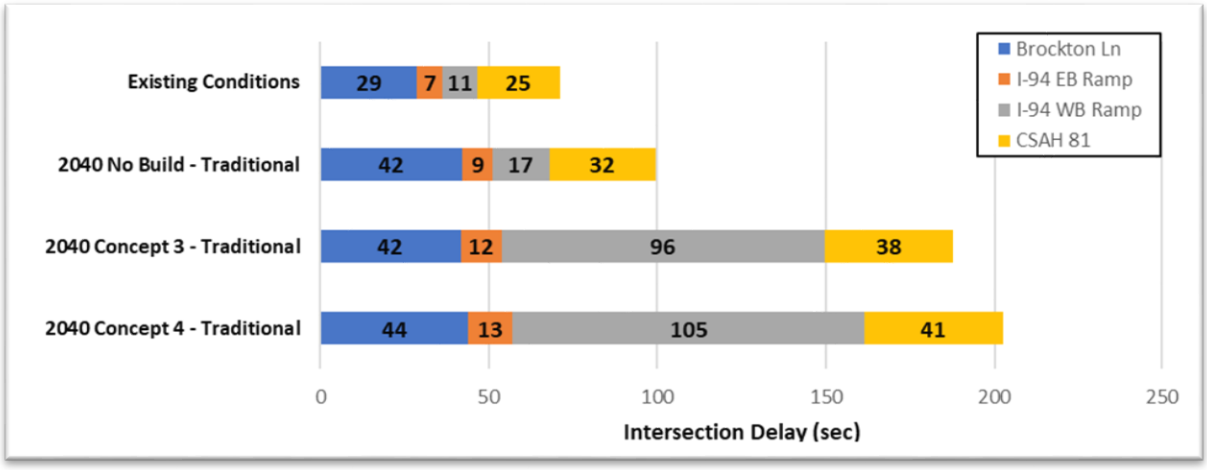


Figure 46: I-94/Dayton Parkway Intersection Delay; AM Peak Hour – Improved Geometry

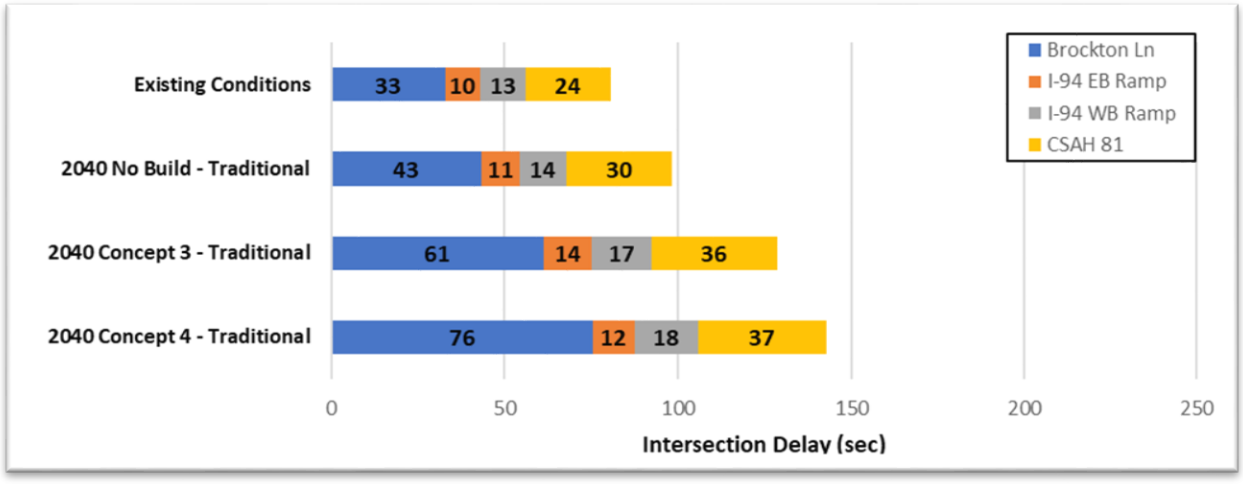
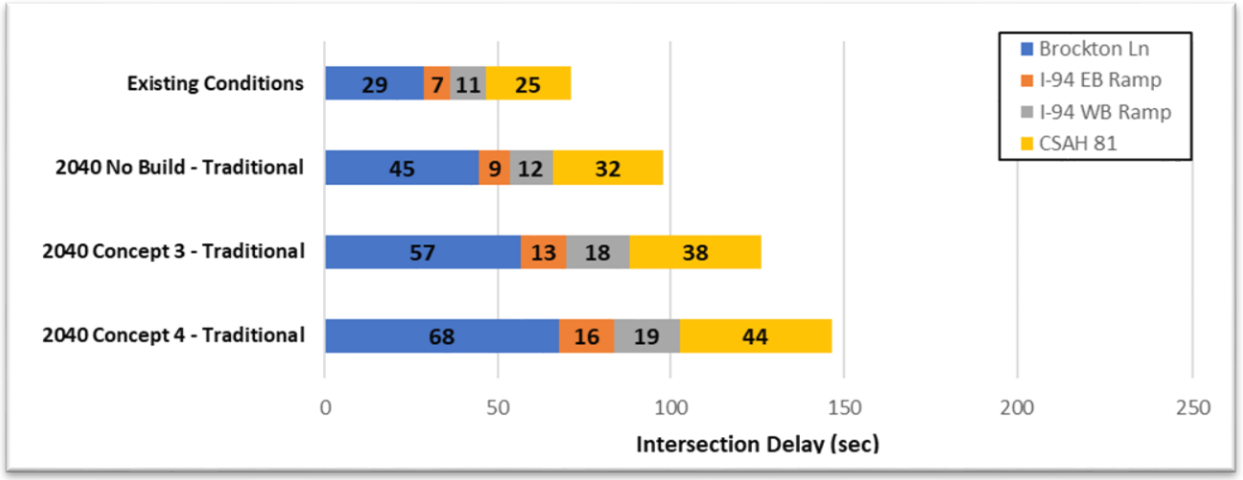


Figure 47: I-94/Dayton Parkway Intersection Delay; PM Peak Hour – Improved Geometry



Intersection Delay Sensitivity Test

Peak hour operational analysis was also conducted for the I-94/Dayton Parkway interchange using forecasts assuming increased telecommuting. The same methodology was used to calculate intersection delay under the telecommute forecast as under the forecast with traditional travel behavior assumptions.

AM peak hour intersection delay with existing geometry is shown in Figure 48 and PM peak hour intersection delay with existing geometry is shown in Figure 49. These figures show that the existing I-94/Dayton Parkway interchange will operate acceptably with or without a new river crossing under scenarios with additional telecommuting.

Figure 48: I-94/Dayton Parkway Intersection Delay with Increased Telecommuting; AM Peak Hour – Existing Geometry

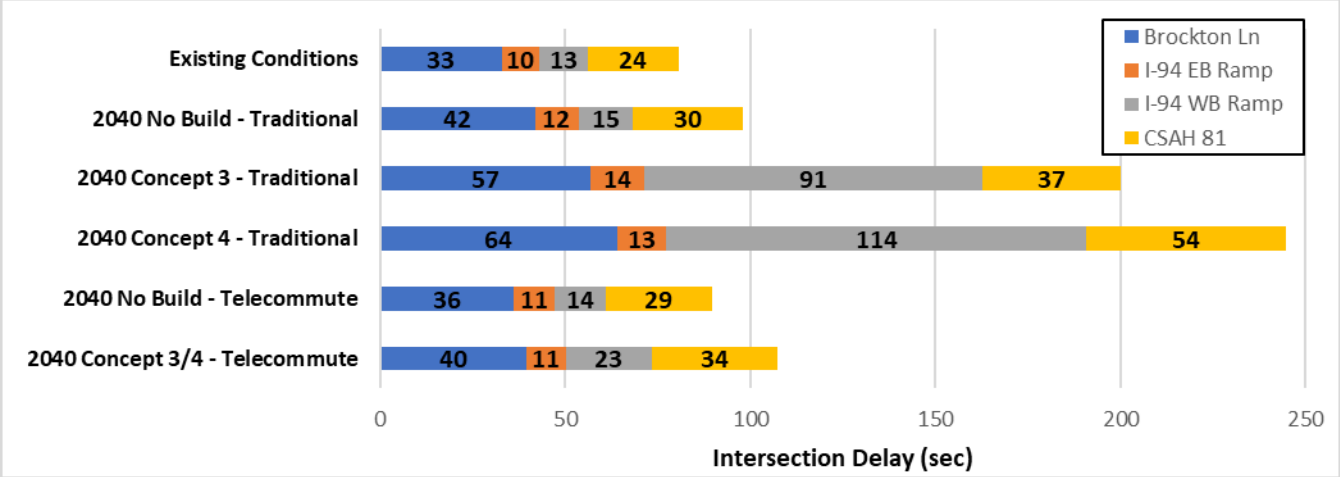
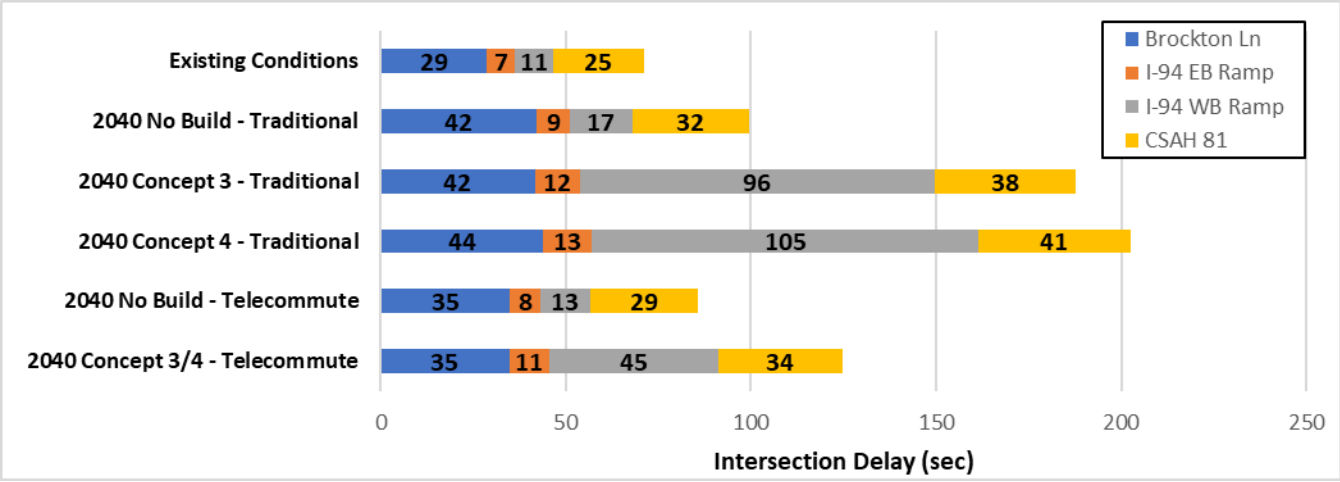


Figure 49: I-94/Dayton Parkway Intersection Delay with Increased Telecommuting; PM Peak Hour – Existing Geometry



Highway 10/Armstrong Boulevard Interchange

The Highway 10/Armstrong Boulevard interchange is shown in Figure 50 below. This interchange was evaluated to determine if it can accommodate future traffic volumes expected with a new Mississippi River crossing following the Zanzibar/Armstrong alignment.

Figure 50: Hwy 10/Armstrong Boulevard Interchange

Intersection Delay

Analysis of operational benefits at the Highway 10/Armstrong Boulevard interchange was conducted using Synchro/SimTraffic during future year peak hours. The results of this analysis indicate the existing interchange will operate well under 2040 no-build conditions if a new Mississippi River crossing is built as described in Concepts 3 and 4. Figure 51 and Figure 52 show the impact of the new river crossing on peak hour intersection delay at the Highway 10/Armstrong Boulevard interchange with existing geometry. Peak hour intersection delay at the interchange with improved geometry is shown in Figure 53 and Figure 54.

Figure 51: Hwy 10/Armstrong Boulevard Intersection Delay; AM Peak Hour – Existing Geometry

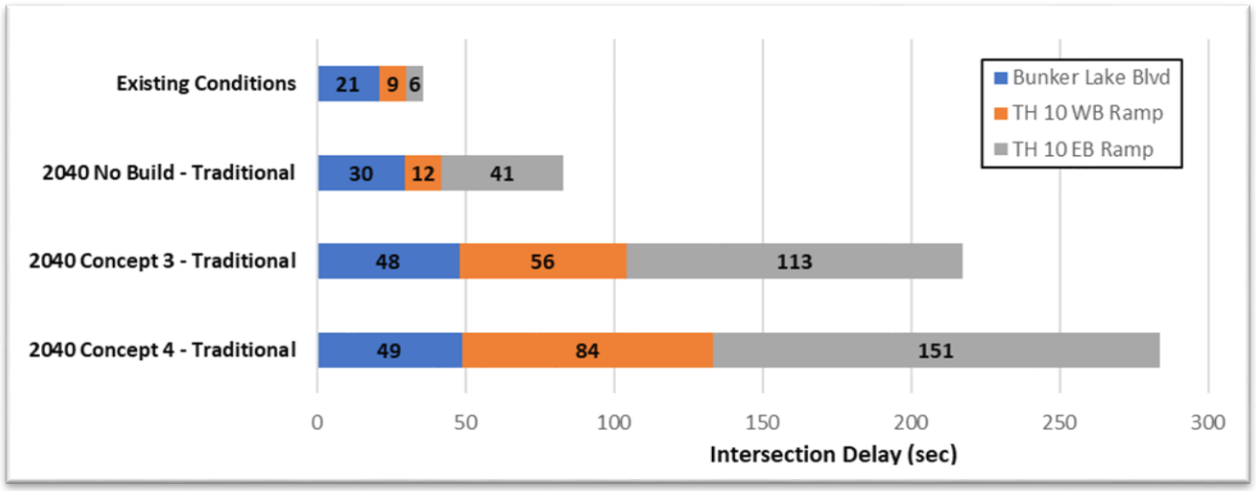


Figure 52: Hwy 10/Armstrong Boulevard Intersection Delay; PM Peak Hour – Existing Geometry

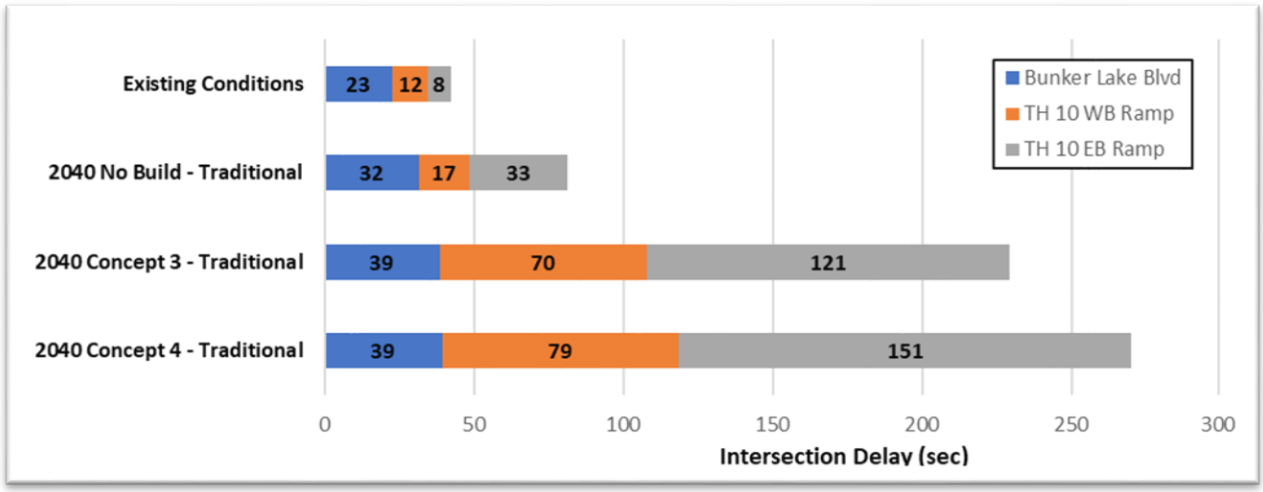


Figure 53: Hwy 10/Armstrong Boulevard Intersection Delay; AM Peak Hour – Improved Geometry

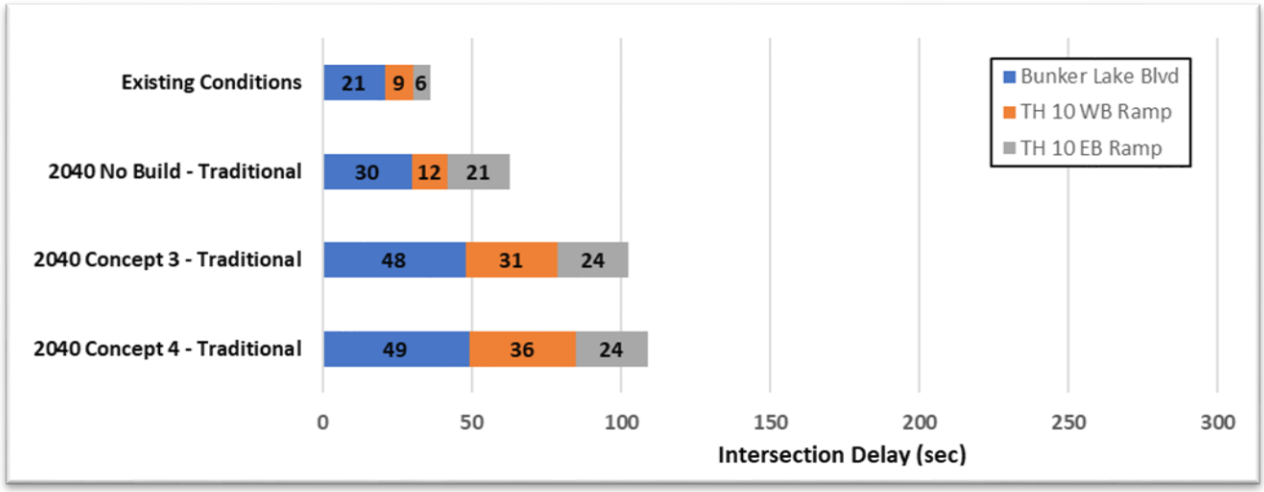
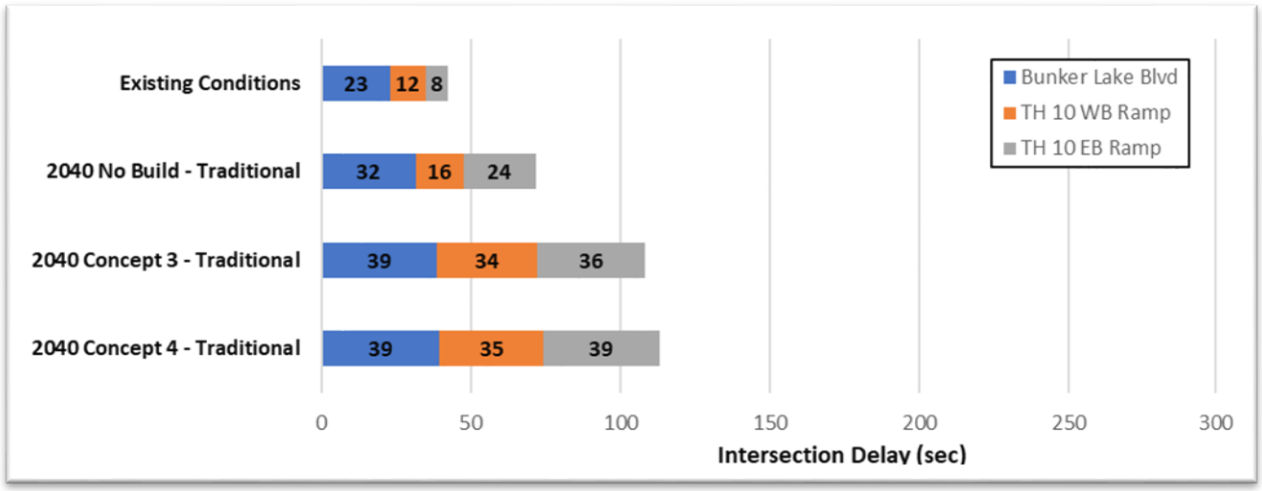


Figure 54: Hwy 10/Armstrong Boulevard Intersection Delay; PM Peak Hour – Improved Geometry



Intersection Delay Sensitivity Test

Peak hour operational analysis was also conducted for the Highway 10/Armstrong Boulevard interchange using forecasts assuming increased telecommuting. The same methodology was used to calculate intersection delay under the telecommute forecast as under the forecast with traditional travel behavior assumptions.

AM peak hour intersection delay with increased telecommuting and existing geometry is shown in Figure 55. PM peak hour intersection delay with increased telecommuting and existing geometry is shown in Figure 56. These figures show that the Highway 10/Armstrong Boulevard interchange will operate below 2040 no-build conditions if a new river crossing is built, but with significantly less delay under forecasts with increased telecommuting than under forecasts with traditional travel behavior assumptions. This is especially true during the AM peak hour, at which time intersection delay under the telecommute build scenario is half the delay under the traditional build scenario.

Figure 55: Hwy 10/Armstrong Blvd Intersection Delay with Increased Telecommuting; AM Peak Hour – Existing Geometry

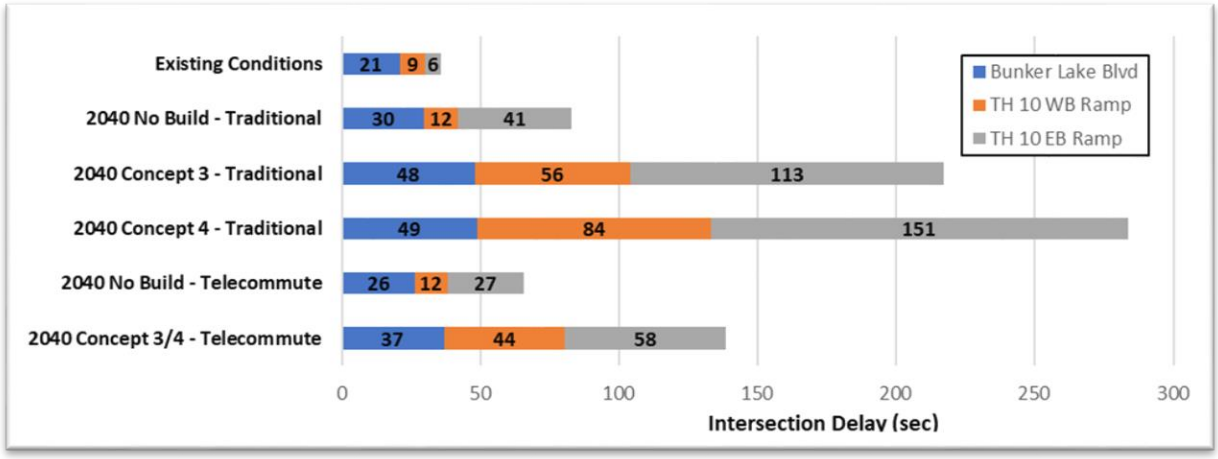


Figure 56: Hwy 10/Armstrong Blvd Intersection Delay with Increased Telecommuting; PM Peak Hour – Existing Geometry

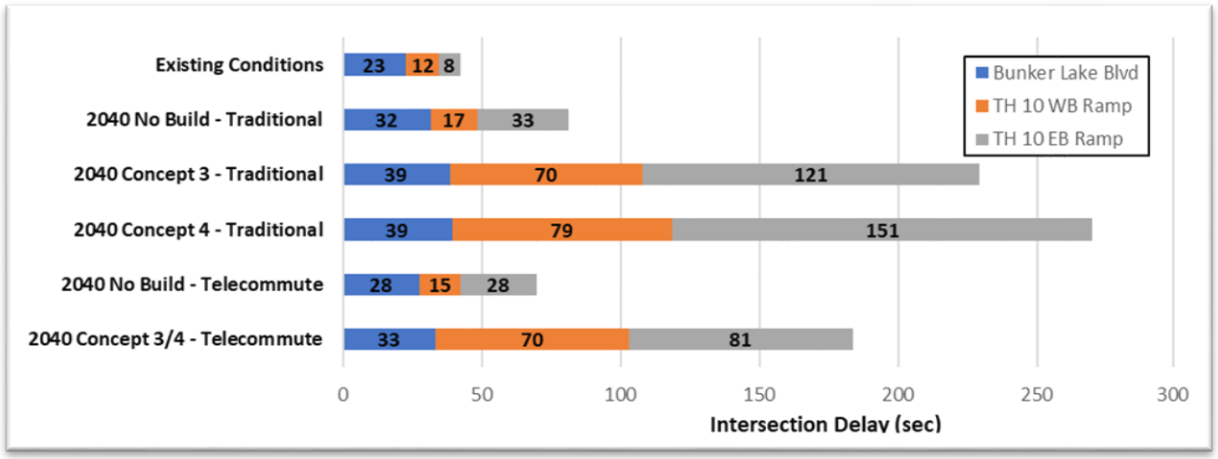


Figure 57 and Figure 58 show intersection delay at the Highway 10/Armstrong Blvd. interchange with increased telecommuting and improved geometry. These figures indicate there are operational benefits to improving the geometry of the Highway 10/Armstrong Blvd. under both traditional and telecommute build scenarios if a new river crossing is built, resulting in additional traffic movements at this location.

Figure 57: Hwy 10/Armstrong Blvd. Intersection Delay with Increased Telecommuting; AM Peak Hour – Improved Geometry

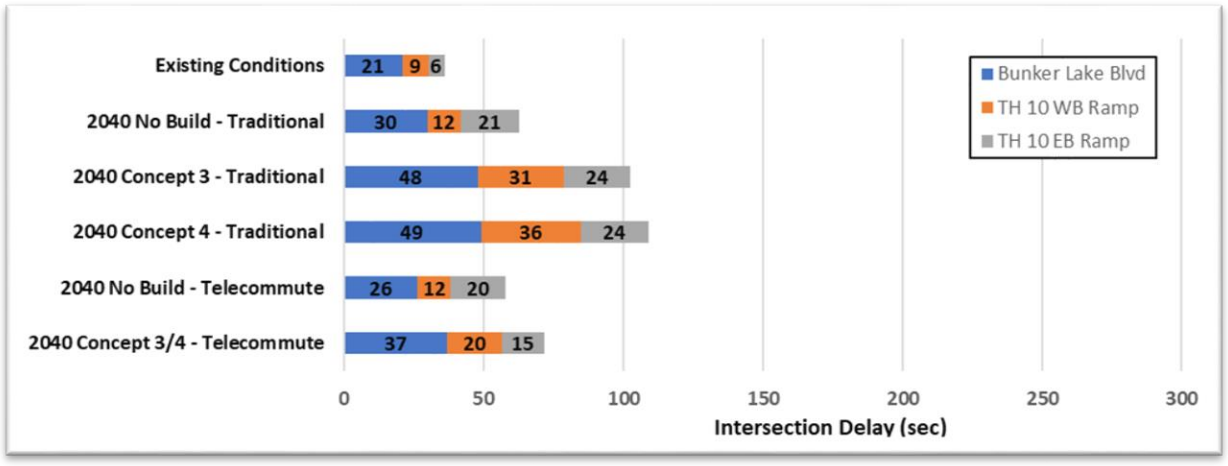
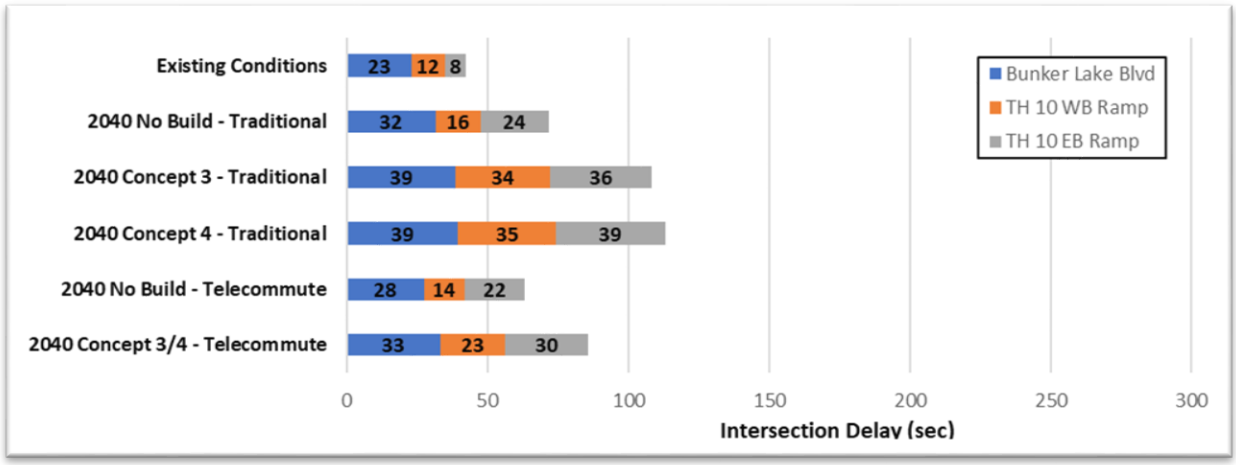


Figure 58: Hwy 10/Armstrong Blvd. Intersection Delay with Increased Telecommuting; PM Peak Hour – Improved Geometry



Highway 169 Mississippi River Crossing

A key segment of Highway 169 Mississippi River Crossing is shown in Figure 59 below. There are currently several issues on this crossing, including heavy delay and long queues during several hours of the day and limited right-of-way to address capacity needs.

Figure 59: US 169 NearSouth of the Mississippi River

Congestion Duration

This corridor was evaluated by analyzing hours of congestion. To determine hours of congestion, an existing daily volume profile was developed at the river crossing in each direction. This volume profile along with the existing hours of congestion on this corridor was used to determine the maximum throughput in each direction at the river crossing. Based on the existing data, the river crossing capacity was determined to be 2,500 vehicles per hour in each direction.

The feasibility analysis team then calculated year 2040 congestion duration on Highway 169 using the corridor's capacity threshold and future daily volume profiles developed for no-build and build scenarios. Forecasted changes in daily volume were applied to hours not already at capacity under existing conditions. This methodology quantifies congestion duration as the number of hours the daily volume profile exceeds corridor capacity. Year 2040 volume profiles for Highway 169 near the Mississippi River are shown in Figure 60 and Figure 61 below.

Figure 60: Highway 169 Year 2040 Northbound Volume Profile

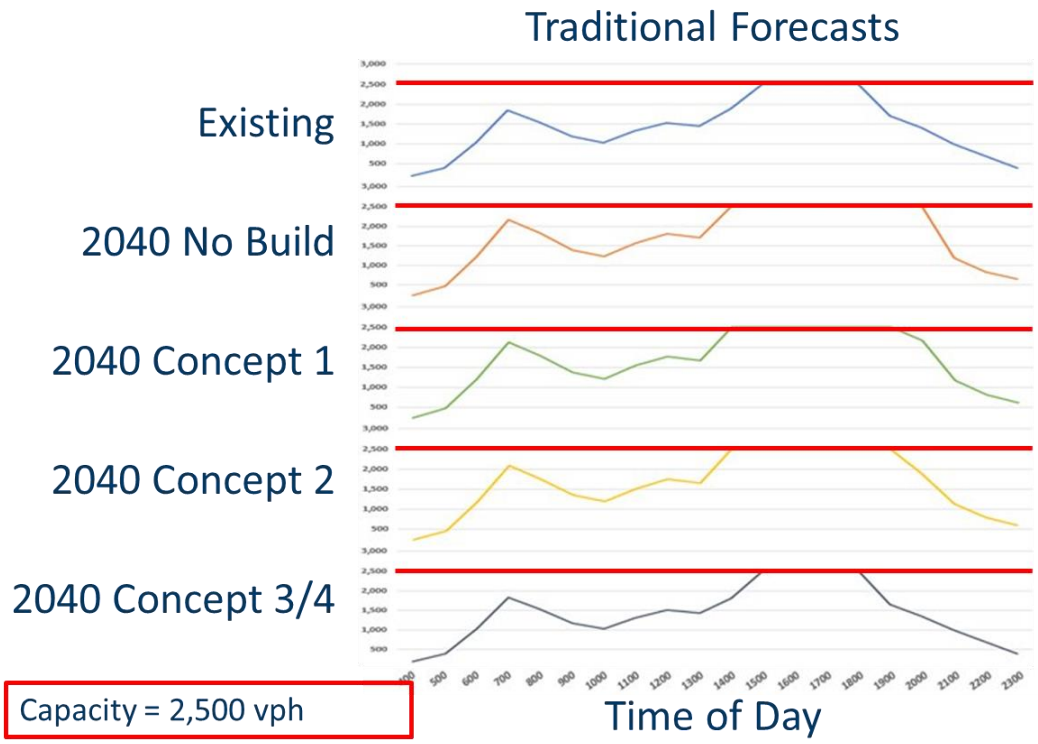


Figure 61: Highway 169 Year 2040 Southbound Volume Profile

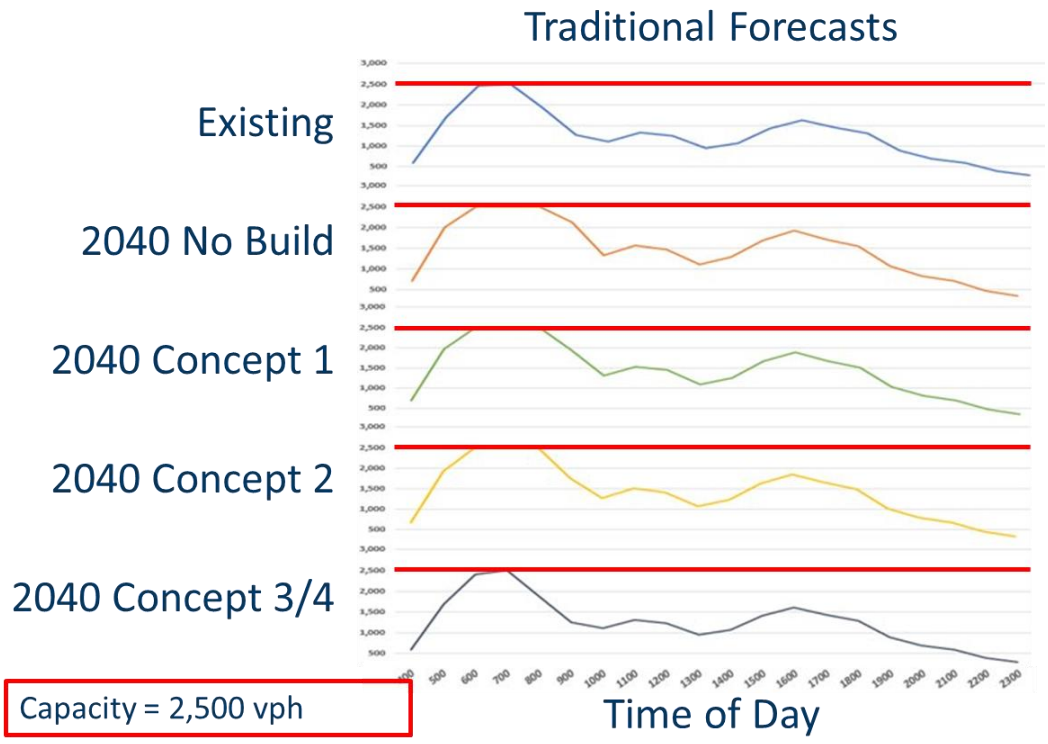
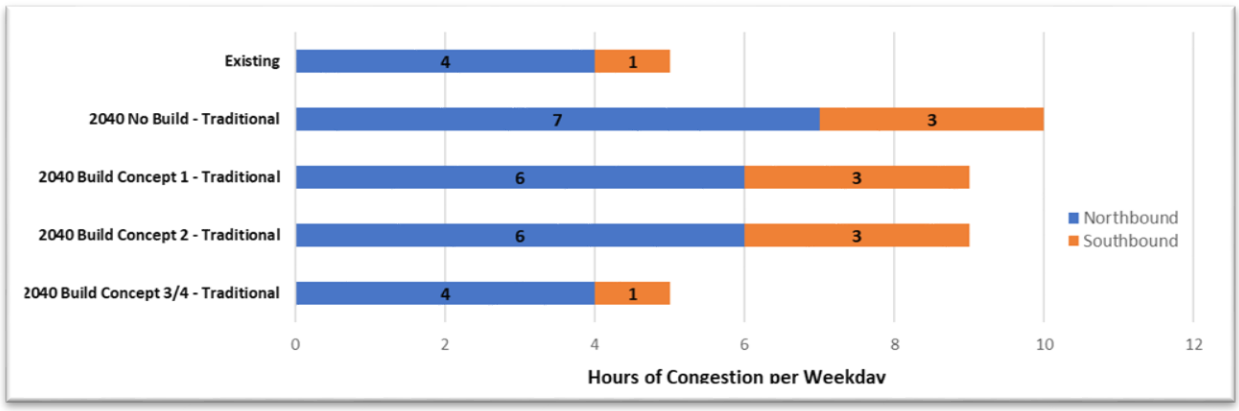


Figure 62 shows year 2040 congestion duration on Highway 169. Under existing conditions there are four hours of congestion in the northbound direction, and one hour of congestion in the southbound direction. Congestion duration increases to seven hours in the northbound direction and three hours in the southbound direction under the 2040 no-build condition. Under both Concept 1 and Concept 2 scenarios, northbound hours of congestion decrease to six hours per day, while hours of southbound congestion do not change. Northbound hours of congestion for Concepts 3 and 4 decrease to four hours per day while the southbound congestion decreases to one hour per day.

This analysis indicates that congestion duration on the Highway 169 crossing will double between 2018 and 2040 under no-build conditions, from five hours per day (four hours northbound and one hour southbound) to 10 hours per day (seven hours northbound and three hours southbound). Under the Concept 3/4 scenario, year 2040 congestion duration returns to levels consistent with year 2018 conditions.

Figure 62: Highway 169 Year 2040 Congestion



Congestion Duration Sensitivity Test

A congestion duration sensitivity test was also conducted for 2040 congestion duration on Highway 169 using forecasts that assume increased telecommuting. The same methodology was used to determine daily hours of congestion in the telecommute scenario as the scenario with traditional travel behavior assumptions.

Figure 63 and Figure 64 on the next page provide 2040 daily volume profiles for both directions of Highway 169 under telecommute scenarios. These profiles illustrate the times of day Highway 169 is congested (volumes reach the corridor's capacity threshold). Congestion duration – the range of times volumes reach the corridor's capacity threshold – is broadest under the 2040 no-build scenario. The duration narrows modestly under the Concept 1 and 2 scenarios. Under the Concept 3/4 scenario, congestion duration narrows significantly relative to 2040 no-build.

Figure 63: Highway 169 Year 2040 Northbound Volume Profile; Increased Telecommuting

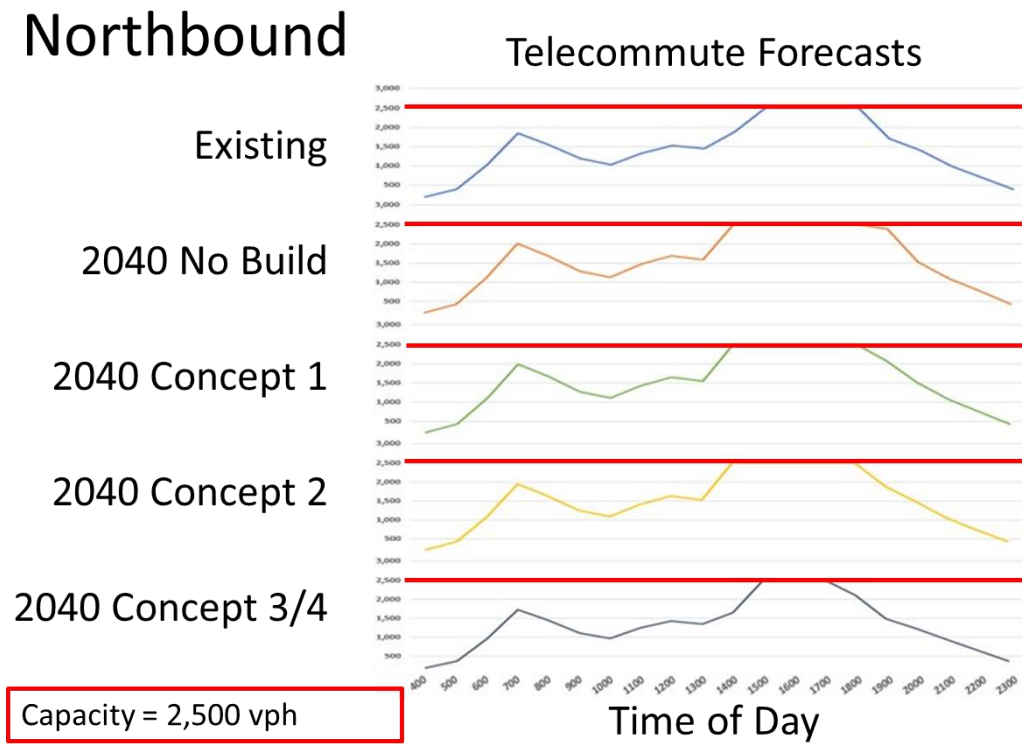


Figure 64: Highway 169 Year 2040 Southbound Volume Profile; Increased Telecommuting

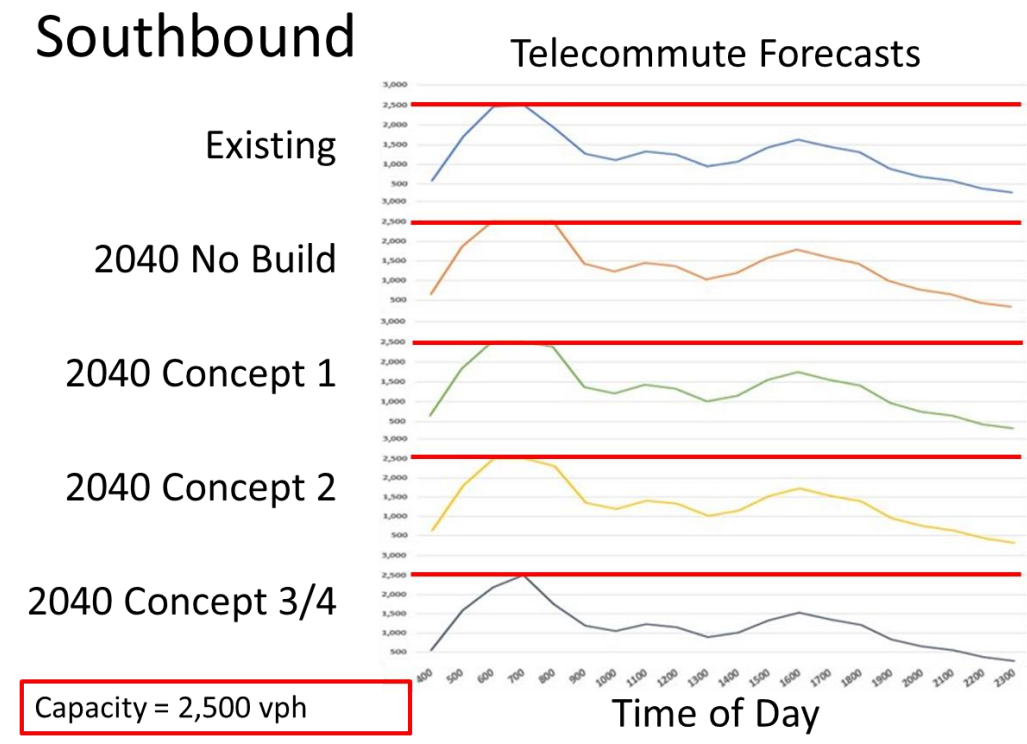
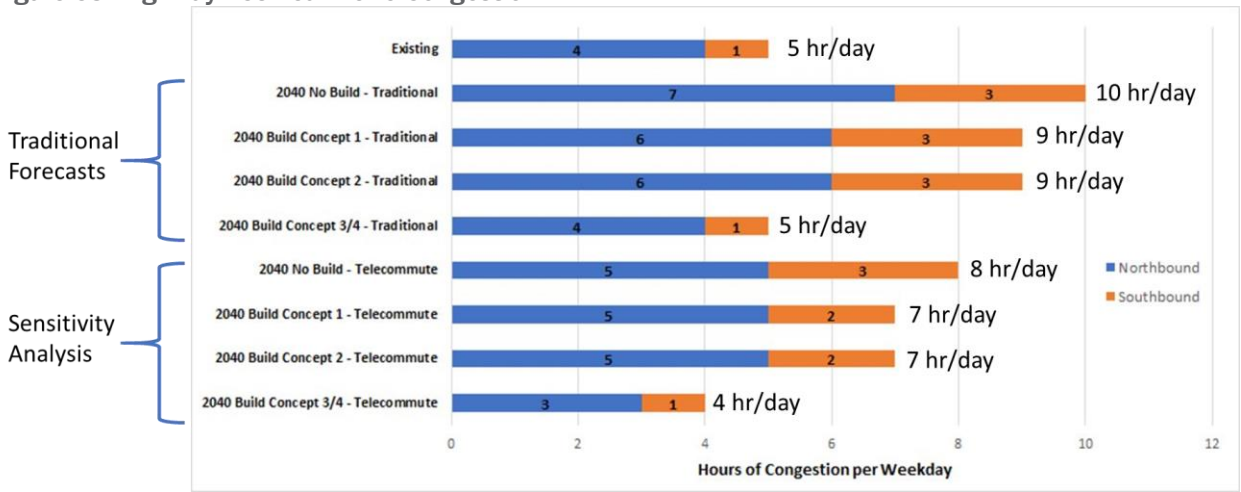


Figure 65 shows 2040 congestion duration on Highway 169 under traditional and telecommuting forecasts. It shows that even with increased telecommuting, the Highway 169 Mississippi River Crossing is expected to be congested eight hours per day, an additional three hours per day relative to existing conditions. This congestion falls to four hours per day under Concept 3/4. Taken together, these results suggest that congestion on Highway 169 is only slightly sensitive to the telecommuting, and that a new river crossing is effective at congestion reduction under traditional and telecommuting scenarios.

Figure 65: Highway 169 Year 2040 Congestion



IX. Conclusions and Next Steps

The Northwest Metro Mississippi River Feasibility Analysis explored regional travel patterns and considered whether improvements to existing highway and/or a new Mississippi River crossing in the northwest portion of the Twin Cities Metropolitan Area are feasible solutions to existing and anticipated mobility challenges. This final section summarizes the study's conclusions and recommends next steps for further analysis and project development.

Conclusions

As noted in the introduction, this study does not include a project recommendation. The study's results are presented as findings regarding the region's land use and planning context, prior transportation studies, travel patterns, current and anticipated mobility challenges, year 2040 traffic forecasts, teleworking rates, and the feasibility of four highway improvement concepts. These conclusions are summarized below.

Context Analysis

- Northwest metro highways have been studied multiple times over the last 30 years. Most of these studies identify the need for additional highway capacity.
- Growth is anticipated to continue in the northwest metro area. Ramsey, Corcoran, and Dayton are among the fastest growing communities in the Twin Cities.
- Investments have been made to address congestion and support future growth. Some communities have invested to accommodate a future crossing.

Origin-Destination Analysis

- Nearly 240,000 daily trips cross the Mississippi River using Highways 101, 169 or 610.
- Each crossing performs a unique role in regional travel patterns:
    - Highway 101 carries the most interregional trips.
    - Highway 169 is used by many short trips to local destinations.
    - Highway 610 serves the most commutes to and from the urban core.

Congestion Analysis

- There is heavy AM and PM peak period congestion in both directions on Highway 169 north of the river and Highway 101 north of the I-94/Highway 101 interchange.
- The worst corridor bottlenecks on northwest metro area highways are associated with traffic signals on Highway 169 and on Highway 101 southbound near South Diamond Lake Road.
- Highway 101 experiences a significant amount of holiday related congestion due to a four-fold increase in interregional traffic.

Concept Development

- A total of 14 highway improvements were screened for consistency with local & regional planning, residential and community impacts, and natural resource impacts.
- Improvements carried forward from the screening were packaged into four concepts.
    - **Concept 1:** Mobility improvements on Highways 10 and 101
    - **Concept 2**: Mobility improvements on Highways 10, 101, and 610
    - **Concept 3:** Arterial river crossing following the Zanzibar/Armstrong alignment
    - **Concept 4:** Expressway river crossing following the Zanzibar/Armstrong alignment
- Estimated net cost of the concepts range between $170M and $350M
- All segments improved under Concepts 1 or 2 were found to be "under capacity" post improvement but had minimal impact on river crossing congestion.

Traffic Forecast & Analysis

- Congestion is expected to increase on northwest metro highways under year 2040 no-build conditions.
- Concepts 1 and 2 draw traffic from local roadways onto Highway 10, 101, and 610. These concepts do not significantly change traffic volumes on the Highway 169 river crossing.
- Concept 3 draws 25,000 vpd to a new river crossing and reduces traffic volumes on Highways 101 and 169 by 8,000 and 10,000 vpd, respectively. Concept 4 draws 30,000 vpd and reduces traffic volumes on Highways 101 and 169 by 9,000 and 13,000 vpd, respectively.
- Concepts 1 and 2 reduce V/C ratios on improved facilitates but have little impact on the Highway 169 river crossing. Concepts 3 and 4 reduce V/C ratios on Highways 169 and 610 relative to no-build conditions.
- A 2040 traffic sensitivity test that increased telecommuting rates found that Highway 610 would be under capacity between Highways 169 and 252 in an increased telecommute scenario. I-94 and Highways 10, 101, and 169 are expected to continue to be congested under both traditional and telecommute forecasts.

Benefit-Cost Analysis

- The four concepts developed in this study provide regional travel time savings through decreased VHT. Concept 4 provides the most travel time savings among the concepts evaluated.
- All four concepts have a B/C ratio of at least 1.0 under scenarios with traditional travel behavior assumptions. Each concept retains a B/C ratio greater than 1.0 under a sensitivity test that considers increased telecommuting.

Operational Analysis

- The four concepts developed in this study result in significant operational benefits for the I-94/Highway 101 interchange. Concept 2 (southbound Hwy 101 to eastbound I-94 flyover ramp) achieves the most benefits, but Concept 1 (conversion to a diverging diamond interchange) is more cost effective.
- A new river crossing following the Zanzibar/Armstrong alignment reduces delay at the I-94/Highway 101 interchange by diverting traffic away from Highway 101. This results in a greater than 50 percent reduction in AM peak hour delay.
- A new river crossing following the Zanzibar/Armstrong alignment results in a 50 percent reduction in year 2040 congestion duration at the Highway 169 river crossing, from 10 hours per weekday under the year 2040 no build scenario to five hours per weekday under the Concept 3/4 build scenario.
- A new river crossing following the Zanzibar/Armstrong alignment increases delay at the I-94/ Dayton Parkway and the Hwy 10/Armstrong Boulevard interchanges. Relatively small-scale geometric improvements are available to mitigate these increases, allowing these interchanges to continue to operate acceptably with a new river crossing connection.
- Traffic sensitivity analysis reached the following conclusions:
    - The operational benefits of Concepts 1-4 at the I-94/Highway 101 interchange are similar under traditional and increased telecommuting forecasts.
    - The I-94/Dayton Parkway interchange operates acceptably in the telecommute no-build and Concept 3/4 build scenarios.

- The I-94/Armstrong Boulevard interchange operates under year 2040 no-build conditions in the telecommute Concept 3/4 build scenario, but delay caused by increased traffic volumes can be mitigated with improved interchange geometry.
- The Highway 169 river crossing remains highly congested under the year 2040 telecommute no-build scenario; Concept 3/4 reduces congestion under both traditional and telecommuting forecasts.

Next Steps

The Northwest Metro Mississippi River Crossing Feasibility Analysis developed four feasible solutions to current and anticipated mobility challenges in the northwest metro, including two concepts comprised of a new Mississippi River crossing. This technical analysis concluded with a series of facilitated discussions between MnDOT and city, county, and regional partners about next steps for the river crossing concepts.

These discussions revealed that agencies generally had a common understanding of the opportunities and challenges associated with the study's river crossing concepts, and that there was openness to participating in a corridor coalition to coordinate future priorities. In general, partner agencies recognize a new river crossing is a long-term endeavor and roadway improvements need to be made in the context of community development.

There are several steps partner agencies can take to advance a river crossing concept along the project development process. These steps include:

- Identify a **project champion**
- Establish a **project vision** to determine improvements that align with local goals
- Develop a **prioritization plan** for implementing improvements in the vision
- Conduct **public involvement** to incorporate additional voices into the process

With successful execution of these steps, a new Mississippi River crossing could proceed along the illustrative implementation timeline provided in Figure 66. This timeline assumes 20+ years between establishment of a project vision and construction. Preservation of right-of-way for a new river crossing alignment is a critical activity throughout the entire timeline.

Figure 66: Illustrative Mississippi River Crossing Implementation Timeline